

# Water for the World



## Planning How to Use Sources of Ground Water Technical Note No. RWS. 2.P.1

Ground water is found in most parts of the world. In rural areas, it may be the safest and most reliable source of water. It is usually free from disease-causing bacteria. Very often it remains available in all seasons. The disadvantage of ground water is that it must be extracted from beneath the ground and sometimes from great depths. Planning how to use sources of ground water is important to ensure that these sources are developed in the most efficient manner possible.

Planning involves setting goals, then establishing step-by-step procedures toward those goals. There are eight major actions involved in project development for which planning is important. It is necessary to (1) recognize the problem, (2) organize community support and set objectives, (3) collect data, (4) formulate alternatives, (5) select the most suitable method, (6) establish the system, (7) operate and maintain the system, and (8) evaluate the system.

This technical note discusses planning and implementation of these eight activities. Read the entire technical note before beginning the planning process. Worksheet A may be adapted for use in cataloging information as planning proceeds.

### 1. Recognize the Problem

This is done by gathering information from regional and national governments, questioning villagers and village leaders, and observing actual conditions in the field. A problem exists with the community's water supply if it is of poor quality or insufficient quantity, if the source is unreliable, or if it is not easily accessible. Each of these conditions may pose a health hazard to the community. Determine whether people in the community suffer from diseases

caused by the lack of a safe water supply. See "Means of Disease Transmission," DIS.1.M.1. Some of these diseases and their relation to water are shown in Table 1.

Table 1. Water and Disease

Role of Water	Disease
Drinking Unsafe Water	Cholera Diarrhea Typhoid Fever
Lack of Safe Water for Personal Hygiene	Ascariasis Scabies Trachoma

In general, water should be clean, clear and good-tasting. It should be available year-round in quantities of at least 15 liters per person per day. If any one of these criteria are not met, a problem exists.

### 2. Organize Community Support and Set Objectives

The main objective of a groundwater supply is to provide an adequate quantity of safe water from a convenient and reliable system. A good water system will reduce the incidence of water-related diseases and improve the overall health of the community. An accessible supply increases water use for hygiene-related purposes including cleanliness. It will also reduce the time spent carrying water and allow more time for other activities.

A successful project must include a plan for community support. See

"Methods of Initiating Community Participation in Water Supply and Sanitation Programs," HR.2.M, "Community Participation in Planning Water Supply and Sanitation Programs," HR.2.P, and "Community Participation in Implementing Water Supply and Sanitation Programs," HR.2.I. Support is gained through promotion of the project and involving the community in it.

Promote the project in the community by creating an awareness of the water supply problem. Organize meetings and educational programs, show pictures or films, and make home visits to explain the connection between a good water supply and good health. Once the community is aware of the problem, it will be more willing to work toward a solution by contributing time, effort, and resources.

Involve the community in the project. Enlist the support of local political, religious, and community leaders, and include them in decision-making. Ask the potential users of the water system for their opinions and advice. Discuss the cost of the project and emphasize the need to finance not only its construction but also its operation and maintenance.

### 3. Collect Data

This is an ongoing process that actually begins the problem recognition step. However, the majority of the data is collected after the preliminary investigations carried out under Step 1.

To plan the system, you must have correct and complete information about environmental, social, and economic conditions in the community. The data needed can be roughly divided into six categories: (a) past projects, (b) environmental conditions, (c) present water supply, (d) geography, (e) resources, and (f) customs.

#### (a) Past Projects

The success or failure of a past development project, especially in water supply, can guide decision-making. Mistakes of the past can then be avoided. Information about past projects may be available from village elders or local governmental agencies.

#### (b) Environmental Conditions

Determine the incidence of water-related diseases by personal observation, questioning villagers and village leaders, and checking health records if available. Local health clinics may have this information. See "Means of Disease Transmission," DIS.1.M.1.

#### (c) Present Water Supply

Determine if the present water supply is safe. See "Analyzing a Water Sample," RWS.3.P.3. Determine if the present source yields a sufficient quantity of water. At least 15 liters per day for each person in the community is needed. Ask villagers if the supply of water decreases during the dry season or if the quality changes perhaps because of flooding during the wet season. Measure the distance from the source of water to village dwellings and the time it takes to fetch water.

#### (d) Geography

Draw a map of the village showing the main geographical features and all sources of water: wells, springs, ponds, streams, and rivers. Determine the depth to the water table, particularly during the dry season. Do this either by examining present wells, questioning well owners or well drillers, or by drilling test wells. Note the prevailing soil conditions: sandy, clay, boulders, or hard rock.

#### (e) Resources

If possible, the community should contribute labor, materials and money to the water system. List the names of skilled and unskilled workers, the available materials, tools, and equipment, and the sources of funds in the community. Try to limit the amount of outside material and assistance.

#### (f) Customs

Question villagers and village leaders about their attitudes toward water use and their preferences for specific methods of water supply. People may be influenced by their religious or cultural beliefs and taboos. Know the village well before proposing a water project.

## r. Formulate Alternatives

Once all available data is collected, use it and the information in "Methods of Developing Sources of Ground Water," RWS.2.M to formulate possible solutions to the problem. The best alternatives will provide the community with safe and abundant water from a reliable and accessible source at the lowest cost. Alternatives may be a single method or several methods of developing sources of ground water. When formulating alternatives, consider only those methods that are appropriate or practical for the community and are basically acceptable to the people. When the most likely alternatives have been formulated, select the best method.

## 5. Select a Method

When selecting a method of groundwater development, study the features of each alternative carefully and analyze the collected data thoroughly. The decision on which method to select should be based on the information in "Selecting a Method of Well Construction," RWS.2.P.2, and on the following two factors:

Community Needs. Determine whether the source can meet the needs of the community now and in the near future, based on estimates of community growth. Do not choose a sophisticated method if a simpler one will do. Consider improving existing groundwater sources before developing new ones.

Social Acceptability. Determine whether the method selected and the proposed location of the well are acceptable to the community. The greater the community acceptance of the system, the more willing the people will be to use it and pay for building and maintaining it.

## 6. Establish the System

Once the best method has been chosen, develop a project plan. The plan will serve as a guide throughout the project and ensure that labor and materials are available when needed.

In many cases, a plan must be submitted to a government agency or donor organization for approval. The plan should state a goal, provide population information, indicate the number of people affected by the project, and demonstrate how the project will aid the community. This is especially important when money is sought from international donors. Determine their requirements as early as possible. In such cases the plan should be quite detailed and include information on the proposed system, costs, sources of finance, and plans for construction and sources of materials.

Proposed system. Design drawings for the project should be submitted with the plan. The drawings should include all measurements and capacities. Photographs of the work site and a topographic map showing houses, buildings and water sources should accompany the plan.

Costs. The plan must include a list of all estimated costs including materials, tools, equipment and labor. If land must be purchased, this cost should be included in the total. Local materials probably will be less expensive and should be used whenever available. Labor costs will depend on the local pay rate and the time and skills required. Any labor or materials which are donated should be included in total costs.

Sources of funding. If at all possible, local funds should be used to finance some portion of the project. This money can come from such sources as contributions, fund-raising activities or user fees. Money for the development of larger scale, or more expensive, water systems may be available from governmental organizations, international groups or private donors. Donor agencies generally require that the community contribute a percentage of the total cost.

Implementation schedule. Determine the amount of time necessary to complete the project. Attempt to schedule it at a time when volunteer labor and money are available in the

community. Generally, this will be after harvest time or just before planting season. Fund-raising activities should take place during times of increased community income.

Plan for construction. Develop a plan for constructing the system including both the labor and supplies needed. A complete materials list for the project will help ensure that tools, equipment and materials are at the site when people come to work. If tools and materials are stored at the site, provide a well-protected, secure place to store them. If possible, there should be a supervisor at the site so that workers will know what to do at all times. If the system is very complex, a contractor may be hired to do the construction.

## **7. Operate and Maintain the System**

Plan for the continued operation of the system. This should include a training program for local villagers. No matter how simple the system, there will always be a need for maintenance. The people in the community should know about basic construction, pump repair, and well disinfection. The people in charge of maintenance must know where to obtain spare parts, extra chlorine, and other resources important to the system. A local storehouse could be established.

## **8. Evaluate the System**

Evaluate the system to determine if it is achieving the goals set at the beginning of the project. To measure the system's success, use the four characteristics of good water supply: quality, quantity, accessibility, and reliability.

Quality. Is the quality of the water acceptable? Test the water, if possible. Determine if there has been a decline in water-related illnesses since the completion or improvement of the system. Fewer cases would indicate that quality has improved. Make sure the source is protected from sources of contamination, and that treatment is adequate.

Quantity. Is the quantity of water produced adequate? Determine if the system is meeting the daily needs of the users, and if it would meet the needs of additional users.

Accessibility. Is the system accessible to all intended users? Determine if the community is satisfied with the supply's location, or if there are problems getting water. Also, find out if water consumption has increased since the system was developed. An increase in consumption may indicate that water is more easily available to the users. If traditional family water carriers have increased time for other activities, try to estimate the benefits gained from this extra time.

Reliability. Is the system reliable? There should be no design flaws or breakdowns. Water should be reaching the users without interruption. If technicians have been trained, evaluate their performance in operating and maintaining the system.

The evaluation of the system will provide important information for the development of future projects. Compare the success of this project to projects in other communities to gain valuable lessons in the development of groundwater supply systems.

**Worksheet A. Planning the Development of a Groundwater Source**

1. Name of community \_\_\_\_\_  
2. Number of people to be served by water source \_\_\_\_\_  
3. Type and number of water-related diseases in the community per year \_\_\_\_\_

4. Significant beliefs and taboos about water \_\_\_\_\_

5. Present source(s) of water \_\_\_\_\_

Determine:

(a) water quality \_\_\_\_\_

(b) water quantity \_\_\_\_\_

(c) accessibility \_\_\_\_\_

(d) reliability \_\_\_\_\_

6. Potential source(s) of water \_\_\_\_\_

Determine:

(a) water quality \_\_\_\_\_

(b) water quantity \_\_\_\_\_

(c) accessibility \_\_\_\_\_

(d) reliability \_\_\_\_\_

7. Community resources and organization

Determine:

(a) sources of income \_\_\_\_\_

(b) seasonal distribution of income \_\_\_\_\_

(c) labor and materials available \_\_\_\_\_

(d) infrastructure in existence \_\_\_\_\_

(e) concerned community leaders and groups \_\_\_\_\_