International Water and Sanitation Centre
WHO Collaborating Centre

# Partners for Progress

## An Approach to Sustainable Piped Water Supplies



28 Technical Paper Series

**IRC INTERNATIONAL WATER AND SANITATION CENTRE**

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The centre aims to ensure the availability and use of appropriate knowledge and information in the water, sanitation and environment sector in developing countries.

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*Partners for Progress*

Coverphoto: Extension worker and village water committee member at a waterpoint in Malawi.

# PARTNERS FOR PROGRESS

An Approach to Sustainable
Piped Water Supplies



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**Abstract**
User satisfaction and scheme reliability were among the successful outcomes of demonstration projects with piped supplies for small communities in Malawi, Zambia, Indonesia and Sri Lanka. Since 1983 these projects have fostered maximum involvement of communities in all stages of project development. This book provides concepts and guidance on the "partnership approach" in which responsibility for projects is shared between agency and user communities. The comprehensive text emphasizes subjects such as community participation and women involvement and an integrated approach of piped water supplies, hygiene education and sanitation - by phase - in the project cycle, rather than dealing with these subjects separately.

Keywords: piped distribution / small community supply systems / community participation / water committees / planning / design / construction / health education / women / maintenance / administration.

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# *Preface*

Since the Water and Sanitation Decade began, there has been an increasing emphasis on the partnership approach to community water supply planning and implementation, with prospective users becoming more and more involved in decision-making, construction and operation of new facilities. With the recognition of operation and maintenance and resource availability as major constraints, policy makers have also been turning their attention to planning, training and institutional developments which better link decisions to the future upkeep and resourcing of the installed facilities.

Within this framework, this book focuses on programmes involving piped supplies for rural or urban fringe communities. In doing so, it recognizes that piped supplies are appropriate for only some of those in need of new water supplies. In many cases, the financial or technical commitments needed to keep a piped water supply functioning will be beyond the reach of target communities and supporting agencies. Boreholes equipped with handpumps or improved dug wells may then be a more appropriate solution. It is far preferable in the long term for a community to have dependable supplies from sanitary dug wells, than an unfulfilled promise of more convenient and plentiful supplies from unsustainable higher technologies. Often, the right solution will be a mix of technologies, with provision for progressive upgrading as the community gains experience of new systems and reaps the health and economic benefits of improved supplies.

Because choice of the wrong technology can have such a damaging effect on the success of new water supply programmes, the rules for choosing different types of piped supplies need to be fully understood. It may seem obvious that water projects based on motorized pumps need dependable supplies of power or fuel, but countless well-intentioned schemes in developing countries stand idle because diesel supplies are unreliable. That comparatively straightforward example clearly illustrates the need for proper planning to take account of constraints on future operation and maintenance.

If these needs are recognized at the planning stage, and the necessary time and budgetary allowances are made, piped water supplies can be one of the most important steps in community development. Not only should the provision of safe, convenient water facilitate health and socio-economic benefits, but the community organization needed to make the water system successful can provide a starting point for many other development activities.

To develop and promote some of these concepts, funds from the Netherlands Directorate-General for International Co-operation (DGIS) were utilized by IRC to support the development of community-based water supply and sanitation methodologies based on public standposts in four developing

countries (Malawi, Zambia, Indonesia and Sri Lanka). The Public Standpost Water Supplies (PSWS) demonstration project (1983-1986) promoted maximum involvement of communities in all stages of project development. It also emphasized the need for the government agencies concerned to provide dependable support and to help equip community members for their role in the future running of the systems. A follow-up project (1988-1992) on Piped Supplies for Small Communities (PSSC) in both Malawi and Zambia, aims to develop and apply the community-based approach further, and puts new emphasis on the development of mixed levels of service.

Within these projects, measures taken to achieve an agency/community partnership have differed significantly from country to country, depending on the traditional roles of different community members and of local and central government agencies. In all four countries, community participation produced good results, including a visibly increased commitment to self-help in water supply and sanitation and other health issues. The process was time consuming though, and it is important to recognize that involving whole communities in decision making needs time and patience from both community members and implementing agencies. However, it is fair to say, on the basis of the project experiences, that the resulting benefits in user satisfaction and scheme reliability justify the investment in time, effort and flexibility of approach. These experiences, along with information from projects in a number of other developing countries, have been used to develop the concepts and guidance here.

The main theme throughout the book is therefore planning and developing sustainable piped water systems in rural and peri-urban areas. Its objectives are both to review and summarize current experiences and to translate them into more general project guidelines for the entire project cycle. Chapter 1 sets out the principles of this approach, and the lessons learnt from previous experience.

Choosing the right technology and service level are key conditions to sustainability; they are discussed in Chapter 2. Increasingly day-to-day management of the resulting system will be carried out wholly or partly by the communities themselves. The basis for this management is laid in the project preparation and planning phases, when the partnership approach begins. Chapters 3 through 5 discuss these crucial stages. They cover both technical and non-technical aspects, and describe the way local men and women can take part in informed decision-making and building of local management capacity.

A key phase is design and construction. This is addressed in Chapter 6, with special emphasis being given to user acceptability and involvement. However, the proof of sustained functioning and use only comes during the operational phase covered by Chapter 7. This phase is nowadays correctly receiving increased attention, and much progress is taking place in development of community support systems, community based financing, and monitoring and evaluation of project performance and use. The final chapter looks at ways

programmes can be improved using some of these concepts, including demonstration and exchange of information. An appendix looks at the wider setting and describes some universal sector issues as optional background.

Finally a word on potential users. The book is aimed principally at developing country professionals of all disciplines who are involved in planning, implementing or supporting piped supplies projects. It is not intended to be a technical text or one that focuses on any single subject. Instead the book aims to promote the integrated approach, with professionals of many backgrounds working together to assist communities to plan, realise and successfully sustain and benefit from piped water supplies. Feedback in the use and application of the book and suggestions for future improvements of development are warmly welcomed.

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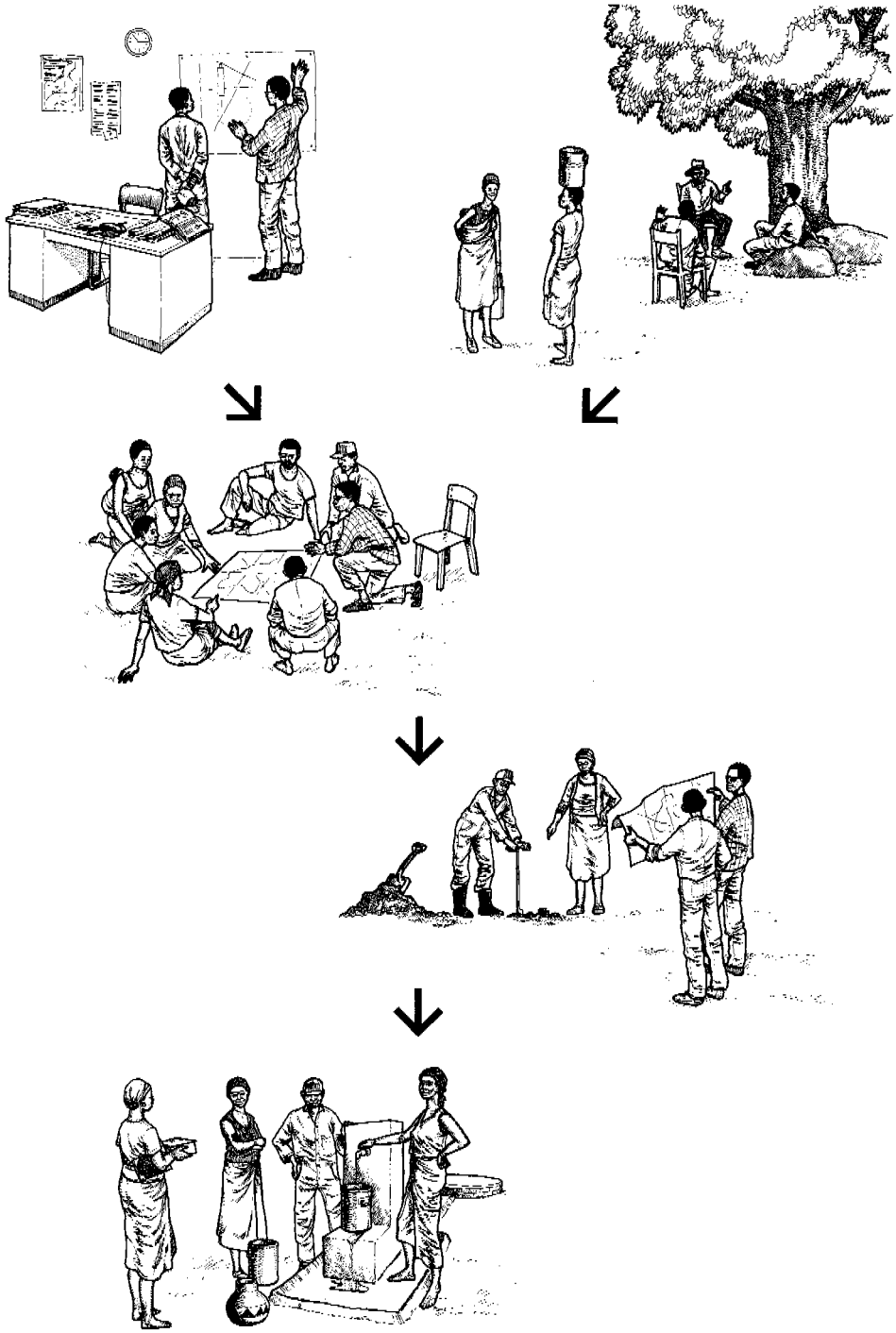


The Partnership Approach.

# 1. *Towards Sustainable and Effective Services*

Considerable improvements for many millions of people have been brought about by the International Drinking Water Supply and Sanitation Decade (IDWSSD). Nevertheless, by the end of 1990, when the IDWSSD came to an end, at least 800 million people in the rural and urban fringe areas of developing countries were still without a safe supply of drinking water (WHO, 1988). With the developing world population rising at a rate of 160,000 people per day, the challenge of providing basic services for all people by the end of the century is formidable.

But providing new or improved water supplies is only part of the challenge. Experience during the IDWSSD has shown only too clearly that operation and maintenance of water supply systems once they have been installed poses severe difficulties for many water agencies. Examples of recently implemented water projects which have fallen into disuse and disrepair are all too common. They represent a waste of money and effort, and have a strong demotivating effect on the communities concerned when further initiatives are suggested.

## 1.1 Objectives of improved community water supplies

The IDWSSD has helped donors, recipient governments and sector agencies to learn some important lessons about the approaches to community water supply improvements in developing countries. The most critical of these lessons involves the relationship between the water agency and the benefiting community at all stages of project planning, implementation, operation and maintenance.

Failures of all types of water projects can frequently be traced to the fact that either the community or the water agency has been unable to meet the commitments necessary to keep the installed facilities functioning. Because so many water systems have fallen into disrepair, the key concept for water projects today is to ensure **SUSTAINABILITY**, that is, to *design, build and manage improved water services in such a way that they continue to function reliably and well, and the funds for keeping them functioning continue to be available.*

**"Functioning reliably"** in this context means that the systems function throughout the year with convenient operating times and only infrequent breakdowns, which are quickly repaired.

**"Functioning well"** implies that the systems supply enough water to meet at least the basic needs of all households in the defined project areas, and that this

water is of a consistently acceptable quality. It also means that the systems are expanded in time to cope with population growth and increased water use, and that enough funds continue to be available to maintain the agreed standards of operation.

The cases where water agencies can do this job alone are not frequent. Most agencies deal with large and rapidly growing numbers of small and scattered water systems in large areas, often with difficult access. The same agencies usually have a shortage of trained manpower, lack of reliable transport and insufficient funds to meet the service requirements of the system. One way out is to lower agency costs (for example by decentralization) and seek more financial contributions from the government and/or the users. Another, and increasingly popular approach is to reduce direct maintenance costs and improve results by sharing maintenance and repair tasks, including management and financing, with the user community itself.

However, sustainability is not the only goal for a successful water supply project. Sustainable services which a part of the population in the project communities does not actually use, or uses ineffectively, fail to realize their potential health and socio-economic benefits. The sustainability concept is therefore complemented by the concept of **EFFECTIVENESS**: *all families in the project communities actually use the improved water service in an optimal way.*

**"Optimal way"** in this case can have several meanings: general and exclusive use, hygienic use and developmental use.

**"General and exclusive use"** occurs when all households in the project communities use only the improved water system, at least for drinking. This will only happen when the improved water system is competitive with the formerly used water sources, the service is reliable and affordable and the water quality (taste, colour) acceptable. In some cases, unimproved water sources will still be used by some or all households, e.g. in case of competitive traditional sources, or prolonged breakdown of the improved system. This need be no problem when drinking water is consistently boiled, or when traditional sources are adequately protected and hygienically used (see figure). However, this is seldom the case without special project inputs.

**"Hygienic use"** means that drinking water from the improved water system is collected, stored and drawn in a safe manner, without risk of contamination. Also intake areas and water points are kept clean and free from polluting activities and conditions. Further, the volume of water used from the improved system should increase in comparison with that from traditional water sources, indicating improved personal and domestic hygiene.

"**Developmental use**" occurs when women and children benefit from shorter distances, lower efforts and/or greater safety in water collection; women and children have as a result more time and energy to spend on domestic or economic work, education and community development. More surplus water becomes available near to the home for vegetable gardening, animal husbandry and small-scale industries like brick and tile making. While such benefits are feasible, they usually only occur with the right preconditions and inputs.

Hygienic use of water includes improved personal hygiene, and brings greater health benefits. Photo: PROWWESS.

The concepts of sustainability and effectiveness are related: when systems do not function reliably and well it will not be possible to establish good use. On the other hand communities have to be convinced of health and other benefits of safe and sufficient water to be motivated to take up a large share of maintenance and management responsibilities and tasks for long-term sustainability.

To promote sustainability and effectiveness as they are outlined here, agencies have to adopt a new approach and acquire new skills, different from those which have been usual up to now. Instead of emphasizing technical knowledge and inputs only, they will need to focus more on ways of sharing knowledge, decision making and tasks with communities.

## 1.2 Piped systems and the need for partnership

Piped water systems offer excellent opportunities for the sustainable implementation and effective use of improved water supply. The term "piped supplies" covers a range of water supply systems with different degrees of sophistication and complexity. Piped supplies differ from "point source" systems (handpumps and dug wells) in that the water is conveyed by pipes some distance from the source to a number of distribution points. The power needed to achieve this water transmission will ideally be natural (gravity flow from upland streams or springs) or, more commonly, where gravity flow is not possible, be provided by motorized pumping (electric, diesel, solar, wind) from boreholes or river intakes to elevated storage tanks. At the consumer end of the system, distribution of the water may be through public standposts, neighbourhood taps, yard taps, or individual house connections.

When they function reliably, piped supplies offer a higher level of service than point source systems. Taps can be more conveniently located than the boreholes or dug wells from which consumers must lift or pump their own water; and the quantity of water available from a reliable piped supply system is generally greater than from a dug well or handpump. As a result, general and exclusive water use and improved hygiene are more easily obtained, especially in the case of group, yard or house connections. Average water use for communal taps within 250 metres for example, ranges from 20 to 50 litres per person per day (l/p/d). For single private taps this range is 30 to 60 l/p/d, while use from communal traditional sources may be as little as one litre, but is usually around 4 to 12 l/p/d.

The pre-condition "when they function reliably" is important. The price of the increased convenience of piped supplies is added complexity and extra cost. Piped supplies keep functioning only when pumps, pipes, valves and taps are regularly maintained, leaks are promptly repaired, fuel supplies are continuous, and spare parts are on hand when needed. They depend too on water resources being sufficient to cope with growing demand, and on suitable drainage facilities being provided and maintained, to dispose of extra wastewater. There is no shortage of examples of systems where these basic requirements have not been met. Long queues of water containers waiting for the next "on" period of an intermittent supply are a common sight in developing countries.

Often the problem can be traced back to poor planning. Attractions of piped supplies compared with, for example, handpumps encourage their adoption for communities where upkeep of the technology cannot in reality be afforded or managed. The result is a badly functioning scheme and "beneficiaries" worse off than they would have been with a less superficially convenient but more reliable system based on handpumps. Where communities do have the resources and the willingness to look after a piped water supply system, careful planning and design are essential ingredients of long term success. In most cases, the agency

will need to prepare local people for such tasks as lubricating pumps, checking and repairing taps, tracing and repairing leaking pipes. Guidance will also be needed on appropriate management and financial systems to ensure that fuel, spare parts and major repairs are available and can be paid for when needed. If surface water is used and there is a need for treatment, additional training of operators will be necessary, along with the organization of supplies of any chemicals needed.

As well as equipping the users to meet their maintenance commitments, the water agency must accept commitments of its own. Any initial training will need to be followed up with refresher courses and regular monitoring and advice for local caretakers/mechanics and management organizations. Supplies of fuel and spare parts will have to be organized, as well as agency assistance for the more major repairs. The agency will also need to offer continuing hygiene education, advisory and problem solving services. Cost recovery mechanisms will be needed to ensure that the agencys own inputs are sustainable.

Regular training is needed for local mechanics, as well as for agency staff. Photo: WHO/WPRO.

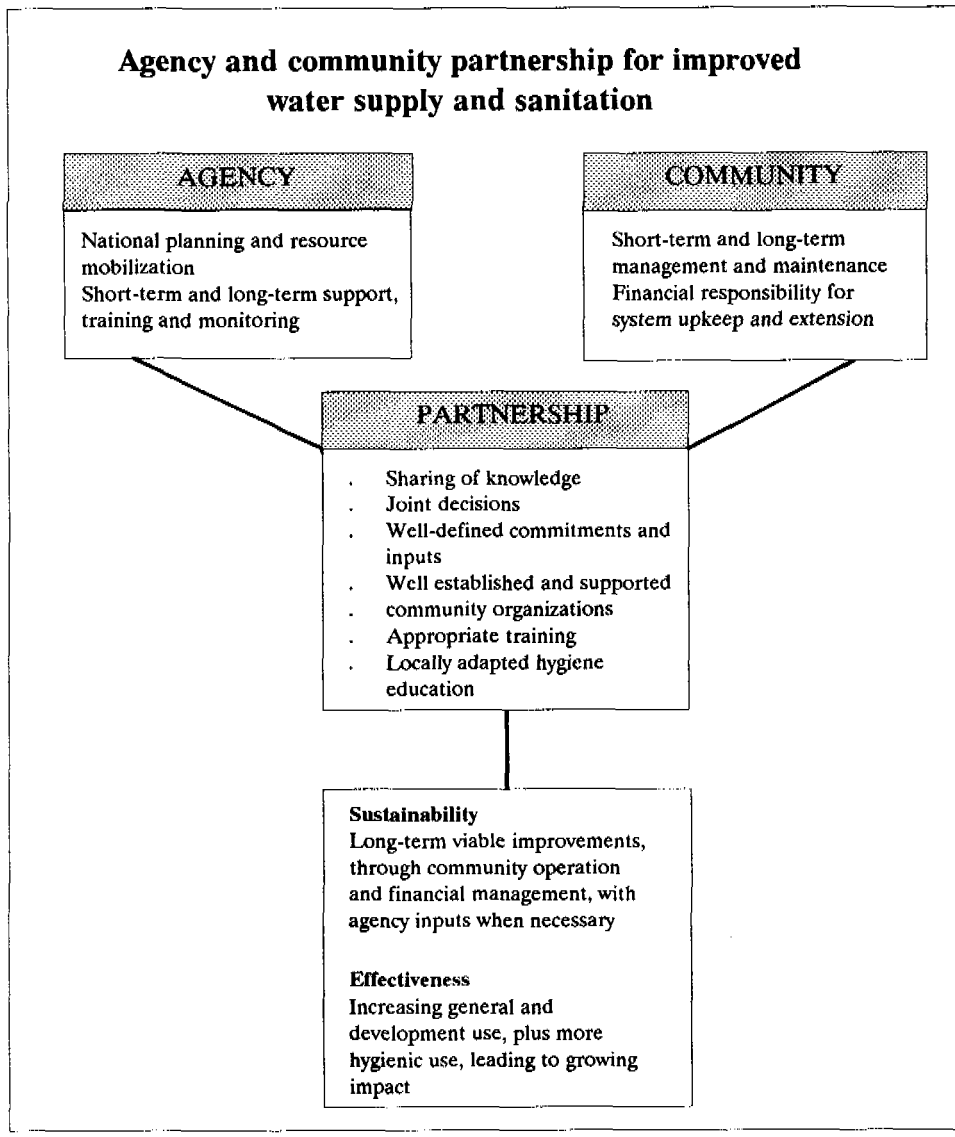
Recognition of these, and many other needs of a successful piped water supply system, has led to the concept of a "**PARTNERSHIP APPROACH**". Right from the start, it is argued, decisions about types of technology, levels of service, positioning and frequency of neighbourhood taps, organization of water committees, provision of local labour for construction, selection and training of community members for maintenance duties, and so on, need to be reached jointly through continuous dialogue between the prospective users of the new system and the implementing agency. This partnership not only has to continue throughout the project cycle, including the monitoring and evaluation of all phases, but also after the project, when community and agency co-operate in maintenance of the system.

Community participation is not a new concept, but its application in the planning and implementation and maintenance of water supply systems is only recently being attempted in such a comprehensive way as called for by the partnership approach. However, experience shows that it is only when the community is in this way involved in all parts of the project cycle, and plays a real part in decision-making, that new systems will be accepted and successfully maintained.

Adoption of the partnership approach requires considerable skill on the part of the implementing agency. Technological knowledge must not be used to override the desire of a community for particular levels of service, but must be shared in such a way that the choice emerges through the community's own decision-making processes. Ways of involving different sections of the community in water supply planning, implementation and operation are discussed throughout this book.

## 1.3 Some key aspects of the partnership approach

Why is this partnership so important for sustainability and effective services? Experience over the last ten or more years shows that communities will only maintain and pay for water supplies which they feel are an improvement over their traditional systems and consider are worth spending their limited resources on. The best guarantee to obtain accepted and sustained water systems is to involve users early on in decisions on what they can get, what the technical, cost and health consequences of each option are, and how they could organize such improvements. The following are some key aspects of the partnership approach, drawn from the lessons learnt from world-wide experience so far.




## Choosing technologies that are acceptable and sustainable

One useful general principle applying to technology choice in community water supplies evolved during consideration of the preconditions for success on handpump projects. It is that "the technology chosen should give the community the highest service level that it is willing to pay for, will benefit from, and has the institutional capacity to sustain" (Okun and Ernst, 1987).

There is sometimes a tendency for water agencies, perhaps under pressure from donors, to steer communities towards choosing lower cost technologies, on the basis that available funds can then be spread further. While it is a mistake for a community to aim for a level of service too high for it to afford or sustain, those users who do have the resources to sustain yard taps or house connections should be encouraged to do so. Seemingly "cheaper" options will often fail because they do not meet the people's aspirations and will not be accepted. It is however important that consumers receiving higher levels of service should pay the full costs of providing such services, if others are not to be penalized.

An example is the standpost programme supported by USAID in Thailand in the 1960s (Dworkin et al, 1980). The installed pumps were not maintained and used only to a limited extent because the service was not considered better in terms of convenience, privacy, water quantity and quality. Subsequent rainwater collection tanks and piped systems with yard connections became very popular, especially when appropriate financing systems to sustain them were set up.

On the other hand it is wrong to presume that yard-tap supplies automatically provide a higher level of service than, for example, handpumps. If the supply to the yard taps is only available for a few hours a day because of water or fuel shortage, or if pump breakdowns mean that no water can be supplied for several weeks until the mechanic arrives, most communities when asked to make a conscious choice, would sacrifice the "convenience" of yard taps and settle for a walk to a neighbourhood handpump supplying continuous water and repaired by the village caretaker as soon as it breaks down. The key point is that, whatever technology is chosen, it must be sustainable with the resources available to the community.

## Accepting varying needs and capacities as a starting point

Taking sustainability as a guiding principle means recognizing two additional points:

(a) different communities are not necessarily uniform in their needs and capabilities and
(b) within the communities themselves, user needs and readiness to contribute also varies.

As a result, a mixture of technologies and service levels may often be the right answer.

At present, often only single technologies and service levels are introduced, regardless of the characteristics of the communities concerned. At one end of the range of conditions, communities may be poor isolated villages with subsistence agriculture and limited technical and administrative experience, yet a great sense of unity and self-help tradition. At the other end are large, well-to-do settlements situated along main roads or railways, with growing businesses, a cash economy, modern administration and a desire for efficient

private services without community demands on self-help and voluntary administration. Yet both types of community often get the same technology and service levels, because of national standards or donor decisions, even though individual consumers may be willing to meet all extra costs for an above-standard service.

Within communities, needs and potentials also differ. In the Thai case for example, even when yard-tap piped supplies were offered, some poor families were not ready to pay the relatively high water rates and did not connect to the service. This hampered the public health and social benefits of the system, and 60% of the systems provided water for less than the whole community. A greater mix of service levels, eg. group connections next to private taps or spreading payment of connection costs, may increase the accessibility of lower income households to a sustainable basic service.

## Planning for community involvement

For the partnership approach to be fully effective, the agency has to plan carefully for the involvement of communities in all project planning and decision making. The communities not only have to be informed on the project but the agency must in the first place work with them to identify their needs and capacities. To give both the agency and the communities a good overview of conditions and issues that have to be taken into account, it may be necessary to gather some baseline data on water use and needs, socio-economic status and health and hygiene conditions, of the communities concerned.

Another important aspect of planning for community involvement is the identification or establishment of strong community organizations which will be able to take on the management of the improved water system.

## Informed decision-making during local planning

If the communities are to take on all or part of the maintenance, management and financing tasks after the installation of the water supply, it is only logical that they should get an informed choice on what they are going to maintain, administer and finance. Each technology type and service level has its own consequences for community inputs during construction; cost and complexity of maintenance and administration; likelihood of reliable service; quantity and quality of the water supplied; potential benefits for community and family health; costs and productive use of water; time gains. It is only when the full consequences of each option are considered that the users can make a wise choice, and the basis is laid for future community contributions.

## Choosing appropriate maintenance, management and financing systems

Just as the appropriateness of the technology choice and service levels have to be considered on their longer-term consequences, so have the appropriateness of different maintenance, management and financing options. Management of the water system by an existing village organization may for example be possible when this organization is efficient, can handle different tasks at the same time and represents the interests and has the support of the whole community and not just of a specific section. In other cases, some other form of local management will have to be looked for. The same goes for local maintenance and financing, say in choosing between repairs by village-selected, trained and employed staff, or instead relying on private enterprise in the area, or in choosing between monthly collection of water rates or organizing different types of public fund raising.

## Continuing local planning after the design phase

During local design and planning the basis is laid for future maintenance, management and financing, for example by choosing suitable village water organizations, suitable candidates for maintenance training, and agreeing on the principles and approximate costs of local maintenance and management tasks. More detailed planning of the active work will come during the later stages of the project, when the physical work has started, and again when it is nearing completion. Thus, there is a progressive refinement and practical character to local planning, supplemented by specific training for agreed tasks.

## Formal division of responsibilities and rights

Another fundamental aspect of the partnership approach is that the sustainability of any water system depends on the right division of responsibilities between the beneficiaries and the water agency concerned, in both implementation and operational phases.

Duties and rights of each party in planning, construction and maintenance need to be clearly defined, and mechanisms for making sure they are kept agreed upon. This makes clear where each party stands and increases opportunities for corrective action, for communities as well as agencies. Agencies may for example have the duty to ensure that all construction material is in place before self-help in trench-digging is started, to avoid trenches that have caved in by the time the pipes arrive. Communities may have the duty to keep maintenance records so that the agency can assess the cost-effectiveness of its participatory programme in the longer run, and at the same time have the right to receive the training, record books and supervision needed to do a good job.

## Training and support on technical and managerial aspects

The capacity of a community to manage the maintenance of a particular technology can be developed only if project planners include some essential provisions in the overall programme. Unless tools, lubricants and regularly-needed spare parts are easily accessible locally, the community will have to depend on agency mechanics, even for routine maintenance. Evaluation and possible strengthening of manufacturing, distribution and sales outlets for essential materials and components must be part of the project planning.

Similarly, planned training programmes for caretakers and mechanics, and practical training in simple budgeting, financing and financial management for village water organizations are vital to the ultimate success of the community water project.

Training for these tasks will often involve strengthening the capabilities of local or district offices of the agency itself to support community activities or to establish collaborative programmes with other agencies or institutions capable of training and supporting community organizations. Thus, the PSWS water supply project in Malawi (Kwaule, 1988) had first to develop a more practical bookkeeping system and train programme staff in monetary skills before it could train rural committees for better financing and financial management.

## Complementary improvements in sanitation and hygiene education

Apart from sustainable and reliable water systems, there is another essential component if maximum health benefits are to accrue: provision of new water supplies has to be accompanied by complementary improvements in sanitation and in hygiene education. This need for integration means that water supply programmes must have an interdisciplinary approach, combining technical aspects of health, water supply and sanitation with socio-economic and cultural issues influencing the upkeep and use of new facilities. Merely adding general health programmes to water supply projects has proved not to work (Burgers et al, 1988). Usually successful water supply projects demand a specific hygiene education strategy as well as close collaboration among ministries and agencies at all levels, to work towards the common goals.

## Planning for extension and upgrading

Agencies also need to encourage communities to see the development of water supply systems as a step-by-step process. As benefits accrue and operational experience is gained on the first level, so the demand for improvements and the capacity to sustain them grows, until the community is ready to take further steps. Thus progressive upgrading of initial lower technology solutions - such as public standposts to neighbourhood and yard taps - and expansion of service to new settlements areas, can be achieved as the community develops.

## Monitoring, evaluation and sharing of information

To be able to improve on project actions and procedures and to learn from experiences, regular monitoring and evaluation of projects are necessary. With the partnership approach both agency and communities will contribute to monitoring and evaluation and will benefit from the results.

Finally, it is important to recognize that the replicability of successful approaches depends on the sharing of information about both successes and failures. Timely and comprehensive recording of project results and evaluation of the approaches and technologies used, provides valuable data for future planning and implementation. For example the results of the PSWS demonstration project have been laid down in a series of country-level reports, including a comparative overview of the different approaches developed in the four participating countries.

# 2. *Choosing a Community Water Supply System*

Most water supply programmes implemented by developing country organizations, with or without the support of donor agencies, need to involve a range of technologies. The aim is to match the needs, resources and willingness to pay of different community groups with an appropriate mix of, for example, yard taps, neighbourhood taps, public standposts and handpumps. As discussed in Chapter 1, sustainability and effective use are the overall goals. Of the many criteria for successful community water supply programmes contributing towards achieving these goals, experience shows that three are fundamental:

(i) The community must be convinced, through having participated in the decision-making process, that the level of service and technology provided is the most appropriate.

(ii) Users must be willing to contribute, in cash and kind, to the upkeep of the system once it is installed.

(iii) The water agency must recognize and fulfil its commitments to provide continuous technical and non-technical support and ensure the availability of necessary fuel, materials, tools and spare parts.

Meeting these three criteria requires investment in both time and resources during the preparatory and planning phases of community water supply programmes. Community participation, as we shall see later, means involving all sections of the community in decision-making. It means too that agency staff have to be able to communicate the technical information needed in a comprehensible way, so that informed choices can be made.

In any decision-making process, the final choice is going to be the option which shows the best return in terms of perceived benefits compared with the investment in cash, time and energy. However, the community's perception of benefits will rarely coincide with that of the water agency.

To the promoter of improved water supplies, the prime benefit to come is continuous access to safe and sufficient water. To the beneficiary, convenience may well be a more important criterion. The challenge for the water agency is to convince villagers to abandon traditional sources of "free" water, to work for and pay for a safe and more plentiful supply.

That is just one example of the knowledge gap which may have to be bridged in guiding community members to the right choice of water supply technology. Others relate to the reliability and sustainability of the different options under consideration, or to the constraints of water availability and quality, or to the benefits of standardization in terms of future maintenance.

Taking sustainable and effective use as goals, and recognizing that in any single community there will be a range of solutions to suit different user groups, how then can the water agency and the community decide on the right choice of water supply system?

## 2.1 Options and considerations

The process of selecting the most suitable, sustainable and acceptable service level for a given community starts with assuming an initial service level (see Table 1). This initial assumption is to be based on the community expectations placed in a realistic framework of existing conditions.

The first choice then to be made is between alternative water sources. Natural springs offer many advantages in terms of water quality and ease of extraction. Wherever springs are available and can be protected from contamination, they will be the first source to be considered. Unfortunately, for some 90% or more of the people in need of water supplies, no such convenient source exists. For them, groundwater often offers the best option. Like spring water, this tends to be clean, but getting it out of the ground needs some kind of mechanical effort. Where groundwater is either too expensive to extract or not available, rivers, streams or lakes will have to be used. Treatment of some sort will almost always be necessary for these supplies because of contamination risk.

Having selected the source, a series of progressive decisions and considerations then determines the level of service to be provided. The subsequent steps outlined in Table 1 illustrate a process based on achieving the highest affordable and sustainable service level for a particular community. The desire to achieve the highest practical service level must clearly take account of the prospects of reduced reliability as dependence on power supplies, technical support and external supplies increases. Most of the decisions are value judgments, weighing potential benefits against costs and risks of failure. Villagers have to be fully informed of their commitments in time and money associated with each decision, which means that careful analysis has to be made of institutional and manpower requirements as well as capital and running costs for each potential option.

Frequently, difficulties in meeting the implied institutional, logistic or financial commitments will lead to a lower level of service.

### Selection of service levels

In essence, Table 1 is meant to guide the selection process and indicates key points to consider when going through the process with the community.

**Table 1: Choosing an appropriate water supply system**

| QUESTIONS | CONSIDERATIONS |
|---|---|
| 1. *INITIAL SERVICE LEVEL ASSUMPTION*<br>What service level is reasonably expected? | - improved traditional source<br>- handpumps<br>- public standposts<br>- neighbourhood taps<br>- yard taps<br>- house connections |
| 2. *WATER SOURCES*<br>Which reliable water source is available?<br>Can this provide the required amount of water? | - springs<br>- groundwater<br>- rainwater<br>- surface water<br>- streams<br>- lakes, ponds |
| 3. *ENERGY SOURCES*<br>What reliable energy source is available? | - gravity flow<br>- electricity<br>- diesel supply<br>- wind<br>- solar energy<br>- biomass<br>- human power |
| 4. *WASTEWATER DRAINAGE*<br>In which way can the wastewater be disposed hygienically? | - soakaway<br>- gardens<br>- sewers<br>- drains |
| 5. *TECHNICAL RESOURCES*<br>What skills and materials can be made available to sustain the desired service level? | - skills/technical advice: diesel/electro mechanics, pump mechanics, plumbers, carpenters, masons, caretakers<br>- materials: pipes, pumps, taps, valves, fuel stores, chemicals, spare parts |
| 6. *ORGANIZATION*<br>What is the most appropriate organizational structure to sustain the desired service level? | - village organization<br>- water committee<br>- water supply agency<br>- extension service<br>- power utility<br>- training opportunities |
| 7. *CAPITAL RESOURCES*<br>What are the financial resources available for the desired level of service? | - users' funds<br>- government subsidies<br>- ESA support |
| 8. *RECURRENT RESOURCES*<br>What kind of payment system is most appropriate for the users' ability to pay? | - fund raising<br>- communal income<br>- regular contributions<br>- water vending<br>- contribution in kind |
| 9. *APPROPRIATE LEVEL OF SERVICE*<br>Is/Are the levels(s) of service chosen appropriate for all segments of the community? | - acceptability of different levels of service<br>- social justice<br>- rates tailored to users' ability and willingness to pay |
| 10. *SELECTION OF APPROPRIATE SERVICE LEVEL(S)* | |

Higher levels of service bring increasingly complex demands and greater risks of failure. For example, when users have no other control of water availability, neighbourhood tap schemes commonly operate for only 1-2 hours a day, with taps left permanently open. The level of service is thus very much lower than planned though costs remain high, and there is little incentive for the village to look after the system. Again, when house connections are provided, it is vital that proper provision is made for sanitary disposal of wastewater. This in itself is often a high cost item, which can double the per capita cost of the water supply system.

## Resources coverage

The main task in planning water supply improvements is to match the proposed service level with available resources. If that match is right, further progress may follow in only a few years, as financial and technical resources develop. Success or failure depends primarily on one factor: can the new water system be sustained?

Income levels of villagers in most of the developing world are enough to cover at least the maintenance costs of a properly designed handpump programme. Higher levels such as motorized pumping greatly increase the organizational complexity of operating and maintaining the community water supply system, add the need for guaranteed fuel or power supplies, and push up costs.

Improving the service level from a motor-pumped point source to a distribution system feeding standposts will again mean higher overall capital costs and maintenance commitments. For some users, incomes will be high enough, energy sources dependable enough and institutional development sufficiently advanced for the higher service level to be achieved immediately. More frequently experience in operation of a less complex community water supply system and realization of the benefits from improved supplies will be necessary before the community can take further steps.

## Considering rehabilitation as a viable option

It is an uncomfortable fact, but one which must be faced, that past policies and approaches have led to inappropriate investments in poorly planned water schemes. In some cases the schemes have broken down or been abandoned by disenchanted users. Other projects are being kept in operation at inordinate expense, creating an unacceptable drain on government and community resources.

Rehabilitation of these defective schemes can provide an economic alternative to investment in new projects, but that decision should not be automatic. Just as with a new scheme, the rehabilitation option has to be evaluated by balancing community needs, preferences and capacity to sustain with the support potential of the water agency. In assessing the scope for rehabilitation, the

community and the agency together need to review what went wrong last time and ensure that lessons are incorporated in any remedial proposals.

Above all, rehabilitation should not simply be a matter of replacing broken equipment or infrastructure. The most common cause of failure is organizational: either the agency or the community has been unable to provide the resources needed to keep the system in operation. Replacement of failed parts will not eliminate that cause, unless it is accompanied by appropriate organizational changes and acceptance of commitments by both the agency and the community - the same approach in other words as would be applied in the planning of a new system. Similarly, expensive schemes should not be kept going by further injection of unsustainable subsidies.

By no means all failed schemes result from the choice of too expensive a technology or service level. As mentioned already, there are numerous examples of low-cost technologies falling rapidly into disuse because they do not meet the desires of the community for greater quantities of water or more convenient supplies. Review of inadequate past schemes should also explore the potential for improvement or upgrading, with appropriate provision for community-managed upkeep of the upgraded schemes.

### The place of piped supplies

The decision-making process illustrated in Table 1 is a logical way of determining the right technology/service level mix for a new community water supply. In many communities, the final decision will involve a mix of yard taps and neighbourhood taps and/or handpumps, with a majority settling for the easier achievement of reliability with handpump-based systems. Installation and maintenance of handpump-based water supplies are well covered by other publications (Arlosoroff et al, 1987; IRC/IDRC, 1988). In this Technical Paper, we focus on the achievement of sustainable piped water supplies, in circumstances where this solution is appropriate.

## 2.2 Piped supplies in practice

Detailed technical design of individual components of piped water projects is the subject of numerous textbooks and is not covered in this Technical Paper. It is however necessary for planners and implementers of community water supply projects to appreciate the options available and the way that different components link together to produce a complete piped water supply system.

### Water sources

The optimum source of clean drinking water is a copious mountain stream from which clean water can be piped a short distance under the power of gravity.

Such sources do exist, but they have usually been tapped already, and most projects will have to look for other alternatives.

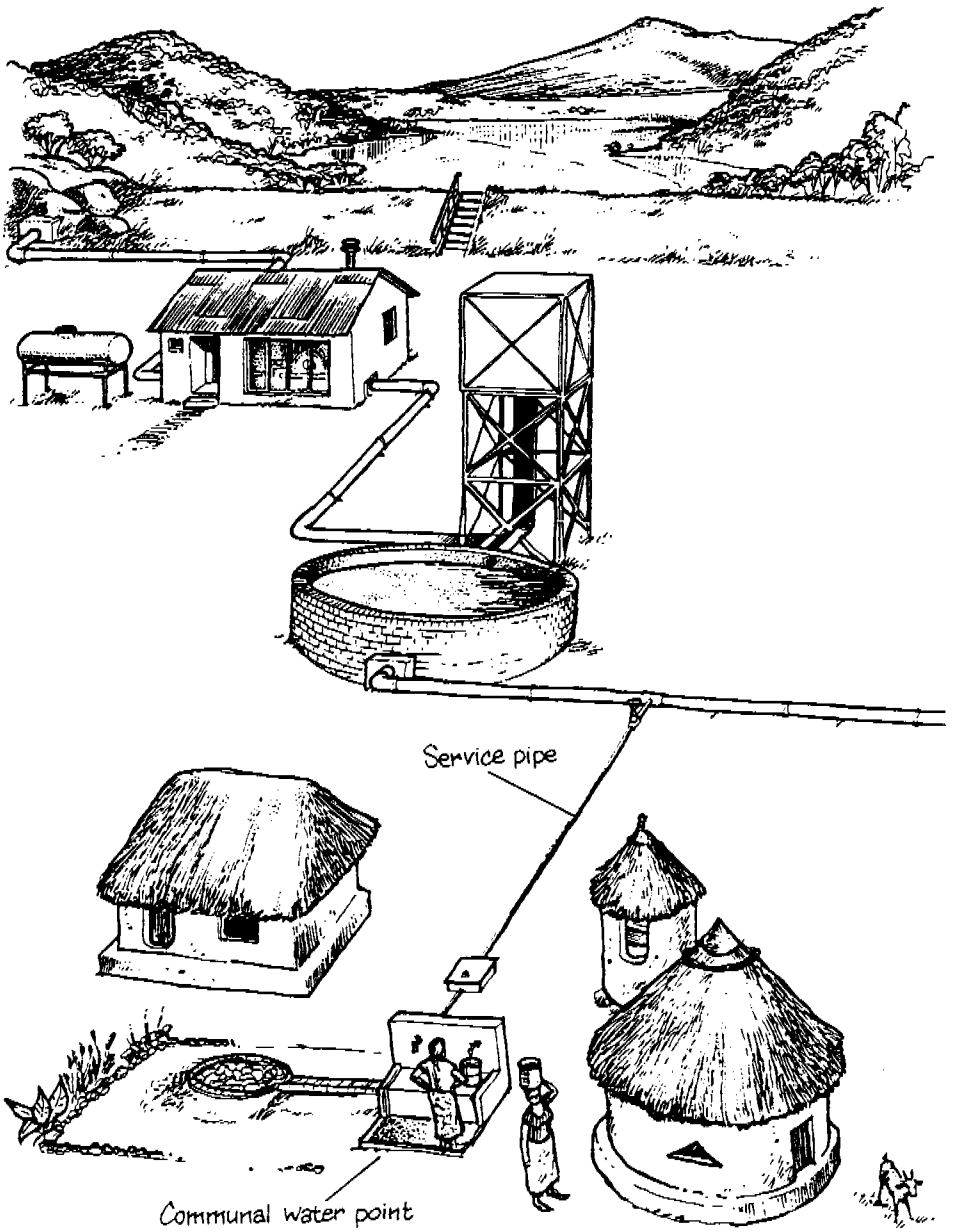
The simplest choice is between surface water (rivers, streams, ponds) and groundwater. As a drinking water source, groundwater has one big advantage: it usually requires no treatment. On the other hand, in many places it must be raised by pumping, which adds cost and complexity to the project. As a general rule, it is preferable to accept the pumping costs involved in lifting groundwater, rather than installing the treatment plants necessary to protect the community from the effects of contamination of surface water supplies. However, this is by no means always the case. Simple treatment methods like slow sand filtration and basic disinfection are well within the capabilities of many communities, and may result in more economic and dependable supplies than pumped groundwater, especially where the groundwater itself needs treatment to remove impurities such as iron.

## Intake works and energy source

For a groundwater-based piped water project, the water will be raised from wells by electric or diesel pumps. In most cases, the wells will be drilled down many metres into suitable water-bearing strata, or aquifers. Sophisticated drilling rigs are able to drill several holes a day when properly managed, though one hole a day is seen as good progress in many rural water programmes. Well drilling is an operation which is usually contracted out to specialist contractors, though some large water agencies may operate their own drilling teams. Wells need to be properly protected by appropriate screens and gravel packing, to prevent sand from entering the pumping elements and causing rapid wear of moving parts.

The choice between electric and diesel pumps is not just an economic one. It depends much more on the relative reliability of electricity and diesel supplies. Restricted water supplies caused by power cuts are familiar to most people in developing countries and may limit use. On the other hand, diesel is also in short supply in many places, and serving remote water pumps may be low on the priority list of regional suppliers. Again as a generalization, it is preferable to install electric pumps, which are inherently simpler to operate and maintain, wherever the power supply can be relied upon.

Where the water source is a river or stream, intake works may include major structures such as dams or barrages, or on smaller schemes simple diversion structures leading into bankside storage tanks. Often these will be remote from the community, and special arrangements are needed to ensure reasonable protection of the intake from serious pollution, and to clear screens and intake channels of leaves and debris.




From intake to waterpoint.

Increasing concerns for protection of the environment, and for the social impact of development activities which may involve displacement of communities, give an added perspective to water project planning. On large projects, a separate environmental impact study may be needed as part of the project planning.

## Transmission and storage

Groundwater projects will usually involve wells close to the point of use. Transport of the drawn or pumped water will often occur by bucket or container to the home. Sometimes, the water is pumped directly into elevated tanks which ideally provide about a days storage, to cope with peak demands and short pump breakdowns. The usual economic solution is a latticed steel structure with a steel-framed tank on top.

Sometimes, the surface water source can be chosen so that there is enough elevation above the user community for gravity supply. More commonly, the water will have to be pumped some distance through pressure mains. Both gravity mains and pressure mains have their problems. In the case of gravity mains, the route may be critical. It should avoid too many ups and downs, where air valves are needed to avoid air locks and disruption to supplies, and silt outlets may be needed at low points to prevent blockages. Gravity mains are also more prone to contamination through infiltration of polluted surface water or soil salts. Pressure mains avoid this last pitfall because of the higher pressure differential, but are more likely to leak, and need more substantial support where they change direction.

## Treatment

Drinking water should, as far as possible, be colourless, odourless and pleasant to taste. More specific guidelines on bacteriological and chemical content have been provided by the World Health Organization and are issued as standards by many countries. Achieving the necessary standard, and safeguarding consumers against contamination of surface water sources, generally means that surface water must be treated before entering the distribution system. The more sophisticated forms of treatment commonly applied in industrialized countries are rarely appropriate for community water supplies. Sedimentation, slow sand filtration and simple disinfection are adequate for safeguarding most supplies, though they depend on an appropriate level of skill and supervision in the scheme operators. The water treatment plant should be upstream of the elevated storage tanks, which then become treated water reservoirs.

## Distribution

From the storage tank, water is distributed to the users through a pipe network. In a "branch system", the pipes spread from a single main and end at the point

of supply, the tap. Such networks are only suitable for small communities served by a few standposts, and possibly a few house connections. For larger communities, the usual system is a "looped" network. This involves a ring of mains feeding interconnected distribution pipes in which the water may flow in either direction depending on demands from different users. Though this system is more complicated and involves more valving and greater pipe lengths, it provides a better pressure distribution and eases the problems caused by repairs, because short lengths can be valved off without interrupting supplies to all users. Moreover, there are greater possibilities for expansion and upgrading. However, sometimes ground levels and the dispersed layout of the community may make a looped network uneconomical, and the branched system may have to be used.

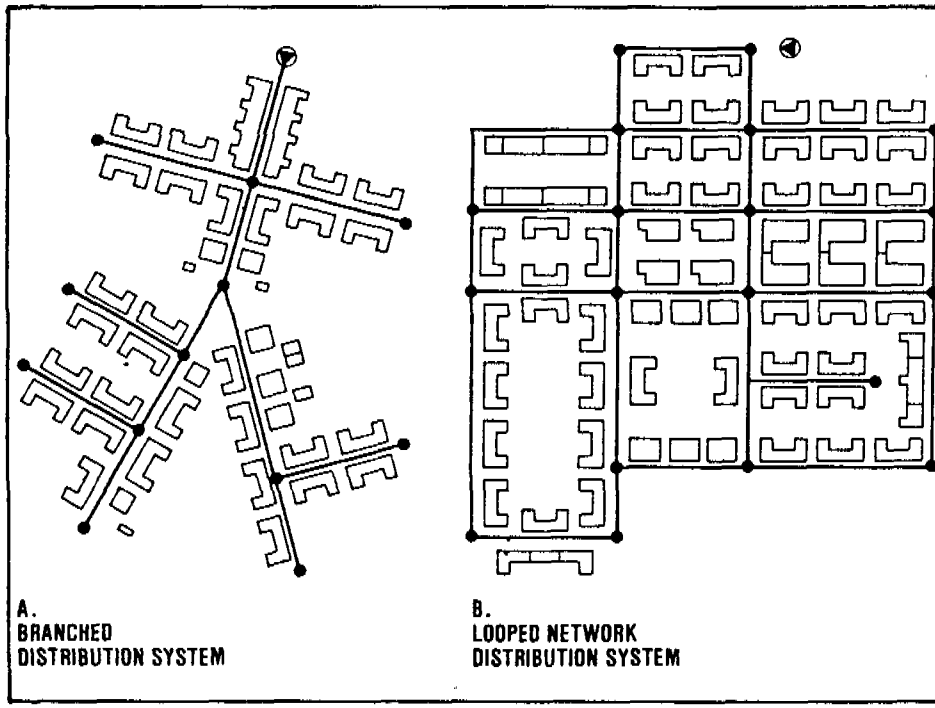
## Service connections

Piped water supplies permit a variety of service levels to be provided from the same distribution system. As we have seen, this allows different sections of the community to opt for the service level which best suits their own resources - provided the financial mechanisms are designed to make this possible.

**House connections** are the highest level of service. They provide individual households with an internal water supply from a secondary distribution pipe. Internal kitchens, toilets and bathrooms can be fitted when house connections are available, but it is vital to recognize that water consumption is high and proper provision for wastewater disposal is needed before house connections are provided.

**Yard taps** provide the next level of convenience. Taps are sited in individual houses or family compounds. Water is close at hand, but has to be carried into the house, so that internal plumbing of toilets or kitchen facilities is not possible. Yard taps encourage relatively high use of water. This has benefits where the supply is adequate and the use is "effective" (see Chapter 1), but it also means that adequate provision must be made for disposal of the resulting sullage water.

**Neighbourhood taps** provide the service level which suits most communities able to manage piped water supplies. Multi-point taps are provided for a specified group of households, generally totalling 50-100 people. Users fill their containers at the tap and carry the water back to their home - a maximum distance of about 200m in most cases. Specifying which households have access to the taps makes billing easier and more equitable, and induces a sense of ownership among the users.




Looped network and branched network.

**Public standposts** have often been used in the past as the cheapest option to serve poor communities. Their use is not recommended, except in special circumstances (markets, schools, clinics), where use can be readily supervised and abuses controlled. Too often, public standposts fall into rapid disrepair because of a lack of defined responsibility for their upkeep.

A key issue with both neighbourhood and public taps is the strong likelihood of high wastage through leakage or misuse of taps. Automatically closing taps have sometimes been successful in saving water on larger, mainly urban, schemes, but they are expensive, unpopular with users, and prone to failure. With manual taps installed in an unreliable system, and without community involvement in management, the tendency is for taps to be left open when the system is shut down, to be sure of filling containers when supply is restored. The resulting increase in per capita consumption leads to shorter periods of supply, exacerbating the problem.

## Drainage

It is vital to recognize that proper provision for wastewater disposal is necessary when any piped system is to be constructed. There are many instances of wastewater from piped systems causing public health and environmental damage. The encouragement of mosquito breeding and hookworm transmission are examples.

Wastewater should be properly catered for by soakage pits, diversion for garden irrigation, or discharge to stream, river or sewerage system.

## Community priorities

The final two questions in Table 1 relate to the community's willingness to pay for the planned service level. This hinges on perceptions of the benefits to come from access to the new supplies, and on development priorities. A group of users who recognize the economic and health benefits of having water available in every household compound may reasonably choose to commit the resources needed for installation and upkeep of yard taps. Elsewhere, a school or mosque may have higher priority, and the group may therefore opt for a less costly water supply such as neighbourhood taps, which can be upgraded later.

# 3. *Establishing the Community-based Partnership*

All too common breakdowns and poor utilization of water systems are the visible signs of organizational inadequacies, but that is not where the problem starts. The real difficulty is that it is rare for piped water schemes to be planned, designed and implemented with sustainability as a prime objective. When they are, and when the organizational needs of a sustainable approach are recognized from the beginning, the respective roles of community members, local authorities and central agencies can be defined logically, and in partnership. Only then will the right organizational structure emerge, and the commitment of each group be achievable on a long term basis.

## 3.1 Institutional framework

### Common difficulties

Institutional weakness is a major obstacle facing many countries. Creating effective organizations means education, training, vehicles, equipment, wages and so on. Money and other resources for these are frequently lacking.

Experienced people are required to pass on the essential skills, and a general shortage of good staff is made worse by governments' inability to compete with private sector wage levels. The result is that government agencies cannot hope to manage the full range of tasks involved in running individual community water supplies. The chain of command is too long, and the costs, logistics and staffing implications are too prohibitive for their limited resources.

Despite this, two basic forms of institution-based water management systems are common around the world. In the first, the decentralized system, the main responsibility for planning, finance, design and construction lies with a central government ministry. Responsibility for all aspects of operation and maintenance is however divided among independent local authorities scattered around the country. In effect, the scheme is handed over on completion of construction, and the implementing authority has no further involvement. This divided system is quite common, particularly in rural areas, and is often blamed for ineffective maintenance of piped supplies, handpumps and other communal facilities.

Second, there are unitary authorities, which have national responsibility for all aspects of water supply. Strategic matters are dealt with centrally, and remaining responsibilities are distributed among regional or district offices.

Unitary authorities are answerable to government, but are often free to act autonomously in planning and implementing water projects. This arrangement is sometimes criticized for being insensitive to users needs, though the clear lines of responsibility do provide the opportunity for some integrated planning beyond the construction phase.

In both systems, where consumers are to be charged for the water, an administrative structure is usually aimed for, often carrying responsibility also for maintenance of the water system. However, even where such maintenance is planned, it is usually top-down, with the central or local agency attempting the impossible task of managing numerous scattered projects from a distant base. A common element in both these institutional arrangements is that community involvement, where it exists at all, is usually confined to the provision of free labour and materials during construction.

## Partnership approach

Experience is now growing of a different approach, involving the community and local and national government in partnership. Where appropriate, the private sector and non-governmental organizations can also be involved.

The basic difference in this "partnership approach" is that it is designed to be community-based. In other words it begins by identifying what is needed at the community level to ensure that a new water supply achieves the long term objectives of sustainability, optimum utilization and health impact.

As tasks are defined, the first question is, "Can it be done by the community?" If the answer is "no", the process continues, to define the support necessary from outside agencies, to enable as much as possible to be achieved at local level. Finally, a balance is reached in which the resources which will be called upon from both the community and the agency can be reasonably anticipated to be forthcoming. In reaching this balance, the initial selection of an appropriate level of service may have to be modified.

A crucial aspect is that the answers to these planning questions need to come from all the partners. A decision that the community can take responsibility for water intakes for example, can only be taken if the community is represented in the planning process and recognizes and accepts the commitments that are being made.

> On rural water supply projects organized by Nepal's Ministry of Panchayat and Local Development (MPLD), a co-ordination workshop is held at the start of a each construction season. Participants include the chairmen members of Water Committees and the Programme Team, including the director, accountant, engineers, overseers and technicians. Slide shows, films and posters help to explain the features of the water supply and sanitation programme, and the workshop has an emphasis on communication through group discussions and sometimes role playing. The aim is to allow individual Water Committee members to share their problems and develop a wider understanding of the programme. Topics covered include: government policy on water supply and sanitation; principal features of

the programme; office and field staff, tasks and responsibilities; maintenance management and selection of Village Maintenance Workers; sanitation and hygiene education; and smokeless, low-energy cooking stoves (Boot and Heijnen, 1988).

## A new role for agencies

The partnership approach begins when the project planning begins, and the principle of community decision making must be maintained throughout the project cycle. The role of the water agency needs to adapt to the capacities and desires of the community as the project progresses. In the development phase, the agency has a catalytic role, helping the community to reach appropriate decisions on technical and financial issues; once the scheme is operational, the agency plays a supporting role, ensuring that supplies and back-up services are available when needed. The agency also needs to monitor operational projects, evaluate approaches and modify the type of support provided as necessary.

For effective community-based planning and management, strong community organizations are needed. Merely creating them is not enough, they need training, guidance and occasional support. This requires special inputs and approaches from the project agency. Technical water authorities, whether central government or unitary or local authorities, are not normally equipped for such tasks. They either have to employ specialized personnel or collaborate with other organizations (government services, NGOs, training centres) which have expertise in social organization and management training and support.

Co-operation with other agencies or specialized staff does not free the technical agency from making changes in its own organization and approach as well. In community based planning, agency staff have to communicate in an organized way with local users and committees. Instead of doing all maintenance themselves or handing the systems over completely, they now become trainers, supervisors and supporters to community mechanics and community water managers.

This need for communication and advisory skills has significant implications for technical staff recruitment, training and career structures. Staff should be recruited not only for their technical skills, but also for their willingness and aptitude to work as partners with community members. Training programmes on participatory skills, such as SARAR (training for community Self esteem, Associated strength, Resourcefulness, Action planning and Responsibility, Srinivasan, 1989), and on involvement of women (INSTRAW, 1991) are among the resources now available to agencies wanting to develop new capacities for participatory projects and programmes.

Some of the changes in skills and knowledge will come from growing experience in the field. Others will require organized interventions. To date, national governments and donors have been reluctant to use even a small part of project implementation funds for more fundamental capacity building in the

implementing organization, or for feedback of field experiences and approaches into national manpower development and training systems.

## 3.2 Forms of community organization and representation

To carry out its envisaged role in the planning, implementation and upkeep of a piped water supply, the community needs to develop and have access to appropriate organizations. Responsibilities will have to be assigned for technical and administrative tasks; funds will have to be collected, stored and managed; materials and parts will have to be bought when needed; and the water agency will have to be kept informed about problems, support requirements and future needs.

In some cases, community organizations may already exist which can be modified to take on the additional role of managing water systems. In others, new structures will have to be created. The leading role of women in water collection, hygiene and sanitation must be reflected in appropriate representation on any committees or other organizations. Accountability is also important. Users will only continue to pay charges if they are convinced that the funds are being used for the right purpose.

The type of organization needed in any particular community will vary according to the community's development experience and cultural traditions, and needs will evolve as the project cycle progresses. Arrangements which have been found to work in different circumstances, often in combination include:

### Individual/group responsibilities

When the right sense of ownership and pride in a new water supply has been engendered, individual users, or groups of households on a rota basis, will willingly carry out some routine tasks to keep water points clean and tidy. This may involve such duties as clearing mud and rubbish from the surface of the soakaway pit, sweeping out the run-off channel, and replacing missing stones from the apron standing area.

### Caretakers

Caretakers are the key individuals in any community-managed water supply system. Their responsibilities need to be carefully defined, along with any incentives/rewards for good performance, for each scheme individually. In many places it may be worthwhile to consider women as caretakers as traditionally they will often have been responsible for the proper use and maintenance of existing water sources. Essentially, the caretaker should be able to undertake daily and weekly tasks needed to ensure continuous hygienic operation of taps, standposts, service pipes, valves, meters, and pumps. He or she should keep records of the condition of installed facilities and any servicing carried out, and

should have ready access to mechanics or other support as needed. A checklist of preventive maintenance activities which can readily be carried out by appropriately trained village caretakers is included in Chapter 7, Table 6.

## Tap committees

Where these committees are formed, their function is to look after hygiene around the taps, as well as monitoring basic maintenance and repairs. Sometimes they collect money charged for the water, buy spare parts and pay caretakers. Tap committee members live near the tap, meet other users frequently and pick up local knowledge. This is useful for planning changes to or expansion of the system. The committees should be allowed to pass on this knowledge by having a voice in higher level organizations. Tap committees should include a number of women. Their involvement ensures that those who are responsible for the provision of family water supply will also contribute to its proper management.

## Water committees

These committees are formed specifically to administer community water supply. Because they have that sole responsibility, they can dedicate all their energies to water planning, management and development. At the same time they make it easier for community members to have a voice. They also form the point of contact with outside agencies. To be balanced and reflect the community fairly, these committees should include men, women, the old and the young. The committees should include representatives from all factions or special groups. And they should exploit available talent by including skilled people, such as teachers and health workers. Because water committees have been proven to be a powerful instrument for community-based management, they are discussed separately and in more detail in section 3.3.

## Scheme committees

Where piped supplies serve more than one village, the establishment of an overall scheme committee is advisable. On very large schemes, sub-committees might be used to represent people served by a single branch of the distribution network. Using scheme committees allows running costs to be spread over participating communities. Each community deals with contributions from its own members, and looks after maintenance of its own system. Sometimes water users are responsible only for the upkeep of networks within their community boundaries, with water agencies operating the scheme as a whole. In those cases scheme committees can arrange for convenient operating hours, solve problems of water allocation between villages, provide supervision of agency-paid operators, finance stand-by operators, and so on.

Water committee in Honduras meets agency representatives. Photo: IRC/Espejo.

Scheme committees also have some disadvantages. In large schemes, committee members from scattered villages cannot easily attend committee meetings. Management and financing are also more complex and require more co-operation and unity. After initial problems, some large village schemes in southern Tanzania for example have been redesigned as smaller group schemes (DANIDA, 1987).

## Development and health committees

Where these comittees cover areas coinciding with the project boundaries, they are obvious vehicles for discussions. However, some existing committees of this type may be prone to political infighting and may not necessarily represent the views of the whole community.

### Traditional bodies

In some countries, for example those of West Africa, chiefs and councils of elders retain considerable authority. These people should be the targets for initial approaches, although it must recognized that traditional leaders do not necessarily represent the whole community. In other countries, traditional leaders have lost legitimacy. Agency staff with local knowledge should be able to decide how best to work with traditional bodies where they exist.

### Local authorities

In some cases the local authority boundary coincides with the project area. Those authorities can be a logical focal point for consultation, but care must be taken to prevent political conflicts harming planning progress. In many countries however, local authorities are far removed from ordinary people, and may not truly reflect community views. It will often be better to organize the water supply system through direct lines with community groups, utilizing caretakers and water committees.

## 3.3 Water committees

As has been mentioned, it will often prove appropriate to set up a special water committee to concentrate on the new water and sanitation project. Such committees should include women as well as men, and consist of representatives from all sections of the community. People with special knowledge or skills, such as teachers, plumbers, mechanics, and so on, could also be members. The committees must be generally respected, have enough time and resources to function properly, and honestly represent the interests of all community groups without favour.

Committees can either be formed by the water agency or the local council or preferably, be directly elected in a community meeting. One advantage of having a free election of the members of a water committee by local men and women is that it gives communities a chance to choose those they think most capable and trustworthy, without being constrained on who to include or not. Considering the tasks and responsibilities of water committees can help community members in choosing the right candidates. The most important tasks of a water committee are:

- to represent the community in contacts with the agency
- to organize contributions by the community, in cash or kind, towards construction, and towards operations and maintenance
- to organize proper operation and maintenance, including supervision of caretakers
- to keep accurate records of all payments and expenditures
- to promote hygienic and effective use of the new facilities

- to hold regular committee meetings to discuss and decide on issues, procedures, and problems
- to inform the community regularly about decisions and to report on revenues and expenditures.

Women are often involved in the management of traditional water sources, but they are frequently excluded from management of improved water supply such as piped systems. Functions on local tap committees in the Malawi Communal Water Point project, for example, were often held by men, while the actual work was done by their wives. In the PSWS project this situation has changed, with more women now being included on water committees. They make important contributions by their high motivation, and through their easy access to other community women.

An IRC/PROWWESS study found that practical steps often make a difference. Women's participation needs to be discussed with local leaders, and village women themselves should take part in selecting female committee candidates. Women's involvement is further facilitated when project staff help them to unite and provide special support during the first meetings.

Women's involvement in water committees should be more than token. Putting one woman alone on a committee of men cannot be a fair way of representing half the community. In Tanzania it was decided that half the village water sub-committee members should be women. In some areas there was deliberate discrimination in favour of women to ensure their impact on the water project.

As committee members, women are often made responsible for traditionally female areas of activity, such as hygiene and education. Often women are also chosen as treasurers and rate collectors, while chairpersons are usually men. But in many countries, women will take an active part in construction, maintenance and other activities too (Van Wijk-Sijbesma, 1985). Women should therefore be given the encouragement and opportunity to participate to the full in all areas of project development.

## Composition of a water committee

A village water committee normally has around 7 members:

- chairperson and vice-chairperson
- secretary and vice-secretary
- treasurer
- several other member or advisory members.

Village caretakers may also be members of the committee, or if they are not members, they should work closely with the committee.

The water committee meets.

It is a good idea that both the chairperson and the secretary have assistants. In this way the work will not stop even if the chairperson or secretary is absent. But it is better to have only one person as treasurer, so that everybody knows exactly who is responsible for the money (*Village Water Management Handbook*, Maseru, Lesotho: MB Consulting for USAID, 1987, p.17).

The presence of **local leaders** in water committees has advantages and disadvantages. On the positive side, they can add authority to the committee and make decisions easier to reach and implement. On the other hand, they can also dominate the committee and influence decisions in favour of an elite group.

In open elections attended by the majority of the users, both men and women, participants can either include or by-pass existing leadership, except when these leaders are so powerful that by-passing is impossible in practice, even when the majority would like to do so. Agency influence in these cases is unlikely to yield much, as its presence in the community is only temporary and too great an involvement in local politics would be counterproductive. It is important, however, that the agency recognizes these difficulties and tries to include minority groups and poor households to the best possible extent. In the PSWS project in Sri Lanka, the agency was aware of political and class differences. Early measures were taken to solve the problems.

**Involving all shades of local opinion**

"Although it was not prominently seen, there were political factions in the villages, believing in different political ideas. There was tendency that these oppositional political leaders may act as blockers and damage the project later on.

...

It is important that these leaders are identified, to meet them individually and brief them about the project. A social visit to them is a mark of recognition and respect. Further, they should be given some responsibility for the project. This approach has paid us very rich dividends and so far no opposition has been noted.

...

There was some fear that only the privileged people would be getting the water supply by way of private connections and others would not benefit from the project. Intensive educational efforts were planned to help the people to understand the economic and health benefits that they will enjoy as a result of the contributions of those who can afford to pay for private connections."

*From: PSWS Project Sri Lanka, Overview and Final Report, 1986, pp. 24/25*

## Table 2: Some typical elements of a water users' organization constitution

| | |
|---|---|
| **General characteristics:** | Name, place of residence and purpose of the organization; date of establishment; legal status. |
| **Membership:** | Qualifications and conditions for membership; procedures for application, acceptance and cancellation as members of the organization. |
| **Income sources:** | Contributions, rates, subsidies, loans and other rightful revenues. |
| **Committee(s):** | *Composition:* number and functions of committee members; composition of executive committee and sub-committees where necessary;<br>*Election:* occasion, procedure; length of term of office; possibility of re-election; by-elections in case of resignation, etc;<br>*Representation:* of the interests of all user groups, including women and low-income households;<br>*Functions:* responsibilities and authority of each function; character of work (voluntary or paid); type of remuneration. |
| **Meetings:** | *Committee(s)*: frequency, purpose and authority of committee meetings;<br>*General Assemblies:* frequency of assembly; minimum period between announcement and assembly; user information on time, place and purpose;<br>*Purpose of meeting:* rendering an account of the preceding period; appointment of a financial control committee for the financial period; recruitment and election of committee candidates; other relevant business;<br>*Validity of meetings:* representation of various user categories; voting rights (e.g. heads of households only, or male and female heads, or one adult vote); quorum for important decisions; conditions for a general meeting on request of users. |
| **Changes:** | Procedures for changing the statutes; procedures for winding up the organization. |

Source: Van Wijk, C. (1987).

# 4. *Preparing for a Piped Water Supply Programme*

Governments and external support agencies need to have a clear picture of what a water supply and sanitation programme involves before they can allocate funds. This preliminary investment and preparation work is known as *pre-planning.* Until pre-planning is complete, nobody can know just where piped systems would be viable and what would be an appropriate mix of house connections, neighbourhood taps, handpumps, etc. Normally work in this phase is part of a *feasibility study,* and often it will require the appointment of consultants, wherever possible locally based.

**In preparing recommendations for future programmes, planners must, at all times, keep in mind the long-term goals of improved health, time saving and convenience, achieved by ensuring the sustainability, maximum use and impact of new facilities, and improved hygiene behaviour.**

Typically, a piped scheme will form part of a regional programme including a number of communities. In the pre-planning phase it is not possible to visit every community. For a Sri Lankan programme of water supply rehabilitation/ upgrading schemes the government identified 49 possible projects with the aim of implementing 30-40 of them. Six representative communities were chosen for the feasibility study.

Generally, a 5% sample of all communities in a relatively uniform programme can be regarded as statistically valid. The sample size has to be chosen in the full knowledge of local conditions. Care must be taken to hear views of all sectors of the community. When the programme moves into the detailed planning phase, which follows this one, each community will receive individual attention in detail.

Pre-planning involves assessing water resources, and present and future needs. Initial judgments on options for technology types, levels of service and communities' capacities to implement and sustain new supplies are made in liaison with the communities themselves. Costs are assessed and timetables are established.

Pre-planning is also a time for actively promoting community involvement in all aspects of the programme and introducing discussion on of hygiene education and sanitation improvement in the sample communities.

## 4.1 Pre-planning aims

The pre-planning phase is intended to give planners, designers and legislators the basic information needed to begin detailed planning and implementation on

a project-by-project basis. Its aims include: to identify the scope of a programme, to determine the broad mix of technologies, to set targets and priorities, and to identify resources and preparations needed to carry out the programme. The outcome of pre-planning must be presented in a way which enables strategic decisions to be taken without restricting final choices. **Final decisions can only be made after full community participation.**

## Defining the scope of a programme

Few water supply planners start work on a new programme without some existing background information. Existing projects, area plans or other documents can provide valuable data on populations, available resources, and on how previous approaches worked. Extremely helpful sources of information might be the results of previous monitoring or evaluation exercises, which, may usefully cover non-technical as well as technical issues.

*Contents of a pre-planning study*

The pre-planning or feasibility study should include:

1. *Planning and design data*

- An inventory and typology of communities, with population figures and growth forecasts
- An annotated map of the supply area, with population densities, industrial/institutional requirements, relevant elevations, and other features..
- An estimation of water demand, present and future, and description of uses other than domestic
- An estimation of suitable water sources and treatment requirements
- Assessment of existing experience and status of different types of water supplies, including community and women's involvement
- Pumping energy requirements and potential energy sources
- An estimation of types and quantities of equipment and material required

2. *Evaluation of data*

- An evaluation/assessment of past community performance in community development activities
- An appreciation of communities' willingness and ability to implement and sustain improved water supplies
- An assessment of a attitudes to and potential for community participation and the involvement of women in all project stages
- An outline of viable maintenance support organizations and spare parts distribution arrangements
- An indication of the likely technology options judged most appropriate for each community on technical and socio-economic grounds

- An assessment of sanitation and hygiene practices and needs
- Requirement for co-ordination between government departments and agencies with an interest in and contribution to make to water development
- An evaluation of human resource demands and training needs for construction, maintenance and support

*3. Policy issues*

- Cost estimates, including costs of promoters and activators of community participation and continuing extension support after the project has been implemented
- Financing details and cost recovery proposals
- Targets and objectives linked to use of new facilities, water quality and hygiene education support
- Institutional needs for technical, social and health components of the project in terms of legislation, policy, equipment, materials, transport, training and communications
- Arrangements for monitoring and evaluating the projects

Selection of technology at this stage will be based on broad general judgments of technical and socio-economic factors in the representative sample communities. Statistical projections can be made in broad terms, without preventing communities from reaching their own conclusions on the most appropriate technology after more detailed discussions later on.

A plan might forecast that say 10% of the people in a programme area will have house connections, 20% will be served with yard taps, 30% will be served with standposts and the rest with handpumps and improvement of traditional sources. This is enough information for costing and detailed planning of legislative, managerial and institutional needs. It may also be accurate enough for preliminary enquiries about procurement. But it does not inhibit the opportunity for individual communities to participate fully in final decisions about their improved supply.

At the pre-planning stage, warning signs of things that might go wrong in the completed systems may be noticed and corrective measures taken. If, say transport is difficult or skills are scarce, facilities for distributing spare parts and developing training centres need to be started in advance of full programme implementation.

## Agreeing on programme targets

Usually a programme will be planned for a specific time period with targets set to fit available funds and human resources. Targets should be well defined and realistic. "Improvement of the water supply situation in small urban and rural communities with problems of water shortage and/or quality" is an unhelpful

way of expressing an overall objective. It is too vague, and provides no basis for monitoring and adjusting the programme as experience is gained. An example of a more specific way of expressing targets follows.

*Within five years*

- Provide 60% of all communities with a population of less than 3,000 people with improved water supplies and sanitation, wherever such improvements are appropriate and wanted by the community.
- Plan and implement projects to ensure that at least 80% of the people will continually use safe water supplies for their domestic needs in a hygienic fashion.
- Achieve (specified) sanitation and hygiene related behaviour improvements amongst 90% of the communities served by the programme.
- Provide training and support to ensure that pumps, pipelines, taps, and other hardware are properly maintained to minimize breakdowns.
- Provide alternatives to prevent people going back to their original contaminated sources during breakdowns.
- Recognize and facilitate the vital role of women in all stages of the programme.
- Involve communities in all stages of programme development through local organizations where they exist, or new ones where they do not.
- Implement projects in a way that strengthens the communities' capacity for problem-solving and development.

It is important to include not only the traditional constructional targets, but also some targets linked to functioning and use of the facilities, and to hygiene behaviour. The aim is to maximize the number of facilities working and having some impact, not just to put facilities physically in place.

This broadening of programme aims will be new to many agency workers, and progress will be dictated by experience. Targets for the early years should not be set too high. Lower targets allow the programme staff and communities to learn from experience and provide an opportunity for pilot projects to be tested where appropriate. Lower targets will also allow for adjustment without creating the impression of running late or failure, which could demoralize all concerned. This is particularly important for communities which are not accustomed to close involvement with development projects. Signs of early failure might easily damage self confidence.

On the other hand, targets should not be too low. The needs are urgent, and monitoring of progress towards an achievable target can inspire greater efforts.

## Setting programme priorities

Planning requires decisions regarding which communities should first receive new water supplies. Priority criteria for selection of communities have to be established in the pre-planning stage and publicized to avoid later accusations of bias, for political or other reasons. Priority criteria vary considerably from country to country. They are often linked to water shortages or serious quality problems. Criteria are sometimes established to favour the poorest populations.

In some places community willingness to contribute is a condition for the project to go ahead. This is an important condition, but carries with it an equally important obligation on the part of the promoting agency to deliver and be reliable in the fulfilment of its promises. Delays in delivery often cause a lot of mistrust and bad feeling and have consequences for subsequent user inputs.

It is possible at this stage to classify communities into a number of categories, with high and low priority based on the selection criteria. Sometimes it is easier to organize implementation on a zone basis, starting in areas with the highest concentration of high priority communities, but also including some lower priority projects. In other cases, the programme will cover all communities ranking as top priority before moving to the next level of urgency.

Target communities should be made aware of the criteria for attaining a high priority rating. Explaining the criteria is another opportunity to involve the communities in making group decisions. There is a danger that poor or remote populations with low influence may be unjustly excluded from priority classification. Great care has to be taken to ensure that programme information reaches all communities and that criteria are fairly applied.

### *Presenting and using the findings*

The pre-planning report provides a basis for strategic decisions on programme implementation and may well be an important element in requests for funding, so it must well argued, logical and concise. It must recognize the need for judgments to be flexible at community level, but sufficiently detailed over the whole programme to permit reliable estimation of costs and other resource implications.

Simplified graphical presentations effectively illustrate data. Graphs are easier to assimilate than the tables on which they are based, and can provide visual support for forecasts on numbers of standposts or house connections required, training needs and project scheduling. Qualitative and behavioural aspects of community life, such as types and amounts of water and latrine use can be understood more readily from simple graphs than from tables.

After the review of the pre-planning report and a decision to go ahead, the next task will be to prepare a more detailed implementation plan for the first batch of project communities, including a schedule of work/plan of operation, definition of tasks and authorities of the various parties involved, determination

of training needs, preparation and implementation of training activities, and a system for monitoring, evaluation and feedback of experience.

The more detailed steps involved in the preparation of specific projects are described in Chapter 5.

## 4.2 Community involvement in planning

Pre-planning is the first opportunity for the community to become involved in the water programme. Already at this stage agency workers can stimulate a partnership between the agency and the community. The partnership will encourage both sides to contribute information, energy and resources.

### Assessing participation potential

At this early stage it is important to establish which formal or informal support for community participation is available in the country, and which institutions or organizations may help in promoting participatory approaches. Some critical questions to be posed before going into the field are:

- Is there a legal framework which permits community participation?
- What is the country's and region's background in community participation?
- What is the political climate which supports or constrains community participation?
- How can existing social or developmental structures best be used for the proposed programme?
- Who can help in the preliminary establishment of community participation processes?
- What government and non-government organizations are concerned with water and sanitation, community participation and the involvement of women?
- How do felt needs for improved water supply and sanitation/cultural traditions/languages vary across the country/region/programme area.
- Will the technology of piped supplies increase or decrease the acceptance of schemes and the degree of community participation?

Answers to these questions should be based not only on the existing situation in the country or region, but should anticipate future changes. The answers will help establish the scope of community involvement through the rest of the programme, so it is vital that they are analyzed thoroughly. Technical planning of water supply is nearly always left to specialists. The same approach is needed in planning community participation, where other government ministries (such as a community development ministry), may have expertise and experience to offer. Alternatively collaboration with an experienced non-governmental organization may be beneficial.

As an example, all four participating countries in the PSWS project set up an

organizational structure in which government agencies concerned with water supply, community development and health and hygiene education collaborated in the project. At the community level the project frequently made use of existing traditional community self help structures to build up the participation potential (Parwoto and Kwaule, 1988).

## Learning from the community

Planners use surveys in sample communities to forecast water supply needs and desires across the whole programme area. The sample chosen should represent the different physical and ecological conditions in the area, as well as differing community characteristics (socio-economic status, settlement pattern, ethnic and religious groups, etc.).

As well as technical and physical surveys, socio-economic surveys are carried out. The purpose of these initial socio-economic surveys is to provide the basis for later community participation activities. The surveys enable planners to estimate the likely mixture of attitudes over the programme area as a whole. For example, communities may differ in their willingness and capacity to contribute to capital and recurrent costs of piped supplies.

Learning from the community.

Men and women might also identify different priorities, as may different income groups. Existing patterns of water use and hygiene habits will have an important impact on the community's perceived needs and preferences for water supply improvements. Studies will therefore look into the ways water is collected and used, to assess how convenience, quality and quantity can be improved.

Clearly the community members themselves are rich sources of this physical and socio-economic information. They know better than anybody what are the good water sources, and how they are affected by the changing seasons. They know how their communities are developing, and can make useful inputs in assessing future needs. If previous supplies have failed, the people will know why. They also know the history of earlier participation projects, and can give useful information on the community's interest in an improved water system and the opportunities for community-based management.

In a project in Tanzania, local people already had negative experiences with shallow wells (they dried up) and diesel pumped systems (they were unreliable). Communities therefore wanted to know exactly what the risks and costs would be of either option, before deciding to support a new water project. They also told about community-managed projects which had failed earlier due to lack of management skills and financial control, and asked to be given a say in the composition of the managing body, and have training on proper bookkeeping and management control included (GTZ, 1989).

When seeking information, women and children should be viewed as important sources. Both groups tend to be closely involved with finding and carrying water, so they will know all the shortcuts and pitfalls. How women would like the scheme to be developed is also an important design input. Women tend to have a more intimate knowledge of community activities than men. In their own way, children too have a special perspective and are less likely than adults to distort their opinions for diplomacy reasons.

Typical questions to discuss with members of sample communities during a sample feasibility study are:

*Water sources*

- What are the present sources of water for your village? In the wet season? In the dry season?
- How far away are they?
- What is their reliability, especially in the dry season?
- Are any existing water sources not used? If so, why not?

*Water use and present community practices*

- How is water used in your village, (for what purposes)?
- How much water is used?
- Are different water sources used for different purposes? If yes, why?

- Do you have any arrangements/agreements for proper use of traditional water sources? For upkeep of these sources and immediately surrounding areas?
- How are these measures carried out? By whom?
- Have experiences been good or bad?

*Felt needs and expectations*

- Have you heard about a planned water project? If yes, what do you think about it?
- Is there a need for the project?
- Is the project important?
- What other priorities does your community have?
- What type of water supply do you expect (e.g. piped water, handpumps, wells, etc.)?
- In order of priority, what are the most important uses of water?
- Which needs must be satisfied first?
- Do men and women have different viewpoints?
- What benefits do you think a water project will bring?

*Community participation/willingness to participate*

- Do you feel you should contribute to the water project?
- How? During planning? Construction? Maintenance?
- Are you prepared to contribute?
- What problems do you think might arise if everybody in the community is asked to participate in an improvement of water supply?
- How can money to meet construction and ongoing operation/maintenance costs be raised?
- What training needs to be provided to help the village manage its water supply?
- Do men feel women should be involved in water projects? If so, in what ways?
- Do women feel men should be involved in water projects?
- Should the community be consulted in the selection of sites for handpumps and standpost taps?

*Women's issues*

- Are water supply, health, and sanitation problems for women in your village?
- Do women come together to discuss these problems?
- What happens afterwards, i.e. do women decide to do something about these problems and then do it?
- Are women in your village organized?
- Do women have a say in village affairs?

*Health, hygiene and health education*

- What diseases are most common in your village?
- Do they have anything to do with water or latrines or unhygienic conditions?
- What hygiene problems are most serious in your village?
- What should be done about them?
- Are you willing to do something about them?
- Is health education given in your village?
- How is it done? How often? By whom?
- What is taught?
- Is it easy to apply what you have learned?
- Do many people practice what is taught?
- Do many people participate in health education meetings?
- If not, why not?

*Sanitation*

- Does everyone in your village have a latrine? If not, why do you think this is?
- Are there any problems with the types of latrines built in your village?
- What could be done about these problems?

There is a growing number of social scientists in developing countries who have the right training to collect and analyze data of this sort, and anticipate possible problems. They can help to develop and test participation procedures, including special measures to involve women, and to formulate training programmes for field workers. Employing these specialists as agency staff can have an important impact in the pre-planning phase.

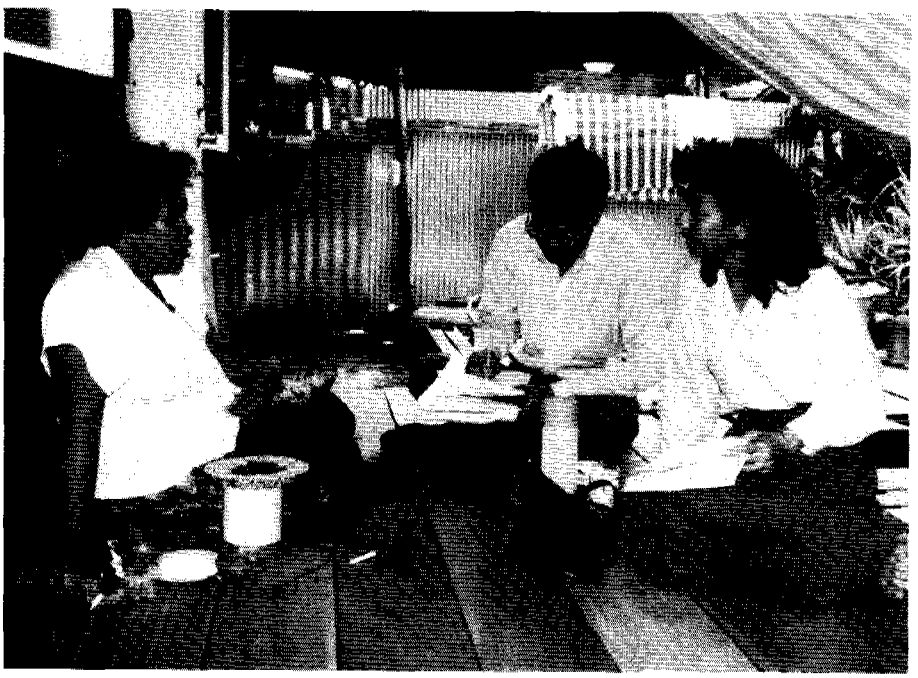
## Involvement of the users

There is very much more to community-based water development than compiling information, although that is a valuable activity provided it does not end up as a massive collection of general statistics. The communities should be full partners in the development, contributing wisdom, work, skills, materials, and cash throughout the whole life of a project.

Agency workers carrying out the feasibility study must ensure that views of all sections of the community are heard. Study teams must be able to obtain the views of women, community leaders, the poor, tribal and other distinct groups. For this type of study, formal interviews and questionnaires are usually not the best methods to be used. They may indeed reduce the possibility of free dialogue. This in turn reduces the chances for more in depth insights into local conditions and potentials within the limited time available for the study.

While getting information about local conditions the agency teams must ensure at the same time, that the communities become more aware of the benefits, costs and maintenance implications of the different types and levels of water

supply under study. To avoid raising undue expectations, communities may need to be warned that actual implementation can take a long time. They should be told too that the community will be asked to participate further in planning, construction, maintenance, and so on.



Agency workers carrying out a feasible study must ensure that views of all sections of the community are heard. Photo: IRC/Boot.

To achieve this two-way flow of information and to demonstrate the partnership approach, feasibility study teams should be competent in social communication and be able to deal with health and social issues as well as technical matters. Technical and social staff need to collaborate closely. Techniques for obtaining local information as well as stimulating the agency/community dialogue are:

**Group interviews**: Investigators use a general check-list to guide open discussion about present conditions, possible improvements and the role of the community. The way individuals in the community interact often provides clear

insights into complex situations, practices and opinions in a short time. Group discussions also set the tone for future planning meetings.

**Community self surveys:** Volunteers from the community help collect data and analyze water, sanitation and health conditions. They are then involved in identifying community resources available for improvements. As with group discussions, identifying problems and collectively finding solutions helps to build a feeling of commitment and responsibility in the programme's early stages.

**Action research:** On larger programmes, it is useful to explore options in a number of demonstration communities. These allow potential water consumers to see for themselves the full implications of individual technologies and allow participation procedures to be tested on a small scale. Through social research and practical experience, effective programme procedures can be developed and subsequently applied in more and more communities.

Regular monitoring and periodic evaluation visits continue the learning process. To help to keep field workers up to date and for training purposes, experience from demonstration projects and evaluations should be spread widely by regular updating and distribution of handbooks and manuals.

## Promoting women's key role

There is no doubt that actively involving women in planning and management of water supply improves performances and enhances benefits. Yet women are still often excluded from important roles in large programmes. Involving women fully should be high on the priority list for planners. From the start, attention should be given to involving women at every stage. During the PSWS project for example the importance of women's participation was increasingly recognized, and efforts were made to include women as project staff members. In the communities women were encouraged to become members of tap/water committees.

Usually it is necessary to allocate specific resources to stimulate women's participation, and the heading "Role of Women" should be a compulsory part of each phase of the programme plan.

## A checklist to ensure women are included in water and sanitation programmes

### *Assessing needs and priorities*

1. Is data collected regarding the use and needs for water and sanitation services differentiated by sex?
   - Are illness and death rates for target diseases given according to sex?
   - Is the social and economic information about the target population sex-specific (e.g. women's employment, women's literacy, women-headed households, etc.)?

2. Do women participate in setting priorities and objectives? Do men and women identify needs and priorities differently?

3. Are women specifically mentioned in the objectives? Are targets sex-specific?

### *Accessibility and acceptance of water/sanitation facilities*

1. Are women's work patterns or time-use taken into account in:
   - placement of water systems?
   - placement of latrines?
   - timing of water operations?
   - health education sessions?
   - training activities?

2. Are technologies used suitable for women? Is the engineering design appropriate for women's use? Do latrine structures ensure privacy and conform to cultural rules? Can women repair the facilities? Can women afford to maintain them?

3. Are women's attitudes and beliefs taken into account in devising health education? Are health activities geared toward "mothers" only? Are fathers and other women taking care of children also included?

### *Project personnel*

1. What is the proportion of women staff in the programme?

2. Is there special recruitment of women as programme managers, water and sanitation engineers, extension workers and programme promoters?

3. Are women represented in decision-making positions?

### *Programme training*

1. Do programme training activities give equal opportunity to women?

2. What is the proportion of women in training activities? What special efforts are being made to involve more women?

3. Do educational and promotional materials show women as sanitation engineers, as programme workers? Are men shown using the facilities?

### *Community involvement*

1. Have women's organizations been identified, notified and involved in the programme?

2. Do work plans exist for the involvement of women's organizations?

3. What kind of support is being given directly to women's organizations?

### *Programme effects, monitoring and evaluation*

1. How will the programme affect women's health and nutritional status? Will the programme monitor and collect indicators of effects on women?

2. How will the programme affect women's access to water and use of water? How will it affect women's work in cleaning house, clothes, children, food preparation and cooking?

3. What changes are expected or have occurred in women's use of time (e.g. number of hours worked) and what were the hours saved used for?

4. How will the programme affect women's income? Do changes cost women more or less money than before? Do women use time saved to make money?

*Source: The Tribune, A Women and Development Quarterly Newsletter 43, September 1989. pp 22/23.*

## 4.3 Preparing for health improvements

Water and sanitation-related diseases account for the majority of cases of disease in the world. They form one of the prime health problems, with serious income and cost consequences for national governments as well as individual families.

**Table 3: Incidence and effects of selected diseases in developing countries (excluding China)**

| *Type of Disease* | *Estimated cases/year* | *Estimated deaths/year* |
|---|---|---|
| Diarrhoeas | 875 million | 4,600,000 |
| Ascariasis | 900 million | 20,000 |
| Guinea worm | 4 million | * |
| Schistosomiasis | 200 million | * |
| Hookworm | 800 million | * |
| Trachoma | 500 million | ** |

* Effect is usually debilitation rather than death
** Major disability is blindness

Source: Esrey et al.

These figures reveal just how dangerous and economically devastating unsafe and insufficient water can be, and underline one of the greatest potential benefits of improved supplies.

The benefits are only *potential* because good supplies on their own are not enough. Studies in Lesotho, Bangladesh and the USA failed to demonstrate any marked reduction in diarrhoeal disease following improvement of water quality alone.

In *Water for the Third World,* Asit Biswas (1981) wrote that his home town of Balasore, India, had been equipped with standposts and some house connections. But he found that:

- people were given no information on how to store water to prevent contamination at home;
- although people had safe water in their houses, they still drank from the nearest source, regardless of its condition, when away from home;
- small children, who are most prone to disease, were often not taught to use safe water;
- water spilled from standposts was allowed to pond creating disease breeding-grounds. After new supplies were introduced, malaria became more common;

- when the system broke down, people reverted to their old polluted sources, and because their bodies were accustomed to clean water they were more vulnerable to disease than before.

It is increasingly being recognized that improved water supply by itself is not a guarantee for decisive improvements in community health. Provision of improved sanitary facilities and additional changes in hygiene conditions and behaviour are also required to reduce the many transmission routes of water and sanitation-related diseases. Hygiene education aims to address these changes and thus to provide the essential link between improved facilities and practices (Burgers et al, 1988).

## Hygiene education

It has already been mentioned that effective water services provide water of a sufficient quantity and quality in such a way that it is generally, exclusively and hygienically used and where possible also contributes to local development.

In achieving general and exclusive water use, hygiene education plays a role in combination with other important aspects. For example women, who are the prime decision-makers on choice of water source, will only use new water sources when they are competitive over the old ones and do not give specific problems, such as salinity, hardness or iron content, lack of privacy or socially raise barriers and conflicts. Social and technical aspects are therefore equally important in achieving optimal use of improved facilities.

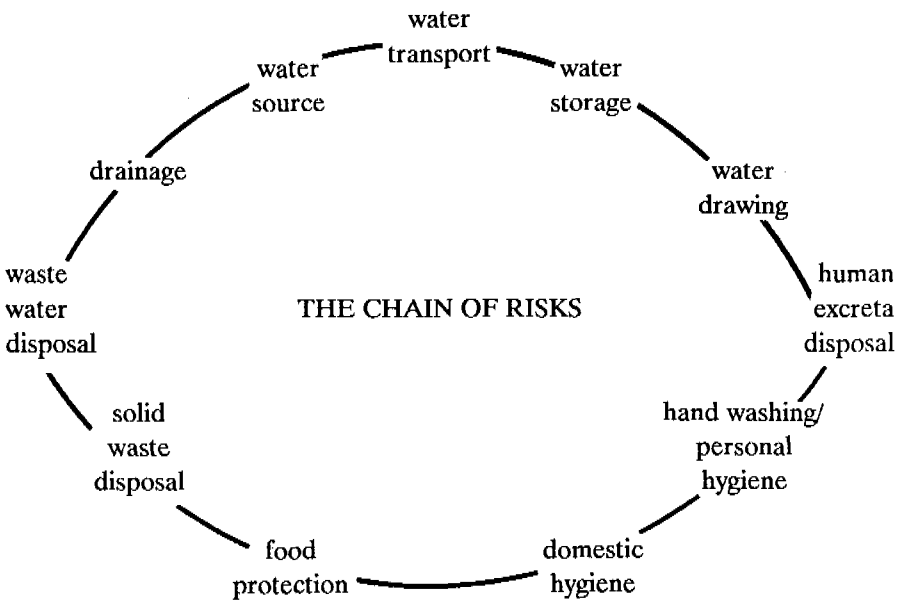
Hygienic conditions of water point surroundings and upkeep of hygiene at water points are as much a matter of social organization as of hygiene education.

The first task therefore lies with engineers and social scientists who must adapt programmes and designs to the needs and potentials of all user categories. They cannot rely on health staff changing the behaviour of the people without adapting the technology aspects of the improved facilities to the wishes and requirements of the users, and without acceptance of responsibilities and management tasks by the community.

Hygiene education should nonetheless accompany and supplement any water supply programme. It should be taken up into the programme planning as early as possible.

Along with water and sanitation, water use and hygiene practices in homes and schools have to improve, if the projects are to realize their potential health benefits. For example, over 20 studies show that drinking water from improved sources is often handled unsafely at home, and more than 10 studies show this results in unacceptable amounts of contamination (Van Wijk-Sijbesma, 1985).

**The chain of risks in transmission of water and sanitation-related diseases**




Source: Van Wijk-Sijbesma, 1989.

Not all types of hygiene education programmes are effective in achieving behavioural change and improved hygiene conditions. A review of past programmes (Burgers et al, 1988) showed that many stop at raising health awareness and providing general knowledge on symptoms, treatment and prevention of water and sanitation related diseases. More effective programmes:

- have a limited number of clearly defined objectives;
- differentiate between target groups;
- either work directly with the groups with the greatest needs, or adapt activities to the needs and potentials of the different groups;
- involve target groups in identifying priorities and planning, implementing and evaluating programmes;
- use other than health considerations alone in the promotion of hygiene facilities and practices;
- are well planned, staffed, budgeted and implemented;
- have a proper balance between the development, production and distribution of tested audio-visual tools and other educational inputs;
- include evaluation on performance and results.

Planning for effective hygiene education programmes in the preparation phase thus includes reviewing local conditions, needs and practices on the one hand, and assessing the availability and capacity of health education organizations and the appropriateness of their methods and materials on the other.

Often, these organizations will have their own programmes and priorities and may not be available consistently for a water supply programme, unless special manpower, transport and budget arrangements are made. In some of the PSWS-participating countries for example, hygiene education and sanitation, while agreed upon at ministerial levels, remained small and unsystematic, because they had no funds and clearly formulated programme of their own. As a result, a catching-up exercise had to be organized which is now under way.

Integration of hygiene education and sanitation in a water supply programme usually requires an organizational structure for co-operation of government agencies at various levels (ministerial, regional district), sometimes including NGOs working in health.

At ministerial and regional level government staff works together to plan and integrate the various aspects of the programme: technical aspects of water supply and sanitation; community participation aspects; hygiene education aspects.

At district or local level extension workers (e.g. health workers, community development officers) work together in planning with the community, in implementing educational and technical programmes, and in involving the community in operation and management of the improvements.

If such an organization does not exist already, setting up one in the pre-planning stage of a water supply programme is an absolute requirement. Hygiene education should start early in water supply programmes, and ideally it should not end with the completion of construction of a particular project but continue to monitor and support further improvements.

## Sanitation

More and more water supply programmes recognize safe disposal of excreta as relevant to their programme success, and include sanitation in the projects.

Feasibility studies in the preparatory phase offer good opportunities to assess the need to link sanitation activities to the water project and assess existing programmes, organizational capacities and results in terms of latrine coverage, maintenance and use.

As with water, sanitation practices and needs will differ between and within areas and communities, and programmes which tune in to such conditions have a better chance of success against lower costs. Adoption of latrines is for example higher among higher socio-economic classes, so in principle, lower subsidies will be needed for these groups. A practical guide on social feasibility studies for low-cost sanitation has been published in the TAG Technical Note Series of the World Bank (Perrett, 1983).

Important requirements for including hygiene education and sanitation in water supply programmes are:

- an organizational structure for co-operation of government agencies at various levels, sometimes including NGOs;
- special budget arrangements for personnel inputs, transport, training, educational and demonstration materials, etc.;
- comprehensive programme for hygiene education and promotion of improved sanitation, to be built into the overall water supply programme at an early stage.

## 4.4 Technical data collection

The planning team will need a considerable quantity of technical data in order to base the engineering aspects of the programme planning on a sound footing. As already mentioned, much of this may be available already, from the records of previous plans, programme and specific projects.

There is already a wealth of guidance on engineering feasibility available in other texts, and this book will not therefore explore technical data collection in depth. Because of their important links to the quantity and quality of water, two aspects, hydrogeological and water quality information, will however be discussed a little further here.

### Hydrogeological surveys

Full knowledge of the quality and quantity of local water sources, and their seasonal variations, is essential for planning a programme of community supplies. Nearly three quarters of the world's fresh water stock is in the ground at depths up to 50m. Nearly 25% is at greater depths, and only some 2% is on the surface. Assessment of surface supplies is relatively simple, but getting information on groundwater, the main source, is more difficult. Detailed hydrogeological surveys require specialist skills and can be expensive. Costs can be kept down by using available sources of information such as:

**Existing wells:** These are obvious sources of data on quantity and quality of groundwater. Depth should be measured at the end of dry seasons. Well users can give useful information on problems that may have arisen over the years. Any pumps in place or other metal objects in frequent contact with the water should be studied for signs of corrosion. Tests of acidity or alkalinity (pH), and electrical conductivity are needed to indicate whether water is corrosive.

**Master plans**: Where these exist they should be studied for available information.

**Geological maps:** These provide a guide to the likely location of large aquifers, but are not accurate enough to pinpoint small local sources.

**Aerial photography**: Specialist techniques can be used to identify surface and subsurface features. They can also highlight potentially useful water lenses. Such photographs may be available from specialist agencies without the need to carry out specific surveys.

**Satellite photography**: Use of satellites to assess natural resources is growing rapidly. Commissioning specific surveys is very expensive, but already vast areas of the world have been scanned. It is possible to acquire photographs from various agencies. Interpretation of these images requires special skills. Site-specific surveys covering a programme area need to be carefully planned to obtain maximum information at least cost. Among techniques available for mapping groundwater and assessing quality are electrical resistivity measurement, seismic refraction measurement, geophysical well logging and test drilling and pumping.

The aim of hydrogeological surveys is to build up the best picture possible of existing and potential water sources. A profile of the main aquifers, denoting likely minimum water levels and quality parameters, should be produced. This data can be added to the village inventory to help in technology selection.

## Water quality

In planning piped supplies, quality of water is important since it will dictate the extent of treatment required. Surface water will often be contaminated, and although groundwater is likely to be cleaner, that too can contain harmful substances or organisms.

An important parameter of drinking water is the potentially disease-causing organism content. It is not practical to test for all organisms, so water is examined for specific types of bacteria which originate in human and animal faeces, the source of most pathogenic (disease-causing) bacteria. Suitable indicator bacteria of faecal contamination are coliforms known as *Escherichia-coli* (E-coli), and faecal *streptococci.*

Water samples should be collected in sterile bottles according to standard procedures. They should be stored in cool shade. Tests should be carried out within a few hours. Two methods exist for conducting tests: the multiple tube method, and membrane filtration. The first is cheaper and the equipment is readily available, but the tests take five days to carry out, must be started within two hours of sampling, and need sterile glassware.

Even when water is bacteriologically acceptable, it can still be made undrinkable by organic materials and minerals. The main problems are caused by excess amounts or iron, manganese, fluoride, nitrate, heavy metals, turbidity and colour. The World Health Organization has guidelines for levels of compounds which can be accepted in drinking water (WHO, 1982). Although the water supply agency will be responsible for carrying out tests and designing treatment works, final approval and control of drinking water quality should remain with the health authorities.

# 5. *Detailed Planning with the Community*

After the preparation phase, the programme will undergo an appraisal to ensure that it is soundly based. Appraisal is undertaken by people other than those responsible for the preparation itself. If external funding is involved, the appraisal will generally be carried out by overseas specialists who will review the feasibility report. When this appraisal is successfully completed and funds have been allocated, the programme will be ready to move into the planning phase.

In many respects, this phase echoes the activities carried out during the preparatory phase. This time however, attention is focused directly on each of the selected communities, rather than at a sample.

## 5.1 Planning aims

The overall aim of this phase is for the agency and community jointly to make decisions on the best mix of technology, the level of service, the actual designs, and the local implementation, maintenance and management systems to be adopted. These decision will take account of the available resources and the commitments that each partner will have to make. The planning stage aims to ensure that:

- the supply is one that the community wants and can use and benefit from fully;
- the level of service provided is the highest that the beneficiaries and the agency can afford and sustain;
- suitable organizations are created to allow agency workers and communities to learn from each other in the planning process;
- the supply is one that the community can operate and maintain largely with its own people and money;
- chosen technology and maintenance, management and financing systems are appropriate to local conditions;
- maximum benefits are derived from the new supplies;
- training is provided to allow community members to participate fully in their projects;
- agency staff are trained and organizations adapted to provide continuing support during and after project implementation.

It is important for the communities to understand and accept their ownership of the projects. The community-based approach involves the agency workers in providing support in terms of information, skills, finance and human resources.

Agency workers should spend time with the community to exchange views and discuss problems. Photo: PSU Indo-Dutch Co-operation in Water Supply and Sanitation.

But the scheme itself, the decisions concerning it and responsibility for its ultimate upkeep must lie largely with the communities.

The local planning phase is a period of close contact between the community and agency workers. Agency workers should spend time with the communities. Single day visits by agency workers in a rural water programme in Guinea-Bissau failed to produce a satisfactory result. The planners learned from this experience and afterwards stayed with communities for several days explaining the project proposals and holding discussions and meetings. The agency teams comprised a man and a woman. They were recruited locally where possible and specially trained for their tasks (Visscher, 1982).

## 5.2 Issues for consideration

Main issues to consider with future users and water supply managers in this stage of the process are: the choice of a piped supply or other system; the appropriate level/mix of services including service to disadvantaged groups; and local maintenance, management and financing systems.

## Choosing piped supplies

When considering whether piped supplies are an appropriate choice, the following considerations may be relevant:

- Time saved by not having to carry water could be used in productive and developmental activities.
- Piped supplies are more difficult to justify in communities with low population densities, but in such areas, piped supplies could have a role in promoting and concentrating settlement and other development activities.
- The aim should be for the community to cover at least operating and maintenance costs. This might not be always possible for piped supplies if pumping is necessary, in which case it must be clear to the agency how continuous maintenance and repair of installed systems is to be financed. Cross subsidy, in which higher recovery from better-off sections of the community provides enough revenue to pay for the upkeep of systems serving poorer groups, may sometimes seem attractive. However, examples of successful operation on that basis are extremely scarce.
- Distance of water source, water availability, possible detrimental effects of use, disposal of surplus wastewater, year-round reliability, quality and other factors all need to be carefully assessed.

Issues on which users commonly want information in an early stage include the extent or coverage of the system, the approximate costs to individual households, the amount and reliability of water supplied, the amount of digging in cases of voluntary labour, and the say of the future owners and contributors on design details.

Taken together, these points are likely to influence the joint decision of the users and agency on whether to choose and support a piped system. In one country, villagers chose more easily sustained handpumps over the piped system originally promised by politicians, when they learned that the piped system would have to be diesel-pumped and involve large distances of trench-digging. In another part of the same country, where diesel-pumped systems existed with a history of fuel shortage and long breakdowns, and feasibility of handpump wells was low, the villagers wanted to be informed exactly on the running costs and reliability of either option before deciding on rehabilitation of the piped system or replacement by handpump wells.

## Planning service levels

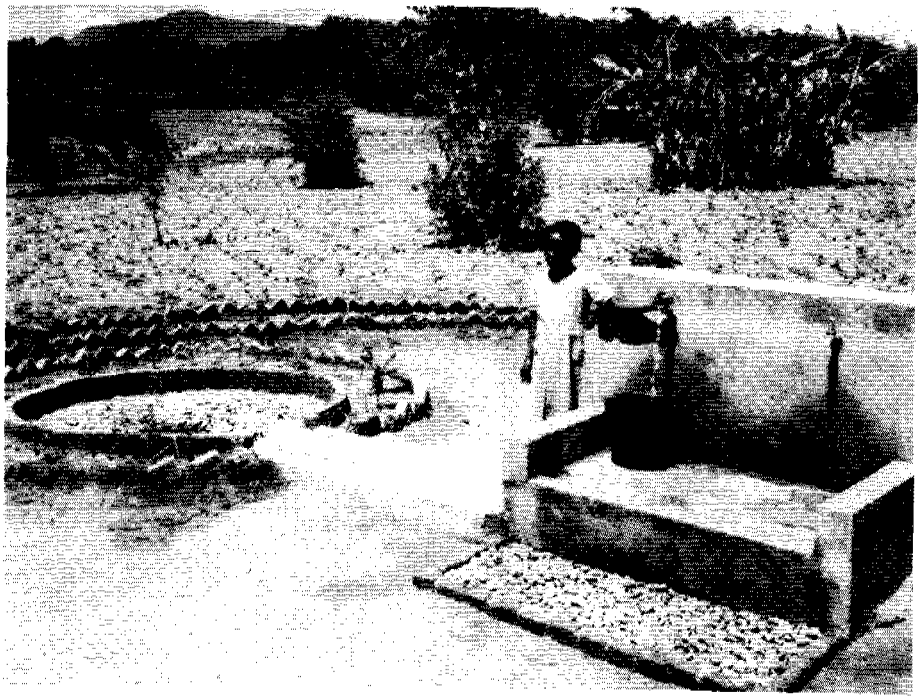
Different sections of the community have different water needs and capability to pay and contribute, so there is not one ideal level of service. House connections might be appropriate for the better-off sections. In other areas, individual yard taps, neighbourhood taps or public standposts will be more suitable. For outlying areas, piped supplies might not be the right choice at all

and handpumps could be the answer. The selection process described in Chapter 2 is one way of arriving at the right technology mix for individual community groups.

Assessment of the number of households wanting to take a yard or house connection and households interested in forming user groups, gives planners an indication of what mix of services to plan for.

A specific point for discussion with local leadership at this stage is the scope of and reasons for choosing a private or group connection, their implications for the community health impact of the system, and what agency and community could do about the situation. In a project in India for example, local leaders and project staff went from well-to-do village sections to the poorest areas to increase awareness of the need for a community water supply to serve the whole community and not just selected parts. Thereafter, discussions on how to reach all with a feasible system became much easier.

When progressive development of service levels is not planned ahead, piped schemes can quickly meet capacity problems. A public standpost scheme for 400 villages in Latin America first ran into financing problems because many users wanted private taps. Conversion to a number of house connections brought new operational problems. These resulted in further non-payment and finally the abandonment of the scheme as a whole (Van Wijk-Sijbesma, 1979).



A well-maintained communal tap in Malawi (PSWS Project). Photo: IRC/Boesveld.

True public taps are now out of favour as a first step in piped supplies. These taps have no clear owners and tend to be neglected. Their use nowadays tends to be restricted to sites such as markets, bus stations or other recognized public places, and even there, careful consideration has to be given to ways of managing their operation and maintenance. Neighbourhood standposts, or group connections with identifiable owners, are more likely to be well run and maintained. Private yard connections could be the next stage, and from there the final step for families could be full house connections.

It is not necessary for the whole community to climb the first steps of the service level scale simultaneously. At any time there will probably be an appropriate mix of service levels. The progressive approach has important implications for design, which are discussed in the next chapter.

## Ownership and the partnership approach

The fact that after construction the community or groups of communities together become the owners of the village water system has a profound influence on the agency-community relationship. No longer can a system be imposed on its users and managers. Instead, agencies will have to assist communities to make informed choices; prepare them for the resulting maintenance, management, health and financing consequences; and guarantee the minimum support which most communities will still need to keep up their operating and management capacities.

Even when full community management is not possible, such as in large schemes with a relatively high technical and administrative complexity, some degree of ownership and control, e.g. for the distribution network and operating service, is important. Service in a rural pumped scheme in Tanzania, operated by the district service of the Ministry of Water, benefited immediately from a limited but crucial increase in community involvement on two aspects. The first was that the scheme villages were allowed to finance a stand-by operator, who ran the scheme while the government-employed operator was away to arrange for (sometimes village-paid) fuel or for other reasons. The second was that the operators were made responsible both to the district water office and the village scheme committee (Van Wijk-Sijbesma, 1989).

During the detailed planning stage of participatory projects it should be completely clear how the construction, maintenance and financing will be divided between the communities and the agency, and what mechanisms of control each party will have. Usually, during construction, the community will contribute voluntary labour, local materials and/or contributions in cash to the capital costs. The agency suggests how the communities can organize these contributions, and consults them on adaptations to be made to fit specific local circumstances, such as harvesting times, migration patterns and form of women's involvement. It also helps organize local planning and training. More details on the different forms of self-help in piped supplies are given in the

next chapter on implementation of design and construction.

In the course of detailed planning with the community, the basis is also laid for future maintenance, management and financing. Candidates to be trained for local maintenance and repairs are usually chosen during this phase, so that they can receive on-the-job training during construction. Experience has shown that the social acceptability of the candidates is at least as important as their technical suitability. Selection criteria to be taken into account include:

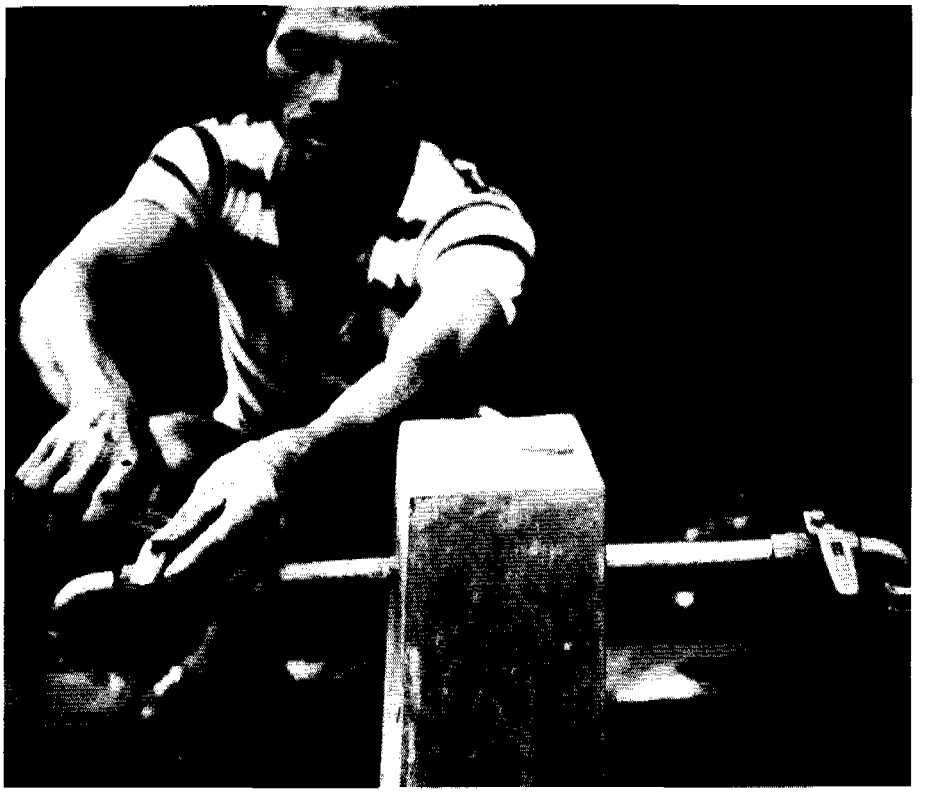
- permanent residence in the area
- other sources of income
- mobility and ease of access
- reliable and respected person
- high personal motivation for the work
- able and willing to keep records
- previous technical experience, or clear interest and aptitude during training.

In principle, communities can choose their own caretaker or community mechanic, or decide to share an area mechanic. The latter may be a person shared between several villages in one scheme or area, or someone from the private sector who gets additional training from the project and is able to replenish his or her stock of tools and spares from the private market, or through an agency supply system.

It is very important at this stage to prevent any later misunderstandings or conflicts on the payment of caretakers and mechanics. While it is clear that mechanics will have to be paid, a monthly salary is not always realistic, both in terms of amount of work to be done and capacity of the communities concerned. Often, payment per job (which may partly be fixed maintenance visits, partly ad-hoc repairs) will be more realistic. This implies that the mechanic must serve a large enough area, and have the communication and transport to do so. Or he/she must have other sources of income besides maintenance and repair of the local water supply, or have other alternatives for subsistence.

More detailed planning for local caretaking (preventive maintenance, reporting of problems, upkeep of hygiene and proper use), usually does not take place until the later stages of construction of the scheme.

Finally, at this stage the community also decides on the local organization which represents the users in more detailed planning issues, organizes local contributions to the construction and takes on later management. Usually, one community organization will be chosen for all tasks. In Latin American countries, there is also a tradition to choose two committees. The first one does all the work in the pre-construction and construction phase and represents the whole community. The second one is chosen by the registered users only, for the management of the completed supply (Espejo, 1989).



A local mechanic in Playangan, Indonesia, repairing a communal tap. Photo: PSWS Project Indonesia/Parwoto.

## 5.3 Promoting community involvement

Correct decisions in the detailed planning stage will only come as a result of close partnership between agency workers and the community. In the end, the community has to decide what it wants and can sustain. Agency staff are there to:

- explain the project and describe the options of technology and levels of service;
- explain what will be expected in terms of community participation and obtain commitments on operation and maintenance;
- explain and accept the agency's own obligations/commitments;
- help establish necessary community organizations for planning, financial management, hygiene education, operation and maintenance;
- provide necessary training;
- obtain all physical and socio-economic information necessary for detailed design;

- explain the importance of continuing improved water supply for all, with improvements in sanitation and hygiene if community health is to improve;
- explore other potential benefits, and their implications for project planning and design;
- design any support activities needed for operation and maintenance, such as supplies of fuel, spare parts and special skills.

## Meetings and home visits

First contact is often left to agency workers who, ideally, have local knowledge. The approach should be made with discretion to avoid, for example, being identified with one community faction to the annoyance of another. The agency worker first makes contact with formal leaders when proposals for the participatory project will be outlined.

Discussions with the community can take place through public meetings where the project proposals and implications are explained. Parallel activities of hygiene education and sanitation improvement should also be explained. To maximize the effect of such meetings, some of the following actions can be useful:

- discuss with local leaders the importance of men and women attending meetings;
- hold meetings at times and places of maximum convenience for most of the people;
- use all available channels to announce meetings and encourage attendance;
- invite questions and comments from all sections of the community;
- hold separate meetings, or small informal neighbourhood gatherings, in situations where women or poor households would find it difficult to express themselves openly.

Agency workers must treat these meetings seriously otherwise they will be written off as vehicles for endorsing government decisions already made. Many people are suspicious of "officials" and everything they do. For community participation to succeed, agencies and communities must become mutually respecting partners. The poorest and worst served sectors of communities are often the least vocal as well, but they are the ones most in need. One of the aims of the past decade has been to pay special attention to these groups, especially in rural areas.

More detailed local planning of design, construction, maintenance, financing and complementary hygiene improvements usually takes place with representative community organizations, such as water committees. Plans and decisions made may afterwards be confirmed in a larger community meeting.

At this meeting, the community will make formal commitments to contribute labour skills, cash or goods for construction and upkeep of the new supplies. These are then matched by agency commitments to provide training, tools,

Informal neighbourhood gathering in Guatemala. Photo: IRC/Espejo.

spares and specialist skills when needed. Where customary, a contract between community and agency is signed at this point.

Besides public and neighbourhood meetings, community surveys and home visits are sometimes used to inform individual households about the project, find out what water sources and sanitation they presently use, and assess their interest in and willingness to pay for improved services. Such community assessments, often carried out by female schoolteachers and other local women can be a good way to reach other women when they cannot easily attend public meetings.

## Flexibility

Of necessity, flexibility must be a highly important feature of any partnership approach; these is not one recipe, no fixed set of rules to be followed. Each country has to adapt the general principles set out in this book to its own circumstances and cultural background. Differences between rural and urban areas have to be taken into account, as well as possible previous experiences of

the local people with development projects in general and attempts to improve their water supply in particular.

> All the PSWS demonstration projects treated community participation as a continuous learning process, bringing users into decision making, and increasing self-reliance and the potential for future social development. The approaches were different in the four countries, in each case building on local conditions and whatever self-help practices were already in being.
>
> In Sri Lanka it was decided to carry out preliminary research on the socio-economic background and the sanitary habits and health knowledge of the communities concerned. The research served also as an introduction of the project to the people. At the same time the project team approached the village leaders and the existing local voluntary institution (Gramodaya Mandalaya) directly, to start planning and implementing the establishment of public standposts.
>
> In Zambia, the village headman was the contact point between the agency and the community, and called meetings of villagers to discuss plans and commitments. Zambian communities were given freedom to decide on their own communicating mechanisms. They also had more direct influence on the initial siting of standposts (mainly the concern of the women), on management of the taps, and on general planning issues. In Malawi, where the standposts had already been constructed in a sister project, the PSWS approach focused on community participation in the operational phase. The Tap Committee, with members elected by the community, became the manager of daily operations. It also became responsible for collecting and paying water charges and for small repairs. Larger maintenance work remained the responsibility of the Water Department.
>
> The Indonesian approach was different again. Provincial authorities have specific responsibilities for community participation, and they conveyed the PSWS approach through their own channels, with the help of the project team. Specific training was given to sectoral officers responsible for water supply development, and they in turn trained village development cadres. The cadres initiated community self surveys, the results of which were discussed in village gatherings.
>
> Each approach has its own merits and limitations, and all contributed to improved techniques on the practicalities of user involvement (Parwoto and Kwaule, undated).

## Feedback

Final results of the planning phase should be presented to the community through its organizations, or better still at public meetings. Agency workers may have to summarize the planning report in the local language and discuss the findings with the people. Equally important is making sure that officials of the local administration (who are often not directly involved in the project) and politicians are well informed on progress and problems. Newspaper coverage when used carefully, can have a good impact on the development and promotion of a programme.

There will be times when the locally expressed needs will differ from what the agency is able to offer. The agency should certainly try to convince such communities of the value of the recommended solution, but should also look for other answers, possibly with other agencies. This could arise, for example when both men and women in the community are more interested in building a road

than new latrines. The water agency should at least contact the roads agency and pass on the view.

Where water supply and sanitation is judged by the community to be of too low a priority to justify the agency taking action, it may be best to postpone the improvements, and meanwhile top up with hygiene education to improve appreciation of good water supply and sanitation.

## 5.4 Planning for good health: hygiene and sanitation

As has been explained, it is necessary to start early with making provisions for the integration of hygiene education and sanitary improvements into water programmes.

In the pre-planning phase, existing conditions and felt needs will have been assessed, organizations identified and arrangements made to link community-based hygiene education and sanitation programmes to the water supply project. The detailed planning discussions for a new water supply system also offer excellent opportunities to introduce the related topics of water use, hygiene and sanitation and make a start with local hygiene improvement programmes.

**Table 4: Prevention of water and sanitation linked diseases**

| *Disease* | *Safe water* | *Safe excreta disposal* | *Personal/ domestic hygiene* | *Safe handling of food* | *Safe wastewater disposal* |
|---|---|---|---|---|---|
| Diarrhoeas | *** | *** | *** | *** | * |
| Roundworm | ** | *** | ** | *** | ** |
| Whipworm | ** | *** | ** | *** | * |
| Pinworm | ** | *** | *** | ** | * |
| Hookworm | ** | *** | ** | * | * |
| Guinea worm | *** | * | * | * | * |
| Schistosomiasis | ** | *** | * | * | ** |
| Skin/eye infections | * | * | *** | * | * |
| **Louse-borne infections** | | | | | |
| Malaria | * | * | * | * | ** |
| Yellow fever/dengue | * | * | * | * | ** |
| Filariasis | * | *** | * | * | *** |
| Sleeping sickness | * | * | * | * | ** |
| River blindness | * | * | * | * | ** |

Source: Boot, 1984. (Adapted from: Maximizing Benefits to Health, WHO, 1983).

*** = Very important measure ** = Important measure * = Less important measure

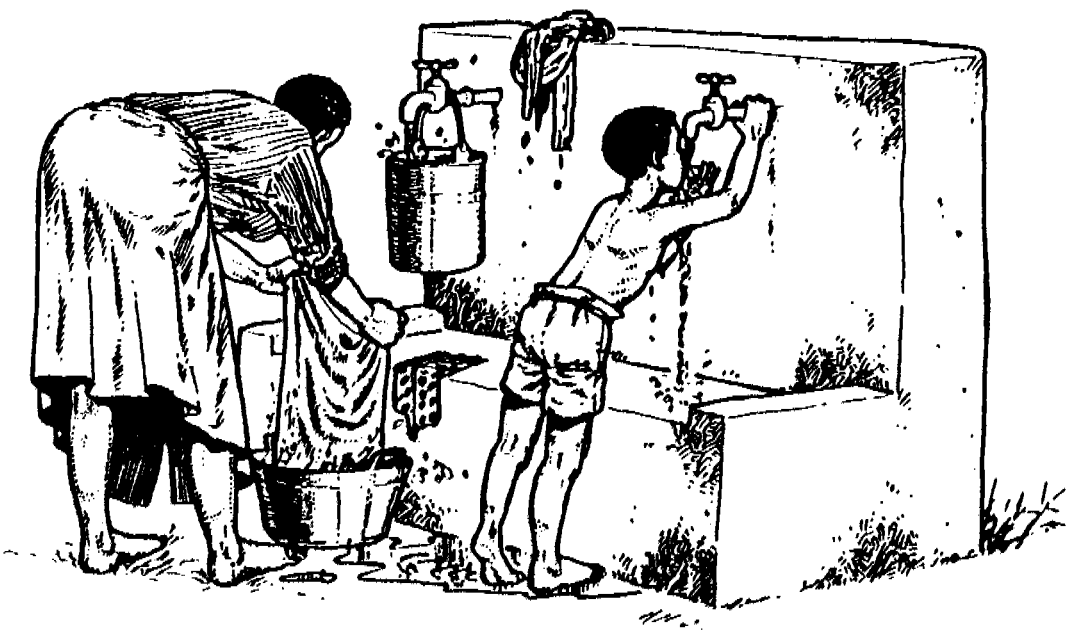
## Education activities

Operating a hygiene education programme is skilful work and the responsible agency workers need proper training and equipment. A hygiene education plan should focus on promoting actions by men, women and children to prevent or reduce diseases. It should not attempt to provide medical details of disease and transmission routes. Nor does education involve simply telling the communities how to behave.

Rather, the health staff will have made a comprehensive programme for bringing about specific hygiene changes in the communities they work in. Basically, two types of hygiene education programmes exist: promotional programmes, and organizational or participatory programmes.

Promotional programmes investigate local hygiene practices and underlying reasons for each target group: men, women, children, different socio-economic and cultural groups. They then assess how each group can best be reached and with what types of messages and activities.

A small number of essential health risks is selected for change and messages and actions are adapted to the possibilities and roles of each target group. Thus, the Togo rural water and sanitation project included a hygiene education plan of six campaigns on different themes, each lasting four to six months.



A case for hygiene education.

Community health workers organized slogan contests, meetings, demonstrations, short dramas and lessons. All this was supported by a regional programme of wall posters and radio announcements.

Organizational or participatory hygiene education helps the community or groups in the community to organize and to identify and solve local hygiene problems. Project workers work with existing groups and committees or unite people to form new ones. They then help these groups to review existing hygiene practices and conditions, identify what changes are needed, set priorities and plan, implement and monitor activities to realize the selected changes.

More details on planning a participatory hygiene education programme with a community can be found in IRC's publication "Making the Links" (Boot, 1986).

## Health committees

It is usually a good idea for the community to set up a health committee to discuss, develop and promote specific local hygiene education activities. Sometimes, the water committee or other community body can fulfil this task.

Health committee members will usually include community leaders whose authority can help promote the health programme. These people are unlikely to be interested in the details of hygiene education and will prefer to deal with general issues. In that case agency workers should ask for a sub-committee to be established.

Sub-committee members should be people who are personally interested in health and are accepted by the community as a whole. Usually, these people belong to neither privileged nor under-privileged classes. Women from ordinary households should be well represented.

## Hygiene educators

World-wide experience shows that hygiene educators drawn from the communities themselves are the most effective. For the Jamkhed health education programme in India, the communities selected educators on the basis of their motivation, interest, wish to change old habits and sensitivity. Formal education and literacy were not seen as important and most of the chosen educators had never been to school. Periodic meetings of all educators were used for ongoing training and exchange of experiences among the educators themselves (Arole, 1984).

Women are often seen as the best educators because many of the issues revolve around domestic hygiene. But, as always, men should not be excluded. They too have a role both as promoters and targets for education.

One man and one woman for every 500-1,000 people were elected as educators in the Imo model water/sanitation programme in Nigeria. Men were found to be more effective in organizing communal labour, promoting environmental

sanitation, and building latrines. Women became more involved with household and child care, improving personal surroundings, treating infant diarrhoea and home water storage (Aig-Ojihomon, 1984).

Among questions that need to be raised with local groups and committees by the hygiene educators are:

- What are the main behaviour changes that are needed?
- What activities are needed for individual groups?
- When should hygiene education activities be held?
- Where should the activities take place?
- Who should take charge of education activities?
- How should follow-up activities be organized?

In Sri Lanka hygiene education was from the start an important component of the PSWS project. In accordance with findings from preliminary research on health knowledge and sanitation practices, a community health and hygiene programme was set up. Older school children were selected to form groups of voluntary hygiene instructors. They received short training and then would visit all households to give information on proper use of water and sanitation (Karunadasa et al, 1987).

## Organizing to keep water safe

Maintaining safe water supplies up to the taps is the job of trained operators, but keeping it safe after it leaves the tap is everybody's responsibility. Water may become unsafe at any point between collection and use. The first area of risk is the tap or the standpost itself and the area around it. The following good practices need to be discussed with the community, and special arrangements made on who exactly will promote and supervise these activities:

- Handle taps with care.
- Keep taps clean and prevent people, especially children, from touching taps spouts or putting their mouths to them for drinking.
- Clean the area daily.
- Clean drains regularly to allow spilled water to escape.
- Prevent tap areas from getting muddy.
- Repair cracks in concrete and mortar.
- Bathe and wash clothes away from drinking taps.
- Keep animals away from the tap.
- Collect, transport and store drinking water in a safe way.
- Draw drinking water safely from storage vessels.

Sri Lanka: hygiene education by voluntary instructors. Photo: PSWS Project, Sri Lanka.

## Coping with breakdowns

Piped supplies will fail from time to time, although effective maintenance should minimize this. While the taps are out of order it is important that users are aware of safe ways of using other sources. Boiling polluted water for 10 minutes is a sure way of killing bacteria, but that can be expensive. A cheaper, though less effective way is to store water for 24 hours before using it. In that time, many of the bacteria die or settle to the bottom, together with the solid pollutants.

## Improved sanitation

When a latrine project is linked to the piped water supply project, the socio-economic feasibility study will already have established what practices, problems and needs people have, and what improvements could best be tried. During pre-planning, existing experiences with sanitation programmes will have been reviewed, a sanitation project organization will have been selected and a general strategy and implementation plan made which reflects earlier lessons and experiences.

Major decisions to make with the individual communities during local planning are (1) to include sanitation improvements or not and (2) whether to treat sanitation as an individual household responsibility or as a community health issue.

**Household-oriented sanitation projects** usually start by giving sanitation information and motivation to the community through meetings, pamphlets, household visits etc. In this, increased status and convenience are often more forceful latrine promoters than health messages.

Special efforts to reach the women in this phase usually pay off, since women have a greater need for the privacy of a latrine and are also in charge of children's sanitation. Typical topics covered in this stage are:

- the link between water, excreta disposal and health;
- the benefits (health, status, privacy and safety to women) of improved latrines;
- the technology options and their characteristics;
- costs and user contributions in cash/kind;
- application and installation procedures.

Models, demonstration latrines, visits to completed projects and various audio-visual aids also help in informing and motivating future users. Usually construction is assisted either by an external technical organization, government or contractor. In Zambia several latrine models have been created through the PSWS project. Some of these were pit latrines made with low-cost local materials, others were factory produced concrete VIP latrines. Most people were not able to afford completely new latrines, but they made improvements on their traditional latrines based on the demonstrated models.

Recently, good success has been achieved with training private craftsmen or health workers on latrine production and installation. In Thailand, male and female health workers get training and starting capital to make water-seal latrines for village households participating in a community latrine project. In Mozambique, small-size latrine slabs ("sanslabs") are made by specialized co-operatives. In Lesotho, a large number of latrines have been constructed through the private sector. Twenty percent of the latrine builders trained are women. Latrines installed by trained local craftsmen in Uttar Pradesh, India, were of a better quality than latrines installed by contractors through the state water board (De, 1987).

Approaching latrine improvements as the responsibility of individual households also has some disadvantages. As mentioned before, latrine ownership is directly linked to household income and socio-economic position. Flat latrine subsidies therefore often reach only the better-off households, even though these would and could install the same latrine at its full cost.

A local artisan involved in latrine construction, Sri Lanka. Photo: PSWS Project/Sri Lanka.

Demonstration latrines also usually go to the most prominent households and have little outreach to the lowest socio-economic groups. Locating demonstration latrines at public places does not have this disadvantage, but here poor upkeep may counteract general use as well as the demonstration effect.

**Community-based sanitation projects** treat sanitary excreta disposal as a communal as well as private responsibility. Local leaders, groups and organizations are assisted to make an inventory of local excreta disposal conditions and problems and plan for local improvements. Sometimes, local schoolchildren do a village latrine inventory. Typical activities in such programmes include support from the local administration, teachers and parents for construction or improvement of school latrines, improvement of other public hygiene conditions, and community assistance to single parents, old couples and other people lacking labour and/or funds to build a latrine. Thai communities established a revolving fund for sanitation improvements with a small amount of starting capital and some technical, organizational and

managerial training from the government. Individual families borrow money from this fund to install a water-seal latrine and gradually pay back their loan to the fund (GTZ, 1989).

One of the main lessons of the Decade about sanitation is that latrine projects do not stop at installation of the underground parts. Completion of superstructures, actual use by all members of the family throughout the year, including for disposal of infant excreta, proper maintenance and hygienic upkeep are more crucial and less easy to achieve. Partly, this requires more user consultation on planning and designs, partly more monitoring, support and evaluation during the post-construction period. In community-based programmes, such follow-up is often done by community organizations and volunteers.

## 5.5 Training

### Training community members

During the planning stage, agency workers should help the community to find and train enough people for full participation to be possible. The community knows which of its members are the most reliable and appropriately skilled. They therefore are responsible for selecting the people for the various jobs, and can be helped to make wise, well-considered choices.

A review of tasks, responsibilities and workload of each community worker, such as caretakers, scheme attendants, treasurers and community hygiene educators, makes it easier to choose the right candidates for training. Tasks for community members to undertake which may require training include:

- operation
- maintenance
- repairs
- financial management
- hygiene education
- sanitation promotion.

An important training need in the PSWS project in Malawi emerged from an analysis of the causes of non-payment of water rates by the tap user groups. The main reason was not willingness or capacity to pay, but lack of managerial and financial skills in the tap committees. Inflexible tap opening hours, lack of financial control, misunderstanding of the financing system and lack of support from the central water councils resulted in users refusing to pay and committees mishandling funds and delaying payments. A training package was developed to answer these needs. It included:

- guidelines, training and monitoring for *tap committees* on membership, administration, tap management and financial control;
- special guidelines, training and monitoring for *tap committee treasurers* on financial administration and record keeping;
- a guideline for *plant operators* on their role in group meter reading and social communication;

a guideline for *central water councils* on group-managed taps and the council's role in conflict mediation.

The four schemes with 68 tap committees benefiting from this trial training package thereafter moved to the top ten in the country in terms of financial performance. As a result, the training programme is being expanded to gradually cover all 600 communal water points (Kwaule, 1989).

Training can often be given on the job, and should be performance oriented, not theoretical. Special attention is needed to make it possible for women to attend. Often, solutions can be found to overcome practical and cultural problems. Holding courses in the town or a central village, organizing group travel and providing child-care facilities are some of the measures taken by water programmes to ensure wide participation.

## Training agency staff extension workers

The partnership approach also calls for new skills and techniques for agency staff which are not generally part of their past training. New staff may have to be recruited, or existing staff may be retrained in motivating and assisting communities in the development of community-based approaches. For more details on training in community motivation and participation, reference is made to the Occasional Paper "Training Community Motivators in Water Supply and Sanitation" (IRC, 1987) published in co-operation with the World Health Organization.

In Indonesia the PSWS project team trained regional and district officers responsible for water supply development, to help carry further the participatory approach. These people then became trainers of village development cadres, who, based on their training, conducted community self-surveys at village level. These surveys were then used to inform and motivate the people for participation in planning and implementation of the projects. This training methodology proved to be successful, and has since become used in national projects in different regions of Indonesia (Parwoto, 1989).

Indonesia: training of trainers. Photo: IRC/Boesveld.

# 6. *Design and Construction*

Major decisions on technology type and service level will have already been made when the design stage is reached. Now the task is to produce detailed designs which will:

- incorporate practical details acceptable to the users;
- allow construction to take place in an orderly and economical way;
- ensure that the installed system can be easily operated and maintained;
- allow for flexible future extension and upgrading.

Designers should not concentrate solely on the physical aspects of the project. They therefore must take full account in their designs for cultural, social and the other important influences that will bring the engineering of a water supply scheme to life. Agency technical personnel responsible for design should have had direct contact with the community being served, and a close knowledge of the earlier planning discussions.

## 6.1 User acceptability

As a piece of engineering, a piped water supply is comparatively straightforward. But if only engineering criteria are used, there is a high risk that the scheme will fail. The pumps and taps might work in the physical sense; water will flow when the taps are turned on. But if they are not used, then the effort of introducing new supplies will be wasted.

Ensuring that standposts are socially acceptable is a vitally important aspect of design. It means that designers have to base their decisions on a full understanding of how the community uses and carries water. The only way to get that understanding is to consult the community and also to observe its habits. Women in particular should be consulted before designing standposts and neighbourhood taps, and their requirements should be given a high priority.

Developing the detailed design with the community requires informed decision-making and sometimes strong negotiations, in which both technical and socio-economic implications are taken into account. In a piped water project in northern India, public standposts were originally located outside the village. Involvement of an NGO in user consultation revealed that for general use, taps within the village were preferred. Alternative sites were chosen without the technical advice of the water agency. As a result, the selected sites were partly situated in low-lying areas with insufficient drainage potential. The resulting unhygienic conditions led the water agency to conclude that community participation in siting did not work, and not that the users were not

able to get sufficient guidance to make decisions themselves (Van Wijk - Sijbesma, 1989). Informed decision making in the Communal Water Point project in Malawi however, was based on a dialogue between technicians and community representatives, balancing what was preferred by the users with what was technically feasible (Kwaule, 1989).

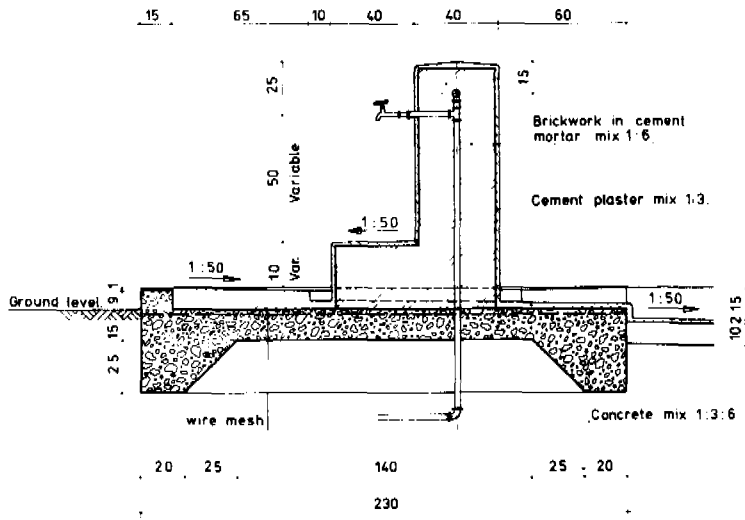
Informed discussions bring out community knowledge, for example where burial grounds have to be avoided by pipelines and standpost sites. It can also create a better understanding of the technical limitations of piped systems. Users in a Zambian PSWS village preferred their standpost in a central place under a big tree. They changed to a further away and lower-lying (but still drainable) site when it was explained by the engineer that the elevation of the first site would affect the pressure in the taps. The community would see if they should build a sunshade and washing facilities at the new site, as the women would otherwise have to carry the water up a steep slope to their homes.

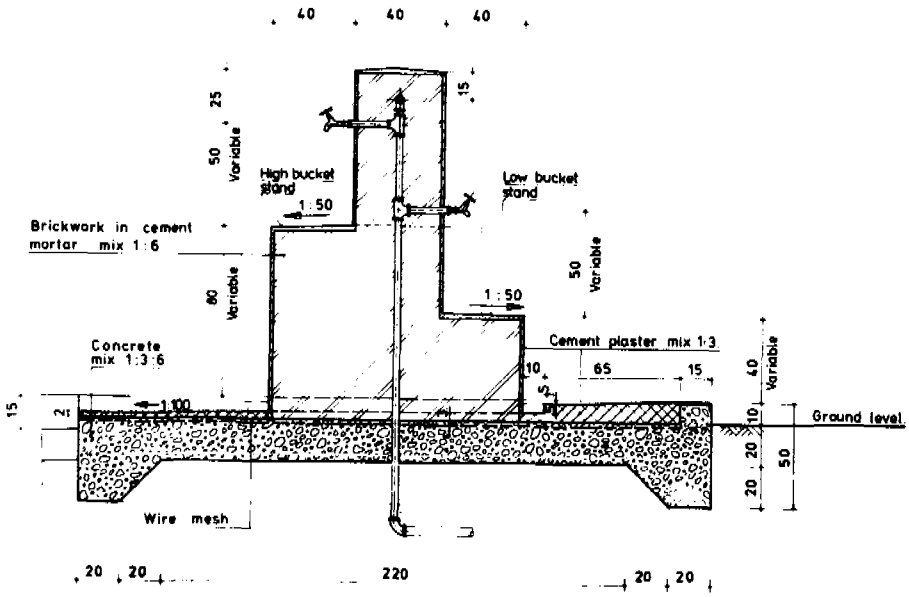
The following are therefore some important points to consider in ensuring that designs are acceptable:

**Number and location of standposts**: Where designs include neighbourhood (and perhaps some public) standposts, they should be enough in number and well-distributed so that all people can use them easily. Walking distance should normally be less than 200 metres.

Unfortunately, some projects still locate standposts along the main road, simply to keep down initial costs and facilitate construction. Other projects count one standpost with four taps as four separate outlets, to meet design criteria on paper, without regard for actual user potential. Another administrative device is to locate standposts generously, but only in the main village of an administrative area. Outlying hamlets belonging to the same area are then counted as served, but get no taps of their own. Locations in school grounds, temple grounds and at busy street corners often restrict free use and privacy for women, and street-locations may have safety risks for children.

**Design of standposts and layout of site**: Users may have practical or cultural preferences for the lay-out of the site. Drainage capacity of the soil and the drainage provisions (sloping platform, channel, soakpit, drain or diversion for garden irrigation) are essential parts of location and site design, and in general require more attention than is usual. How people carry water also affects the design of neighbourhood and public standposts. If women carry water on their heads, small platforms or stands about 1m above the ground should be built, to support the pots whilst filling and facilitate lifting the pots onto head or shoulder. The taps should then be about 1.6m above ground. Where children too carry water, lower taps about 1.1m above ground should be provided. If animals are used to carry water, standposts should allow for large and small containers.




Two examples of concrete and brickwork standposts. Modifications can be made according to local requirements.

The standpost structure should be strong, to prevent damage by misuse or animal impact. Favoured designs are based on a plinth and support of rendered concrete blocks, or reinforcing the vertical water pipe by surrounding it with a 100 and 150mm pipe, set in the ground, and fine concrete.

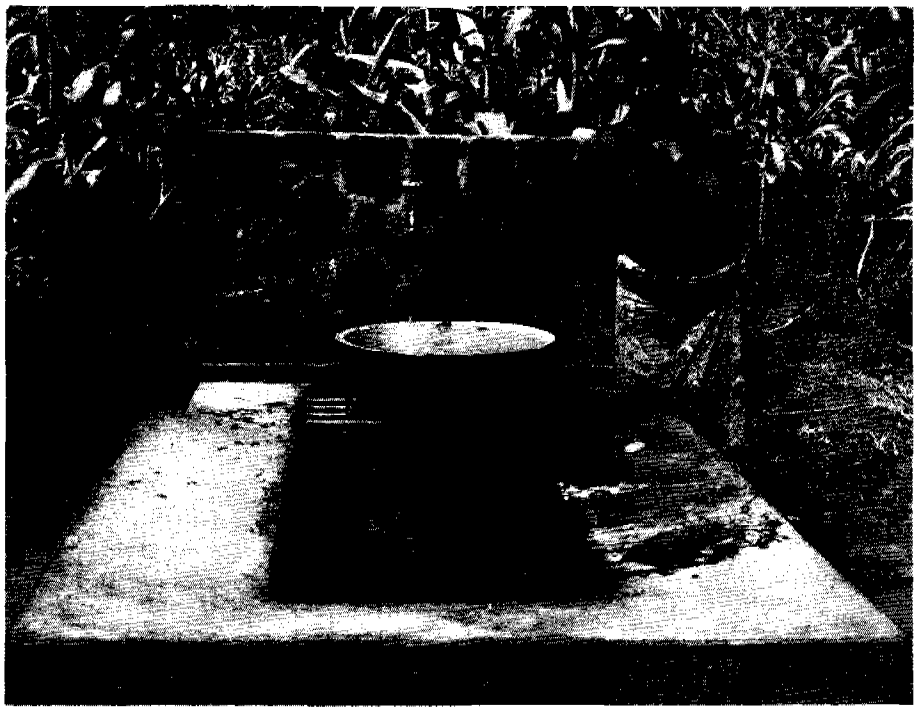
**Additional provisions for washing, bathing and cattle watering**: Body and clothes washing also have to be considered in design, as well as the need for drinking water. For example, women might require privacy for bathing. It may seem inconvenient to provide for these secondary activities which consume much water, but if people are going to use standposts in these ways anyway, it is wise to make allowances from the start. This is especially the case when there are strong socio-economic or health arguments for doing so. A ban on washing and bathing near standposts has forced women and children back to standing in schistosomiasis infected water, simply because it was less tiring to do the work at the old source than to carry all water for washing and bathing home from the new standpost. In areas where cattle can be expected to use tap water, special arrangements will also have to be made. Sometimes the design capacity must also be corrected.

Design and location of additional facilities should be a subject of consultation with women, cattle owners, and other interested parties. In a Malawian project washing slabs were not used because women do their laundry with detergent. In Tanzania, where soap bars are used, women disliked raised washing blocks as users became soaked; they preferred a sloping slab at floor level. In Zimbabwe, the washing and bathing facility was partly covered, to allow the sun to dry the place in the morning and afternoon, but protect users from the fierce midday rays (Du Toit, 1980).

**Future expansion areas**: Another design consideration is where future expansion areas of the villages will be. If it is known that a new road is planned then the chances of economic growth in that area are quite high. In such a case it would be wise to include suitable T-junctions to which new connections can later be fitted and decide on adequate pipe diameters to carry the anticipated new water demands. In turn, water and development committees should also be aware of the need to plan settlement in relation to the expansion potential of the water scheme, and be familiar with the lay-out of the design.

## 6.2 Design guidelines

The following sections discuss individual design components of piped supply schemes. When considering how to assemble the components for a particular project, designers should keep in mind flexibility for the future. Well considered designs can result in large potential future savings for relatively small initial investment.



Provision of washbasins should be taken into account in the design phase. Photo: IRC/Heijnen.

Some of the following suggestions may be helpful when considering a piped supply. More detailed design guidance on the elements of piped supplies can be found in the technical references listed in the Bibliography.

## Basic choices

Major design variables include the number and spacing of standposts, locations and number of house connections, volume of water supplied, minimum pressure in the pipes, and the amount of network looping thought necessary to minimize disruptions during maintenance and repair. Variations in all of these will affect total costs to different degrees. Cost implications of improving the service by changing some or all of these variables should be assessed.

Increasing water flows by raising pipe diameters for example is relatively cheap, but improving the service by adding more standposts is not. Going for a looped network instead of a less reliable branched system, can be expensive, but brings benefits in terms of reliability and potential for future upgrading and extension.

Given limited budgets, increased benefits in some aspects of the system often have to be made at the expense of others. Cost comparisons need to be made on the basis of both capital and recurrent costs, and should take account of the different levels of benefit of the different options provided. Numerous economic text books provide guidance on ways to combine capital costs and recurrent costs to compare options over the project life cycle.

In the partnership approach, it is important to separate agency and community contributions to both construction and operation and maintenance. In a community with ample repair and maintenance workers, for example, more standposts could be included using savings made by adopting a simple branched rather than looped system. In this case, breakdowns could be rectified quickly minimizing disruption to supplies. Where repair skills are scarce on the other hand, a looped system will allow water to continue flowing while mechanics are brought in from outside. This increased reliability might have to be achieved at the expense of the total number of standposts provided.

## Water consumption

In designing a system, both present and future demand should be considered. It is generally advisable to provide excess capacity for about 10 years. Where standposts or neighbourhood taps are destined to be converted into future house connections, treatment facilities and the distribution network should be based on a consumption of up to 100 litres/capita/day.

Consumption from standposts and house connections depends on local habits and the availability of other sources. Non-domestic uses, such as watering plants, can also consume significant amounts of water. Spillage and wastage should be minimized, but allowances must still be made for this.

## Design flows

Systems should be designed to meet needs when water is most wanted, that is the peak demand. In some places the domestic water consumption in the early evenings can rise by a factor of three or more (the peak factor) above the average level. Where there is a significant day-time use in industry or agriculture, variations in demand are not so large. Demand also changes with the climatic seasons.

Accurate values need to be calculated by taking note of or estimating average per capita demand, people served, peak flow factor and waste at the standpost. Makers of taps can usually supply graphs showing discharge rates at different operating pressures. The peak flow factor has to be established by observations and experience, and it should allow for changes over the year. Peak flow is likely to reach three to five times the average flow.

**Table 5: Water use**

| **Typical domestic water use** | | |
|---|---|---|
| *Supply type* | *Typical consumption (litres/capita/day)* | *Range (litres/capita/day)* |
| Standpost/well about 1km away | 7 | 5 - 10 |
| Standpost/well about 500m away | 12 | 10 - 15 |
| Village standpost/well up to 250m away | 20 | 15 - 25 |
| Neighbourhood standpost up to 250m away | 30 | 20 - 50 |
| Yard connection | 40 | 20 - 80 |
| House connection - single tap | 50 | 30 - 60 |
| House connection - several taps | 150 | 70 - 240 |

| **Non-domestic water use*** | |
|---|---|
| *Category* | *Typical water use* |
| Day school | 15-30 litre/day/pupil |
| Boarding school | 90-140 litre/day/pupil |
| Hospital with laundry facilities | 220-300 litre/day/bed |
| Hostel | 80-120 litre/day/resident |
| Restaurant | 65-90 litre/day/seat |
| Mosque | 25-40 litre/day/visitor |
| Cinema | 10-15 litre/day/seat |
| Office | 25-40 litre/day/user |
| Railway/bus station | 15-20 litre/day/user |
| Cattle | 25-35 litre/day/head |
| Horses/mules | 2-25 litre/day/head |
| Sheep | 15-25 litre/day/head |
| Pigs | 1-15 litre/day/head |
| Chickens | 15-20 litre/day/100 birds |

* figures allow for 20% water loss and wastage.

Peak water use can also be controlled where necessary. This can be done by limiting the number of taps at each standpost, by limiting opening times by a valve controlled by the tap committee, or, sometimes, by using flow restriction orifices. Such orifices are cheap and easy to install and remove, but their use is never popular and can lead to real problems over acceptability of water supplies. However it is carried out, flow control should not be too severe. If long queues form and the standposts become inconvenient, consumers might revert to their original polluted sources. Frustration caused by inadequate water flows can also lead to vandalism.

## Network design

Water has to be kept under sufficient pressure to flow from all outlets at the required rate. But it must also be low enough to cut down losses from leaks. Minimum allowable pressures in a system go down to 5m head, but design pressures of 8-20m head are common. Around 10m head seems to be a good

compromise. Fixing on a minimum pressure at the lower end of the range means that the system capacity can be increased later by raising pressures.

Length of pipework will be dictated by the extent of the network and the degree of looping involved. Pipes need to be big enough to handle the required flow. On the basis of the desired mains pressure and tap pressure, and the known pipe length, pipe diameters are determined according to the hydraulic friction losses which will arise as the water flows through the pipes. Pipe manufacturers provide charts showing what diameters will be needed for peak flows. Service pipes of 50-75mm diameters are generally suitable for most piped water distribution systems and 50mm should be taken as the minimum size.

Studies (World Bank, 1977) have shown that the cost of a distribution network is affected mainly by changes in pipe lengths rather than diameter. Pipe length per person can be viewed as a approximately constant value. About 1 m/person of pipe will be needed for a population density of 100 people/hectare, and 50 people/standpost. Unit length gets smaller with higher densities of populations and users/tap, and larger as the degree of branching increases.

## Standposts

More standposts and more taps at each standpost means a better service but also greater cost. Standpost should generally be located so that the maximum walking distance by any consumer is 200m, though in sparsely populated areas and with no competitive traditional sources, 500m might be acceptable. The required standpost discharge capacity for each tap is normally 14-18 litres/minute. A single tap standpost should be used by no more than 40-70 people. As a rule of thumb there should be one tap for every 50 people served. A multiple tap standpost can provide adequate service for up to 300 people, and a target of about 100 people is often set. There should be an absolute maximum of 500.

Many of the basic features of standpost design have already been discussed under user acceptability (section 6.1). Additional features such as laundry, bathing and cattle watering facilities were also discussed. There where these are provided, they should be near to the standpost, but separate.

Proper drainage of the standpost is such an important issue that it is discussed separately in a following section.

Often standposts need to incorporate some kind of barrier to keep animals away. This may for example be an enclosing wall or protective kerb about 800mm high. If animals pose a serious threat to hygiene, cattle grids should be installed at the standpost entrance. As has been mentioned, separate troughs should be provided for watering livestock away from the standpost enclosure.

In some places, standposts can be part of what are sometimes called comfort stations. These incorporate public toilets, showers and washing rooms. All water comes from the same service pipe, and wastewater can be discharged into the toilet outlet. Public taps should be on an outer wall. Comfort stations only

function when reliable maintenance and financing arrangements can be made.

In socially cohesive areas with strong internal organization, comfort stations can be operated and maintained on a neighbourhood basis. Participatory hygiene education made a significant difference to use and maintenance of clean-based comfort stations in Ibadan, Nigeria. In less cohesive areas, paid operation is more realistic to make sure that the water delivered is paid for and the station is kept clean. An example are the comfort stations in Patna and other Indian cities run on a no-loss, no-profit basis by a voluntary organization (Seager, 1987).

## Taps

The tap is the interface between the user and the physical system itself but it is rarely given sufficient thought in design. Simple manually operated taps are best. These should be easy to use and sturdy. It should be simple for caretakers to replace washers or install a new tap if necessary. The tap should be locally available and ideally locally manufactured. It should not be of such a high quality or made of such materials to attract theft.

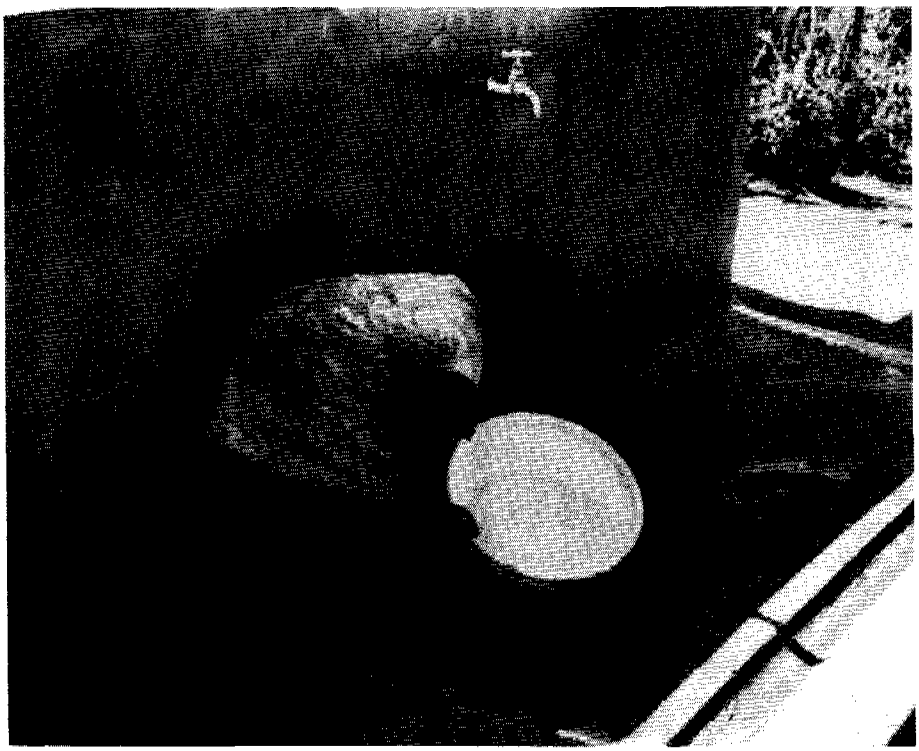
New developments in manual water taps include those based on a swivelling nylon ball, controlled by a simple lever handle rotating through 90 degrees, similar to a gas tap. This is easy to control, and avoids the danger of overtightening, a common problem with standard screw taps.

Experience with automatic taps has been mixed. A number of designs are available but few are popular with users. Usually users find ways to circumvent the automatic tap and hold them open, leading to exactly that excessive water use that the automatic tap was trying to prevent in the first place. Except in the case of the true public standpost situated in public places where there is no possibility of joint ownership, it is probably better to rely on social control and charging systems to prevent wastage and excessive use, rather than trying a technical solution such as an automatic tap.

## Drainage

Water is always spilled at standposts, and if pools are allowed to form they will become health hazards, providing a habitat for hookworms and breeding grounds for mosquitos. To avoid this, good drainage is required. Where possible, wastewater should be carried away and used as animal drinking water or for agriculture.

In the simplest case the hard platform around the standpost slopes away toward the outer edges to trenches or soakaway drains. This is the cheapest and most common arrangement.



Taps should be easy to use and sturdy. Photo: IRC/Van Dam.

Alternatively, the floor slopes toward the centre, where waste is carried away in a channel. This type of standpost is more costly and can be less hygienic if the drainage channel becomes blocked. It should only be used where good standpost upkeep is anticipated.

The drainage water can be fed into soakage pits or drainage channels filled with stones or rubble. Alternatively it can be fed to irrigate small gardens of sugar cane, banana, or other plants needing a lot of water.

Where a soakage pit on channel is used, it should be in permeable soil, and care should be taken by regular upkeep to make sure that sand and debris does not prevent the water from draining away.

## 6.3 Design responsibility

Designers have to produce information in such a way that people responsible for construction can understand exactly what is intended. Sufficient information must be provided also to enable maintenance and repair to be carried out, and

to permit future extension and upgrading works.

Often the design work is carried out by engineers and technicians of the promoting agency itself, whether governmental or non-governmental. Sometimes, particularly for the larger and more complex works, a firm of local consulting engineers will be retained, to be responsible to the agency for the design process. Often this responsibility is extended to include supervision of construction on behalf of the agency.

Whoever is responsible for the detailed design of the scheme, the principles already set out - the need to work in close liaison with the users, take account of previous planning discussions, and keep user acceptability in mind - remain valid.

To systematically record the details of the design, a series of *project documents* are usually drawn up. These will form the basis of formal agreements between the responsible agency and the construction organization.

The usual design documents include a series of technical drawings. These show the location of water extraction points, standposts and house connections, and pipe layouts. There will also be engineering details of standposts, pump houses, water intakes, treatment plants and other components. If concrete is used, drawings showing arrangements of steel reinforcement will be provided.

Designers will also produce a list of required equipment and materials sometimes called a bill of quantities. This document can be used to make accurate estimations of project costs. A bill of quantities is frequently the basis for outside contractors, when used, to calculate their competitive bids.

Another common document is the specification, which describes required material qualities, equipment performance and how the work is to be done. For example, the specification will lay down how the pipes are to be connected, how concrete should be mixed, and so on.

## 6.4 Construction choices

Construction is the phase in which the results of all the previous discussions and plans take physical form. There are a number of ways of tackling construction depending on the scope of the work and the capacity of the local people to take part. This section looks at some of the alternatives. A wide variety of approaches to construction can be adopted. They include self-help, direct labour by the agency, commercial contracting or a mixture of these.

### Self-help

Community members can undertake many construction tasks with some training. This approach has various advantages. It can strengthen the communal sense of ownership for the scheme which starts from joint planning and decision-making. When well organized, self-help construction reduces the burden on the agency, and can be part of the community's capital cost

contribution. Direct cost savings can be as high as 40% in the case of schemes supplied by gravity (IRC, 1988). Construction activities can also be the basis for training people to be scheme caretakers, or to take part in other economic activities.

Self-help construction should be seen as part of the continuing participation process and not simply as a means of obtaining cheap labour. Construction is a time when the project generates a great deal of activity and disruption to community life.

All this focuses people's attention on the project and provides opportunities for training and education. Agency workers should be encouraged to:

- maximize the self-help element;
- identify local skilled people, such as masons, carpenters and labourers as early as possible;
- train local people to fill gaps in available skills;
- include on-the-job training for caretakers during construction;
- carefully brief trainees to avoid them developing falsely high expectations of the skills, status, jobs and pay they will receive;
- encourage trained people to remain in the community by giving specific, practical, low-level training; on-the-job training is preferable to formal methods;
- develop clearly written simple manuals in local languages on aspects such as pipelaying, concrete mixing and trench digging;
- use the opportunity of self-help construction to give briefings on hygiene education and other issues (such as cash-raising) during rest breaks;
- employ tools, equipment and methods that are already familiar to the local people;
- ensure that tools and materials are available before mobilizing the self-help workforce.

Good organization, a clear explanation of standards and adequate supervision are equally important keys to good self-help. Typical factors that can affect the later reliability of the service are PVC pipes kept in the sun, too shallow trenches, uneven trench floors, and trenches too close to roads carrying heavy traffic. A simple tool, such as a wooden T-bar to measure trench depths and widths can help to maintain construction standards.

Special effort should be made to organize community contributions (labour, skill, cash, materials) for construction in such a way that all beneficiaries contribute, and contributions are divided in an equal way. It should be kept in mind that seemingly equal contributions can in reality press more heavily on the more disadvantaged groups.

Some communities decide for instance that male and female adults should contribute the same amount of cash to the installation of the system. In cases

Trench construction involving the community. Photo: PSWS Project, Sri Lanka.

where women have to pay this amount from their own (smaller) sources of income, this means in reality that the women pay a much larger proportion of their income to the community water supply than the men.

More details on the ways in which self-help labour is organized are available from *Training Community Motivators in Water Supply and Sanitation* (White and Gordon, 1987) and *What Price Water* (Van Wijk-Sijbesma, 1987).

## Direct labour

This method uses workers employed by the project agency or other bodies. The workers tend to be experienced and have some local knowledge. Because the workers are employed by one organization, their deployment can be readily planned. Direct labour organizations, in ministries of works, for example, are usually reasonably well equipped with construction equipment and tools.

Such organizations do not benefit from the high level of motivation found in self-help groups, nor do they usually have to compete with other organizations to win the work. For these reasons direct labour can become inefficient without proper control.

### Contractors

On larger projects, where specialized operations such as earth dam or reinforced concrete reservoir construction may be involved, it will usually be necessary to let the work to private construction companies with the necessary skills and experience. Private contractors may also be the most effective way of carrying out drilling operations where pumped groundwater is to be the water source.

Using contractors can be an effective way of implementing a project. Contractors usually recruit their labour forces in the areas of their projects, and have to provide training where necessary.

Contract requirements need to be spelled out in formal, legally binding agreements, and variations after the contract is signed are likely to be costly. Because contractors are in the business of making money, their interests are not necessarily those of the community or agency, and care has to be taken to prevent shortcuts, through proper supervision.

This can be organized by the agency or the consulting engineers representing it, or by the community itself, through its water committee.

### Mixed methods

All piped water supply projects will have large elements of relatively simple work suitable for self-help construction methods. Even when there is a need to use contractors, it should be possible to arrange the work so that community members can play a direct part. For example, the building of a concrete river-intake can be commissioned to a contractor, leaving trench digging to local workers. That way, costs can be kept down while some of benefits of learning through construction are realized.

Care must be taken to avoid the self-help part of the project from causing delays to the contractors. Contractors are usually legally entitled to claim compensation from the client for delays caused by other people on the project, and the sums can be quite large.

## 6.5 Commissioning of the scheme

When construction is complete, the time comes when, at last, water starts flowing from the new taps. Agency workers could use the resulting community excitement as an opportunity to drive home important messages. The need for a well established water or tap committee which looks after proper operation and maintenance and cash-raising should be underlined, as well as the responsibilities of the community for hygiene measures to strengthen the impact of the new water supply.

Community interest could be heightened by organizing a commissioning ceremony with speeches from visiting officials and community leaders. It is

important that the ceremony gives due recognition to the community's own efforts, avoiding situations which imply that the improvements are a gift from any authority or donor. Any plaques or notices should make clear that the facility has been completed by the people of the village themselves with secondary support and help from other bodies. In some cases a religious ceremony is appropriate. It may be necessary to stimulate the financing of these ceremonies from community funds, to avoid one or two wealthy families paying for them and in this way assuming ownership rights over the new facilities.

Commissioning is by no means the end of the project cycle. In good projects a viable system of community-based operation, maintenance and financing will have been established, with a scheduled system of monitoring and support from the agency planned and budgeted for. With good arrangements, the partnership developed during the earlier phases will continue. While avoiding empty promises about the level of continuing support, agency workers still can make clear that they will be on hand to help solve serious problems. At the same time they can help in reinforcing the understanding of the continuing responsibility of the users themselves.

# 7. *Sustaining Reliable Supplies*

Once construction is over, the piped scheme enters the longest phase of the project cycle, its operational life. Regrettably, this post-construction phase has in the past been the most neglected of all. Donor agencies in particular have commonly seen commissioning of the new water supply as the time when their involvement comes to an end. Yet it is during the next years of operation that all the anticipated benefits should be starting to flow and the real return on the investment should be realized. Now, all the planning and design is put to the test, and the community cannot be cut off from support in coming to terms with the new technology and the financial and operational discipline needed to keep the water flowing.

This too is the time when new lessons will be learned for future projects. Monitoring and evaluation of ongoing projects, backed by formal ways of recording and sharing the information gathered, provide the most important of all data for future planning and design. They also, of course, allow corrective actions to be taken promptly if things start to go wrong.

The post-construction phase is also the time for intensified health and hygiene education, and for agency staff to give practical demonstrations of routine maintenance tasks, leak detection, waste control, and general problem solving. Finally, after a number of years it will see the start of planning for the next phase - extension/enhancement of the system.

## 7.1 Operation and maintenance

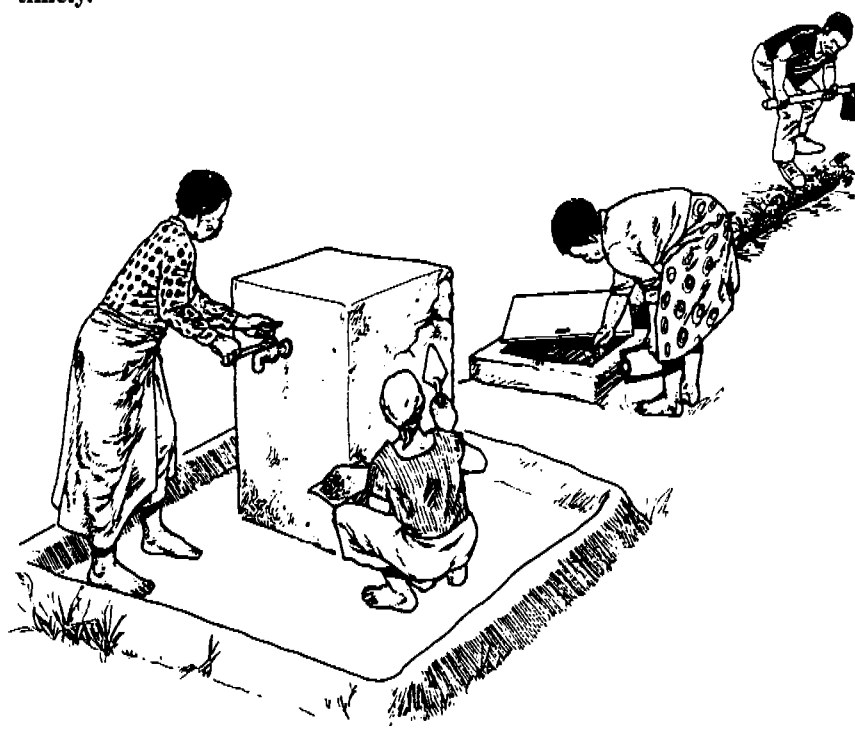
Good planning and design will have laid the groundwork for successful operation and maintenance of the new water supply system. Just to remind ourselves of some of the more obvious needs:

- a community water committee should now be well established, with its responsibilities clearly defined, and support on hand for problems it cannot handle directly - many of the difficulties which arise on community water supply projects can be cured quickly and cheaply if the right organization is in place from the start;
- individual community members will have been given basic training and accepted responsibilities for routine chores such as keeping tap surroundings clean and tidy, checking taps and meter boxes, changing faulty washers, clearing leaves from intakes, lubricating pumps, etc;
- regular fuel supplies will be organized, as will any chemicals needed for treatment processes, and stocks of commonly needed spare parts, lubricants, and other materials;

- major repair inputs will be available when necessary from the water agency of private enterprises, under previously agreed conditions;
- water agency staff will be making regular visits, providing top-up training and advice, and looking for early symptoms of future problems; and
- community-based financial management systems will have been organized to ensure that funds are available for routine and emergency repairs.

## Community-based maintenance

The term community-based maintenance (sometimes called community-managed maintenance) is becoming accepted now as a key concept in successful water supplies. The implication is that a community organization has to initiate maintenance activities, and will have the responsibility for obtaining any assistance needed. The assistance may come from the water agency or from other sources, such as the private sector or a local NGO, but it will be provided at the request of the community, and will be paid for from community-managed funds. **An important condition for this maintenance system to succeed is that the agency's assistance is always dependable and timely.**



Maintenance and small repairs by the tap committee and community members.

Maintenance is more than simply mending broken parts of a piped system. Good maintenance aims at preventing components from falling into disrepair. The partnership approach is vitally important. Agency workers cannot economically carry out routine daily inspections of all community water supplies. Community members on the other hand are well placed to perform such inspections, and with appropriate training can become very capable at these tasks. However, they are unlikely to have the skills or equipment available for such major tasks as borehole rehabilitation or major pump maintenance. These tasks will remain the responsibility of the agency.

An important aspect of community-based maintenance is the opportunity for increased preventive maintenance. Regular inspection, lubrication, bolt tightening, etc., can have a marked effect on breakdown rate, at minimal cost. In comparison with the centrally-managed maintenance of community water supplies, properly organized community-based maintenance can reduce per capita running costs by a factor of ten or more (Okun and Ernst, 1987).

Table 6 is a checklist of preventive maintenance activities which can readily be carried out by village caretakers with appropriate training and equipped with the right tools and materials.

**Table 6: Preventive maintenance tasks**

| *Checkpoint* | *Action* |
|---|---|
| Taps | Inspect for leaks; replace washer where necessary; tighten joint; grease spindle; demonstrate correct use; emphasize need to close tap after use. |
| Standposts | Check that water drains freely; check for cracks or erosion in masonry; check taps are securely attached; make necessary repairs. |
| Service pipes | Inspect for leaks (patches of green grass may reveal escaping water) excavate round pipe, find problem, repair/get help. |
| Valves | Check for leaks; replace washer if needed; report major problems. |
| Meters | Check for leaks/damage; report major problems. |
| Locking meters/valves | Decide convenient opening/closing times; assign responsibilities for keeping key secure on a rota basis, or with a responsible user. |
| Water flow/quality | Test flow tap; taste water; check colour; report problems immediately. |
| Pumps | Lubricate periodically; clean filters; drain oil; tighten bolts; check fuel stocks and re-order as necessary; clean surroundings. |
| Treatment facilities | Open/close valves; clean/replace sand; add replenish stocks of chemicals. |
| Records | Record all inspections and measurements in a standard log-book. |

The logic of community-based maintenance is compelling, but a second and most important condition for it to succeed is that the preparatory work has been carried out during the planning, design and construction phases. In particular, the agency should ensure, through regular training and refresher courses, that the necessary technical, managerial and financial skills are available within the village organizations.

The benefits of community-based maintenance can be expected to include:

- lower maintenance costs, through the use of locally available skills;
- reduced downtime when repairs are needed, leading to greater system reliability and user acceptance;
- an improved sense of ownership, with less vandalism and more cleanliness;
- development of community skills for use in other related fields, including, for example, organization of sanitation improvements.

In the detailed planning of local maintenance and repairs the water committees or other local management organizations play an important role. They will have to know what the tasks of local mechanics or scheme attendants and tap-site caretakers are, and work out ways and means for the regular supervision of their work. A small stock of spares may have to be kept in the village, requiring arrangements for safekeeping and registration of turnover. Simple records are an essential condition for the internal control by the community of functioning and financing of its water supply. They are also essential for the monitoring of the effectiveness of community-managed maintenance by the programme agency in the area as a whole. And in case of problems beyond village capacity, the committee must know where it can go for different types of assistance, what support it can expect, and whether any payment will be involved. When communities have to pay for external maintenance and repairs, some form of guarantee may be required to ensure that it gets value for the payments made to the agency or enterprise.

In addition to preventive maintenance and simple repairs community members, directed by appropriate committees, can play an important part in preventing pollution of the water supplies and safeguarding the health of the users. In a project in Colombia for example the water committee used village self-help to plant trees around the intake zone of a piped water system, to protect the intake and keep cattle away. Table 7 lists actions which water committees should consider important in connection with potential water contamination or other public health risks (Van Wijk and Heijnen, 1981).

**Table 7: Pollution preventive activities**

| *Checkpoint* | *Action* |
|---|---|
| Pollution at water intake | In the intake area, prohibit clothes washing, bathing, crop growing, animal watering, excreta disposal, waste disposal. |
| Pollution in distribution system | Trace and mend leaks in pipes, storage tanks, access chambers, meters; discourage children from playing near meters, access chambers, storage tanks, treatment works. |
| Pollution at collection point | Cover the surrounding area with stones to stop mud forming; discourage water spillage; ensure taps are shut when not in use; build fences to keep out animals. |
| Pollution in area surrounding collection point | Encourage planting of grass/plants; empty waste water in drains; keep area free from rubbish; discourage playing children, vandalism and animals. |
| Inadequate drainage | Improve drainage by directing water to a garden, small animal drinking trough or soakaway pit; fill pebbles; free drainage channels of mud and leaves. |

## 7.2 Financial management

Discussions during the planning phase should have left the community and agency workers with a clear view of how the project's capital and recurring costs will be met. The community should normally contribute something towards construction costs and aim to take full responsibility for operation and maintenance costs.

Funds can be raised either from the whole community or from individual users. In some cases, water vending or indirect taxation can be used. The following section discusses some options for fund-raising. A fuller analysis is given in What Price Water, published by IRC (Van Wijk-Sijbesma, 1987).

### Community funds

Raising community funds for standpost systems overcomes the difficulty of trying to work out how much water individual consumers use. This difficulty is much reduced with house or yard connections. Funds can be raised by voluntary donations, using community income, establishing a revolving fund or creating production co-operatives.

### Voluntary fund-raising

Funds are collected periodically through lotteries, festivals and so on. The method is opportunistic and amounts collected are uncertain.

Who is responsible?

Annual collections can be effective in communities with seasonal incomes. In farming areas, for example, fund-raising can take place after crops have been sold. The system does not link donations to amount of water used, and can only work where there is a good communal spirit.

Voluntary donations are used at Kidoda in south Kenya. The 196 households agree on a target figure to be raised to maintain the village gravity-fed public standposts. Each family decides how much it can afford, and in some cases donations take the form of work or goods. Goods are auctioned and the money banked. The water committee collects the money, issues receipts and chases up late payers (Van Wijk-Sijbesma, 1987).

## General community revenue

In some places, profits from communally owned activities are invested in running the water system. This method usually relies on all households having roughly equal access to the supplies, otherwise the less well served consumers would feel unfairly treated.

Families in Mukinzi village, Tanzania, all work at cultivating a communal field, and the proceeds are put into a water fund. Families not contributing a fair amount of work either make up the balance in cash, or are given a larger area

to cultivate the following season. People unable to work the field for genuine reasons are exempt. Profits from communal activities can vary widely and at times might not match the needs. One way of smoothing income flow is to spread the investment over a number of activities (Van Wijk-Sijbesma, 1987).

## Community revolving funds

Initial capital is raised either through government donations or an issue of shares to consumers in the community. If shares are sold there is often a limit on individual ownership to prevent power concentrating in the hands of richer families.

The capital is used to make loans to individual households or groups to start small enterprises or improve housing and sanitation. Loan repayments plus interest make it possible to provide funds for a greater number of people. Sometimes capital is used to set up communal enterprises, such as a shop.

Revolving funds are quite common in the area around the Ban Sieo village in Thailand. Each of the 148 families can buy up to ten shares in the fund at a fixed price. Ban Sieo has set up a cooperative shop, while neighbouring communities have gone into rice milling, biscuit baking, silk weaving and so on. A fifth of the Ban Sieo shop's annual profits are added to the fund's capital and the rest is paid out to shareholders and used to improve village services (Van Wijk-Sijbesma, 1984).

## Production co-operatives

Sometimes, improved water supply is established by a group of families rather than the whole community. Among these groups are production co-operatives whose members contribute regular payments in cash or kind, or buy shares. The fund is used for loans to cooperative members or to finance group activities. Profits are often used to pay for new basic services like water supply and sanitation.

Co-operatives are not always suitable for establishing services for a whole community; they tend to comprise people of similar economic and social groups. Most communities comprise various different groups whose interests might not always be the same. So, for example, a co-operative of wealthy farmers is unlikely to cater for the needs of poor neighbours.

Problems with co-operatives were found in Muquiyauyo, Peru, during the 1960s. Muquiyauyo's co-operative helped finance and install public taps in all the main streets. Later, water supply became a community system and was expanded to include house connections in homes along the main streets. Many of the families getting house connections had not contributed to the original effort. At the same time, co-operative members in the side streets had less opportunity to install house connections. The result was a rift in the community (White, 1981).

## Regular charges

An alternative to community funds is the practice of charging water users fixed, regular contributions. These can be related to actual water use and to the operation and maintenance costs of a community system. Charges can be based on flat rates, graded rates, a mixed system or water meters.

## Flat rates

This is the simplest form, in which all households are charged the same regardless of how much water they use. This is easier to organize with private taps or group connections where users can be clearly identified. Flat rates should be used in cases where consumption is more or less uniform, otherwise disputes will arise. Tap committees can be set up to distinguish between regular and occasional water users. The committees can also help to decide on fair rates.

In communities with strong social ties, the introduction of paid group connections can be effective. Group members sharing a yard tap would divide the charge between them. Owners of private house connections in such a system would have to pay the whole charge themselves.

The treasurer of the tap committee collects and records contributions from the users.

## Graded rates

Flat rate payments do not distinguish between rich and poor sections of a community. One way of spreading the financial burden away from poorer families is to introduce graded rates. Graded rates should be encouraged in communities where there are large differences in income levels.

In such systems, consumers are divided into categories based on their water use and income. This provides a graded system without the expense of meters. Setting the rate is easiest where there are valid indicators of wealth and consumption. In some areas size of land holdings is a good indicator, but where land quality is variable, other means will be needed, such as housing quality.

The Sibundoy farming community in Colombia set up four categories of rates after investigations by an agency worker. The investigation went into existing data, like tax returns, and also the socio-economic status of each household. Final decisions on grading were made in a general community meeting. The highest rate set was about four times greater than the lowest (Van Wijk and Heijnen, 1981).

Another way of grading payments is to raise a levy on cash crops sales. This is most feasible where crops are sold through co-operatives or a single commodity marketing body, and where water supplies are community-owned. With this method, the levy income rises with inflation of cash crop prices. This effectively links the water fund to real prices.

Setting graded rates can be complicated if disagreements are to be avoided. Conflicts over water use led tap users in poor urban areas in Malawi to stop paying their bills. Domestic consumers objected to some people using water for their businesses. At the same time, there were disagreements over charges made to households of more than one family (Kwaule, 1988).

Water agencies can help groups solve these disputes by formulating policies on fair rates. Ways of accounting for group and house connections within the same system, as well as domestic and business uses, have to be devised.

## Mixed systems

In some systems it is possible to finance free public standposts for the poorest community members through charges on private connections. But achieving the right balance between private and public outlets is not easy. Better-off households might prefer to use free standposts, if they are plentiful, rather than face water bills.

In such cases, where one section of the community is expected to support another, agency workers will have to find ways to stimulate a sense of communal responsibility.

## Metered taps

In larger communities, particularly where water is scarce or becoming so, meters are often introduced. Meters allow charges to be directly linked to actual consumption, but installing meters is expensive.

Individual household meters also need fairly elaborate administrative support in issuing bills and collecting charges. Household meters do, however, allow for flexibility in charging systems. Users can pay at the same rate for each unit of water used, or charges can be banded, with prices rising with increasing consumption. Such systems ensure that wealthier households with, say, flush toilets and gardens pay higher rates for some of the water they use.

Metered group connections are particularly suitable for urban areas where the population is often moving and other charging systems relying on communal trust might be difficult to operate. In the Malawi communal water point schemes, 20-30 families form tap user groups. These pay jointly an agreed monthly rate for a specified volume of water from a communal tap. Calculations on monthly volumes are based on the average consumption by a typical household. In Malawi, this volume is six buckets of water daily for a household of 4-6 people.

Actual consumption is metered, and monthly bills are prepared by agency-paid operators. Group payments are made to local government cashiers. The groups can either pay for the actual amount of water used, or they can stick to the average agreed rate as long as they remain in credit. That way, seasonal variations are smoothed out over the year (Kwaule, 1988).

## Connection charges

The high connection fees often charged by water authorities to individual households can exclude many people from the benefits of piped supplies. There are various ways of softening the blow of initial charges. In South America and elsewhere, connection loans are provided and repaid as part of monthly water rates.

Another method popular in rural and poor urban areas, especially in Latin America, is to encourage consumers to make contributions in the form of construction labour. Subsequent new consumers have to pay an amount equivalent in value to the voluntary work already performed by others.

## Other methods

*Water vending*

Formal water selling systems are also being used to generate operation and maintenance income. There are a number of methods of vending including:

- Water kiosks, which are constantly supervised. Vandalism and water waste are reduced, while small repairs can be noticed and dealt with immediately. But charges have to cover the vendor's pay and are usually therefore

considerably higher than for standposts. Users are vulnerable to exploitation at times of water scarcity.

- Concession sales allow households with private connections to supply water to other people. These systems favour the richer community members who can become richer through water profits. Agencies should consider making the system fairer, where possible, by giving concessions to people in need of extra income. High priority should be given to women heads of households.
- Coin operated taps are prone to mechanical breakdown and robbery, and are not recommended.

*Indirect taxation*

Taxes most commonly used are based on property or housing. The system is simplest when all involved households have the same service levels and when the same organization manages funds and water services. Administration becomes complex when there is a mixture of service levels.

Indirect taxation relieves the water agency of the burden of collecting money. But the system leads to a number of difficulties. The ultimate amount of money raised often fails to keep pace with the demands on water administration.

A water vendor in Nepal. Photo: H. Heijnen.

At the same time, the water agency does not have direct control over revenues raised, which might be diverted to other sectors. Indirect taxation is also remote from water use and can lead consumers to losing sight of real costs.

Generally, it is better to have separate financing for water. Indirect taxation should be limited to those cases where a specialized agency is in charge of both tax raising and water administration.

## 7.3 Training for local management

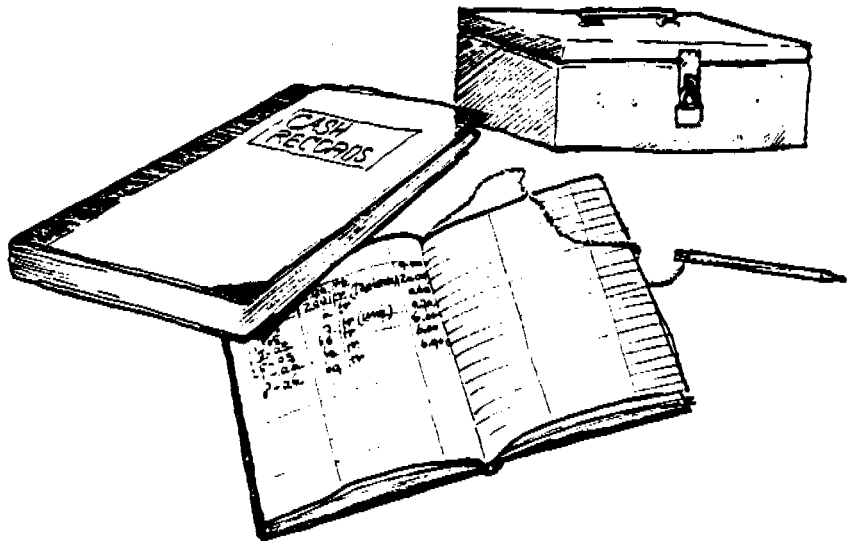
Besides helping local management organizations such as water committees to choose the most feasible financing system, they will usually need financial training before the system can be implemented. Local management organizations may have to get an idea of the approximate size of short and longer-term recurrent costs, learn how to make budgets and how to keep good administration. They should know how to keep the system's accounts and why and how to account for their management to the users which have chosen them or in whose employment they are. The users themselves should also know broadly how the water system will be managed and what their rights are as users and tariff-payers. Analysis of payment problems in Malawi showed lack of financial administration skills of the treasurers of the tap committees to be one of the underlying causes. It was remedied by the development of training materials, the organization of training on-the-job and the incorporation of financial performance of local treasurers in the project monitoring system. A more general guide to help train trainers of community water managers in simple financial management, "Cost-recovery for Village Water Supplies, a Training Guide for Community Development Assistants" is presently under testing in Tanzania (Van Wijk-Sijbesma, 1987).

## 7.4 Agency support

Just as the community will have accepted its responsibilities for managing the upkeep of the water system, so the water agency will have committed itself to providing support for activities and organizational matters which the community cannot handle. Basically, the agency must see that the community is continuously equipped to ensure the proper functioning and use of the water supply system, and that the anticipated health benefits are realized through complementary hygiene and sanitation developments.

### Technical support

Throughout the life of the water system, situations will arise which cannot be handled by locally-based workers, however well trained and equipped. While local scheme caretakers should have been provided with all the necessary tools for routine maintenance tasks, it would not be practical or economical to make




rarely-used heavy equipment and specialized skills available in every village. It follows that when major breakdowns occur, the community will need to call on the services of agency workers, sometimes at district or regional level. Response time is important. Users' confidence in their water supply system will soon dissipate if it is out of action for weeks or months at a time waiting for the agency technicians to visit.

If the agency is not sufficiently well organized or equipped to handle technical support of a new water supply programme, it is possible to mobilize private sector support, providing this is planned in advance. Local motor mechanics, building contractors, blacksmiths, and several other tradesmen have proved willing to undertake water supply maintenance for groups of villages, sometimes with very encouraging results. The individuals concerned will normally need some initial training in the special needs of the water system, and may need initial financial support to equip themselves with the necessary tools and equipment.

## Organizational support

When committee work is new, no immediate problems call for attention, and when the first enthusiasm wears off, committees tend to stop functioning. Regular support from the project agency, via its scheduled monitoring visits, helps to establish routines and provides important opportunities for further training on the job.

With the right pre-planning, fuel supplies, spare parts, and regularly needed materials will be available to the community when needed. If they are not, the fault lies with the planners and designers. Unfortunately, it is often the case that schemes stop working for long periods while the operators wait for one or other of these vital components.

Simple record keeping and stock management routines help villagers to avoid running out of essential materials or parts. These routines will usually be new to the people concerned, and agency staff need to watch carefully, to see that the local caretakers recognize the value of simple record keeping. Similarly, staff will need to provide ongoing advice and guidance in the early stages of financial management. Experience shows that water users need to be sure that cash they hand over for water services is being used for the right purposes, or they will stop paying. It is not enough that the water committee treasurer knows where the money is or what it has been spent on; financial records are essential. Inputs from the agency may be necessary to help solve disagreements on organizational disputes.

Through the PSWS project in Malawi an organizational support system has been set up to monitor and support water councils and tap committees. Local monitoring assistants regularly visit all communal water point tap committees in the project area. They assist the members with any problems which arise in the performance of their operation and maintenance tasks and particularly with financial management. The Water Department has noticed a marked difference between communal water points which are monitored this way, and others which are not. The monitored communal water points function better and payment of revenues is much better organized.

## Training

Caretakers, mechanics, water committee officers, and village health educators will all need follow-up training, as the water supply system moves through the operational phase. On-the-job training combines the theoretical and practical work of technicians, while experience of actual operation reveals gaps in the preparatory training of all staff. Planned training follow-ups are needed, linked to monitoring of maintenance and payments.

In the Western Development Region of Nepal, in the year following completion of a village water supply scheme, the Village Maintenance Worker (VMW) is invited to attend a one-month training course. Some 40 VMWs from throughout the region attend the course, which is designed to refresh their knowledge and evaluate their first few months of working alone. The training is carried out in a village where the water supply system is in need of repair and maintenance (Boot and Heijnen, 1988).

To back up any training courses, and to ensure continuity when new people replace experienced ones, all routine operations should be documented in

simple manuals. Preparation of manuals with good graphics and minimal text is a specialized skill, but there are increasing numbers of examples for such routine operations as changing tap washers, making pipe joints, and so on.

### Hygiene education

Throughout the project preparation and implementation phases, hygiene educators will have emphasized the ways in which the new water system could bring health and cleanliness benefits to the community. Once the water supply is functioning, there will be increased opportunities for demonstrating and reinforcing the health messages.

The new water points become natural focal points for the women of the village. Trained village health workers can take advantage of these daily gatherings to encourage and motivate the women to introduce better hygiene behaviour in their families. They may also be able to build support for improved sanitation facilities, and influence the water committee or other village organization to develop latrine construction programmes.

Wherever possible, agency staff should be prepared to respond to requests for technical or financial support generated through community discussions. Quick action can serve as further encouragement; slow responses cause disenchantment and lack of interest in future messages.

## 7.5 Monitoring, evaluation and information sharing

Agency staff (planners and those supporting operation), donors and the user committees can learn important lessons from their own and others' experiences. Regular monitoring of projects are therefore important. They enable the agency to adjust its project planning procedures and training programmes, to introduce corrective measures to improve the functioning or use of the water systems, and to anticipate the need for rehabilitation, expansion or upgrading of the existing services.

For the communities, monitoring and evaluation allow them to compare their achievements with others, and may reveal changes that need action by the water committees, caretakers or water users.

For the donor, monitoring and evaluation enables feedback on progress of the programmes, and facilitates additional support to the planning of assistance to future programmes.

Both monitoring and evaluation support a wider process of information exchange, contributing to more effective and sustainable development of the sector as a whole.

## What to monitor

The value of data to assist the day-to-day functioning of water systems can be lost if too much information is collected. The time needed to analyze and assess the data has to be taken into account. Essentially, data should be collected with a particular purpose in mind, and it is helpful if agencies prepare national guidelines, so that data collection and reporting systems become standardized wherever possible.

One important purpose of monitoring is to help with operation and maintenance of the particular project and to plan future projects. With this in mind, agency staff should have a checklist of items to be recorded on each visit to the project, or at prescribed intervals. On the technical side, these will include measurements of pipeline pressures, tap flows, pump characteristics, water levels in wells and reservoirs, meter readings, chemical usage in treatment works, pressure drops in filters, and so on. Caretakers' records of repairs or maintenance interventions also need to be scrutinized regularly, and compared over a period of time, to give early warning of problems ahead.

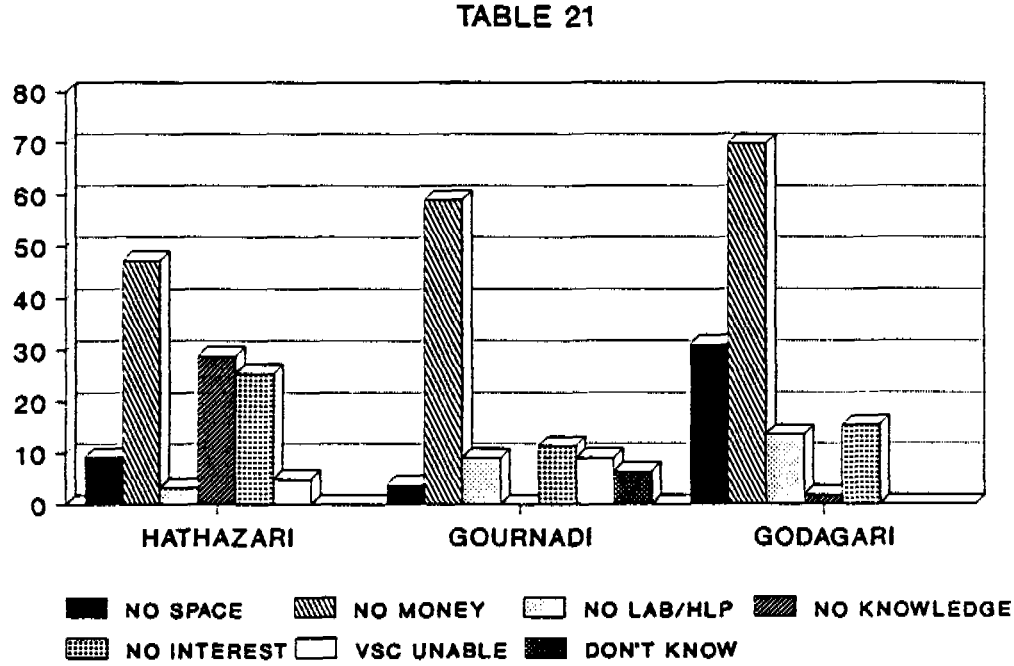
Equally importantly, monitoring involves a developing picture of the way in which water supply facilities are being used. Information may come from a variety of sources, including school children, who can be encouraged to record how the water is being used in their own homes, or direct observations at particular water points, to compare actual usage with planning predictions.

Organizational aspects too should be monitored. The frequency and purpose of water committee meetings, the involvement of women in such meetings, the financial records, and the speed with which users' complaints are dealt with, all provide useful evidence of the success or shortcomings of the present system.

## Interpreting the results

To make the best use of monitoring data, the results need to be scrutinized periodically and judgements made on any corrective action which may be needed. Often it is the trends in particular variables (reduced volume of water flowing through a particular branch, or sharp increase in number of households using unprotected water sources) which raise alarms. Graphical presentation of the data is the best way to highlight such trends, and compilation of monthly or quarterly statistics in graphical form can be a very effective management tool.

Quarterly reporting provides a trigger for data analysis and the production of summary charts for review by agency management. Concise reporting with good visual presentation of data makes assessment easier and also means information can be made more useful and more readily available for planning by others.




Example of graphic presentation of survey results.

## Evaluation

Evaluation is an opportunity for a periodic review of the development and operation of a project. Using monitoring data and other sources, overall conclusions can be drawn, and recommendations made for the improvement of the projects.

Evaluation findings will be of interest also to other ongoing projects, and will greatly benefit the planning of new ones.

The World Health Organization has published detailed guidelines on ways of evaluating water supply and sanitation projects (WHO, 1983), which identify the types of measurements and observations which need to be taken systematically to develop a full picture of the functioning and use of the facilities, and diagnose necessary improvements. IRC together with UNICEF has also developed a set of modules for use in workshops on evaluation of water supply and sanitation projects (UNICEF, IRC, 1987). The modules cover individual steps in the evaluation process from initiation of an evaluation to the

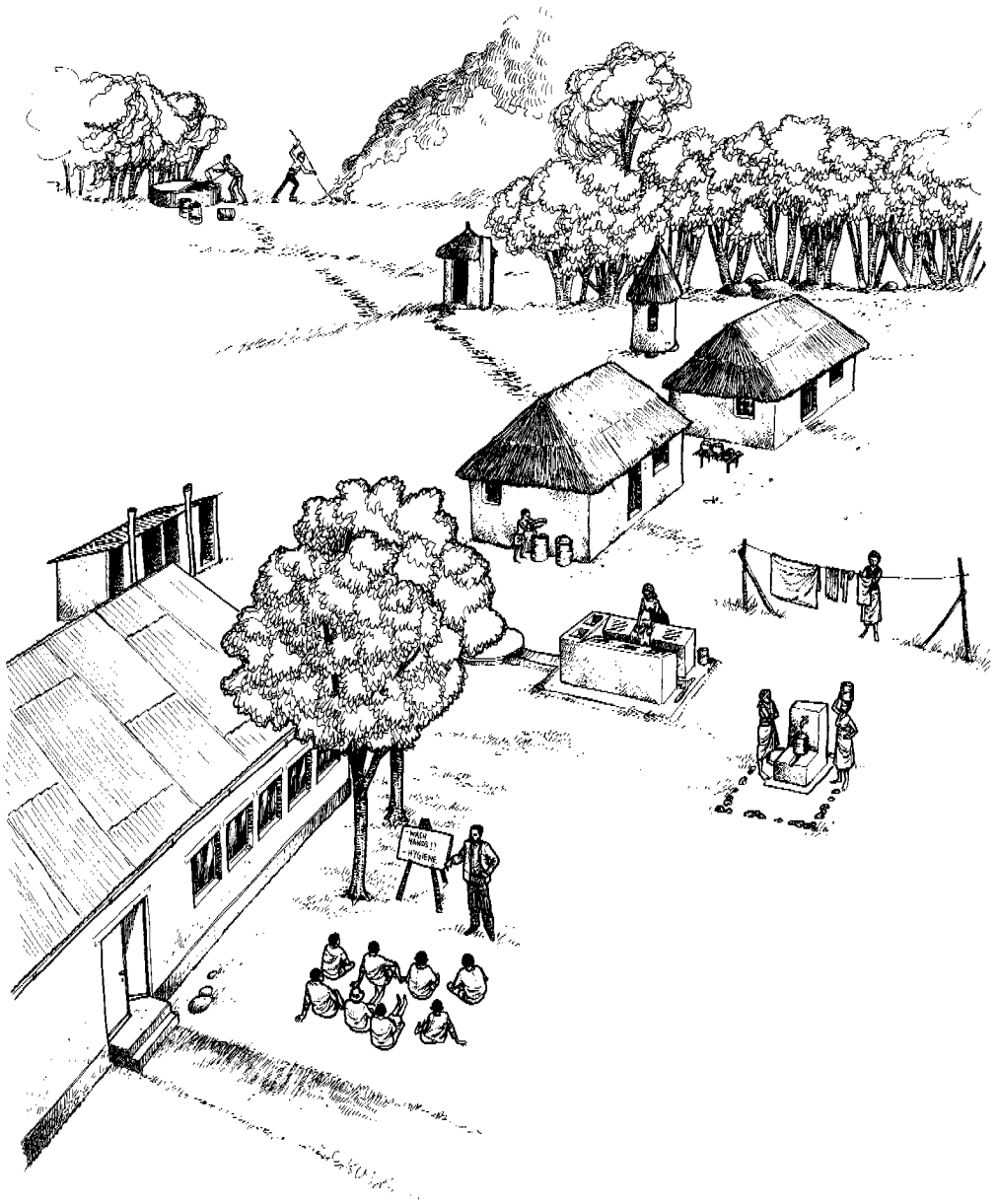
use of evaluation results. These modules show how community members and agency project staff themselves can play a full part in the evaluation process, with clear benefits in terms of self-generating improvements, and valuable data for both water agency and committee.

## Information sharing

Monitoring and evaluation each contribute to a broader process of information exchange which helps promote more effective and sustainable projects.

Indeed some of the best information available to planners and designers of new water supply and sanitation projects and those helping existing ones to remain sustainable, is documented experiences from similar projects in other places. Where does this information come from? It has to be collected, recorded, analyzed and presented in reports. And the user has to know that it exists and where to find it.

A great deal of work has been done in recent years, by IRC and others, on ways of improving the exchange of information among water supply and sanitation practitioners. Guidance on ways of building up technical information exchange activities, beginning at the project level, is given in two IRC publications (IRC, 1988b, 1988c), which include recommendations for regular exchange of information between agency staff in the form of quarterly reports, newsletters, and various other mechanisms.



The integrated approach.

# 8. *Starting Points for Programme Improvement*

The International Drinking Water Supply and Sanitation Decade has been an opportunity for developing countries and donors to learn many lessons about right and wrong approaches to the widespread provision of new water supply and sanitation services. In the preceding chapters, we have attempted to draw together those lessons and show how a successful community water project should be based on an approach which includes:

- **partnership** between community and agency;
- **integration** of key components, particularly water, sanitation and hygiene education;
- consideration of the full **project cycle**, particularly the need for the project to remain sustainable during its working life;
- **flexible choice** and **progressive development** of service levels.

The approach is many sided and challenges many traditional relationships among water agencies, donors, and benefiting communities. It calls for attitudes and skills not previously recognized as part of the make-up of a sector professional; and it involves devoting time and resources to preparatory and support activities for which there is often no immediate visible return. However, the increasing number of countries and agencies with experience of applying the partnership approach, shows that the arguments are convincing and the evidence of success is growing. Teething troubles are generally short-lived, and the flexible nature of the approach is proving beneficial in helping to solve the many problems which are bound to arise during implementation of even the best planned programmes.

In this chapter we draw on those experiences, to offer guidance to agencies wishing to take new initiatives, on initial difficulties they may face and on some possible ways of overcoming them. To those seeking to embark on the partnership approach for the first time, the number of new initiatives, policy changes, budgetary provisions, and so on, may well seem daunting. Few agency staff have the authority, or the organizational support, to institute such wholesale changes all at once in any programme. Nor is such an approach desirable. Each change will bring its own teething troubles, and these are best handled one step at a time.

## 8.1 Promoting integrated approaches

At the national level, a useful initiative may be the establishment of inter-ministerial project working groups or steering committees, to ensure that the interests of health, water supply, sanitation and community development are considered together.

The integrated approach to development can also be promoted incrementally, beginning at project or district level. Committed project staff can achieve a great deal by initiating contacts themselves with their counterparts in other agencies/ministries. Typically, this may lead to common initiatives, such as joint field visits, training workshops, and so on.

In Zambia, for example, when the Public Standpost Water Supply demonstration project began, there was often no sanitation component in water projects. Motivated project staff introduced sanitation components informally on a small scale at first, and demonstrated the benefits of the integrated approach. A new follow-up project includes a mandate to integrate sanitation with the provision of new water supplies; and there is money in the budget for helping with the provision of sanitation facilities (Zambia, 1989).

## 8.2 Demonstration as a starting point

It is at the individual project level that change is most manageable. Success on one project can also provide a powerful motivating force to spread the messages to a wider audience and to encourage further progress.

Identification of demonstration projects and freedom to develop, test and systematize more participatory approaches in a "learning by day" manner can be a good way to begin. Demonstration projects give national staff the opportunity to improve upon existing systems and try out motivators in guided experiments.

This can then trigger a wider interest in integrated and partnership-based methods, and the larger scale use of the approaches developed. There are several cases of the incremental adoption of new approaches in the PSSC project. Following the success of neighbourhood groups in the financial management of PSWS demonstration schemes, such groups will have an extended role in the operation and maintenance of new communal water point projects in Malawi. In Indonesia too, promotion of the partnership approach in small demonstration projects has led to its widespread adoption now in the planning and implementation of other new water supply and sanitation programmes (Parwoto and Kwaule, 1988).

Demonstration can also be carried out within a planned ongoing programme. Though full community involvement in all phases of the project cycle is a time-consuming process, it need not have a dramatic overall impact on the scheduling of a major water supply and sanitation programme, if the preparatory phases of projects scheduled towards the end of the programme

are brought forward to compensate. A starting point may therefore be the introduction of community/agency dialogue on projects initially scheduled for the latter end of a water programme. Experience gained and problems encountered will provide pointers for continuous evaluation and adjustment of approaches, while the impacts of the new approach become gradually evident.

## 8.3 Developing expertise

Unless specialist expertise is available within the agency, better progress and greater chances of success may come from the employment of advisers during initial stages of a programme. There is a growing number of social scientists with the right training and experience to help in the development of local community participation procedures, including special techniques to involve women. National universities may well be useful sources of such expertise, and wherever possible national experts should be used. Short training courses and contacts with other participating projects can also help to develop the additional skills required.

Staff training and recruitment can have an important influence on agency attitudes and approaches. Community-based training, accompanied by the recruitment of experienced sociologists, strengthens an agency's capacity to recognize and implement the necessary changes. Secondment of staff between agencies is a helpful way of sharing scarce expertise and of spreading messages.

## 8.4 Collecting and exchanging information

Information is a most important management tool. Decision makers at community, agency and government levels need to know when problems are starting to develop and to have access to data from other projects, or even other countries, where similar situations may have arisen. Collection and exchange of information should therefore be a priority in the organization of programmes. Guidelines on the establishment of simple project-level information exchange systems are part of a recently published Framework for Technical Information Exchange (IRC, 1988c). Information exchange is a two-way process, and it follows that all projects need to include a component for collecting, documenting and making available experiences in as comprehensive a way as possible.

Bearing in mind that a key issue in measuring the success of a new water project is that of its sustainability, agencies can help themselves to build up knowledge and experience of successful approaches by linking monitoring and evaluation of projects to the performance and use of installed facilities. These types of data help to steer planning and design of future programmes, and their collection can be initiated simply and cheaply.

## 8.5 Building in flexibility

Careful planning and design is a prerequisite for success in any development project, but no amount of initial preparation and detailed evaluation of previous experiences can eliminate all problems. Every project and programme throws up its own challenges, and agencies and communities have to be prepared to deal with the unexpected and to adjust plans accordingly.

Pressures to get facilities into operation quickly may militate against the broad-based consensus approach; budgetary pressures may mean that short-term financial considerations supersede long-term ones; well-intentioned commitments by the agency or the community may prove unsupportable in the long-term, key personnel may move away, leaving technical or managerial gaps; or political changes may influence the make-up of key committees and agencies.

Solutions to changes and unanticipated problems such as these can generally be found, if some basic principles are adopted from the start. Organization of the partnership approach has to build in flexibility and to allow time and resources for problem solving. Some degree of permanence or continuity in the project team is important here. Higher-level working groups or technical support teams offer knowledge and developing experience, and can provide rapid responses to new problems. Their task is made easier if there is a political commitment to the project and documented policy guidance which can help cut through bureaucratic delays when decisions are needed.

Donors are increasingly willing to support community-based approaches to development even considering the necessary extra inputs in time, money and expertise. Project proposals from agencies should therefore be worded to emphasize the partnership approach to be applied.

Sometimes it will be necessary to trim back programmes to suit changed financial circumstances. Again some basic rules can be applied. It is generally better to do a few schemes well than to attempt to spread reduced resources more thinly and end up with more schemes but facilities which do not meet peoples' needs or aspirations. The dilemma of deciding not to serve some communities can be eased by building in and supporting the potential for community self-improvement, as an adjunct to agency-assisted programmes. Training materials such as IRC's Community Self-Improvements in Water Supply and Sanitation (IRC, 1988d) and WASH's series on well construction, spring capping and rainwater catchment (Edwards et al, 1984) provide examples of such approaches.

An important criterion when awkward choices have to be made about which projects should be deferred, is that high priority be given to projects which, as well as high impact, have a strong demonstration potential. This may mean, for example retaining in the programme a project in which new ideas for promoting self-build latrines are being included, at the expense of a more routine project with less demonstration potential.

These and other decision needs will be familiar to agencies and individuals associated with community development activities. Whatever planning approach is used, projects may be subjected to budgetary cuts, political influence, staffing and organizational change, and many other challenges. The advantage of the partnership approach is that all those involved in the project contribute to solving the problems as they arise, so that the outcome is accepted by all parties and the sustainability of the completed project remains assured.

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# *Appendix A: The Wider Setting*

A community's piped supply scheme and its associated sanitation and support programmes are always part of broader plans and organizational structures. The plans are moulded by policies and issues at local, regional, national and global levels. They are then implemented within essential legal and institutional frameworks.

In this appendix, we look at the background to some of the broader aspects that influence the development of projects and programmes. The overall setting will always influence the adoption of new approaches such as the one outlined in this book.

## A continuous cycle

Piped water schemes pass through a series of linked stages from conception, through planning, design and implementation to operation and maintenance. This is commonly known as the "Project Cycle". But it does not end there, and the use of the term project cycle is significant here. First, it correctly implies that each stage of a project is built on the experience of the stage before. Second, it points to the feedback of information and experience from operational projects into the planning of new ones. That requires the addition of a further element in the cycle: **monitoring and evaluation**.

For years, the development assistance process unwittingly encouraged a feeling that a project is completed when the pipes and pumps are in place and the water is flowing. In practice this has meant that once construction is over, project staff close their files and move on to another scheme. That approach deprived planners and communities of the opportunity to make good use of the constantly growing experience gained in project development. It also ignores the decades during which the piped supplies are used by communities. This is when all the early planning mistakes and new opportunities come to light. During this time, the system is constantly tailored to the changing requirements of evolving communities, providing invaluable information for future planning.

The partnership approach described in this book therefore continues through all stages of the cycle, with the relative involvement of the community and that of the water agency varying to suit the community's growing capabilities and experience.

## Sector competition

Public spending and politics are inseparable. Setting priorities for public investment is essentially a political activity. At the same time, patronage can bring power. When cash is short political pressures become more intense and the rivalries between ministries and within the public sector can intensify. All these factors affect the levels of investment in water development.

### *Water as a political tool*

Piped water can transform the life of a community. It can free large numbers of people, mainly women, from a daily toil of water carrying, and create opportunities for economic and social benefits. Consequently, water supply can be a potent political tool and one that is open to misuse.

The temptation exists everywhere for politicians and public servants to try to win goodwill by promising water supplies. There is a natural tendency for people with power to favour their home towns, regions or tribes.

Exploitation of water for political purposes clouds the criteria for development, and can result in an unfair deployment of resources. It can also lead to inappropriate selection of types of supply for communities, resulting in wasted resources or missed opportunities.

### *Water as a poor relation*

Investments in industry, cash crop agriculture, roads and so on are often readily justified and made attractive by the promise of obvious income and economic benefit. When funds are short and interest charges on foreign loans cut into export earnings, these more immediately rewarding sectors are strong contenders for investment.

By contrast, economic returns on piped water schemes have proved difficult to measure, and the social benefits are not immediately obvious. Politically, it is possible to delay water development by obscuring the urgent need with the question: If a community has survived with existing services, why can't it go on for a while longer?

This attitude is most often applied to rural communities. Rural people are out of the public gaze and often wield little influence with decision makers in the distant towns. The result can be a disproportionately high level of attention being focused on urban communities.

### *Why water?*

In fact there are powerful humanitarian and economic arguments in favour of giving water development for both urban and rural communities the highest priority. Even though the economic returns cannot be accurately calculated, they clearly exist. Piped water supplies, especially when accompanied by

sanitation and hygiene education improvements, can and do improve health, and reduce the economic burden of illness. This liberates human and financial resources for productive activity, as well as bringing savings on medical care. Similarly, piped supplies cut down the time wasted every day by countless people carrying water from distant sources to their homes. That time too can be spent fruitfully.

Also, the very activity of community based water development creates new skills. Planning, construction, operation, maintenance and financial management all provide new experiences which have long term application in other economic activities.

### *International agreement*

Many of the arguments in favour of increased investment in water supply and sanitation have been marshalled on a global basis during the 1980s. Collaborative efforts in support of the International Drinking Water Supply and Sanitation Decade (IDWSSD) and the World Health Organization's programme Health For All 2000 have generated promotional literature and key messages, all of which can help in national campaigns for higher priority for the water supply and sanitation sector. Post-Decade plans will continue this promotional effort.

## Legal frameworks

Piped water supply schemes involve extracting water, digging trenches in public or private land, creating new organizations, making charges and spending money. All these activities have to take place within a system of laws.

Historically, water law has followed three stages of national development. The first corresponds to an early phase when water availability exceeds demand. Then laws encourage wider use of water. In the next development stage, demand exceeds availability. In this case laws attempt to regulate demand. In a third, industrialized stage, demand grows and legislation turns towards pollution control and promoting water reuse.

### *Law making*

Fundamentals of water policy which do not require frequent amendment, can be enshrined in a water code. Details can be covered by regulations and bye-laws. Water code can be divided into four categories:

*Rights on natural water*

This contains provisions establishing the power, rights and duties of individuals and government over natural water sources.

*Rights on land*
This gives government powers over private land for management of surface and groundwater.

*Registration and licensing of rights*
This deals with allocations between competing water uses. It aims to satisfy national planning priorities, protect and quantify consumers, and offer security of supply.

*Administration*
Water law has to define aims of the authority responsible for development, control and maintenance of resources. It also has to provide suitable powers and constraints for the water authority and for non-governmental and community-based organizations.

### *Law shaping*

Existing laws may have to be re-shaped to reflect the adoption of community-based management of water supply and sanitation projects. Water Committees and Tap Committees need to operate on an accepted legal basis. Water agency structures should allow for and promote community involvement in the whole cycle of water development. Local bye-laws are needed to register rights and obligations of both the water agency and the users, to control the administration of water charges and the disbursement of funds, and to provide a legal framework for dealing with defaulters.

## Finance

Early estimates of the costs of providing safe water and adequate sanitation for the world's urban and rural population have been reduced substantially by choice of more appropriate technology. This has been one of the successes of the International Drinking Water Supply and Sanitation Decade, through the development and increasingly widespread adoption of low-cost technologies.

Community-based piped water projects offer continual scope for further cost reductions. Community choice will generally favour use of local labour and materials wherever possible. Most significantly, recurrent (operation and maintenance) costs can be brought down by the partnership approach.

### *Agency/community contributions*

It is ironic that, in many countries, the only people paying an economic price for water are the poorest sections of the community. While better-off urban consumers frequently receive water at a subsidized rate, because of inadequate tariffs and collection procedures, those without access to public supplies

depend on water vendors, who charge the market rate.

It follows that the financial resources for developing new supplies do usually exist, even in poor communities. The need is for organization and management of the resources in an equitable and sustainable way. National agency budgets should be based on appropriate cost recovery from those who can afford to pay, and this should be accompanied by mobilization of local cash resources and other community contributions, through matching choices of technology and service levels.

It is possible to develop community-based water supply and sanitation projects which are totally self-sustaining on the basis of community contributions. But that is not the whole story. Almost inevitably in any piped water project, there will be a need for some foreign currency. This is needed to pay for imported equipment, materials and fuel, and for professional services. Foreign currency is generated through exports, and many developing countries face great difficulties in generating enough to cover all the competing demands for the development of infrastructure such as water supply and sanitation.

### *Bilateral financial assistance*

Bilateral assistance is money one government (a donor) gives or lends to another, often in goods or services. Some countries provide this assistance in the form of grants, which are non-repayable. Others offer long-term loans at nominal interest. Bilateral assistance commonly includes commercial elements. These are most often expressed through conditions that the recipient government spends the grant or loan to buy goods and services from the donor nation. This so called "tied aid" is used widely. Even when governments have a policy of not tying aid, it is often made clear that the donor nation expects to see some of the money flowing back into its own industries.

The commercial factor also takes form through "mixed credits". By injecting finance into commercial loans, donor governments soften the effective interest charges and give their exporters an advantage over competing countries.

### *Multilateral money*

Most donor governments channel a portion of their development assistance through international agencies. These agencies obtain funds from many governments, so the assistance they give is described as "multilateral". The biggest multilateral agency is the World Bank. There are also three regional development banks (Asian, African and Inter-American). Funds and technical assistance for water and sanitation projects may also be available from the United Nations Development Programme (UNDP) and various other UN agencies such as UNICEF and WHO.

The banks basically offer two types of finance. Normal loans are offered to member governments at nearly commercial rates. They are however available

for the sort of long term investment in infrastructure that would not normally attract commercial banks. Poorer countries are financed through the World Bank's soft-loan affiliate, the International Development Association, or through special funds of the regional banks. These "soft loans" or credits are interest free, although a small service charge is made. Multilateral loans are not tied. The UN Agencies usually offer grant assistance.

### *Cash conditions*

Because of the scale of investment needed, water supply development is heavily dependent on international help. That dependence puts constraints on national water planners. The most obvious comes with tied bilateral aid. With this form of aid, planners are not always free to select the most appropriate types of technology, hardware and services.

If a number of external support agencies are financing water projects in one country, there is a strong risk that the type of equipment installed will be different from region to region. This goes directly against the desirable policy of standardization. It can greatly complicate spare parts procurement and training of operational and maintenance staff.

Tied aid can also hinder the adoption of community-based development since the export interests of donor countries may not be compatible with community requirements. Multilateral aid avoids this form of donor influence, but it has its conditions too. The big aid banks do not lend for individual projects in isolation. Projects normally fall into programmes which form the basis of negotiations. The banks judge these programmes in the context of the countries' broader economic situations. Sometimes loans are made on condition that the borrowing government reduces public spending, or cuts subsidies on fuel, for example. Clearly all of this has an impact on water supply development.

This sort of economic intervention was traditionally the role of organizations like the International Monetary Fund, but the World Bank is more and more adopting a similar position. During the 1980s the World Bank took a greater interest in "structural lending". That is lending to support economies rather than to finance development directly. This reduced the scope for project lending.

## Donor collaboration

During the IDWSSD, there has been an increasing degree of collaboration among external support agencies (ESAs), comprising multilateral lenders, bilateral donors, UN Agencies and international non-governmental organizations. This was formalized in the Hague, The Netherlands in 1988 with the establishment of a Framework for Global Co-operation. Activities initiated by an ESA Collaborative Council are designed to improve the effectiveness of support efforts in individual developing countries. The donors will agree jointly on ways in which they can best respond to requests from developing country

governments for sector assistance.

In this way, it is hoped that problems over conflicting bilateral attitudes to sector development will be avoided, and support will be based on the established needs of the country concerned. Global concepts agreed by the ESAs as important in sector development are based on the earlier developed "Decade Approaches" (see box) and include issues such as community participation, the role of women, and the complementarity of water supply, sanitation and health education.

For agencies in developing countries, this should mean a readier acceptance at government and donor level of the need for community choice and community management of water supply and sanitation schemes.

## Decade Approaches

- Complementarity in developing water supply and sanitation
- Strategies giving precedence to underserved rural and urban populations
- Programmes promoting self-reliant, self-sustaining action
- Socially relevant systems that people can afford, using technologies appropriate to specific projects
- Association of water supply and sanitation with relevant programmes in other sectors, particularly with primary health care, concentrating on hygiene education, human resources development, and strengthening of institutional performance.

# *Index of Selected Keywords*