

EXECUTIVE SUMMARY

SAFE WATER AND WASTE DISPOSAL FOR RURAL HEALTH: A PROGRAM GUIDE



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COMMUNITY HEALTH CELL
Koramangala

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India

In 1981, about fifty percent of the people in developing nations did not have reasonable access to a safe water supply. Roughly 75 percent did not have adequate sanitation facilities.

Improvements in water supply and sanitation facilities in recent years have not kept pace with population growth so that more people are unserved today than in 1970. The heaviest concentrations of unserved people are in rural areas.

The principal result of inadequate water supplies and

sanitation facilities is a heavy burden of diseases, a burden that is greatest on children. The developing nations have a high mortality rate among infants and young children. Half of all deaths in developing nations are among children under five, with malnutrition and infectious disease the primary causes. The disease that is most often involved is diarrhea—a result of the lack of clean water and of poor personal, household and community sanitation practices. Many other diseases, unknown or already eliminated in developed nations, are widespread.

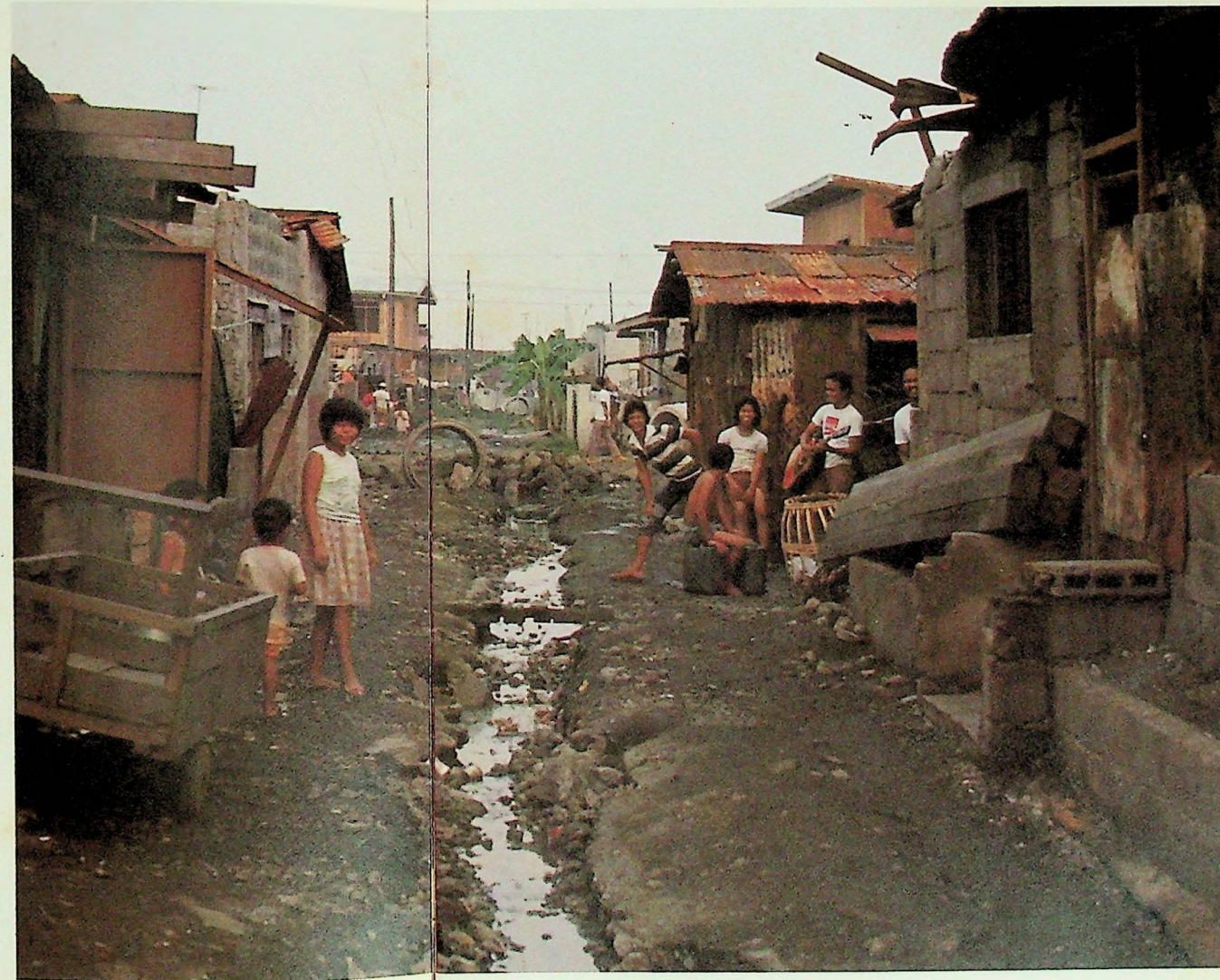
Improvements in water supply and sanitation in developing countries have many positive effects. They promote economic and social, as well as human, development and are a good investment for the countries needing improvements, for other countries wishing to be of assistance, and for international agencies.

Water-Related Diseases

| Category | Transmission | Examples of Specific Diseases |
|----------------------------------|--|---|
| Water-site insect carried | Disease-carrying insects breed in or near water | African trypanosomiasis Onchocerciasis Malaria Arboviruses Filariasis |
| Water contact | Disease transmitted by contact with water | Schistosomiasis |
| Water quality/microbiological | Disease transmitted by consumption of microbiologically contaminated water | Cholera Typhoid fever Diarrhea Dysentery Guinea worm |
| Sanitation-related/water hygiene | Disease transmitted by inadequate use of water | Shigellosis Trachoma and conjunctivitis Ascariasis Scabies |

Environmental interventions to control water-related diseases make a health difference, as the experience of industrialized and many developing nations shows. These interventions involve water supply, more sanitary methods of excreta disposal, better hygiene education, or

some combination of these. In order to plan such interventions effectively, there must be an understanding of the principal water-related diseases and the way each is transmitted. Most interventions can occur at the transmission stage. The most important of these diseases may be classified as shown in the accompanying table.





Water Quality Standards

Efforts at water supply improvement are usually directed at achieving at least minimum adequacy in terms of both quantity and quality. Developing nations that want to attack disease and ill health through water improvements must surely develop water quality standards.

The current methods of assessing water quality were fashioned over the past two hundred years in the urbanizing areas of Europe and North America. While these methods may not be completely and automatically applicable to the developing nations, this experience offers valuable guidance. At present, the most widely accepted standards are those formulated by the World Health Organization.

Water quality standards should be applied as a means to better health, not as an end in themselves. The test of water



quality standards is their effectiveness as a tool to evaluate water supplies as a source of microbiological diseases. Indicator organisms, especially the coliform group, are widely used as tests to assess the possibility for these disease-producing pathogens to occur in a water supply.

Water System Development

Although water has many beneficial uses, the domestic uses such as drinking, cooking, cleaning, and bathing are especially important because of their relationship to disease and health. Improvements in water supply systems generally occur through changes in the source of water and in the means of distribution to the users.

The steps involved in the development of a water supply system are as follows:



Step 1. Identifying a Water Source. Potential sources are surface water and ground water.

Step 2. Retrieving the Water. This refers to the means used to retrieve the water from its source and bring it into the distribution system. Wells and intake structures are examples of retrieval methods. Retrieval also includes devices for moving the water, such as windmills and pumps.

Step 3. Treating the Water. This may not be necessary if there are no harmful contaminants in the water. If there are such contaminants, there are a number of treatment technologies available for dealing with them.

Step 4. Storing and Distributing the Water. Water may be distributed directly from the source without storage. Since people do not use water at a constant rate, however, it is usually better to have a means for storing water in quantity so that high-demand periods may be accommodated.

All water systems require repairs from time to time; complicated systems require constant monitoring and maintenance if they are to function reliably. This aspect of water supply development should never be overlooked or neglected.

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Waste Disposal Systems

Waste disposal includes non-water carried human excreta disposal, domestic wastewater disposal, solid waste disposal, and industrial waste disposal. The most common non-water carried human excreta disposal methods are bury and cover, overhang toilets, bucket deposit and collection, pit or vault privies, bored hole latrines, water-sealed privies, aqua privies, compost toilets, chemical toilets, burn-out or incineration toilets, and oil-flushed toilets. These are listed in order of least to most complex.

Domestic wastewater disposal methods suitable for use in rural communities in developing nations include septic tanks, cesspools, evapotranspiration beds, elevated mounds, package aerobic units, sand filters, trickling filters, and stabilization ponds. If certain conditions can be met, the water-sealed privy is probably the best non-water carried excreta disposal method. The choice of a wastewater disposal method depends on the

amount of wastewater to be disposed of, the human, institutional and capital resources available, and the type of soil present.

Urban or town solid waste disposal on an organized, community-wide basis is quite an expensive, labor-intensive undertaking. In many rural villages, scavenging and re-use of waste materials make solid waste disposal a relatively minor problem. If a solid waste disposal system is needed, it should probably be one such as composting that allows for re-use of waste materials or a sanitary landfill which allows the land to be used later for another productive purpose.

Industrial waste disposal is and will continue to be an increasingly important problem in the developing nations. There is a wide variety of physical, chemical and biological processes available to remove particular types of pollutants from industrial wastewaters. The treatment method will depend on the precise type of industry and the pollutants which need to be removed from its wastewater.



Planning Water Supply and Sanitation Programs

Planning water supply and sanitation programs takes place within a political situation. This situation must be realistically assessed by the planner. The approach chosen should reflect political realities. Variations depend largely on the extent to which planning approaches are expert-biased or user-biased. Generally, the most successful water and sanitation programs are user-biased because this approach is more likely to ensure community understanding and support of the program. The approach that is most likely to result in an efficient and successful program is one that involves the community at every stage of project planning and implementation. The planning process occurs in seven stages:

- (1) Recognizing the Problem
- (2) Formulating Goals
- (3) Collecting and Analyzing Data
- (4) Generating Alternatives
- (5) Appraising and Selecting Programs
- (6) Making New Programs Work in Practice
- (7) Evaluating Programs

There are three key factors in environmental health program planning: community participation, human resource development, and economic considerations.

Community Participation

Community participation is one of the most important factors in determining the success or failure of a water supply and sanitation program. Social and cultural attitudes toward water supply and sanitation technologies will weigh heavily in determining whether the new facilities are used or simply sit idle. To ensure that the facilities are used, it is essential that community members be involved in the planning and execution of all projects.

Community participation consists of more than contributions by community members of time, money and labor in building a facility. For it to be a success, community participation must allow local people to be involved in decision-making. This will be a valuable asset to the project designers as well as to the community. Local people will have much useful information and wisdom to contribute to the project development effort. Community participation affords an opportunity for community education which may be essential to give villagers the



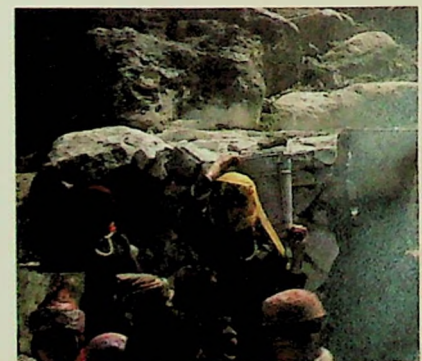
information and understanding they need to make intelligent decisions and to effectively use the facilities when they are completed.

The national water and sanitation plan must have a community participation component that is carefully designed and scrupulously carried out. This is not easy and it will require a community participation strategy that is adhered to in all projects undertaken as part of the water supply and sanitation program. There are a number of techniques that may be used to achieve effective community involvement. The community participation strategy should make use of those most appropriate to a given country and a given community.

Human Resource Development

Of all the resources needed to implement water supply and sanitation programs, human resources (people) are probably the most important. Without the proper mix of human resources, the program will fail. Human resource development is a critical part of water supply and sanitation program planning and requires assessing human resource needs and designing and implementing a training program.

There are several options for types of training methods to be used. The selection of a training method depends on the education and experience of the trainees, the tasks for which they must be trained, and the resources that are available to devote to training. A method that depends on task analysis as the basic training approach is the most likely to be successful. Training should be carefully designed to transfer the precise information that the trainees need in the most effective possible manner. This means that trainers must be carefully selected and may themselves need some training before the program is undertaken.







Economic Considerations

The third essential aspect of water supply and sanitation programming is economic and financial. This includes providing for capital investment in design and construction, paying for operation and maintenance of the completed system, as well as understanding the basic economic principles which bear on the feasibility and timing of the program.

Funds for capital construction can come from the beneficiary communities themselves, from national government and non-government sources, and from international donor organizations. Planning the economics of water and sanitation programs and projects involves consideration of four basic economic principles: demand, supply, costs and benefits. Application of these principles will affect the economic character of the water supply and sanitation program and the individual projects it entails.

Once the system is constructed, the users probably will have to pay for service to defray operation and maintenance costs and perhaps to cover a portion of the construction costs. It is usually not practical or desirable for the operation of water supply and sanitation systems to be fully subsidized by government. Rate establishment and collection are thus often critical to the on-going success of a system but are sometimes very difficult matters from a social policy viewpoint. The key considerations in rate establishment and collection are adequacy of revenues to meet operation and maintenance costs, fairness to the users, and the ability and willingness of the community to pay the rates.

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The views expressed in this document are the responsibility of National Demonstration Water Project and do not in any way represent the policy of the U.S. Agency for International Development. Information on this and other "Water for the World" materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.

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