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SOCIAL ANALYSIS

OF

POTABLE WATER PROGRAMS

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Introduction

Few development projects have a greater potential for directly benefiting the living conditions of the rural poor population than water supply improvements. The benefits which accrue to potable water projects are associated with the four components of supply. These are improvement in water quality, quantity, accessibility and reliability.

The failure rate in rural water systems is extremely high. These estimates of between 35% and 50% are partly attributed to causes other than engineering technology.

This Paper investigates the non-engineering aspects of potable water projects in an effort to improve their site section and design. Through efficient usage of social analysis the failure risk should be reduced.

I. Causal Relationships and Social Parameters Identified in Evaluation Surveys

Three major issues are recurrent in the literature on potable water supply system. These are the classification of water-related diseases, the role of education and last is the broad field of maintenance.

A. Relationships between Water Supply, Sanitation and Health

Re-examination of water-related diseases indicate a typology of four types presented in Table 1-3:

- Water-borne--faecal-oral ingested transmission through polluted drinking water. Design requirement: improve quality.
- Water-washed--faecal-oral ingested transmission and skin, eye infections from poor hygiene and lack of cleanliness. Design requirement: improve quantity and accessibility.
- Water-based--transmission from organism living in the water for example schistosomiasis. Design action: storage and treatment.

- Water-related insects vector--transmission by water-breeding insect bites (i.e. malaria). Design requirement: bring adequate water to the village and destroy breeding sites.

Water supply planners need to incorporate this water-related disease typology into their project plans. If improved health is a major benefit to be accrued from a water project the design must address the particular type of diseases in the region. A community health problem related to water-washed diseases does not need a more costly and complicated water quality treatment system; cost effectiveness demands better planning of water supply systems.

B. The Hygiene Educational Component in Water Supply Projects

The availability of safe water and/or adequate quantity is not sufficient to bring about the expected health results. The population must change their behavior with regards to hygiene. As reported earlier, studies have shown that perfectly safe water at the tap is polluted at the time of consumption. Thus a water supply system will be beneficial in lowering disease rates only if the population understands the links between health, clean water and hygiene. The educational component is not only necessary during a project but is also important in the early planning stages. Without public health education, villagers are unaware of the potential benefits of improved water systems and are not willing to pay for them in either currency or through voluntary labor self-help programs.

C. The Socio-Economic Components of Maintenance

The emphasis on construction and the low priority given to the maintenance component is a feature of national rural water supply programs. Emphasis has been placed on goals and targets with often little if any planning for future maintenance and recurrent expenditures.

This capacity of system maintenance is not entirely a problem of financial reasons or acquisition and delivery of spare-parts; two major social dimensions are prevalent. Village motivation and the project's organizational structure are key elements in a successful water supply investment venture.

C.1 The Role of Village Participation on Motivation for Project Maintenance

Motivation for maintenance is a multi-dimensional phenomena. Motivation may be low because the system's benefits and goals have not been fully understood and appreciated.

A major element of motivation associated with maintenance and system abuse is the concept of community participation and local decision-making. Through participation in the decision-making, and donation of local resources (land, labor and money) the community and its leaders feel a sense of responsibility for the water system and may adopt a possessive attitude about it. The project then makes the transition from their system (i.e. the government's) to our system. When this transition occurs there is increased local effort toward maintenance and payment of water rates associated with recurrent expenditures. There are five major points at which the local population may play a significant role in the decision-making process:

- Whether or not to implement the project based on their own priorities.
- Assist in selection of technology and location of faucets based on their needs and preference.
- Assist in setting the pricing policies and water rate structures.
- Setting the social controls for continued use and maintenance.
- Assist in monotoring and help in the construction, operation and maintenance of the project.

C.2 The Effects of Organizational Structure on Maintenance and Project Operation

Closely associated with community involvement and also effecting motivation and capacity for maintenance is the organizational structure of the project planning, implementation and maintenance.

The administrative framework should have adequate vertical links To ensure continued operation, village systems must be supported with technical advice, operative training, supply of spare-parts and some minor supervision. This decentralization of local support is costly and often excluded or overlooked in the initial resource planning.

D. Summary of the Complementary Component of Water Systems

Nearly all the evaluations of water systems have stressed the fact that a water supply system must be accompanied by a carefully designed package of complementary inputs if it is to achieve development goals of improved standard of living. These major components or inputs, which have been discussed above, are (1) hygiene education (2) a sanitation component (3) community involvement and (4) maintenance support and education. Concentration on these major components should not be taken to imply that these are the only social concerns in potable water projects. These are simply problems incurred in all water projects. Other social

issues may occur in specific areas that must be resolved if the project's impact is at a maximum. Some of these problems are :

- design of an appropriate water fee scheme;
- group identification in the area which lessen communal activities; and
- diffusion and adoption of technology problems.

II. Utilization of Social Analyses by Other Agencies in Potable Water Projects

Both domestic and international agencies have an extremely low commitment to social analyses. The emphasis is usually placed on financial planning. Where social analysis has occurred it has had little influence on the decision-making process. With the exception of the Corp of Engineers, social analyses have been haphazard and unorganized. The Corp uses a standardized checklist but because of policy and lack of interest by decision makers very little effort is expended in carrying out the social analysis. But from discussions with these agencies it appears that social analysis will become better utilized in the future.

A. Domestic Agencies Potable Water Programs

The Corp of Engineers and the Tennessee Valley Authority (T.V.A.) are the only federal agencies involved in actual implementation of water systems. These projects are always in connection with a much larger water project such as flood protection, hydrol electric dam construction and irrigation.

These two agencies are required by law to conduct four types of surveys; two of these deal with economic growth and the other two address the issue of environmental protection and social well-being.

Unfortunately, the social account along with the regional account is not utilized in planning by the Corp because the Executive Office is only concerned with national growth.

B. International Agencies Water Programs; United Nations

Although none of the international agencies interviewed conducted social assessments with any regularity or consistency, most were able to verbalize a set of goals and/or investment components which were translated to planning objectives and village criteria selection.

In the United Nations' system the Children's Fund (UNICEF) and the World Health Organization (W.H.O.) are the only divisions that are actively involved in implementation. The U.N. Development Programme (UNDP) and the World Bank are involved only in technical advice and procurement of financing.

B.1 The World Bank Experience in Social Analysis

The World Bank is concerned primarily with the financial elements of development projects. But the Bank has produced some guidelines for conducting sector analyses and selection criteria. The Bank lists a series of goals and justifications for investments in potable water. The direct goals are improved health, greater convenience and fire protection.

B.2 UNICEF Experience in Social Analysis

The justification for investment in water supply for UNICEF is that young children are particularly vulnerable to diarrhoea and other diseases related to poor hygiene which also contribute to malnutrition.

UNICEF attempts to adjust the urban and wealthier rural area biases of the World Bank by investing entirely in unserved rural areas which can not qualify for "bankable" projects. UNICEF along with other agencies is beginning to recognize the importance of maintenance planning. In the past, very few of their projects had a maintenance component, but presently all of their water system projects have an integrated maintenance program.

B.3 The World Health Organization Experience in Social Analysis

W.H.O. and the Pan American Health Organization (P.A.H.O.) do not directly finance water systems. They assist in procurement of financial arrangements and often prepare engineering/economic feasibility reports with funds provided from UNDP and the International Bank for Reconstruction and Development (IBRD). Their major role is technical cooperation aimed at stimulating and strengthening national water programs through training to increase managerial capacity and the provision of information on appropriate technology.

B.4 A Review of the United Nation's Role in Potable Water Projects

In summary none of the United Nation's organizations are actively involved in social analysis of development projects. UNICEF recognizes possible potential benefits from social surveys but does not have the staff, nor are they willing to invest part of their budget for this activity.

UNICEF is the only U.N. agency that implements only rural water programs. They also are the only U.N. agency that does not require a water usage fee and require communities to pay a portion of the construction cost. In regards to village monetary contribution requirements, the World Bank and

other international loaning agencies are presently re-examing this issue and will probably develop some less restrictive alternatives, or the poorest villages will be excluded from participating in the U.N. Water Decade goals.

C. International Agencies Water Programs: Private Voluntary Organizations

Private Voluntary Organizations (PVO) appear to be more concerned with social issues than donor agencies. They also view water projects as just one component in a rural development program. This is possibly because they operate at the community level and develop all of their projects around the self-help principle. But none of the PVO questioned had a defined system for collection and usage of social analyses in planning.

III. The Major Social Parameters and Their Relationship to the Accural of Benefits

At the most inclusive abstract level the basic benefit from water system programs is improvement in quality of life.

Benefits that are related to actual water supply improvements are presented in Table (5). The mechanism through which benefits are accrued are listed under the four dimensions of water system projects: (1) Accessibity — the time involved in procuring adequate family water needs. This is a function of both closeness of the water and the number of users for each tap; (2) Quantity — the amount of water available for usage; (3) Quality — the level of purity, primarily bacterial count and absence of parasites; and (4) Reliability — an adequate amount of water during all seasons.

Health improvement has been the major expressed benefit or justification for water system investments. But this benefit is very difficult if not impossible to quantify. Health benefits will have an increased possibility if educational components are associated with water projects. Health related to water quality may also equire a sanitation component to assure that water sources are not re-contaminated.

The other benefits (convenience/time saving, increases availability of labor-productivity, agricultural advances, economic diversity and fire protection) are all associated entirely with water being more accessible, reliable and in greater quantity. These causal relationships strengthen arguments made earlier to mitigate importance of water quality in water system planning.

The degree to which all or some of these benefits materialize (health being the most precarious) depends on the planning and integration of projects with other important components.

Even the best designed systems with sanitation and education components will be unreliable if poorly maintained, forcing communities to resort to traditional water sources. Thus, maintenance and acceptance of the system become the major constraints of the success or failure of a Water System project. Projects are more likely to succeed if:

- The community is fully aware of cost and benefits of alternative systems and helps in the selection process;
- A local committee helps to set priorities and management procedures;
- Communication is fluid between the community and project personnel;
- Tariff structures are understood and accepted;
- The project design has allocated funds or a feasible process for collection of funds to meet recurrent expenditures;
- The plan includes a training program for maintenance manpower;
- The project uses and strengthens local political and/or indigenous organizations when ever possible. If new organizations must be developed they are formed in a manner that will not lead to a power struggle in the community;
- The village kinship and stratification structure is considered in the supply scheme; and finally
- There is assurance of good utilization of facilities by discussion and local understanding of the link between water-sanitation, personal hygiene, environmental hygiene and health.

IV. The Use of Comprehensive Social Impact Analysis for Efficient Planning

Social analysis within USAID is too often regarded simply as a justification tool with emphasis placed on beneficiaries. Another element of social analyses must be utilized if projects are to incorporate social designs for development activities. This element, social soundness or feasibility studies, is designed to assist project planners in the identification of communities' capital absorbtion abilities. The feasibility studies will also assist planners in the selection of the most socially acceptable implementation procedures by identifying those social parameters which show the greatest effect on the project's local acceptance and success.

Incorporation of social soundness studies is not the only problem in effective usage of social planning in project designs. At present social analyses are usually carried out during the final stages of project design. At this point in the planning, tentative budgets have been set and general project strategies have been formulated. If the social feasibility statement causes any change in project designs, it is likely to be only minor ones.

Certain types of projects require more individual intervention and project acceptance than others. These <u>active</u> interventions as compared to <u>passive</u> ones require a more careful analysis and social emphasis in the project design. Therefore, project planners need to become aware of the type of intervention required for implementation of various projects. This determination is not as easy as it may seem on the surface; rural water supply and sanitation are a good example. The preceding portion of this Paper dealt with major social components of water systems that in the past had often been over-looked primarily because development planners had preceived water projects as a form of passive intervention. Consultation with the Technical Support - Social Analysis Office should help in identification of the more active intervention programs. Once they have been identified the Mission planners will be aware of the possible social constraints and issues.

This document and others to be prepared like it will assist Missions in identifying crucial social variables of active and semi-active projects. This closer working association between Mission project planners and Washington Technical Support will enhance project designs and ensure a greater impact on the goals of the projects.

INTRODUCTION

Previous emphasis on economic development and GNP has had little effect on the rural poverty in developing countries. Development organizations have learned that industrial investments in growth centers have not trickled down or exhibited a spread-effect to the rural masses. This realization has lead to a re-examination of development objectives with a new emphasis and USAID mandate to invest in projects that directly improve the quality of life of the rural poor.

[illegible] projects have a greater potential for directly benefiting the living conditions or quality of life of poor rural populations than water supply and sanitation improvements. There are four components in water supply improvements. The benefits accrued to the community are often associated with certain of these components. Improved water quality has a causal relationship with quality of health and possibly indirectly through this improved health, increases in productivity. But as will be discussed later, safe water alone is not sufficient to bring about a change in health. Increased accessibility and quantity of water saves time in water procurement which increases the availability of labor for other activities. Other than leisure, some of these may lead to increases in economic activities and productivity. Improved health through better personal hygiene and household cleanliness is also attributed to readily available water in excess of that necessary for consumption. Extra water may also be used to intensify gardening efforts and allow for some protection against fires. The last component of the new water source and/or delivery system, reliability, is necessary if benefits accrued from the project are not severly reduced during the dry season. These concerns at the international level led to major resolutions at the 1976 U.N. Habitat conference in Vancouver and in the 1977 U.N. Water conference in Mas del Plata. The United Nations has declared the 1980s as the International Drinking Water Supply and Sanitation Decade with a goal of supplying everyone with safe water and adequate waste disposal by 1990[1/].

In 1975, the World Health Organization reported that only 35 percent of the population in developing countries were adequately supplied with water by community standpipes or household connections. Furthermore, only [illegible] percent of this "adequately supplied population" were in [illegible] to 77 percent of the urban population. This is a substantial increase from the 1970 levels. This progress was achieved

1/ A major discussion of the resolutions, global baseline statistics and plan of action are found in WHO-UNDP Doc.: GNS/78.2; a review of these items are in Burton (1979).

by investments in urban areas of the order of U.S. $3,000 million for water supply and U.S. $3,400 million for sewage. In the rural areas the investments were $2,250 million for water supply and U.S. $450 million for sanitation. Because of the acute need for improved water supplies to meet the United Nations targets, current investment will have to be increased by the following:

1970	Increase in Investment
Urban Water Supply	1.2 times
Urban Sewage/Excretion Disposal	2.1 times
Rural Water Supply	3.9 times
Rural Excreta Disposal	4.0 times

In response to the U.N. water conference AID is expanding its allocation of funds for water system programs[1/]. At present, projected FY 1980 investments will be $336 million. Of this amount over 270 million is designated for the Near East Bureau. Such a major expansion risks less than maximum benefits without adequate preparation based on past experience and research.

Experience with water systems over the past decade had had mixed results. The failure rate of rural water supply systems is extremely high. Imboden (1977) and Feachem (1978) estimate that 35% to 50% of the water systems are non-functional after 3 to 5 years of operation. Most of these failures are not simply due to engineering technology; water investments are simply more complicated than originally thought. They are complex and difficult to implement successfully due to their multi-dimensional nature.

This Paper is an attempt to determine the non-engineering aspects of potable water investment schemes in an effort to improve their site selections and designs. Through the efficient usage of social impact assessments[2/] including an estimate of the social soundness, the Agency should be able to improve the success rate of potable water investments. The extra expenditures and time devoted for a thorough social analysis is small compared to the capital investment risk in projects with high failure rates.

The first step in development of an appropriate social analysis instrument was to examine how other donor agencies, both domestic and international, determined their investment decisions. From the perusal of their social soundness instruments and knowledge of some of the basic

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1/ It has been estimated that AID may commit around 2½ billion dollars over the decade for potable projects.

2/ Social impact assessment is an estimate of the benefits which will accrue to the population, the types of behavioral changes necessitated by the project, the community absorbtion capacity and finally the major social parameters affecting the project intervention.

social parameters, NE/TECH could develop a semi-standardized Potable Water system social analysis instrument. This would assure the Mission planners that all potable water project social analyses contain those parameters considered the most significant for projects of this type.

Due to the low incidence of agencies' commitment to social analysis, this investigation had to rely almost entirely on some of the major research evaluations of potable water projects. From these reports, it was possible to extract some of the important parameters and constraints on water systems.

I. Causal Relationships and Social Parameters Identified in the Major Evaluation Surveys

Three major issues are recurrent in the literature with regards to water system projects. A major issue is a redefinition of the concept of water related diseases. This has led to a debate between the importance of water quality as compared to water quantity. Another major issue is the role of education in water projects. Studies have shown that an understanding of the relationship between water, hygiene, and health is necessary if the community is to experience health benefits. The last major component is the broad field of maintenance. This is not only a problem of capacity, but often overlooked, it's also a problem of village motivation for maintenance.

A. Relationship Between Water Supply, Sanitation and Health

Over the past few decades a wide array of diseases have been grouped together as water-borne or water-related diseases. This has unfortunately led to a misunderstanding of the nature of the relationship between water and infectious diseases. For too long water projects in less developed countries (LDCs) have been oriented toward water quality. For example, WHO (1971) claims that potable water should have an average of less than 1 E. coli per 100 ml or be condemned. It is not the intent of this report to argue that quality of water is unimportant but recent research suggests a re-examination of the goal of safe potable water with the possible development of less restrictive guidelines.

Due to poor health in the LDCs more assistance should be given to health improvement projects. Gastro-intestinal diseases and malnutrition are the major causes of the death of children in the developing world. But recent research questions whether or not quality of water is the appropriate approach.

Bradley (1977) has suggested a classification of water-related diseases and links them to the appropriate preventative strategies (Table 1). Feachem (1977; 1978) further develops this scheme to distinguish faecal-oral related diseases from skin and eye problems related to the water-washed category (Table 2). Table (3) lists the major water-related infections and assigns them to their appropriate classification. With this more detailed explanation of water related diseases, planners are able to more efficiently design water projects for solutions of particular health problems.

The two major types of water-borne diseases are typhoid and cholera. Both of these classical water-borne strains of bacteria are faecal-oral transmitted with water being only one of the many paths of transmission. Because of their epidemic nature in cities when transmitted through the water supply system, high quality water in potential problem metropolitan areas might be justified. But even then Bradley (1977) claims that typhoid is probably better controlled by means of inoculations which last several years.

Transmission mechanism	Preventive strategy
Water-borne	Improve water quality and prevent casual use of other unimproved sources
Water-washed	Improve water quantity, water accessibility and hygiene
Water-based	Decrease need for water contact, control snail populations and improve quality
Water-related insect vector	Improve surface water management, destroy breeding sites of insects and decrease need to visit breeding sites

TABLE 2
A Classification of Water-Related Diseases

Category	Example
1. Faecal-oral (water-borne or water-washed)	Cholera and Hepatitis
2. Water-washed; (a) skin and eye infections	Trachoma, Scabies
(b) other	Louse-borne-fever
3.3. Water-based; (a) penetrating skin (b) ingested	Schistosomiasis and Guinea worm
4. Water-related insect vectors; (a) biting near water	Sleeping Sickness
(b) breeding in water	Malaria

TABLE 3
Water-Related Diseases with Their Water Association and Their Pathogenic Agent

Water-related disease	Category	Pathogenic agent
Amoebic dysentery	1	C
Ascariasis	1	D
Bacillary dysentery	1	A
Balantidiasis	1	C
Cholera	1	A
Diarrhoeal disease	1	H
Enterobiasis	1	D
Enteroviruses (some)	1	B
Gastro-enteritis	1	H
Giardiasis	1	C
Hepatitis (infectious)	1	B
Leptospirosis	1	E
Paratyphoid	1	A
Trichuriasis	1	D
Tularaemia and Typhoid	1	A
Infectious skin and eye disease	2a	H
Louse-borne typhus	2b	G
Louse-borne relapsing fever	2b	E
Clonorchiasis and Diphyllobothriasis	3b	D
Fasciolopsiasis and Guinea worm	3b	D
Paragonimiasis	3b	D
Schistosomiasis	3a	D
Arboviral infectious (some) and Dengue	4b	B
Filariases and Onchocerciasis	4b	D
Malaria	4b	C
Trypanosomiasis	4a	C
Yellow fever	4b	B

A=Bacteria C=Protozoa E=Spirochaete G=Rickettsiae
B=Virus D=Helminth F=Fungus H=Miscellaneous

The other major faecal-oral related diseases are referred to as water-washed diseases. The most prevalent and acute water-washed disease transmitted through the faecal-oral process are the diarrhoeas. In the less developed world diarrhoeal disease is the single largest cause of death and illness (Gordon, 1964). Children less than two years old are especially susceptible to diarrhoea with often fatal results. Previously, it was felt that diarrhoeal disease was transmitted primarily through the water source but recent research has found little evidence of this thesis (Brisco, 1977; Richardson, et al, 1968; and Feachem, 1978). This raises the whole issue of quality vs. quantity and availability of water. White et al (1972), and Sanders and Warford (1976) have reviewed a large number of studies which show diarrhoeal disease decreases with increases in water avaliability and quantity used. These studies also report very little if any noticeable change in disease rates associated with increased water quality. Feachem et al in their 1978 Lesotho study found that not only was diarrhoeal disease associated with quantity of water but also in the typhoid region of Lesotho the transmission of typhoid was associated with faecal-oral routes other than polluted water. Gordon (1964:360) contends that "water for hygiene, used in adequate amounts and ready accessibility, has more significance for children under two than the provision of a potable supply".

Therefore it is necessary to consider water as a cleansing agent with focus placed on filth-borne and filth-related diseases if the LDCs rural sectors are to control diarrhoeal diseases. Planners must understand the relationship between water use and personal hygiene if there will be sufficient health impacts. Another important dimension in control of diarrhoeas is nutrition. Gordon and Scrimshaw have reported numerous studies that relate malnutrition to diarrhoeal diseases in young children.[1/] They argue that the nutritional state of the infected host is more important in control of the disease than the route of transmission. The other major form of the water-washed category is infections of the skin and eyes. They rarely shorten life but they are responsible for making people miserable. Feachem (1978) reports that 70% of the pre-school children in Ankole, Uganda and 90% of the inhabitants of the New Guinea Highlands suffer from skin infection from either bacteria or mites and louse.

Once the need is determined for increasing the quantity and availability of water, what is an adequate volume necessary for efficient water-washed disease control? White et al (1972) estimates that the maximum benefits accrue to those persons presently using less than 80 liters per capita. The range where increased quantity is most efficient is between 20 and 80 lpc. This range is due to the volume of water necessary for good hygiene. At present a liberal estimate of the global average water volume usage for water sources outside the house is 20 liters per person. The range is large depending on various factors; the most important is convenience. If water has to be carried more than a mile the daily consumption may drop to as low as 5 liters per capita.

1/ These studies are recorded in Wall and Keeves Water Supply, Diarrhoeal Diseases and Nutrition: A Survey of Literature.

The other two categories of water-related diseases, water-based and water-related insect vector will not be elaborated here. Their presentation in Tables 1-3 is fairly straight forward with a simple relationship to the water supply.

Water supply planners need to incorporate this water-related disease typology into their project plans. If improved health is a major benefit to be accrued from a water project the design must address the particular type of diseases in the region. A community health problem related to water-washed diseases does not need a more costly and complicated water quality treatment system; cost effectiveness demands better planning of water supply systems. Even if the disease transmission route is polluted water (i.e. water-borne) there is little guaranty that safe water when consumed is of high quality. This type of pollution is especially prevalent in villages where public taps exist (WHO, 1966; Feachem, 1978). Thus if the supply design is to include high quality water other sanitation components, including education, must be implemented if the project is to be successful in delivery of safe water.

Where water is considered as a cleaning agent, the question "what is safe water?" takes on a different connotation. But what set of parameters should be used? Does this imply a new set of criteria for water supply systems? Feachem (1977), White, (1972) and others feel that the W.H.O. water quality standards are far too stringent given the strong evidence of other transmission routes for water-related diseases. This conventional wisdom of high quality water may have been responsible for the slow development of water systems in the developing world because treatment facilities in water supply designs add a major cost factor to the project. Feachem (1977:88) has designed an algorithm[1/] for decisions in regards to treatment of water. This is reproduced as figure 1. It includes decisions based on the type of water-related diseases encountered in the area. Also a comparison is made between the new supply and the traditional source of water. Feachem argues that if the treatment plant cannot be maintained or afforded the new supply should be implemented without treatment if the traditional source has a similar level of pollution. In this case the incidence of water-borne diseases will be controlled from increased quantity of water.

In most low-income communities infection of the water-washed variety is the major cause of disease and high mortality rates. These diseases will respond to improvements in water quantity, availability and reliability. Therefore water supply designs should be focused to meet these improvements. If quality related treatment is not feasible a risk-taking procedure as guided by figure (1) should be considered. It is a procedure which favors the acceptance of known hazards to achieve known benefits. This is a more rational approach than the conventional wisdom which would abandon the water supply project or build a treatment plant that cannot be operated or maintained.

1/ An Algorithm as found in figure 1 is a decision-making tool. The Planner is guided through the maze by answers of YES or NO to each question found in the rectangles. At the end of the path will be the most appropriate technical design given the parameters addressed in the algorithm.

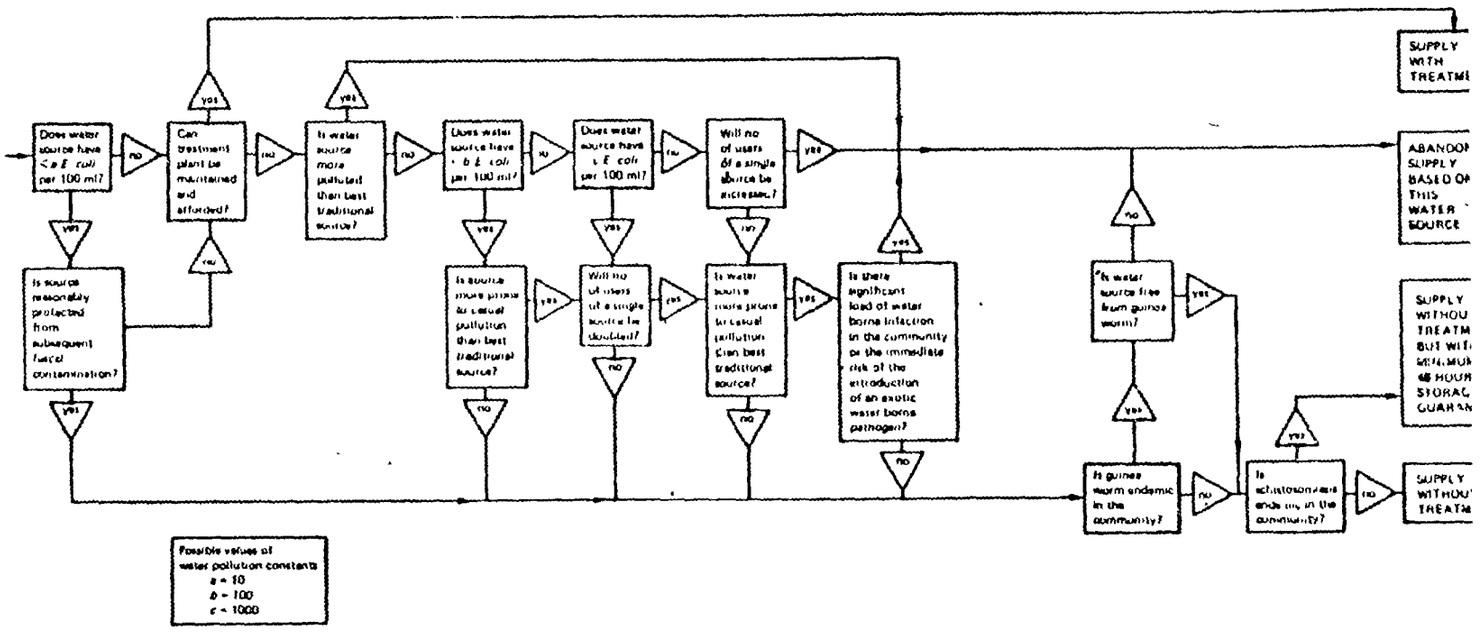

Figure 1 An algorithm of the decision to treat, not to treat, or to abandon a particular water source

In summary, the health planning aspect of rural water projects involves a three-step process to determine the appropriate design:

- Determine the types of water related diseases prevalent in the community or region. This can probably be acquired from local health services.

- Decide from tables 2 and 3 the type of classification of these diseases. If they are faecal-oral, what is the most probable source of transmission i.e. (water-borne, transmitted by water; or water-washed, effected by cleanliness from lack of good hygiene, washing of dishes, bathing, etc.). Remember that most studies show that the majority of oral-faecal diseases are primarily water-washed. Thus you need strong evidence for water-borne designs.

- Determine the appropriate design facilities.

  a. If improved water quality is needed, go to the water treatment algorithm found in figure 1 for determining the best design given structual and financial constraints of the area. The algorithm also incorporates decisions for schistosomiasis and Guinea worm infestations. Also an important factor will be hygiene education and sewage disposal to decrease re-contamination.
  b. If the disease is caused by schistosomiasis, guinea worm or other water-based sources treatment of the water is necessary. But the design will be simpler than that for improved water quality. For example, schistosomiasis only requires a holding tank storage of the water for 24 hours. Other controls include decreasing infested water contacts and snail population.
  c. If water-related insects is the cause, the correct design would include decreasing the need for individuals to visit insect breeding areas by transporting water needs to the village. Also steps should be taken to destroy breeding sites and improve surface water management.
  d. If the transmission is due to cleanliness-water-washed diseases, the most prominent, the appropriate design should improve the accessibility of water through transportation and/or well construction. This decreases distance travelled to collect water (household taps being the ideal). Also important to control of these diseases is the quantity available and the reliability of water supplies. This design provides only the capacity for cleanliness. For success, projects must include a personal hygiene educational component (this is discussed in the next section).

B. The Hygiene Educational Component in Water Supply Projects

The availability of safe water and/or adequate quanity is not sufficient to bring about the expected health results. The population must change their behavior with regards to hygiene. As reported earlier, studies have shown that perfectly safe water at the tap is polluted at the time of consumption. Thus a water supply system will be beneficial in lowering disease rates only if the population understands the links between health, clean water, and hygiene. The educational component is not only necessary during a project but is also important in the early planning stages. Without public health education, villagers are unaware of the potential benefits of improved water systems and are not willing to pay for them in either currency or through voluntary labor self-help programs.

C. The Socio-Economic Components of Maintenance

Maintenance is the other major component that determines the success of water supply projects. An estimated 35% to 50% of rural water projects are not functioning after 3 to 5 years due to maintenance problems. This lack of maintenance is often due to the fact that financing for construction is relatively easily obtained from donor agencies budgets or from local villagers through some form of tariff or water usage rates. For this reason technology should be designed that requires a minimum of maintenance even if the initial cost is substantially higher. The emphasis on construction and the low priority given to the maintenance component is a feature of national rural water supply programs. This tendency is often strengthened as mentioned above from the international donor agencies. Emphasis has been placed on goals and targets with often little if any planning for future maintenance and recurrent expenditures.

This capacity of system maintenance is not entirely a problem of financial resources or acquisition and delivery of spare-parts; two major social dimensions are prevalent. Village motivation and the projects' organizational structure are key elements in a successful water supply investment venture.

C.1 The Role of Village Participation on Motivation for Project Maintenance

Motivation for maintenance is a multi-dimensional phenomena. Motivation may be low because the system's benefits and goals have not been fully understood and appreciated. The Elmendorf and Buckler (1978) study of eight villages found that communities with more complete understanding of the causal relationships between health and water or where considerable time was saved in water procurement (i.e. convenience) were more inclined to volunteer their time for water system maintenance.

Another effect on maintenance motivation is related to the impact of the new water system on the community's cultural-political power structure. If the system affects this structure in a perceived adverse way the system

may not receive the support of the village leaders. When the proposed system appears to cause a shift in the power structure and/or requires a major change in the value system or pattern of life the educational and public relations component will have to be strengthened if the system is to be accepted. This component will have to convince the leaders that the benefits gained are much greater than any preceived socio-economic losses incurred from the project's implementation. Villagers will also have to be convinced and accept the necessity of the required behavioral changes.

Another major element of motivation associated with maintenance and system abuse is the concept of community participation and local decision-making. Through participation in the decision-making, and donation of local resources (land, labor and money) the community and its leaders feel a sense of responsibility for the water system and may adopt a possessive attitude about it. The project then makes the transition from their system (i.e. the government's) to our system. When this transition occurs there is increased local effort toward maintenance and payment of water rates associated with recurrent expenditures. Rowland (1978) survey of 137 Mexican villages reports a high significant inverse relationship between degree of participation in the water project and system failure or deficiency. The systems which were inoperative were those systems where community participation and local assisted planning was low.

Participation also can act as a catalyst to stimulate community organizational infrastructure that continues to function after the project has been completed. Rowland (1978) further reports that attitudes toward participation and self-help are increased through successful participation projects. Participation decreases apathy and increases motivation. He reports the 71% of those who had participated in the water supply project would volunteer again and an impressive 54% of those citizens who did not participate in the present water project would become involved next time.

There are five major points at which the local population may play a significant role in the decision making process. First, simply whether or not to implement or apply for a project based on their own priorities and capacity to meet their obligation to the project. Second, they may become involved in the selection of technically feasible alternatives based on their perceived needs and preferences subject to the community and national constraints of financing and manpower. Next the community may be involved in setting the pricing policies or forms of contributions. World Bank studies have shown that lower delinquency of water use payments occur when the community at large has been involved in setting up the pricing schedule to suit their income flows/or determining the type of in-kind services required. Fourth, setting up the social controls for continued use and maintenance. Local management policies will be more effective if they are adjusted to the community network system and their formal government structures. Finally, local

people can be of assistance in monotoring the construction, operation and maintenance of a project thereby influencing the degree to which it meets the stated aims. All of these activities further commits the community to the project and its operation and maintenance.

A survey commissioned by UNICEF-WHO (ICEF/6.1355) and Rowland (1978) delineated seven factors that appear to have been favorable to community participation in water supply projects (these could probably be applied to most if not all projects).

(1) Participation increased by 21% when the project was requested by the village leaders or groups representing the village after a village meeting approving the project.

(2) Specific government policies to encourage village involvement were found to enhance the extent and depth of participation.

(3) Maximum participation occurred when limited local resources were complemented by external resources, especially those provided by the government. This could be in the form of technical advice and knowledge. Especially if the experts work closely with locals and are sensitive to local concerns, traditions and values.

(4) Participation was higher in areas where the government utilized a decentralized administration and practiced regional planning.

(5) When local leaders have been cooperative and support the project, they are a dynamic force through which community activities are initiated and sustained.

(6) Participation is increased when the mobilization process revolves around tradition (i.e. cooperative efforts are often traditionally associated, with certain seasons like harvest; with leadership of certain individuals like a chief; with certain philosophies like giving assistance to the village).

(7) Higher levels of participation were associated with a short start-up period. Enthusiasm decreases with the time span between planning and implementation.

Project planners should therefore attempt to incorporate as many of these factors as possible in their planning process. Based on past experience this should increase chances of success, with the project becoming a source of pride for the community and therefore maintained at the maximum local capacity.

C.2 The Effects of Organizational Structure on Maintenance and Project Operation.

Closely associated with community involvement and also effecting motivation and capacity for maintenance is the organizational structure of the project planning, implementation and maintenance.

Three major organizational models may be used in administration of water supply systems.

In the direct administration model all of the planning, implementation and maintenance is provided by the central authority or a combination of central authority and a branch office. The only community involvement is the water usage payments. This model is adequate for municipalities but at the village level evaluation has shown that the central authority has difficulty in maintaining the water system due to sparse locations of some of the systems and the lack of village motivation for minor repairs.

At the other end of the spectrum is the self-help organizational structure. At this level the central authority and branch office have limited involvement. Their only functions include disbursement of grants/loans and providing technical advice and supervision. In the pure self-help model as organized in Lesotho, the government became overwhelmed by applications from villages. Most of the villages had already organized for the project and it was impossible for the government to implement all of these programs at the same time. This led to increased village apathy and government bad will. In this approach, need is usually not the criteria for implementation but simply a first come first served basis.

The controlled model (Table 4) allows the government to implement programs at their pace with some degree of control over the process. This model allows for maximum participation, with the government taking a more active role in the project. Through this structure the central authority makes village selections maximizing limited resources according to a predetermined policy and set of criteria. When selections have been accomplished, villages are invited to apply to participate in a water supply project.

The administrative framework should have adequate vertical links. To ensure continued operation, village systems must be supported with technical advice, operative training, supply of spare parts and some minor supervision. This decentralization of local support is costly and often excluded or overlooked in the initial resource planning.

D. Summary of the Complementary Component of Water Systems

Nearly all the evaluations of water systems have stressed the fact that a water supply system must be accompanied by a carefully designed package of complementary inputs if it is to achieve development goals of improved standard of living. These major components or inputs, which have been discussed above, are (1) hygiene education (2) a sanitation component (3) community involvement and (4) maintenance support and education. Concentration on these major components should not be taken to imply that these are the only social concerns in potable water projects. These are simply problems incurred in all water projects. Other

TABLE 4

Administrative Model for Controlled Self-Help*

ivity	Central Authority	Branch Office** (district or region)	Community
blish	Decide upon project selection criteria		
	Obtain information, allocate resources to regions on priority grounds	Select suitable villages and invite them to apply for specified projects	Organize, but only proceed when invited
	Disburse grants and donor funds	Collect self-help contributions, prepare project memoranda	Raise specific funds and labour on an agreed basis
ement	Provide central technical advisory unit, purchase materials	Provide technical supervision	Contribute labour or pay for work as arranged
tain	Provide maintenance funds	Employ maintenance staff	Provide occasional labour or services of a volunteer, alert branch office when necessary

* This Table is adapted from Feachem 1978:251

** A well staffed and well supported branch office is absolutely essential to this model.

social issues may occur in specific areas that must be resolved if the project's impact is at a maximum. For example, one major problem that appears in many projects is the location of communal water faucets. This becomes a special problem when water rates are applicable. Communal stand pipes have a problem similar to all public goods. How do you restrict the use of those who do not pay or contribute in labor? This issue was solved in Kenya by usage of key operating taps with keys kept by the person responsible for water rate collections. But this increased the time constraints of fee collectors and of those drawing water.

If charges are to be made for water, the people must be educated as to the reasons and an effective campaign launched in which the public assists in setting the rate of collection techniques and structures to fit into their income flow structure.

Maintenance and operation cost recovery through water rates has been shown by Rowland (1978) and from the World Bank's experience to increase villages' sense of responsibility for the water system. This attitude of responsibility should encourage good local maintenance and careful use of the facilities. The World Bank estimates that a charge between 3 to 5 percent of family income would be sufficient in most cases to meet operation and maintenance expenses. But rarely can a family pay more than 5 percent of their income for water charges.

A major problem exist in collection procedures for water rates. Charges for water are more readily collected where house connection is provided. Metering of individual supplies, the usual and most equitable basis for urban systems, will not generally be justified in rural communities where consumption is small and only a few houses may have direct connections.

The flat rate collected through family fees, head taxes, water taxes, etc. may have the potential to cause problems based on perceived inequatable rate charges. This issue, with little solution, is the resistance of people to pay equal fees when their families are smaller than average or their house is located a greater distance than others from the standpipes.

In Central American projects implemented by Aqua del Pueblo households sharing a common tap choose its location. This has been very successful in curbing later location dissatisfactions. This choice of location, of course, has to be restricted by technical constraints such as appropriate run-off elevation and cost for added delivery distance.

Another socio-technical problem occurs where planned communal effort and usage may be lessened because of the village's social stratification which prohibits communal activities. These must be taken into consideration in planning faucet and sanitation locations, and in the organizational structure of village participation.

Problems of diffusion and adoption of technology is a software not a technical feasibility problem. Unless these inputs are present in a water system plan, the project risks a high chance of failure of both the physical system and its social-economic goals. Water is a necessity but not a sufficient condition for improved health. At the present state of affairs most water systems are planned almost entirely by engineers. The selection of the most appropriate technology is not just an engineering problem. The technology must be diffused into the social setting of the community. This is where citizen participation and social analysis becomes important in the early stages of planning. Only through this process can decision-makers be assured of the best possible choice of technology and thus improve chances for a successful project.

Technological aspects of potable water systems are covered extensively in various agency publications. One of the most comprehensive is the University of Oklahoma 1978 AID contracted publication titled "Appropriate Methods of Treating Water and Wastewater in Developing Countries". Also in White and Sevious (1977) is a thorough annotated bibliography of the technological choices. This Paper will not attempt to cover these issues except for their interaction with the systems non-technical parameters.

The World Bank summarizes technological decision of village water in four general principles.

. Groundwater is preferable to surface water because of higher quality; in LDCs shallow wells with handpumps should be used whenever possible.

. Systems should be rugged and designed for simple trouble-free operation and maintenance by local technicians.

. Replacement parts should be readily available with system equipment as standardized as possible. The standardization reduces the variety of parts in storage.

. Standard designs, which can be slightly modified to meet local conditions should be used; design should employ, as far as possible, local materials and technology.

A comparison of two USAID projects in Yemen and the Philippires is a good example of the success related to implementation of principle (b) and on designs of local materials and technology.[1/]

The Yemen project's implementation was delayed by eighteen months due to shipment problems. Even then some of the equipment was damaged and most of the pumps did not meet ordered specifications. This led to problems in the training program and the general operation of the project. On

1/ These are covered in detail in the review of AID projects, Appendix A, Technology portion.

the other hand, a Bicol region of the Philippines quality water project was very successful due to the use of local materials. The system was gravity-fed with a filer system using coconut fiber/burnt rice husk. The system maintenance as successfully turned over to local management within a few months.

Appendix A is a review of USAID potable water projects since 1974. These projects reviewed, along with the previously discussed evaluations, give support to the inclusion of other considerations in addition to the contributions of engineers in capital development projects. Engineers seek technical solutions to human problems which may or may not be assimilated into the folkways or customs of the regions. It is only through careful attention to the social elements and the necessary complementary component that a technical solution may be planned and successfully implemented.

II. Utilization of Social Analyses by Other Agencies in Potable Water Projects

Both domestic and international agencies have an extremely low commitment to social analyses. The emphasis is usally placed on financial planning. Where social analysis has occurred it has had little influence on the decision-making process. With the exception of the Corp of Engineers, social analyses have been haphazard and unorganized. The Corp uses a standardized checklist but because of policy and lack of interest by decision makers very little effort is expended in carrying out the social analysis. But from discussions with these agencies it appears that social analysis will become better utilized in the future.

A. Domestic Agencies Water Programs

Domestic agencies involvement in U.S. water systems is based on the right of people to have reliable access to safe water. Therefore, potable water does not need justification. The Corp of Engineers' concern is primarily reliability of water. The quality of water is taken as a given; the objectives for investments in system improvements is based on providing increased quantity and reliability of potable water.

The Environmental Protection Agency (EPA) operates as a regulatory agency to insure that the community's water supply is safe. Concerns are much broader than simply bacterial pollution; the water standard is also concerned with a host of other contaminates, including the mineral content related to water hardness.

USDA Farmers' Home services rural America's water supply needs by providing loans to communities for water system improvements. Farmers' Home's only concern is financial ability of communities to repay water development loans.

The Corp of Engineers and the Tennessee Valley Authority (T.V.A.) are the only federal agencies involved in actual implementation of water systems. These projects are always in connection with a much larger water project such as flood protection, hydrol electric dam construction and irrigation.

These two agencies are required by law to conduct four types of surveys before proceeding with a project. The first two surveys accounts, National Development and Regional Development, are an assessment of the project's effect on national and regional GNP. Alternative solutions are judged against their contribution to economic growth. In the other two accounts emphasis is placed on non-economic concerns. The environmental protection account is conducted to guaranty that the alternative selected will not have an adverse effect on the natural or physical environment. Social well-being (the last account) attempts to measure effects of alternative solutions on the target communities' social parameters. These

parameters include income distribution, health, safety, educational and recreational opportunities, effects on community cohesion, displacement problems, and esthetic values.

Unfortunately, the social account along with the regional account is not utilized in planning by the Corp because the Executive Office is only concerned with national growth. The environmental account is considered in planning processes because of strict congressional laws concerning environmental protection. Therefore, social analysis is under-utilized by domestic agencies. A phenomena that is also noted with international agencies. It had been expected that USAID would be able to learn from their domestic counterparts with regards to social analysis and social parameters of water supply projects. But from perusal of their publications and interviews with domestic agency personnel it is concluded that domestic agencies are as far behind in social impact assessment as are international development agencies.

B. International Agencies Water Programs; United Nations

Although none of the international agencies interviewed conducted social assessments with any regularity or consistency, most were able to verbalize a set of goals and/or investment components which were translated to planning objectives and village criteria selection.

In the United Nations system the Children's Fund (UNICEP) and the World Health Organization (W.H.O.) are the only divisions that are actively involved in implementation. The U.N. Development Programme (UNDP) and the World Bank are involved only in technical advise and procurement of financing. The Bank has commissioned a variety of evaluations and research into potable water projects.[1/]

UNDP has only minimal involvement in potable water projects. They have only supplied financing for 38 projects of which 13 are still in the implementation stage with a monetary commitment of 17 million dollars. UNDP has not established criteria or goals in the commitment of funds for water systems. All planning, implementation and operation is performed by host countries. Technical assistance may be given if requested but usually through another division of the U.N.

B.1 The World Bank Experience in Social Analysis

The World Bank is also concerned primarily with the financial elements of development projects. But the Bank has produced some guidelines for conducting sector analyses and selection criteria. The Bank lists a series of goals and justifications for investments in potable water. The direct goals are improved health, greater convenience and fire protection. These direct benefits also contribute to secondary or indirect benefits. Indirect

1/ These reports are reviewed later in the Paper.

benefits are related to increases in village quality of life. Because rural areas become a nicer place to live the project should slow down rural-urban migration. Also increases in community infrastructure will have a possibility of leading to economic growth. This sort of investment will perform an equalization role through redistribution of real income to the rural poor since repayment of loans will come primarily from general revenue sources.

Although the Bank has set some basic selection criteria guidelines and suggests that host countries conduct a thorough sector study they believe these choices are basically political and thus should be made by the respective governments (Jennings et al 1973:2). These sector studies will hopefully be used by decision makers but their usage is not required other than for determining the financial ability of governments to repay the loan. A copy of the sector checklist is produced in appendix B. One noticeable absence from the survey is social data except for some administration and water organization questions.

The World Bank has emphasized institution building in its technical cooperation and only recently have they taken measures to ensure that poorer sectors of the population benefit from the projects. In 1977 lending for water supply projects accounted for $400 million with considerable expansion planned during the decade.

Since a cost-benefit analysis is impossible the Bank has developed a set of three qualitative/quantitation criteria for selection of communities for water projects.

The most important of these is village involvement and enthusiasm. This is measured by community willingness to pay part of the construction cost and a mantenance fee of around 4% of income. Another selection item is village need based on water quality, quantity, convenience and reliability of traditional sources during droughts. The last item is village potential for economic growth plus the strength and competence of its institutions.

In summary, although the Bank has given some commitment to analysis, they have been concerned primarily with financial matters. In a few of their documents lip service has been given to social analyses but little actual progress has occurred. Since host countries make the final choice, given a few financial constraints, the World Bank's personnel are not willing to devote too much time to analyses that will not effect policy.

B.2 UNICEF Experience in Social Analysis

The justification for investment in water supply for UNICEF is that young children are particularly vulnerable to diarrhoea and other diseases related to poor hygiene which also contribute to malnutrition. Thus, the provision of safe water is one of the most effective and economical ways to help children's health within the framework of primary health care.

Other benefits of adequate water are also relevant to children. Accessible water provides convenience and saves time in collection. This increases time available to mothers for other activities, and encourages self-help community effort.

Water supply and sanitation facilities are often among the first tangible services that reach children and their families in many underprivileged areas. Thus safe water has the potential of becoming a "leading edge" from which other services can be gradually organized. UNICEF recognizes that improvements in health are limited unless other components are present in the programs. Some of these important elements are personal hygiene, appropriate disposal of excreta, household cleanliness, and the general environment around the house. Even though UNICEF recognizes these important factors, which are primarily of an educational nature, only fifty percent of their water supply projects have an educational component. At present 90% of UNICEF funds are allocated to equipment and supplies.

UNICEF attempts to adjust the urban and wealthier rural area biases of the World Bank by investing entirely in unserved rural areas which can not qualify for "bankable" projects. These investments in 1979 totaled $26 million with a commitment for FY 1980 of $50 million. This small amount in comparison to the World Bank is not enough to eleviate the bias of "bankable" projects. UNICEF along with other agencies is beginning to recognize the importance of maintenance planning. In the past, very few of their projects had a maintenance component, but presently all of their water system projects have an integrated maintenance program.

B.3 The World Health Organization Experience in Social Analysis

W.H.O. and the Pan American Health Organization (P.A.H.O.) do not directly finance water systems. They assist in procurement of financial arrangements and often prepare engineering/economic feasibility reports with funds provided from UNDP and the International Bank for Reconstruction and Development (IBRD). Their major role is technical cooperation aimed at stimulating and strengthening national water programs through training to increase managerial capacity and the provision of information on appropriate technology.

P.A.H.O. has suggested that selection of communities for water projects should be based on existing manpower and financial constraints.

The five basic criteria used for selection of target communities are:

- communities that have expressed interest, have requested the system and have offered financial or other assistance for construction and operation;
- communities where projects can avoid unusual or expensive solutions;
- communities with the largest number of inhabitants (not more than 2,000): this decrease per capita cost due to economies of scale;

- communities with access by roads for trucks; and
- communities located within one of the zones of influence of national or local development plans.

Failure to meet the first two criteria are the most important in removing a community from the target list.

The construction cost of P.A.H.O. assisted projects have been broken down as follows: (1) about 50% is covered by a loan from an international agency often repayed by central governments; (2) about 30% is granted by national or state programs; and (3) the remaining 20% is obtained from communities in the form of cash, materials, and labor during construction. In addition, maintenance and operating costs are paid by the community through a water rate scheme.

B.4 A Review of the United Nation's Role in Potable Water Projects

In summary none of the United Nation's organizations are actively involved in social analysis of development projects. UNICEF recognizes possible potential benefits from social surveys but does not have the staff, nor are they willing to invest part of their budget for this activity. At present the evaluation department of UNICEF provides some social analysis but they have considerable constraints on the time devoted to this activity.

UNICEF is the only U.N. agency that implements only rural water programs. They also are the only U.N. agency that does not require a water usage fee and require communities to pay a portion of the construction cost. In regards to village monetary contribution requirements, the World Bank and other international loaning agencies are presently re-examing this issue and will probably develop some less restrictive alternatives, or the poorest villages will be excluded from participating in the U.N. Water Decade goals.

C. International Agencies Water Programs: Private Voluntary Organizations

Private Voluntary Organizations (PVO) appear to be more concerned with social issues than donor agencies. They also view water projects as just one component in a rural development program. This is possibly because they oper-ate at the community level and develop all of their projects around the self-help principle. But none of the PVO questioned[1/] had a defined system for collection and usage of social analyses in planning.

Cooperation for American Relief Everywhere (CARE) requires a social analysis of all projects with subsequent monotoring but this has been carried out in a very unorganized, haphazard manner with each Mission's

1/ Much of the discussion is based on a conference on Water Project Planning for PVO. At the conference informal discussions were held with Catholic Relief Services, Luthern World Relief, and Church World Services. Information on CARE was obtained from extensive interviews.

procedures autonomous. At present, CARE is developing a more structured program of monotoring and evaluation, but it will probably have only limited success due to lack of staff and training that would be required to administer this complex information system.

CARE initially became involved in water supply projects based on the believed benefits to health. But present planning goals are leaning toward availability of water as the major objective with convenience as the major benefit. For example, a recent project in Keyna, financed with USAID monies, uses as justification the amount of time-saved by women.

CARE sometimes uses social analyses in selection of target villages. The components are based on the economic ability for system maintenance and the communities willingness to participate. Unfortunately like most PVOs, CARE has little influence on choice of technology. Host country engineers usually plan the technical hardware of the system and turn the designs over to the PVOs for implementation. But CARE does influence the software devel -opment for water projects. At present all CARE projects have a maintenance component primarily of an educational nature. Also they are adopting a hygiene and system usage educational component as an integrated part of water projects. Presently 50% of their projects have incorporated this educational element.

Because PVOs are community based their real strength in water supply projects is their ability to develop an efficient participation program where village involvement occurs at all stages in the program. Through this type of participation the potential long run success of the project is increased.

III. The Major Social Parameters and Their Relationship to the Accural of Benefits

At the most inclusive abstract level the basic benefit from water system programs is improvement in quality of life. In rural areas this should have the effects of slowing down rural to urban migration. Thus relieving population pressures in the cities. The World Bank also attributes increases in equality to rural water projects due to income redistribution. This redistribution occurs from investment in capital projects at a higher rate than contributions from rural and/or poor areas. Urban wealth is therefore contributing to service delivery for the poor.

In addition to a more equitable society, water supply project which feature self-help and participation also perform as a catalyst for other self-advancement programs. Success in water projects change psychological attitudes or locus of control from external controlled to internal controlled.[1/] Therefore, a water project may be the starting point for rural development. Another latent benefit is the strengthening of local institutions that will be beneficial in other development programs.

Benefits that are related to actual water supply improvements are presented in Table (5). The mechanism through which benefits are accrued are listed under the four dimensions of water system projects: (1) Accessibility — the time involved in procuring adequate family water needs. This is a function of both closeness of the water and the number of users for each tap; (2) Quantity — the amount of water available for usage; (3) Quality — the level of purity, primarily bacterial count and absence of parasites; and (4) Reliability — an adequate amount of water during all seasons.

Health improvement has been the major expressed benefit or justification for water system investments. But this benefit is very difficult if not impossible to quantify.[2/] The review of literature has pointed out the important interactive effect between hygiene education and water quantity/quality on health. Health benefits will have an increased possibility if educational components are associated with water projects. Health related to water quality may also require a sanitation component to assure that water sources are not re-contaminated.

1/ The works of Professor Rotter describes people as being either externals, those who feel controlled from outside their environment and thus accepts things as they are, or internals, those who take responsibility for their own lives and environment. It is the internal controlled individuals who are potential entrepreneurs. These individuals are willing to work at improving their environment.

2/ W.H.O. meeting of experts on Measurement of Health Benefits states that present available methodology does not allow for a good measure of health benefits. P.V. report No. PVN 20 (1976)

TABLE 5

Relationships Between Water Supply Improvements
and
Potential Benefits

›nefits	Accessibility	Quanity	Quality	Reliability
›-saving and ›eniences	Saving on the water collection journey for each household	--	--	Saving during season when unreliable sources fail
.th improve-:; absence lisease and :er nutri- ı through ›eased ab- ›tion	Water piped into homes may increase quantity used (see next column) and reduce exposure to water-based disease	Potential improvement in hygiene if additional water is used	Precludes one avenue of faecal-oral disease transmission	May avoid seasonal use of more polluted sources of water
:eased ›ur avail- :ity and luctivity	Labour released by time-saving	Indirect through health	Indirect through health improvement	Seasonal time-saving
lcultural ıncement	Possible indirect benefit from labour releases	Surplus or waste available for gardening	--	Seasonally significant in some cases
ıomic :rsity	A prerequisite, but not usually a major one	A prerequisite, but not usually a major one	--	Permits permanent settlements
› protection	Time saved in procuring water	Adequate amount to put out the fire	--	Protection during the most crucial period; the dry season

The other benefits (convenience/time saving, increases in availability of labor-productivity, agricultural advances, economic diversity and fire protection) are all associated entirely with water being more accessible, reliable and in greater quanity. These causal relationships strengthen arguments made earlier to mitigate importance of water quality in water system planning.

The degree to which all or some of these benefits materialize (health being the most precarious) depends on the planning and integration of projects with other important components.

Once construction is finished and in operation the system must be properly maintained and utilized if communities are to receive any benefits from the investment. Even the best designed systems with sanitation and education components will be unreliable if poorly maintained, forcing communities to resort to traditional water sources. Thus, maintenance and acceptance of the system become the major constraints of the success or failure of a Water System project.

Projects are more likely to succeed if:

- The community is fully aware of cost and benefits of alternative systems and helps in ~~the~~ selection process;
- A local committee helps to set priorities and management procedures;
- Communication is fluid between the community and project personnel;
- Tariff structures are understood and accepted;
- The project design has allocated funds or a feasible process for collection of funds to meet recurrent expenditures;
- The plan includes a training program for maintenance manpower;
- The project uses and strengthens local political and/or indigenous organizations when ever possible. If new organizations must be devel-oped they are formed in a manner that will not lead to a power struggle in the community;
- The village kinship and stratification structure is considered in the supply scheme; and finally
- There is assurance of good utilization of facilities by discussion and local understanding of the link between water-sanitation, personal hygiene, environmental hygiene and health.

The first four requisites are concerned with community participation which affects motivation for local maintenance. The next three planning elements increases the village's capacity for maintenance. The last two requirements affect not only motivation for maintenance due to appreciation and understanding of the system, but also are directly related to its utilization.

For efficient planning and successful projects, these major social elements must be taken into consideration. The next section will discuss the general procedures for development of social impact analysis procedures. These techniques will assist project planners in the design of proposed water systems.

IV. The Use of Comprehensive Social Impact Analysis for Efficient Planning

Social analysis within USAID is too often regarded simply as a justification tool. Emphasis has been placed on beneficiaries in support of the mandate to serve the poor and to increase benefits to women. This is a necessary aspect of social analyses but a social impact and community profile statement does not provide sufficient information for efficient project planning. Another element of social analyses must be utilized if projects are to incorporate social designs for development activities. This element, social soundness or feasibility studies, is designed to assist project planners in the identification of communities' capital absorbtion abilities. The feasibility studies will also assist planners in the selection of the most socially acceptable implementation procedures by identifying those social parameters which show the greatest effect on the project's local acceptance and success.

Social soundness statements deal specifically with social parameters which effect the project's acceptance, utilization and ultimately its success in terms of community quality of life impacts. Engineers design technical solutions to human problems, the social analyst determines if this solution is appropriate, given the community social environment and experience from previous similar interventions. These important parameters must be considered, and designs must incorporate these social solutions if USAID intends to receive a good return for their investments through implementation of projects which deliver the intended benefits to the population. The cost of a thorough social analysis is little compared to potential losses from an unsuccessful program. In financial management terms social analyses, which includes a soundness study, considerably decreases investment risk and enhances the potential social payoffs.

A large number of social analyses written for development agencies are too unfocused and descriptive to serve in the role of feasibility statement. They attempt to be exhaustive instead of concentrating on the key issues and system parameters (i.e. socio-economic elements that may affect the success of a development project). The analysis must select the most important information in a given situation for in-depth analysis. Most development programs require some needed change in social behavior for projects to deliver the intended benefits. This procedure and the process of this change must be understood and become an integral part of the project implementation.

Incorporation of social soundness studies is not the only problem in effective usage of social planning in project designs. At present social analyses are usually carried out during the final stages of project design; often they are finished only a few weeks before project papers are presented. This is too late for a feasibility statement to be useful. At this point in the planning, tentative budgets have been set and general project strategies have been formulated. If the social feasibility statement causes any change in project designs, it is likely to be only minor ones. This

is a serious problem; social constraints may have been identified and an implementation procedure which increases potential service delivery devel -oped, but at this point in the planning process all that can be done is cosmetic surgery.

Not only should the social feasibility statement be commissioned early in the project design process, but a representative from the TECH/ Social Analysis division or a Mission social scientist should become involved formally in the initial stages of the project. It is important that the social scientist involved is familiar with social problems incurred in projects of this type to ensure that the design incorporates important social dimensions which contribute to a successful project adaptation in the community or region. In fact, early involvement may even lead to a joint identification of an alternative intervention that needs to be examined.

Certain types of projects require more individual intervention and project acceptance than others. These active interventions as compared to passive ones require a more careful analysis and social emphasis in the project design. For example, a health project to control typhoid through an inoculation program is a passive intervention; it usually requires little if any change in behavior, attitudes or values of local inhabitants. The major problem may be simply management of supplies. On the other hand an agricultural project which requires the adaptation of new farming techniques is a very active intervention. In this case, the social parameters are probably the major elements in determining the program's acceptance and success. Therefore, project planners need to become aware of the type of intervention required for implementation of various projects. This determination is not as easy as it may seem on the surface; rural water supply and sanitation are a good example. The preceding portion of this Paper dealt with major social components of water systems that in the past had often been over-looked primarily because development planners had preceived water projects as a form of passive intervention. Consultation with the Technical Support - Social Analysis office should help in identification of the more active intervention programs. Once they have been identified the Mission planners will be aware of the possible social constraints and issues.

This document and others to be prepared like it will assist Missions in identifying crucial social variables of active and semi-active projects. This closer working association between Mission project planners and Washington Technical Support will enhance project designs and insure a greater impact on the goals of the projects.

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The Study found no significant difference in diarrhea rates between villages with and without improved clean water

Donaldson, David (1973) Progress in the Rural Water Programs of Latin America (1961-1971). Washington, D.C. Pan American Health Organization, Pan American Sanitary Bureau, Regional Office of the World Health Organization, 36 pp. in Feachem et al (1977).

The dynamic nature of water program development in Latin America is described, with the estimate that it takes about 8-10 years for a system to develop from water supplied to public fountains, to piped supplies, to 80% of the houses (patio connection). The author feels that key points are the focus on the concentrated rural population, the extensive use of trained technicians, and the promotion of intense local community participation. He proposes three distinct programs: a well program for dispersed populations, a rudimentary aqueduct program for semi-concentrated populations, and a rural aqueduct program for concentrated or "urban" populations. He advocates a mass approach with standardized techniques for these programs, and discusses the problems of financing and administering them.

Elmendorf, Mary and Patricia Buckles (1978) "Socio-cultural Aspects of Water Supply and Excreta Disposal" World Bank, EWT/Public Utilities notes.

Social and cultural factors influencing people's responses to water supply and excreta disposal technologies are investigated in eight case studies of communities in the rural and urban fringe areas of Latin America. The report summarizes each case study including the technologies introduced and community response to them. A second part presents the cross-community findings on perceptions, preferences, related practices, and the use of social science techniques

to understand them. In the last section, the report focuses on the implications of the findings and suggests an approach which can be used by planners to integrate social and cultural factors into project design to ensure the introduction of water supply and excreta disposal technologies which will be accepted, properly used, and maintained.

Feachem, Richard, Michael McGarry, and Duncan Mara (1977) (ed.) Water, Waste and Health in Hot Climates John Wiley & Sons, New York.

This book is a series of articles divided into five distinct but often overlapping areas. Part I deals with health aspect of water supplies. A second part concerns issue of water project in low income communities. In this section topics includes water treatment techniques, economic planning and water system design. The last section discusses the planning of sanitation and waste-water treatment facilities with some articles dealing with waste-water and excreta reclamation schemes. Two articles used estensively in this report were David Bradley's "Health Aspect of Water Supply" where he develops a water-related disease typology and Richard Feachem's "Water Supply for Low-income Communities" where the water system design algorithm is developed.

Feachem, Richard et al (1978) Water, Health and Development: An Interdisciplinary Evaluation Tri-med Books, London.

This is an extensive evaluation of village water supplies in Lesotho by an interdisciplinary team over a period of eighteen months. Part I is a presentation of their findings. In part II these findings and other studies from around the world, are used as a basis for a general discussion on all aspects of the planning and design of rural water programs in developing countries. The authors attempt to deal with problems of selecting appropriate technologies, operation and maintenance. They also investigate usage of the self-help concept and the problem of administration and organization of the system.

Gordon, J. E. et al (1964) "Acute Diarrheal Disease in Less Developed Countries: III. Methods for Prevention and Control" Bull. WHO vol. 31, pp. 21-28.

Argues for more emphasis on personal hygiene, better nutrition, better maternal and child health education as means for control of the most prevalent and most severe form of diarrheal disease--that is, weanling diarrhea. Environmental measures--building latrines, improving water supplies, pasteurizing milk--may be important in general community

control of disease but do not effect weanling malnutrition much because they do not attack its specific transmission route. Authors feel one-shot field surveys have been overdone; surveys should be repeated in order to have much value. Most useful would be a long-term prospective study of a fixed population which would compare results with similar studies done in India, Guatemala and the Arctic.

Gordon, J. E., "Acute Diarrheal Disease", American Journal of the Medical Sciences, vol. 248, pp. 345-365, September 1964.

"As a killing disease, the diarrheas far overshadow upper respiratory illnesses . . ." and "in large parts of the world diarrheal deaths outnumber any other single cause."

Although acute diarrheas lack definable infectious agents, they behave like an infectious process. In diarrheas of early childhood, synergism between malnutrition and diarrhea is an outstanding feature, but "poor sanitation has an equally important part". Highest seasonal prevalence is in hot dry periods. Index case is usually a young child through direct contact with adult carrier. "Water for hygienic uses in adequate amount and ready accessibility has more significance for this age group (less than two years old) than provision of a potable supply." Dietary supplements plus environmental sanitation are the main considerations in diarrhea control programs.

McJunkin, F. E. (1969) "Community Water Supply in Developing Countries" Office of International Health, USPHS PHS/OIH, AID/WHO, Chapel Hill, N. C.

Quotes E. P. Campbell (1959) as source of widely accepted data that each year 500 million people are affected by incapacitating water related illness and 10 million (half of them infants) die. Worldwide, 25% of hospital beds are occupied by patients ill with these diseases. Gives historic review of water related illnesses. Gives typhoid fever graph (Greece and Mass.) and WHO data showing inverse relationship of infant mortality to proportion of population served by water.

McJunkin, Frederick E. (1969) "Community Water Supply in Developing Countries" Chapel Hill, N.C. U. S. Agency for International Development and U. S. Public Health Service

Focusing primarily on urban situations, the report emphasizes the health and economic benefits of improving water supplies and sanitation. It cites institution building as an important aspect of aid to

developing countries, as well as educational assistance, technological improvement, capital and planning aspects. A summary is given of USAID assistance for improved rural and urban water supplies in various countries.

Moore, Helen A., Enrique de la Cruz, and Oscar Vargas-Mendez (1966) "Diarrheal Disease Studies in Costa Rica: I, Plan and Methods of Investigation" American Journal of Public Health 56, pp. 276-286.

— 1966. "Diarrheal Disease Studies in Costa Rica: II, The Prevalence of Certain Enteric Organisms and Their Relationship to Diarrhea" American Journal of Public Health 56, pp. 442-451.

— 1966. "Diarrheal Disease Studies in Costa Rica: III, Morbidity and Mortality from Diarrhea" American Journal of Epidemiology 82, pp. 143-161.

— 1966. "Diarrheal Disease Studies in Costa Rica: IV, The Influence of Sanitation Upon the Prevalence of Intestinal Infection and Diarrheal Disease" American Journal of Epidemiology 82, pp. 162-184.

A survey was made of the sanitary characteristics of 1,202 houses of a canton in the coffee-producing area of Costa Rica. The houses were supplied with piped water (94%) and facilities for sanitary excreta disposal (89%). Meat and milk supplies and handling facilities were also examined. The level of water pollution was high, but piped water appeared to be important in reducing the amount of infection with enteropathogenic bacteria, although diarrhea morbidity and parasitism were not greatly affected. Conclusions include that the incidence of diarrhea was reduced and the prevalence of Shigella infections and parasitism least where a good level of sanitation was found. A bathing facility was needed to obtain the best effects from piped water. Intestinal parasites were prevalent despite the use of pit privies, possibly related to diaper-washing hygiene or other factors.

Richardson, N. J. et al (1968) "Salmonellae and Shigellae in Bantu Children Consuming Drinking Water of Improved Quality" South African Medical Journal 42, pp. 46-49.

The study concluded that no significant difference existed with regards to intestinal infection in South Africa between urban areas with high quality chlorinated water and the rural areas with poor quality water.

Rowland, Francisco and Leon dela Barra (1978) "Analysis Experience of Self-Help and Public Participation in Rural Water Supplies: The Case of Mexico" OECD Development Center, Paris.

This is a report of a research project based on case studies of 137 Mexican villages. The study investigated the demographic characteristics of those who participated in self-help projects. Also the study looks at some of the community structural parameters that effect the level of participation. Finally the study focuses on some of the latent benefits from a participation, both individual and the village. He found level of participation a very positive significant indicator to future village maintenance of the system.

Saunders, Robert and Jeremy Warford (1976) Village Water Supply: Economics and Policy in the Developing World; John Hopkins University Press, Baltimore (available from the World Bank).

The authors examine a wide range of factors—physical, social and economic--that are involved in improving the adequacy of water supply and sanitation in the coming years.

Among the principal topics covered in detail are:

- the character and extent of the problems connected with water supply and sanitation
- the goal of improved health, with specific reference to the relation between water supply and water-borne disease, on the other hand, and social and economic activity, on the other
- the effects of improved water supply and sanitation on productivity, incomes, rural-to-urban migration, and overall development
- problems of, and strategies for, program planning and administration
- the special problems of operation and maintenance
- the importance of recovering program costs from beneficiaries

The final chapter contains a summary of the findings of the study and lists a number of recommendations for improving rural water supply and sanitation.

The book also contains an excellent bibliography of water and health related issues.

Scrimshaw, N. S. (1964) "Ecological Factors in Nutritional Disease" American Journal of Clinical Nutrition, vol. 14, pp. 112-122.

Review article notes that INCAP study Santa Maria Cauque, Guatemala providing safe drinking water, privy for each house, fulltime sanitary inspector, clinic with MD and nurse after three years produced no recognizable decrease in diarrheal disease in children under five" when no associated nutritional measures were taken or changes in food preparation and handling within the home were made. Spread of the diarrheal disease was shown to be by contact within the family group, not by water or flies. A similar village with dietary supplement alone without medical or sanitary help had decreased diarrheal disease.

Wall, J. W. and J. P. Keeve Water Supply, Diarrheal Disease, and Nutrition, A Survey of the Literature and Recommendations for Research (1971). Issued by AID, Latin American Division and ISPC, Bureau of [illegible]

Investments for improving the water supplies in less developed countries have long been made on the assumption that they provide public health benefits, but this assumption has not been evaluated by well-designed research. This literature survey was conducted to assess what evidence past research offers concerning the association between improved water quality and a reduced incidence of enteric disease. The literature does not offer much evidence. More information is needed concerning health benefits that can be expected from water supply investments, what conditions beyond health benefits, and how diseases affected by water interact with other diseases. Findings from the literature on the epidemiology of diarrheal disease reveal that its peak incidence and fatal effects occur among preschool children, particularly those in the process of being weaned. In this age group, fatal diarrheal disease is closely associated with nutritional deficiences. This suggests that diarrhea and malnutrition interact synergistically. Some researchers argue that water quality is not an important factor in controlling diseases of weening children, because infectious agents causing diarrhea do not come from a single contaminated source and the most important factor is the nutritional state of the child.

White, Anne and Chris Seviour "Rural Water Supply and Sanitation in Less-Developed Countries: A selected annotated bibliography". The bibliography was initiated by OECD and performed through the International Development Research Center.

The bibliography is arranged under three general headings; technology, health and disease. There are 242 articles referenced.

White, Gilbert F., David J. Bradley and Anne U. White (1972) Drawers of Water: Domestic Water Use in East Africa Chicago, University of Chicago Press.

Based on detailed field investigations in 34 rural and urban sites in East Africa, this study examines the amount of water used in each household and the factors affecting use: the social cost, including monetary and energy, of obtaining it; the relationship between the quantity and quality of water and the health of the user; and the way users choose among alternative water sources, including why they reject some sources. It gives classifications of types of water improvements, habitas, and health improvements as related to water improvements. Health benefits are not found to increase significantly as additional quantities of water of good quality are provided. The study suggests that changes in standards and in public policy will be required to assure that improvements in water supply keep ahead of population growth. The need to examine the full range of alternative policies for meeting health needs is emphasized.

World Health Organization (1971) International Standards for Drinking Water Expert Committee on International Standards for Drinking Water, Geneva WHO

This is a third revised edition of standards for domestic water supplies. It contains proposed bacteriological, chemical, physical and biological requirements and a maximum permissible radioactive content.

An Overview of Recent AID Experiences in Low Concentrated Water Supply Programs

Recent AID experience in rural water supply programs has been identified by means of search of AID projects active as of 1974 and later, and documented in the Development Information System (DIS). Thirty-one projects were located. In most cases, the project goals were to improve primary health services to the rural poor, and to reduce disease transmission. All projects contained a sanitation training or education component. In many, the provision of potable water was one of several related activities, including immunization; basic medical services; health education focusing on basic hygiene, water use and food preparation/consumption; child care; and tuberculosis control. Most projects contained a component for the construction of sanitation facilities.

The following discussion of specific projects focuses on those for which evaluative material was available during the preparation of this summary. Projects will be discussed as illustrating various technical, financial and institutional problems that may arise in the design and implementation of rural water supply programs. Of the thirty-one projects, seven had substantive evaluative information touching on these problem areas. The discussion also draws on the experience of the World Bank, as described in its Paper, Village Water Supply (March 1976).

Institutional Aspects

The World Bank's Paper states that "Institutional weakness is probably the most important single problem in rural water supply".

* This report was prepared by AID/DS/DIV.

The problem is most apparent when there is a lack of central policy governing rural water systems and when a multiplicity of ineffective and understaffed ministries and agencies share responsibility for a water supply program.

The Thailand Rural Health project (4930179) encompasses a broad range of basic rural health services. Upon project completion, a well-established system of rural health centers will be adequately staffed, supervised, and administered in forty-three "politically sensitive" provinces. One of many health provisions will be the construction of village-level water supply systems.

Administrative and management issues pose a special challenge because of the complex, multi-faceted nature of the project. This project calls for the department of public health to be responsible for the administration of project activities, thereby making a single agency wholly responsible for rural health development and hopefully avoiding the problems that occur when numerous agencies are involved in one program. Such problems would include uncoordinated or inefficient planning and execution of project activities, and unnecessary duplication of demands on the limited group of available trained manpower.

A progress report suggests that the single-agency approach at the national level may generate other problems. A wide communication gap was observed between public health department personnel and the local clients, which seriously hampered village-level health programs requiring family or community decision and action. After five years of project implementation there remained a need for a well-planned

and managed organization capable of providing comprehensive health services, even though substantial progress had been made in developing the trained manpower and physical facilities called for.

In this regard, the World Bank's paper suggests that the administrative framework for a village water program should have adequate vertical links. "Planning, and to some extent construction, can be administered from the top, but to ensure continuing operation, support for village systems must be readily available, and this implies decentralization. This local support must cover such items as technical advice, operative training, water quality supervision, and keeping a stock of spare parts...The cost of establishing and maintaining this local support structure will be substantial, and is frequently overlooked at the planning stage." The World Bank notes that a related defect -- the neglect of operation and proper maintenance after a system has been constructed -- is a frequent cause of failure.

The progress report for this project also noted that integrating health education into all health programs could assist in closing the "communication gap." A PAR (Project Appraisal Report) indicates that health personnel at higher levels, especially doctors, have been reluctant to live in rural areas because of poor facilities and communications, professional isolation, low salaries, and lack of realistic incentive pay. The civil service status of host country technicians was not high enough to attract or retain many technicians. The World Bank paper suggests that the most effective step to attract better staff may be for the government to declare it a key development

sector and to pay greater attention to the requirements for personal motivation.

The World Bank paper suggests that a sector assessment can be useful for determining the context within which a potable water supply program will be established. Problems, resources, and target populations unique to the project area can be identified. In the Nicaragua Health Sector Assessment project (5240102), the assessment was limited to certain key areas, because of a shortage of qualified analysts. The project purpose was to improve the government's capacity to plan and implement coordinated health sector programs. The assessment discusses personal services in rural areas, maternal/child health and population, communicable disease control, rural water supply and excreta disposal, and nutrition.

The PAR states that the assessment report was the most comprehensive and analytical study ever presented by a GON health group or agency. The PAR notes that the personnel involved in the assessment were professionals, but "without sufficient experience to execute complexities involved..." Although dedicated, they needed greater exposure to planning methodologies and project design before being assigned to a national-level health sector planning team. The PAR emphasized administrative problems related to health manpower training, and the subsequent difficulty in executing complex administrative procedures. There was no "political or administrative process to bring new personnel into the sector, resulting in a small turnover of higher level personnel in the past decade."

The sector assessment itself provides information concerning the areas mentioned and recommendations for improvement. The following discussion pertains only to the rural water supply sub-sector. Three separate institutions had overlapping responsibility for rural water supply: 1) the environmental sanitation division of the Health Ministry; 2) the National Department of Water Supply and Sewers (DENACAL); and 3) the Waterworks of Managua (EAM), responsible only for the capital city water supply.

The Health Ministry's environmental sanitation division was responsible for preparing environmental sanitation control guidelines and for inspecting such facilities. A review of inspector reports by a Pan American Health Organization team found "the lack of supervision in public health matters pertaining to sanitation reflects the almost complete lack of interest of the sanitary inspector in doing a more or less acceptable job." Because of a lack of transportation facilities, inspectors were unable to cover all towns and villages.

DENACAL had attempted to overcome its administrative problems by: a continuous review of its procedures; assistance in organization and methods; and more effective planning to improve operation and maintenance procedures.

A large number of rural inhabitants have no sanitary means of excreta disposal, and carry water from easily contaminated rivers, lakes, and unprotected wells. The sector report recommends that a massive program be established to provide adequate local water supplies and sanitary excreta disposal in rural areas, accompanied

by continuing health education programs regarding the use and maintenance of these services. The sector report also points out that the success of a rural water supply program depends on an efficient organization motivated to carry the program to rural clients and provide them the means necessary to ensure the program's continued success. This requires close liaison between the national office and regional offices which in turn can maintain continuing communications with surrounding localities. Intermediate-level technicians are needed to implement programs designed at the national or regional levels. With proper incentives it should be possible to attract and motivate the personnel necessary to carry out the program. The study suggested, as an example, cash rewards for the achievement of projected goals.

In summary, the institutional issues noted by the health sector assessment are: lack of trained manpower; overlapping areas of responsibility between agencies involved; poor planning capability; and the need for an efficient, well-motivated organization at the local level to implement rural water supply and excreta disposal programs.

The Kenya CARE-assisted Village Water Development Activities (6150166) is a water development project with the purpose of providing potable water sources to rural areas. Systems are to be constructed through local community action programs with technical assistance and under the supervision of government agencies. Government support for the project includes payment for CARE personnel

and operational expenses, and provision of trained manpower. Personnel assigned to the Ministry of Water Development are responsible for the technical design of projects, supervision of well construction, and follow-up inspection upon completion. Personnel assigned to the Ministry of Housing and Social Services will assist the local community in handling such matters as functional contributions, and the legal status and organization of the local committee. The local community is expected to provide partial financing and labor for the construction of the water systems; the village is largely responsible for operation and maintenance of the system.

The project envisions completion of thirty water projects a year, serving approximately 300,000 persons. The project proposal suggests that the conveyance of water to rural communities will greatly benefit women who currently spend an average of 3 to 6 hours daily fetching water. It is assumed that by devoting less time to hauling water, women will spend more time at activities such as child care, agricultural production, and education, thereby enhancing their status. Other anticipated benefits include improved health and sanitation.

At the time of the evaluation report, twenty-five individual water projects had been identified for assistance. For ten of these, CARE materials had been installed. However, "it is not clear whether all the systems to which CARE has contributed are as yet delivering secure water (irrespective of quality), nor whether the portion of the system which CARE has installed is as yet operational." One of the major difficulties cited in performing the evaluation was in determining the stage at which

a CARE-supported project is considered completed. Since CARE supports only a portion of each project, its effort could be completed before installation of the entire system and hence not yet operable.

Using costs experienced to the time of the evaluation, planned expenditures would support only sixteen to seventeen projects per year, serving a population of 92,000, compared with the planned thirty projects serving 300,000 beneficiaries. The evaluators conclude that planning estimates of the number of projects and beneficiaries were unrealistic. Experienced costs were determined to be closer to World Bank figures. The evaluators recommend either additional funding or concentration of projects in densely populated areas. This latter approach is also discussed in the World Bank paper, which finds significant economies of scale available for village water schemes. Another implementation problem identified by the evaluators arose from the absence of clear criteria for project selection, taking into account technical requirements and institutional impediments. The evaluators suggest that a major consideration in selecting projects should be the degree of village need, indicated by the interest and involvement of the village, the adequacy and proximity of existing supplies, and the expressed willingness of individual users to pay for water. The cost-effectiveness of the system should be explored before funds are committed, and the capability of local self-governing institutions to ensure long-term management should be assessed. Assumptions made regarding the expected benefits to women could not be proven.

Other deficiencies identified by the evaluators are the result of administrative and managerial problems. For example, a new Ministry of

Water Development (MDW) was created from a department of the Ministry of Agriculture and given primary responsibility for rural water supply projects. The new ministry experienced lack of trained personnel, insufficient budgetary support, bureaucratic disputes at various levels with MOH personnel, and inadequate coordination of activities with other ministries. The new Ministry was unable to provide CARE with the promised technical personnel. Similarly, the Community Development Department of the Ministry of Housing and Social Services had insufficient personnel to encourage and monitor local-level, self-help efforts. Although Community Development Officers appeared to be knowledgeable and well-trained, they and their assistants were responsible for too many projects spread over too large a territory to provide the oversight required to ensure the long-term viability of the projects. To improve this situation, CARE intends to provide assistance to Community Development Officers in the initiation, supervision and follow-up inspection of the projects.

At the time of the evaluation, neither CARE nor MWD had given attention to the quality of water being made more accessible to rural villages. The evaluators suggest that this deficiency was in part attributable to competition and lack of cooperation between MWD and MOH personnel. CARE, working through provincial officers and the Department of Community Development, is making an effort to bring together relevant district and provincial ministerial representatives with responsibilities affecting the water projects.

Technical Aspects

Various factors are identified in the World Bank paper as affecting the type of village water system to be constructed; the level of service; water quality and quantity; and the nature and location of sources. The level of service may range from a simple protected spring or well with a handpump to an elaborate distribution system serving consumers through house connections. Both capital and operating costs increase with the level of service. Increased complexity tends to increase the likelihood of mechanical failure. Standards [illegible] for quality to assure that no chemical or biological [illegible] affect water safety or acceptability. The quantity of water required depends largely on the level of service to be provided, and varies widely from country to country. Because of these wide variations, sampling and demonstration projects are recommended to determine likely demands on the new system.

The water source has a major effect on system design and costs. Groundwater systems will, in most cases, yield safe drinking water without a system of treatment. Surface water sources will normally require disinfection (usually chlorination and storage) and may also require filtration. Where groundwater is available, shallow wells with handpumps are the cheapest means of providing a safe water supply. The use of surface water requiring treatment is several times more expensive than using groundwater. Providing house connections may more than double the per capita cost because of the additional [illegible] required. Distribution costs are a high proportion

of total system costs; providing only a few central water points can reduce costs.

The World Bank recommends four general principles which can be applied to most village water programs.

- Groundwater is preferable to surface water; in LDC's shallow wells with handpumps should be used whenever possible.
- Systems should be rugged, designed for simple, trouble-free operation and maintenance by local technicians.
- Replacement parts should be readily available.
- Standard designs, which can be slightly modified to meet local conditions, should be used; designs should employ, as far as possible, local materials and technology.

The Yemán Rural Water Supply project (2790022) initiates a self-help effort at the local level, using local manpower and material to construct wells and delivery systems. The major concept of the program is to create a personal investment in the water supply system, which will support both the construction and the maintenance of the system. Fifteen villages a year will be provided with water supply systems based on drilled wells. Storage and delivery facilities will also be installed. The project calls for training fifteen Yemanis annually at a technical institute in Beirut in the operation and maintenance of small water systems. Participants will be drawn, to the extent possible, from villages with new water supply facilities.

According to a 1976 PAR, procurement of commodities presented problems which resulted in project delays. Some drilling equipment and supplies took over eighteen months to receive, and some were damaged upon receipt. Delivery of some of the pumps was also delayed, and most of those received did not meet specifications. As a consequence

of these and other problems, the PAR suggests that the project agreement be revised. The major revision would be a decrease in the number of drilled wet boreholes, for the reason that "USAID has found itself unable to function as the contractor for total system implacement." In order to simplify water system implacement, the project is being redesigned to focus increasingly on small self-help projects.

At the time of the appraisal, only one system was operational and the water had not been tested. Because so few systems were fully operational in 1975, the training of Yemeni villagers to operate and maintain well-based systems had been postponed. In 1976, however, eight villagers attended a two-week pump operator course. Another training course was to be offered as additional systems are completed.

In summary, implementation problems arose when the project relied on the importation of parts for well construction. It was recognized by the project staff that fewer problems occurred in the course of establishing small self-help water efforts. Self-help water systems targets were on schedule because most of the material needed was bought locally. The project was revised to reflect the lessons learned during the first years of project implementation.

As part of the Philippines Bicol River Basin Development Program (BRBDP), a monitoring program was organized to evaluate the effectiveness of a rural water supply project using a coconut fiber/burnt rice husk filter. The filter was developed after two years of research undertaken at the Asian Institute of Technology,

Bangkok, to find a simple, inexpensive, and efficient method of water treatment for rural communities in Southeast Asia. The research emphasized the use of local materials as filter media, in a gravity-fed system without the need for backwashing, and the elimination where possible of the use of chemicals. The primary objective of the project was to test its applicability to the Philippines in three pilot areas in the Bicol region..

The study indicates that in those local communities (barangays) where clean water is in short supply or is expensive, there is a genuine demand for improved water, at least for drinking and cooking. Experience in two project areas showed that the filter system can be maintained and operated efficiently and inexpensively by local residents. Water quality was greatly improved by use of filters in all three areas. In one pilot area, system operation was turned over to the barangay. Monthly payments of one peso per family were sufficient to pay for gasoline costs to run the pump and for pump repairs. In the second pilot area several technical problems arose, but the project is expected to continue smoothly,once the necessary adjustments had been made and the project turned over to local leaders. Implementation of the project in the third area awaited connection with municipal offices and the market place.

Local acceptance and interest were found to be functions of providing a trouble-free system. When there were few operational problems, shutdowns, or water stoppages, villager participation increased. Since the gas-operated pump is the sole malfunctioning

component in the system, the key to minimizing problems of acceptance appears to be in using a hand-operated pump at project start. As residents come to depend on the system for their water supply, increased demand for water will foster greater participation, improved financial support, and awareness of water quality needs. At this point, expansion of the distribution system and the addition of a gas or electrically-operated pump would be feasible.

The evaluators emphasized the importance of a long-term maintenance and training program as part of the commitment to the development of rural water supply and sanitation. They state that the failure of planning agencies in other countries to provide for such assistance after completion of the construction phase has been the chief reason for the inability of rural communities to sustain their own projects.

One of two technical assistance projects (9310454) involved field research and testing of a hand pump for use in developing countries. Basic specifications for the pump were established and were still valid at the conclusion of the program. These specifications included:

1) Low production costs;

2) Ease of maintenance using simple tools and unskilled labor;

3) Suitability for shallow or deep well installations with only minor alterations;

4) Capability of being manufactured locally by established firms with a minimum of capital investment; and

5) Ease of operation by small people, including women and children.

The final report for the project also stressed the need for coordination with the local people in regard to operational requirements and pump configuration. The project identified in various developing countries a shortage of pumps and facilities to manufacture them; little or no maintenance in cases where pumps were available; and inadequate storage facilities for spare parts.

During the program, a simple piston pump design was identified as being suitable for LDC needs. After tests were conducted in three countries, it was determined that the basic pump design was satisfactory. Several technical conclusions concerning the design of the pump are described in the final report. The report also describes the research activities conducted in the three test areas -- Thailand, Nigeria, and Bangladesh.

The second technical assistance project (9310563), entitled "Lower Cost Methods of Water ard Waste Treatment in Less Developed Countries," was based on a recognition of the need for structural and nonstructural solutions to technological transfer problems involving water for underdeveloped countries. The project notes that developing countries too frequently attempt to use a technology incompatible with in-country manpower and/or natural resources. The project seeks to address this problem by devising a system or scheme that would identify appropriate technologies for water and waste water treatment, as well as produce and disseminate usable information on in-country compatible technology.

Toward this goal the project develops:

1) a technology study network;

2) a predictive model;

3) validation and dissemination of results through a global workship, publications, and visitation.

The results of the project were:

- A tested model predicting compatible treatment processes;
- State-of-the-art documents;
- An in-country field kit for analysis of treatment process performance; and
- LDC contractor reports on process technology.

In addition, because the project stimulated considerable interest among individuals and organizations, an inventory of unpublished research on the subject is to be continued.

Financial Aspects

According to the World Bank, it is unusual for the full costs of village water systems to be recovered from the villages served, although villages should be required to pay as much as they can of the costs of constructing and operating their systems. Five potential sources of funds for village water systems are cited: central or local government budgets; foreign assistance; institutional lenders within the country; cross-subsidies from urban systems; and the villages themselves. The last source probably will have the strongest effect upon the size of the program to be undertaken, since the other sources are usually inadequate. The main problem areas encountered are determining the ability and willingness of villages to pay;

and devising the system for collecting water charges. The Thailand community potable water project seeks to provide potable water facilities to a limited number of rural communities in security sensitive Accelerated Rural Development (ARD) areas during a five-year period (1966-1971)) and is a pilot project for a comprehensive National Potable Water program. Documentation available for this project describes several financial issues.

Starting with a small nucleus of experienced engineers in the SED (Sanitary Engineering Division) in 1966, the project has grown to over 300 people, including 40 engineers. The SED experienced a low rate of personnel turnover, and lost none of its overseas-trained and very few in-country trained personnel. The reasons cited were the incentive in the training program, designed to build up the professional capability of the SED, and secondarily, a higher-than-government-standard per diem rate for in-country based personnel. Without the incentive of advanced training, the SED would not have been able to recruit the engineers necessary for the success of the project. Following training and promotion, the standing and salary for young engineer recruits became attractive enough to encourage them to stay with the SED.

The project is to cover a large area of twenty-one provinces -- including some areas designated as security sensitive -- within which 600 communities are to be provided potable water systems. The degree to which a village can contribute toward construction costs is taken into account as one of the criteria for selection.

Other factors considered in selecting villages for a potable water system include the following conditions:

1) they have an existing but not potable water source;

2) they are readily accessible by road;

3) they demonstrate interest in the project; and

4) they are willing to develop a rate structure that will pay for operation and maintneance costs as well as provide for future expansion.

The third condition was emphasized. Where it was met, a well-operated system usually resulted. Conversely, in those cases in which a potable water system was installed more in response to security requirements than a demonstrated village interest, the system operated less effectively, primarily because of a lack of financial support.

The fourth condition has generated the greatest problems. Many villagers who verbally indicated their willingness to develop a rate structure and pay water charges following construction, have not "delivered" once the system was installed. It was most difficult to collect water charges from those villagers who were required to haul water from a newly installed public tap. They probably felt that the water from the public tap was free for the taking, not recognizing the fact that the tap water had been treated or that most of the hauling had been done for them via a pipeline. In the case of villagers who could afford a house connection, collection charges were not a problem.

Related problems were the inability of villagers to pay initial pledged contributions, and the refusal of local authorities to permit collected funds to be used for operational expenses until the village

contribution had been paid in full. In some instances, this resulted in a completed system not operating.

Several additional problems were encountered:

- Villagers would pay for water during the dry season, but saw no reason to support the system during the rainy season when they can collect rainwater.
- The water system was seen as a status symbol, and never seen to operate.
- Political differences between villages served by a single system created some difficulties.
- Villagers had been poorly informed, and were under the impression that their original contribution towards construction included house connections.

The problems associated with user charges were minimal or nonexistent in larger villages, where a stronger administrative structure existed and where funds had been made available from other sources of revenue to finance operational costs for the first few months. One possible approach to overcoming some of these financial problems is being tested. The SED is setting aside money from the village contribution to be used to cover operational expenses for the first six months. This step was expected to assure the villagers that water would be available, and give the village administration time to establish a system for the collection of water charges. Evidence that this solution may work was found in a successful installation in one village, where enthusiasm was not generated until after the system was in place and operating for the benefit of the villagers. Despite the problems described, approximately 70% of plants constructed were operating without problems or operational difficulties.

The evaluators stress the importance of villager acceptance. More important than technical training of maintenance crews, and probably more difficult to develop, will be the development of a sense of responsibility among the village operators so that the system and water potability will be maintained. The new generation would not have the built-in resistance to water-borne diseases their elders have acquired, and will be more susceptible to water-borne diseases should an operator allow a once potable supply to become contaminated. Villager acceptance can be promoted through education in public health and personal and family hygiene in cooperation with other public health programs. The evaluators note several reports of villagers disliking the taste of the water supplied by the new systems.

THE WORLD BANK CHECKLIST FOR SECTOR INFORMATION

General Information on the Sector

1. Laws, codes and decrees regulating water sources, allocation, pollution and the organization of water supply and sewerage.
   Responsible authority at national, regional and local levels.
   Distribution of responsibilities between national and regional authorities, municipalities and management of water supply/sewerage systems.
   Legal status of the systems (government department, national authority, local authorities, commercial corporations, concessionaires, etc.,).

2. Situation in rural areas; the agency or agencies responsible for rural water supplies and sanitation.

3. General health conditions in the country. Prevalance of diseases attributable to inadequate and unsafe water supplies and bad sanitation. Data by region and urban centers on waterborne and water-related diseases. Population trends, housing status and programs.

4. Priority and magnitude of investment for water supply and sewerage systems within the national plan.
   Comparison with total investments in the public sector, past and future.
   How are urban water/sewerage capital expenditure financed?

Basic Information on Water Supply and Sewerage Systems

1. Classification of urban centers by size and geographic sub-division.
   Number of cities and towns having both municipal water supply and sewerage systems.
   Number of cities having one but not the other.
   Number of cities and towns without any system.
   Percentage of urban zones covered by the systems.
   Number of centers with overall urban plans and status of such plans.
   Electricity and other types of infrastructure.

2. Broad statistics on water/sewerage operations by size of urban centers and geographic sub-division, giving general information on percentage of private, industrial and commercial customers served from public systems, numbers of public taps, income levels.
   Water consumption data on private, industrial and government customers.
   Broad assessment of the ratio of water consumption to water production, and analysis of difference.
   Past growth of the urban population and of the number of connections and water consumption by each category of customers.
   Per capita consumption of water in various areas and cities.

3. Investments in the past five years for new systems and expansions of existing systems.
   Number of systems newly constructed or expanded in water supply and sewerage. Their classification by size of the urban centers and geographic sub-division.
   Status and problems of implementation of past and on-going projects.

4. Analysis of past investments.
   Classification of financing sources (foreign loans, national departmental or municipal funds, internally generated resources).
   Share of each source.
   Changes in financing sources in the past five years.

5. Mechanism for determination and application of water and sewerage charges, and authority determining tariffs.
   National or departmental coordination.
   Tariff schedules for water and sewerage in several urban centers.
   Policy and criteria for determining the rates (e.g., consumption, category of customers, obligation for the system to cover costs or yeild a certain return).

6. Financial situation and organization of the water and sewerage systems. Their profitability.
   In case of deficit, who subsidizes the systems?
   Changes in amounts of subsidies in the past five years.
   Accounting methods used in the systems.

Profit-and-loss statements, balance sheets of most important systems or relevant chapters of the national budget.
Auditing policy.
Effectiveness of billing and collecting.

7. Value of water supply and sewerage assets. How determined?

8. Investment program for water supply and sewerage for the next five years or any other period covered by the national plan.
Classification of investments by size of urban centers.
List of priority centers. Criteria for assigning priorities.
Financing planned for new investments.

9. Method used in the development of new projects or expansion of existing systems.
Design criteria for water supply systems; for sewerage systems.
Procurement procedures. Equipment manufactured locally. Preference given to local manufacturers and contractors.
Customs policy. Magnitude of import duties.
Responsibility for construction of civil works.
Technical support available for the national authority, number and competence of local consultants.
Availability and capability of local contractors.

10. Man-power resources in the sector. Problems of recruitment.
Use of foreign personnel in consultative or operational executive roles.
Training facilities and policy.
Is information being collected on hydrology and hydrologic and groundwater resources?
Responsible agency and status of the data.

11. Second Development Decade (1970-1980) target established by the UN for water and sewerage for urban populations have been established at 40% to be served by water in houses and 60% from public standpipes, with 27% to be connected to sewer systems in the next ten years.
After ten years, on the basis of present investment program?

12. For rural populations, the Second Development Decade target is 20% to be served by safe water. What is the present situation in the country? After ten years, on the basis of proposed programs?

13. Per capita capita cost estimates (existing and future facilities).

14. Housing conditions in major centers.

15. City planning and master plans for development.

16. National development plan and its priorities.

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Indicators (Variables) Checklist
for
Social Analysis of Potable Water

The last section of this Paper developed two components for project social analyses. The first section consist of a community or regional profile including a discussion of the beneficiaries. The second component is a socio-cultural feasibility study. This statement must accompany all social analyses which are considered to require an active intervention role.[1/] This social analysis guideline is developed with this dichotomy in mind. The first section will consist of indicators used for baseline data establishing the need for the project and the social impact or distribution of benefits and burdens among the different groups in the population.

The second section is a checklist of indicators and social parameters relevant to the assessment of the socio-cultural feasibility of potable water projects. These indicators are extracted from the evaluation surveys reviewed in the main body of this Paper. It is these social parameters that determine the project's acceptance, utilization and ultimately its absorbtion and success in terms of community quality of life impacts.

I. Social Profile and Beneficiaries Social Impacts

A. Demographic Survey: Present and Forecasted Change

1) Population density
2) Settlement typology and village size
3) Per capita income
4) Measure of income equality - use of simple % is adequate
5) Mean years of schooling (level of education)
6) Schooling distribution - % categories
7) Employment statistics
8) Family size and average house size by socio-economic status
9) Migration statistics

1/ Active intervention mode relates to those projects which require a substantial amount of behavioral and attitude changes for the project to provide an acceptable level of benefits to the community. Staff social scientists are the most capable in making this decision.

D. Benefits and Beneficiaries

This section establishes the justifications and assures that the benefits accrue to the poor rural areas and women.

a. Community level benefits:

1) What is the impact on the economic growth potential of the community?
2) Are village organizations strengthened?
3) Does the project increase equitable distribution of resources?
4) Does the project establish important linkages with the government that may be utilized in solving other problems?
5) Number and percent of families in the lower socio-economic status served.
6) What changes are to occur in water quality, quantity and reliability?
7) Changes in farming potential, types of crops, etc.
8) What are other community or regional benefits?

b. Individual level benefits (who is the target population?):

1) Number of people and/or households served.
2) Number of households using each faucet.
3) What is the potential for increased income?
4) How much time will be saved from water collection and how can or will this time be utilized?
5) What is the expected improvement in health? What diseases are to be controlled and how?
6) Is fire destruction a problem and will the new supply increase fire protection?
7) Other specific individual benefits.

II. Social Feasibility

The first sub-section examines the behavioral characteristics of the target population. It is important to understand the changes in behavior necessary for communities to absorb new infrastructure and maximize benefits.

The last three sub-sections examine the problem of system maintenance (maintenance is discussed in I.C of the Paper). Maintenance is both a capacity and motivational problem.

B. Health Statistics

This section and section C establishes the need for the project and the type of benefits that must be addressed in the physical design (i.e. type of disease control, convenience factor, reliability factor, the quantity of water needed, etc.).

1) Infant mortality
2) Life Expectancy
3) Principle health problems
4) Incidence of water-related diseases
   Typhoid
   Cholera
   Diarrhoeal disease (gastro-intestinal)
   Infectious skin diseases
   Infectious eye diseases
   Mites and louse
   Schistosomiasis
   Guinea worm
   Diseases related in insect bites (list types)
   Other water-related disease (list types)
5) Given diseese incidences discuss the need of a water system to supply increased water quality and/or quantity (see Paper, section I.A).

C. Water: Technical (establish need)

Some of these indicators of need will be addressed by the technician. The technician will also discuss a multitude of other issues such as potential sources, possibility of treatment and the appropriate delivery system. These are not included here because they have little social significance. Some of the technical plans will be discussed in the Social Feasibility Section.

1) How far away is the pre-intervention water source
2) Type of terrain travelled for water collection
3) Average time spent for collection of water
4) What is the seasonal reliability of the traditional sources
5) Discribe the quality of water
6) Present per capita quantity of water used in the household if possible list by categories, i.e. drinking, bathing, cooking, etc. (exclude use for animals and gardens).
7) Present amount of water used for animals.
8) Present amount of water used for gardens.
   If low, is there a demand for more water to increase garden size or start a new garden?

A. Cultural Setting - Values, Attitudes and Behavioral Characteristics

1) What do we know about the daily life or routine of the community and what is the present water usage?

2) What changes will occur after the project and what are the expected new water usage patterns?

3) What changes in or new kinds of attitudes and practices will the project demand? How are these to be accomplished?

4) What values, beliefs, attitudes and folkways (individual or organized practices of the community) might be utilized for the intervention and which ones may be constraints to the project?

5) If education programs are a proposed medium for changing behavior patterns and attitudes. Describe the programs and how will they accomplish the goals. What experience have agencies had with these types of educational programs?

B. Structural Constraints

1) Who are the critical groups of people and organizations to whom the project will have to be acceptable? Which groups are supportive? Who are the non-supportive groups and how may they be co-opted--will these non-supportive groups effect the project?

2) Are there any threats to existing social power? How are they to be dealth with?

3) Who is responsible for administration of the project (operation and maintenance)? Are linkages well established between the community and the administrative body?

4) Are established norms for water quality and quantity accepted and understood by the beneficiaries? What programs will be designed to accomplish this task?

5) What local, regional and national administration organizations need to be strengthened? How is this to be accomplished?

6) Describe the educational component of the program and how it will accomplish: (a) necessary changes in behavior, (b) understanding of the expected accrued benefits, and (c) the maintenance and system usage skills.

7) What are the individual economic costs of the projects? Are they disproportionately high and thus will exclude the poor?

C. Feasibility of Participation (See discussion in Paper, Section I.C-1)

1) What active kinds of participation in decision-making, implementation or evaluation does the project expect among beneficiaries? (Will people be participating individually or in groups? What kinds of groups?)

2) Is there a tradition of such participation or previous experience which would ensure that it can take place? (Have the particular kinds of people that the project expects to participate, e.g. poor, women, been able to participate in the past under similar conditions? Will social norms and existing skills allow them to do so now?)

3) What are the social arrangements through which participation will be developed and channelled? (Have these arrangements taken into account already existing ones? Have they taken into account different factions and conflicts among the target population which might hinder the effectiveness of such arrangements?)

4) What steps have been taken to improve participation (see section I.C-1)?

D. Physical Maintenance Component

1) How are recurrent expenditures to be met? Will this be adequate?

2) Describe the planning for maintenance manpower and training.

3) Has the proposed maintenance plan been used with success elsewhere?

4) If a water-rate structure is planned examine the ability to collect the fee. How are potential problems eliminated and what is the incidence and effect of a usage fee on the poor's ability to pay? Also is the rate structure equitable?