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**Technical Discussions of  
the XXVI Meeting of the  
Directing Council  
of PAHO**

Scientific Publication No. 390

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**Strategies for Extending  
and Improving Potable  
Water Supply and Excreta  
Disposal Services During the  
Decade of the 1980s**

1979

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**STRATEGIES FOR  
EXTENDING AND IMPROVING  
POTABLE WATER SUPPLY AND EXCRETA  
DISPOSAL SERVICES DURING  
THE DECADE OF THE 1980s**

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## FINAL REPORT

The Technical Discussions of the XXVI Meeting of the Directing Council of the Pan American Health Organization, XXXI Meeting of the Regional Committee of the World Health Organization for the Americas, were held on 28 September 1979 in the Headquarters of the Organization in Washington, D.C. The topic discussed was: "Strategies for Extending and Improving Potable Water Supply and Excreta Disposal Services during the Decade of the 1980s."

In accordance with the Rules for Technical Discussions,<sup>1</sup> Dr. Humberto Romero Alvarez (Mexico) was elected Moderator and Ms. Jannette Bethel (Bahamas) Rapporteur. Dr. Vicente Witt served as Technical Secretary.

Serving as background documents were the papers "Potable Water Supply and Excreta Disposal Services during the 1980s" presented by Dr. Abel Wolman, and "Possible Strategies for the International Drinking Water and Sanitation Decade," prepared with contributions from Drs. Abel Wolman and Antonio Ordoñez Plaja, and Messrs. Wesley E. Gilbertson, Charles Pineo, Harold Shipman, and Eduardo R. Yassuda.

The Moderator explained the rules to be followed and presented the Guidelines for Discussions.

The participants were divided into two groups, with officers elected as follows: in Group I, Dr. Christine Moody (Jamaica) as Moderator and Mr. Olman Cordero (Costa Rica) as Rapporteur; and in Group II, Dr. Luis A. Cousin (Honduras) as Moderator and Mr. Daniel Juricic Villalón (Chile) as Rapporteur. The Technical Secretaries were Mr. Guillermo Dávila in Group I and Mr. Guido Acurio in Group II.

The working groups approved the Guidelines for Discussions and proceeded accordingly. The views expressed in each working group were summarized by the respective officers and consolidated for preparation of the conclusions presented below.

### **Policies**

It is urgent that the Governments of the Americas consider the provision of water supply and sanitation services a high priority activity, requiring policy decisions at the highest level.

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<sup>1</sup> See *PAHO Official Document* 163, pp. 83-86.

Water supply and sanitation programs should be included in national development plans. Toward that end, in addition to the health justification, it is important to emphasize the economic benefits to be derived from those services in the countries.

For the coming decade, goals established by the countries for providing water supply and sanitation facilities should be realistic and feasible of attainment.

Intersectoral coordination is of fundamental importance in attaining the objectives for the decade, with the ministries of health and specific agencies assuming responsibility for promoting, directing, executing, and administering the different projects, while the health ministries maintain supervision over the quality of the services. There also must be active community participation in the process, including the efficient operation and maintenance of water supply and sanitation services.

### **Management**

The Governments must consider reviewing their statistical systems in order to improve the planning, management, and evaluation of their water and sanitation programs. This information can also be important for promoting sector development and influencing decision-making.

There is also need to review and improve current legal structures in order to obtain optimal water and sanitation services.

### **Human Resources**

The substantial capital investments for facilities must be accompanied by a massive program for training personnel at all levels, including continuing education programs in order to update staff already in the field. These training programs must be conducted in each country or groups of countries with the help of existing universities and other institutions.

Information on the availability of training resources at the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS) and elsewhere in the Organization should be provided to the Member Governments in order to facilitate wider participation in the programs. In addition, CEPIS should intensify its efforts to assist in the preparation of trainers and researchers, the establishment of training units, and the revision of curricula for professionals and technicians.

It is important to provide training for all personnel involved in activities for the Decade, and not only for university graduates. In addition, universities and other institutions must be encouraged to review their curricula for the training of all categories of health personnel so that aspects of water supply and sanitation can be properly incorporated. These aspects should

also be included in programs of instruction for economists and administrators where they exist or are instituted.

If the efforts made for the Decade are to be successful, bilateral and international lending institutions will have to provide financial support for infrastructure development and personnel training, in order to improve the national capacity to absorb and make use of the funds to be invested.

### **Technology**

Governments should adopt appropriate technologies that are compatible with the social, cultural, and economic situations in the given country.

PAHO should explore the possibility of establishing a network of national institutions to engage in research and to select and evaluate appropriate technologies with emphasis on simple, inexpensive methods rather than on those that are highly sophisticated or only of academic interest. These or other institutions should be established and utilized to collect and disseminate information on technologies so that each country may choose those best suited to its needs.

The Governments must study the possibility of promoting the development of local capabilities for the manufacture of materials and equipment used in water supply and sanitation activities. In some cases it might be more advantageous to create such industrial operations on a subregional basis.

### **Financing**

The Governments, donor countries, and lending agencies must give high priority to water supply and sanitation services in the allocation of funds, especially when they are limited and choices among options must be made.

The traditional arrangement for financing the sector with Government appropriations, water rates, taxes, and external loans is insufficient. Accordingly, meeting the goals for the Decade will necessitate identifying and using new sources of financing, like special taxes, bonds, revolving funds, private donations, and community contributions, including what people can themselves provide in labor and materials.

The inability of the poor to pay for these services is a major financial consideration. Governments will have to consider water rate policies that apportion costs equitably, so that higher income earners pay higher rates and subsidies are provided to those whose incomes are low. Also, fee schedules should make it possible for urban systems to be self-supporting, and for those in rural areas to be at least able to meet operating and maintenance costs.

## **Annex**

### **RESOLUTION XXII ON THE TECHNICAL DISCUSSIONS, APPROVED BY THE XXVI MEETING OF THE DIRECTING COUNCIL OF PAHO**

#### *The Directing Council,*

Having examined the report of the Technical Discussions on "Strategies for Extending and Improving Water Supply and Excreta Disposal Services during the Decade of the 1980s";

Considering the progress made in the 1960s and 1970s, as well as the present rate of rural and urban development of water supply and waste water and excreta disposal in the Region; and

Aware of the importance of the targets proposed by the United Nations Conference on Human Settlements (1976) and the United Nations Water Conference (1977) to provide water supply and sanitation services to as many people as possible during the decade 1981-1990, particularly to the underserved rural and urban populations,

#### *Resolves:*

1. To express its satisfaction with the manner in which the Technical Discussions were conducted and to thank the moderators, the rapporteurs, and the consultants for their valuable contributions to the Discussions.

2. To urge Member Governments:

(a) to include the extension of water supplies and sanitation services, particularly in the underserved rural and urban areas, among the priority programs for national development, and to promote intersectoral collaboration with other sector developments;

(b) to give high priority to active community participation in decision-making, implementation, and operation and maintenance of water supply and sanitation projects, particularly in rural areas;

(c) to adopt appropriate technologies compatible with their social, cultural, and economic conditions and explore the feasibility of promoting the local manufacture of supplies and equipment for water supply and sanitation facilities;

(d) to support and seek additional funds for institutional development and the training and continuing education of health personnel at all levels in order to improve the national absorptive capacity to utilize the funds to be invested; and



(e) to explore new sources of financing for program development to supplement traditional mechanisms and external loans.

3. To request the Director:

(a) to continue giving high priority to cooperating with Member Governments in strengthening their urban and rural water supply and sewerage programs including: i) the development of national, regional, and local strategies as well as institutions and low-cost simplified technology; ii) the full utilization of the resources of the Organization, particularly those at the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS), for the training of personnel at all levels and the dissemination to Governments of information on the availability of such activities; iii) the establishment of systems for the exchange of information; iv) the identification and preparation of project proposals; and v) the seeking of extrabudgetary resources to further the collaboration with Governments in implementing their programs; and

(b) to distribute widely the report of the Technical Discussions and the excellent background material, particularly to those agencies and groups outside the health field that are also concerned with furthering the objectives of the decade.

## POSSIBLE STRATEGIES FOR THE INTERNATIONAL DRINKING WATER AND SANITATION DECADE<sup>1</sup>

### Introduction

Few development projects have greater potential for directly benefiting the health and social and economic well-being of peoples than water supply and sanitation services.

Waterborne or related diseases are among the world's three major causes of sickness and death and contribute to high infant mortality, low life expectancy, and a poor quality of life. Such diseases can be prevented if people are provided safe drinking water and waste disposal facilities.

At meetings of the Pan American Health Organization/World Health Organization, the Ministers of Health of the Americas have emphasized the importance of water supply and waste disposal in preserving and improving the health of the peoples in their countries. Despite this concern, there are still millions of people without such services, particularly the poor in urban and rural areas.

Diarrheal diseases are still the most common cause of childhood illness and mortality in many of the countries of Latin America and the Caribbean and account for close to 200,000 deaths in these areas each year. This number climbs much higher if typhoid fever and hepatitis are included in the statistics.

The topic, "Strategies for Expanding and Improving Potable Water Supply and Excreta Disposal Services during the Decade of the 1980s," chosen for the Technical Discussions at the XXVI Meeting of the Directing Council of PAHO, provides Member Governments an opportunity to reaffirm the need for accelerating the promotion, planning, coordination, and development of services for meeting basic sanitary needs in rural and urban areas.

The information that follows has been prepared to aid representatives in their discussions. It outlines developments in the water supply and sanitation sectors in the last two decades, includes an analysis of factors that have contributed to the advances achieved, and identifies some of the constraints on future progress, many of which still exist and will have to be overcome if the goals for the 1980s are to be met.

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<sup>1</sup> Document prepared with the collaboration and contributions of Drs. Abel Wolman and Antonio Ordóñez Plaja, and Messrs. Wesley E. Gilbertson, Charles Pineo, Harold Shipman, and Eduardo R. Yassuda.

## **The Experience in the Region of the Americas**

At the beginning of the 1960s the Latin American and Caribbean countries had 209 million inhabitants—102 million in urban areas and 107 million in rural areas. Sixty million (59 per cent) of those in urban areas had water services, whereas less than 8 per cent of the rural population had service, either at home or through public fountains. Sewerage was available to only 29 million (28 per cent) of those in urban areas and to almost no one in rural areas.

In 1961, the Hemisphere's Governments, in the Charter of Punta del Este, established the goal of providing water and sewerage to 70 per cent of the urban and 50 per cent of the rural population by 1971.

By the end of 1971, 152 million of the 287 million people in Latin America and the Caribbean had piped water. Of the total urban population of 155 million, more than 121 million (78 per cent) received water either through house connections or public hydrants. During this same 10-year period, water supply services to the rural population more than tripled: an estimated 31 million (24 per cent) of the area's 131 million rural residents were served in 1971.

Although the Punta del Este goals for sewer services in urban areas were the same as for water supply, limited resources made it necessary to give priority to providing drinking water. Still, some progress was made. By 1971 sewer services had been provided to 59 million people in urban areas (38 per cent of the total) and to many fewer in rural areas.

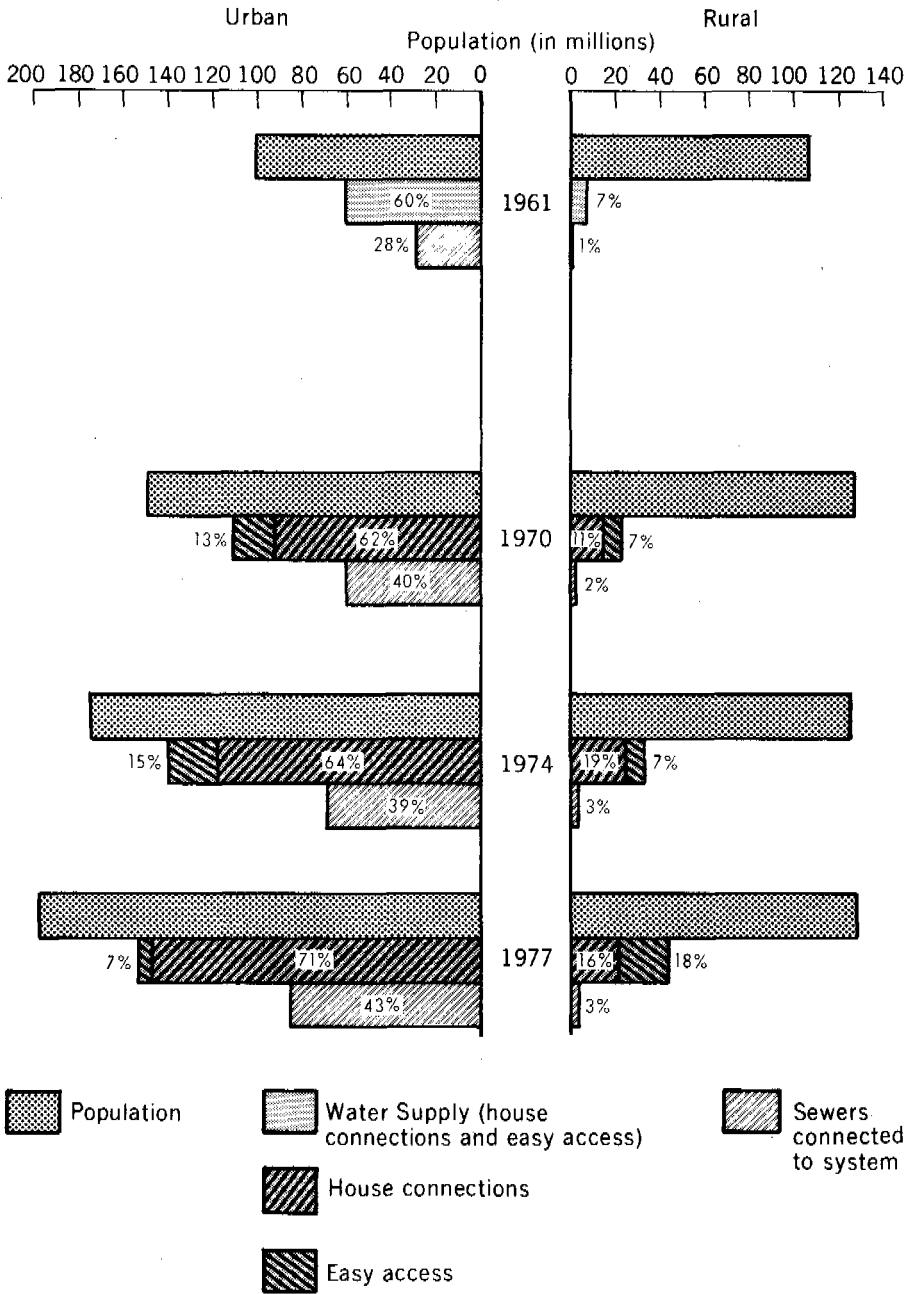
In 1972 the Ministers of Health of the Americas, at their III Special Meeting in Santiago, Chile, reviewed progress and set new goals for the 1970s. These goals expressed the hope that water would be provided through house connections to 80 per cent and sewerage to 70 per cent of the urban population, and water supplies and waste water or excreta disposal facilities to 50 per cent of the rural population.

By the end of 1977, 198 million of 325 million people in Latin America and the Caribbean had access to water through house connections or public fountains. Of the 197 million in urban areas, 140 million (71 per cent) had house connections, and 34 per cent of the rural population had access to potable water. In the same year, 84 million (43 per cent) of the people in urban areas but only 3 million in the rural areas had sewerage services.

Figure 1 shows the number and percentage of urban and rural population served by water supply and sewerage systems in Latin America in 1961, 1970, 1974, and 1977. Table 1 shows the investments made in 1961-1970, 1971-1977, and 1961-1977.

During the past two decades, primary attention has been given to building new and expanding existing systems. Less attention has been paid to the quality of water and the need for adequate operation and maintenance to

**Figure 1. Number and percentage of urban and rural population served by water supply and sewerage systems in Latin America—1961, 1970, 1974, and 1977.**



**Table 1. Summary data on the financing of water supply and sewerage programs in the Americas, 1961-1977.**  
(In US dollars)

	1961-1970	1971-1977	1961-1977
<b>International loans</b>			
Inter-American Development Bank (IDB)	485,570,000	658,922,000	1,144,492,000
International Bank for Reconstruction and Development (IBRD)	61,800,000	449,725,000	511,525,000
U.S. Agency for International Development (AID)	140,850,000	26,963,000	167,813,000
Export-Import Bank (EXIMBANK)	30,510,000	—	30,510,000
Canadian International Development Agency (CIDA)	—	20,616,000	20,616,000
<b>Total</b>	<b>718,730,000</b>	<b>1,156,226,000</b>	<b>1,874,956,000</b>
<b>National funds, including counterpart funds to support international loans and grants</b>			
	1,290,400,000	3,916,910,000	5,207,310,000
<b>Grand Total</b>	<b>2,009,130,000</b>	<b>5,073,136,000</b>	<b>7,082,266,000</b>

safeguard health and protect the investments being made. Intermittent service and the poor condition of distribution systems have resulted in water losses estimated at 40 to 60 per cent and the infiltration of contaminants into the systems when negative pressures develop. Designs too have had their shortcomings. Some of the water supply systems built were oversophisticated and hence were neither fully in line socially and culturally with local conditions nor economically viable.

Lack of trained manpower also contributed to the problem. The significant efforts in the 1940s and 1950s to establish graduate and postgraduate courses in sanitary engineering and the awarding of a large number of study and travel fellowships did not keep pace with expanding water and sanitation programs and so resulted in shortages of skilled manpower which contributed to poor operation and maintenance.

It was those and other concerns that prompted the Ministers of Health to approve Resolution XIV at the XIX Pan American Sanitary Conference in 1974 urging Member Governments to give greater attention to improving the bacteriologic quality of drinking water.

Over the past 10 years, there have been useful innovations in the concept and structure of the institutions responsible for providing water supply and sewerage in urban and rural areas. In the major cities and metropolitan areas there are now specialized water supply and sewerage authorities responsible for system design, finance, construction, and operation. Institutional improvements in smaller communities are also being accelerated.

An overall assessment of past activities shows that by the end of 1977 most of the Region's countries had almost fulfilled the goals for the decade with respect to urban water supply services, but that less progress had been made in providing urban sewerage and rural water supply and excreta disposal services.

Among the constraints that made it difficult to reach the prescribed goals were:

(a) Competition from other development sectors for the use of limited human, financial, and material resources available.

(b) Lack of information among public opinion molders about the needs and aspirations of the people, so that higher priority would be given to providing basic water supply and sanitation services.

(c) Lack of knowledge, understanding, and motivation among public administrators about the importance of water supply, sewerage, and excreta disposal in a country's development.

(d) Fragmentation of responsibilities among many agencies resulting in uncoordinated program activities.

(e) Absence of realistic financial policies, particularly for smaller communities and rural areas.

(f) Lack of trained manpower.

(g) Unsuitable administrative structures and an inadequate legal framework.

### **The International Drinking Water and Sanitation Decade**

The need to extend water supply and sanitation services globally was examined at the United Nations Conference on Human Settlements in 1976. This world gathering and those that followed in 1977 and in 1978—the United Nations Conferences on Water and the International Conference on Primary Health Care—all stressed the goal of providing drinking water and sanitation services to as many people as possible by 1990, particularly to those in underserved rural and urban areas. This global effort has been designated the International Drinking Water and Sanitation Decade.

For Latin America and the Caribbean this raises the expectation that many of the 338 million people living in urban areas and the 147 million in rural areas may have adequate water supply, sewerage, and excreta disposal facilities by 1990. There is also hope that special attention will be given to extending services to large squatter settlements, which represent as much as 25 per cent of some urban populations, and to small communities and the dispersed rural population. Realizing these goals assumes that major commitments will be made at the highest levels of government and that innovative training, financing, and institutional development programs will be initiated.

### **Possible Constraints**

Governments in the Americas are becoming increasingly aware that pro-

viding water and sanitation services is the single most important and cost-effective activity that can be undertaken to improve the health of their people and raise productivity. Progress in the future will nevertheless depend on overcoming some of the same constraints encountered during the past two decades. Briefly it will mean: obtaining support at the highest governmental levels for expanding basic sanitation services as an essential component of national development; collecting and analyzing detailed information about the sector for project development; overcoming institutional weaknesses at all levels; coordinating better responsibilities among agencies; creating national training systems for manpower development; and overcoming economic and financing problems.

### **Motivation**

It is difficult to justify investments in water supply and sanitation services on a strictly quantifiable cost-benefit basis because no satisfactory method has been developed to provide this type of information. Decisions must thus be based on qualitative assessments such as improved public health and the resulting increase in productivity, and in rural areas the slowdown in migration from rural to urban areas through redistribution of real income in favor of the rural poor.

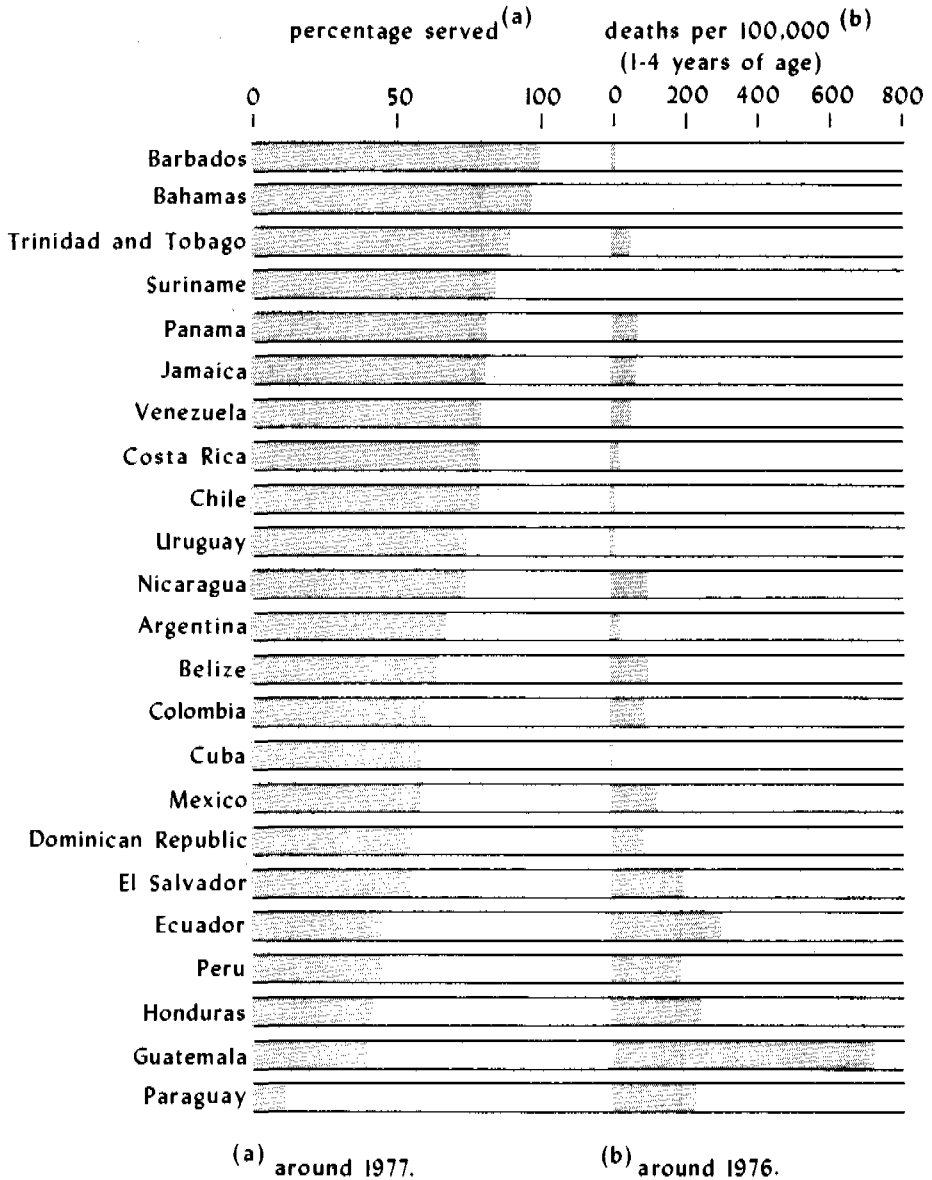
It must also be recognized that epidemiologic studies indicate that the provision of basic sanitation services can be a major factor in reducing enteritis and other diarrheal diseases, the most common cause of infant deaths in developing countries (Figure 2). It has further been shown that a number of debilitating parasitic diseases such as typhoid, cholera, and shigellosis are linked to inadequate and contaminated water supply and poor sanitary conditions.

Decision-making is sometimes affected by lack of information about the sector. An important consideration is thus the collection of sector information to identify problems and constraints, analyze development strategies, estimate investments needed, and recommend policies, institutional improvements, and other measures necessary to assure the success of programs.

Technical specialists can also assume an active role in influencing favorable decisions by transforming technically sound ideas into realistic plans acceptable to political decision-makers. By preparing long-range plans, for example, they can define and justify the objectives to be attained in a particular program and establish priorities in carrying it out. Such long-range plans can also provide orientation and guidance to future administrations and thereby improve program continuity.

Plans of an immediate nature are also necessary because they give prestige and credibility to a Government by identifying goals to be attained during its term of office and provide the information needed for authorizing the mobilization of human, financial, institutional, and material resources.

**Figure 2. Percentage of the population served by potable water and deaths from enteritis and other diarrheal diseases per 100,000 children aged 1-4 years, by country, 1977 or latest year.**





## **Institutions**

Assignment of program responsibilities among national agencies will vary from country to country, but the minister of health in each country should stress the public health justifications for providing water supply and sanitation services, stimulate national commitments, and identify the benefits to be derived from cooperation among interrelated sectors.

A minister of health might encourage the formation of a national water council, or similar mechanisms or groups of concerned agencies, to coordinate policy and guide programs. Such a council should include ministries or agencies concerned with health, planning, finance, public works, agriculture, housing, and economic development.

Institutional weaknesses usually become evident after systems are operational. There is then a realization that the agency responsible for system operation and management cannot fully achieve an investment's potential benefits. It is important to remember that financial commitments do not stop with the construction of a facility. Funds must be made available to create and maintain an infrastructure to operate the utility on sound administrative and fiscal lines and with a staff adequate to maintain a satisfactory level of performance. A system that does not work or works poorly is of no benefit and wastes valuable resources.

The development of permanent community institutions, particularly in rural areas, is a high priority objective. These will vary widely, depending on the size of the water supply and sanitation services and social and governmental conditions. In any event, there are certain basic functions and responsibilities that go hand in hand with local organization, among which are: stimulating and mobilizing local community participation, including labor, in the construction phase; collecting service fees from consumers; maintaining and repairing equipment and facilities; servicing complaints; keeping records of funds and facilities; training employees; participating in planning future service extension, consistent with community needs and capacity; and cooperating with other local social and economic development efforts.

To be effective, local management requires the support of an infrastructure that can provide technical guidance. In addition, it should develop and maintain liaison and cooperative arrangements with neighboring community organizations. These contacts can be very helpful in handling emergencies as well as other problems.

## **Appropriate Technology**

In designing the level of water and sanitation services to be provided, attention must be paid to "appropriate technology." There is no easy answer to the question of what methods and equipment are suitable, except that

they must be compatible with existing conditions and situations. Though current technologies are generally applicable to urban projects, they usually lack the "social" focus that allows them to be integrated with the community participation that is so essential to village, rural, and slum programs. Technologies are also often misapplied because the designer does not clearly understand the basic assumptions implicit in the solutions being used. This usually results in costly overdesigns or unrealistic manpower requirements.

Basically, appropriate technology should: be compatible with the social, cultural, and economic conditions in the particular developing country; be understood by the people using it; be cost-effective (and preferably inexpensive) and simple enough to become part of the individual community's life-style; be labor-intensive; use local materials; develop local industry as much as possible; and be simple to operate and easy to maintain.

Methods and equipment with these characteristics do not necessarily mean sophisticated or modern versus simple basic technology. Depending on circumstances, there is need for modern and capital-intensive as well as small-scale and labor-intensive technologies. Simplicity and smallness should not be regarded as backward or second-rate but rather as appropriate if the intended purpose calls for them.

To meet the challenge of the 1980s, major efforts will need to be made to identify, develop, choose, apply, and evaluate technologies and to exchange and disseminate information among and within countries, including the development of institutional arrangements and systems to accomplish this end.

### **Manpower Development**

The extensive capital investment of the 1980s must be accompanied by a massive program to train national, regional, and local personnel as well as international employees who are needed to guide and help carry out programs and projects. Personnel must be recruited, trained for specific duties, and given the incentives to remain on the job.

Training is required for the following specific categories of personnel:

(a) Professional workers. These include sanitary and environmental engineers knowledgeable about water and sewerage; civil, chemical, mechanical, and electrical engineers; chemists, biologists, accountants; and above all, managers who can exercise professional leadership in the sector.

(b) Technicians and skilled workers. This category is primarily concerned with all activities related to operation and maintenance of physical facilities, from collection of water samples to checking and reporting on the condition and performance of various types of equipment. It includes plant operators, supervisors, workshop staff, foremen, and technicians in the various specialities required.

(c) Semiskilled and unskilled workers. This category embraces waterworks operators and tradesmen such as masons, carpenters, pipefitters, handpump and drilling equipment operators, and orderlies.

(d) Village water system operators. Villagers will need to be trained to operate, maintain, and manage their own systems. Special training techniques need to be developed.

(e) Health workers. Doctors, nurses, health assistants, inspectors, promoters, and other staff need to be trained in the benefits and implications of water supply, among other health education aspects of sanitation, as part of primary health care activities.

Although no precise statistics exist, an extrapolation of a 1972 PAHO survey shows that 400,000 people will have to be trained in the water and sanitation field by 1990. Obviously, training this number of people is a staggering task, particularly since the deficit is both quantitative and qualitative.

Training efforts of previous years have created a nucleus of technically qualified people. A broader multiplier effect is required, however. This means organizing self-sustaining training systems in each country or group of countries and optimizing the use of existing institutions and technical expertise. Through these national facilities it should also be possible to develop suitable performance-oriented training and job manuals and other instructional materials as well as training courses.

### **Financial Considerations**

Developing water supply and sewerage services implies choices among alternatives—i.e., balances between urban and rural development, qualities of service, levels of funding, pricing policies, water rate structures, and the effects of programs on fiscal revenues. These are largely political choices and so must be made by Governments, but they should be made with full realization of their financial, economic, and social consequences.

Project financing requires careful review of the national funds needed, particularly in relation to how much should be borrowed from external sources and how to insure that adequate funds are available for service operation and maintenance and eventual expansion. The largest portion of project budgets will have to come from domestic sources. Rural water and sanitation installations will probably require special financing policies because in many cases the population to be served will not be able to pay adequately for services. Decisions must be made about whether subsidies, if any, will come from national or local funds or be borrowed abroad. Either way there are pros and cons. If funds are borrowed, systems can be installed immediately and benefits to public health realized in a short time. The alternative is to build fewer systems with the limited resources available and thus keep borrowing to a minimum. In any case, it is well to remember that international finance and technical cooperation agencies act and define policies in response to Member Governments' wishes and expressed priorities. Financial policies could therefore be oriented in consonance with the aims of the Water and Sanitation Decade.

System operation and maintenance financing is critical. If water quality is to be maintained, the cost of operation and maintenance, which is usually a good proportion of what it takes to produce the water, should be recovered through service charges to the users. The importance of a financially sound public utility with adequate staff for operation and maintenance and enough spare parts cannot be overstressed. The full benefits of water and sanitation services can only be realized when they are available full time, because intermittent service and other poor operation and maintenance practices usually result in poorly functioning systems that eventually become inoperable.

Budgets for operating utilities should also take into account the need to finance major repairs and replacements. If an agency responsible for providing water and sanitation services follows sound financial policies, it should be able to make occasional large expenditures from built-up reserves.

Revolving funds have shown themselves useful in extending water and sanitation services. They could be used to improve services, and charges paid by users could be returned to the fund over a period of years. They could also be used to finance projects. An example is in Brazil, where the National Housing Bank supports state water and sanitation authorities which have established "water and sewerage funds" that operate as revolving funds and provide a permanent way of solving problems. Funds paid back to the Bank may not necessarily be used for other water and sanitation projects, but instead may be applied to other sectors in which the Bank is interested. At the state level, however, the mechanism is a revolving fund. There are examples in other countries as well.

Some of the multilateral banks have funds that they make available to less-developed countries on concessionary terms. This makes it possible for countries to repay the loans at very low interest and over long periods. As the water agency repays them, the funds are placed in the countries' reserves for reinvestment in other projects, though not necessarily in the water or sanitation sector. Governments usually repay loans after 10 years and at lower interest rates than they charge to carry out projects and thus can create revolving funds.

Another possibility might be for a Government to allow external credit to be used to establish revolving funds for water sanitation facilities and to permit water agencies to use repayments to establish such funds. Under this arrangement, an agency would take over the obligation of repaying the credit to the external bank when payments become due. The initiative for such an arrangement would have to come from the Government and certainly from the agency concerned with water and sanitation.

One major problem that confronts most revolving funds is the struggle to maintain fiscal soundness in the face of inflation. In Brazil this problem has been dealt with by applying the concept of "monetary correction," which insures constant value currency. Another is foreign currency exchange be-

cause community repayments are in local currency and the revolving fund may have to repay a loan in foreign currency. If a Government cannot arrange the exchange, obtaining the foreign currency needed to buy imported equipment can become a major problem.

In viewing the overall financing situation, it appears that funds from donor countries and lending institutions for building water and sanitation facilities will meet most of the Region's needs. Unfortunately, the availability of funds for important complementary activities is not so certain. Among these activities are feasibility and project identification studies as well as manpower and institutional development that is so important for proper system operation and maintenance.

Some donor countries have made funds available for project identification, and some lending institutions have included funds for institutional and manpower development in their loan agreements, but it can be anticipated that funds from these sources will not satisfy all the Region's needs.

Considering the limitations and constraints discussed earlier, some thought should be given to creating a special water and sanitation development fund for the 1980s to which countries and financial institutions could contribute. Such a fund could be used to assist those countries that most need to define their manpower requirements, develop educational plans and programs, and prepare project proposals for new institutions or to strengthen existing ones; to develop mechanisms to facilitate the preparation of project approval by lending agencies; to convene meetings of lending and donor agencies to establish criteria and guidelines for securing resources; to promote the establishment of responsible institutions technically and administratively; and to take on other activities.

Such a fund could also be used to establish subregional technical staffs to help diagnose and solve operational and maintenance problems and facilitate obtaining spare parts. A current problem is the lack of skilled diagnostic manpower, and it is unlikely that training programs will fully overcome it in the foreseeable future. It is not uncommon for systems to be out of service for months because problems cannot be identified, delays occur in obtaining spare parts, or the parts cannot be obtained for lack of foreign currency. With PAHO assistance, a regional mechanism could be established to alleviate some of the problems of currency exchange and reduce the time required to obtain parts.

### **Primary Health Care**

Few health programs are now integrated. There is generally little or no coordination between community water supply and sanitation programs and other components of primary health care or development efforts in other sectors.

Meeting the goals for the 1980s will require more community participa-

tion in determining needs and how they can be met. Many of the failures of the past can be traced to this lack of community involvement in decision-making, implementation, and evaluation. Lack of intersectoral coordination has also led to inefficient expenditure of valuable resources.

Translating the primary health care concept into action to further the extension of basic water and sanitation services will require overcoming these and other shortcomings, such as better informing people of the benefits to be derived from these services and the training of community-level workers. How this can be accomplished will vary among countries. It is likely that experience in carrying out projects will produce improved methods for guiding program activities in satisfying these basic human needs.

### **PAHO Technical Cooperation Program**

With regard to water supply and sanitation, PAHO is cooperating with Member Governments to further the global strategies for the 1980s by assisting in the rapid assessment of current national programs, the preparation of national plans, and the identification and development of specific projects. In connection with the latter, support has been secured from the Federal Republic of Germany for five countries in most need of assistance. In addition, and within the overall framework of the decade, the PAHO Technical Cooperation Program is oriented to the following specific program activities:

(a) Continuing sector studies and the collection of other pertinent data, as part of the World Bank/WHO Cooperative Program. The highest priority will be given to utilizing this information to assist countries in identifying possible projects for financial support from lending and donor agencies.

(b) Seeking extrabudgetary funds to be used for project identification to supplement funds already provided for this purpose by the World Bank and the Federal Republic of Germany.

(c) Holding training courses for national and PAHO field staff to familiarize them with the cooperative program and the procedures that should be followed in developing project proposals. In 1979 courses will be held in Lima, Peru; Guatemala City, Guatemala; and Buenos Aires, Argentina. Others will be held in the Caribbean area and Brazil.

(d) Improving water quality through the development of low-cost technology, identification and solution of problems, and institutional development, including the establishment of surveillance and correction mechanisms.

(e) Encouraging identification of system operation and maintenance-related projects that might be supported by lending and donor agencies. These will include, among others, projects related to leakage and unaccounted-for water and to demonstration of appropriate technology. Also, lending agencies will be encouraged to continue the inclusion of funds for manpower and institutional development in all loan agreements.

(f) Preparing guidelines, manuals, and models for various components of institutional development to be used in implementing new projects.

(g) Reviewing international drinking water standards to determine if modifications are necessary for possible adoption in countries of the Region of the Americas.

(h) Developing manpower at all levels. Increases in fellowships and traineeships will be encouraged for the preparation of managers and to develop in-service training delivery systems to improve the skills of operators and other intermediate-level personnel.

(i) Exchanging information with emphasis on assisting countries in establishing their own systems as part of a network of collaborating institutions.

(j) Extending primary health services to the underserved populations of the Region, including water supply and sanitation services.

An important related activity will be the basic water and sanitation project in Peru to be financed by that country's Government and the Inter-American Development Bank and coordinated by the Pan American Center for Sanitary Engineering and Environmental Sciences in Lima. This program will focus on research, training, and the development of training materials directed to improved system operation and maintenance. To minimize duplication, these activities will be coordinated with those ongoing in the countries and by international organizations.

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## POTABLE WATER SUPPLY AND EXCRETA DISPOSAL SERVICES DURING THE 1980s

Abel Wolman<sup>1</sup>

The United Nations Conference on Human Settlements at Vancouver, Canada, in June 1976, emphasized two significant realities of long standing in a large part of the world. It concluded among other things that:

In the less-developed countries, nearly two thirds of the population do not have reasonable access to safe and ample water supply, and even a greater proportion lacks the means for hygienic human waste disposal.

Safe water supply and hygienic waste disposal should receive priority with a view to achieving measurable qualitative and quantitative targets serving all the population by a certain date; targets should be established by all nations and should be considered by the forthcoming United Nations Conference on Water (1).

The Conference also urged the adoption of water programs for urban and rural areas, with realistic standards for quality and quantity, to be implemented by 1990, "if possible."

These laudable objectives were unanimously approved at the United Nations Water Conference at Mar del Plata, Argentina, in March 1977, in the following terms:

*Realizing* that the accelerated development and orderly administration of water resources constitute a key factor in efforts to improve the economic and social conditions of mankind, especially in the developing countries, and that it will not be possible to ensure a quality of life and promote human dignity and happiness unless specific and concerted action is taken to find solutions and to apply them at the national, regional, and international levels,

1. *Urges* strongly that the recommendations of this Conference be effectively implemented in good faith by all States;
2. *Decides* that these recommendations be known as the Mar del Plata Action Plan (2).

If any additional official mandate were needed to move forward in providing water supply and sanitation services, it was vividly apparent in the deliberations at the International Conference on Primary Health Care, held at Alma-Ata, USSR, in September 1978, which was jointly sponsored by the World Health Organization and the United Nations Children's Fund.

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More than 500 delegates from 140 nations confronted the glaring disparities in access to health care in different parts of the world. Of great importance was the fact that 70 ministers of health were joined by 50 ministers of planning, finance, education, and agriculture at the Conference.

The Conference recognized and emphasized that water supply and sanitation services must be provided for hundreds of millions of people without them. It could not be otherwise because, according to WHO, 80 per cent of all sickness and disease in the Third World are attributable to contaminated water. The contributions that water supply, sanitary disposal of excreta and other wastes, food sanitation, and personal hygiene can make to primary health care are undeniable. Among the long-term goals on which it agreed, the Conference therefore gave adequate supplies of safe water and basic sanitation high priority.

In essence, these are the goals the Ministers of Health of the Americas have set themselves. Achieving them places an extraordinary responsibility on public and private leaders in the 32 countries of the Region. Providing water supplies and basic sanitation has historically been more successful in urban areas than in widely disparate periurban and rural areas, where major challenges to ingenuity and innovation now lie. That village problems can be easily solved is a misconception that has often led to unexpected program failures and permanent frustration in the use of the services. Over-generalization about how to solve technical and administrative problems in both urban and rural areas is likely to lead to failure. The uniqueness of each local situation within the tremendous variety of each country or region places an extraordinary responsibility on every worker engaged in this task.

Definitions of "urban" and "rural" differ greatly throughout the world, and one is sedulously tempted to generalize the approaches for reaching the objectives. In too many instances these efforts are doomed to fail. Human communities range from thousands of people in towns through discrete, scattered farm houses to nomads who stay put only for weeks or months at a time.

Similar variations in culture and religion frequently influence people's attitudes toward the introduction of sanitary devices and ideas.

An awareness of the variation in man's way of life, the availability of natural and human resources, of local wealth, and of organization is a prerequisite to fulfilling the grand goals. It should not intimidate those seeking an overall strategy, but simply remind them that the task is large and that complete success in the next decade is improbable. Notwithstanding, increasing the actual number of people served in the next 10 years is practicable and essential. It must be understood, though, that the program goal is not just building water and sanitation systems, but building them so that they can be operated and maintained permanently. Assuring sustained operation requires close collaboration between national or regional professionals and adequately trained community workers.

The search for justification of such sanitation investment is unending. The World Bank's statement on the matter is worth repeating here, since the issues raised in the competition for limited local resources in every country cannot be ignored. It is predictable that problems in setting priorities will emerge and must be confronted in every country. The World Bank's view is a balanced one:

Ideally, decisions to invest in village water supply should be based on cost/benefit analyses in which both costs and benefits are quantified. However, despite considerable research, no satisfactory method has yet been developed for quantifying all the benefits of improved water supply. Nevertheless, experts in the field, particularly WHO, have little doubt that safe water is essential for good health, and is a prerequisite to the control of those diseases most common to the rural areas of developing countries.

In urban areas, good water supply is essential to the existence of a city and to protect public health. There is usually no alternative to a public water system. Projects in urban areas can normally be supported by consumers' willingness to pay for the service provided. In rural areas, the justification becomes far more tenuous: The threat of epidemic due to waterborne diseases lessens as population density decreases, but the number of diseases is greater. Alternative sources frequently exist but are polluted, inconvenient, or unreliable. Willingness to pay declines, due to poverty or to a lack of appreciation of the benefits of improved supply. Direct benefits which are readily quantifiable—for example, the development of agro-industries, fish freezing, and the like, which had been inhibited by the lack of safe water—may accrue in some cases but are unlikely to be sufficient, on their own, to justify the investment.

In most cases, therefore, it is impossible to present a rigorously economic justification for village water projects. Instead, the justification must rest on a qualitative assessment of the benefits anticipated from the investment. The most important direct benefits from improving the quality and quantity of water available are better public health, greater convenience, and some fire protection. The first two of these may also increase productivity. The indirect benefits commonly cited are a slowing down of rural-urban migration; redistribution of real income in favor of the rural poor; a better standard of living; and the development of village institutions.

Numerous epidemiologic studies have clearly identified contaminated water as the principal agent in transmitting typhoid, cholera, and shigellosis (bacillary dysentery). Lack of safe water for drinking and washing is also an important factor in the spread of other diarrheal diseases, the most common cause of death in infants in the developing world. A number of additional diseases, especially the debilitating parasitic diseases, are linked to inadequate and contaminated water supply and poor sanitary conditions . . . . It is nevertheless difficult to predict exactly to what extent an improved water supply will reduce the number of diseases or their incidence, partly because alternative vectors exist and partly because some of the diseases are epidemic in nature and may be temporarily absent in project areas.

The effect of water on health will depend on many factors, especially the prevalence of various diseases, and the extent to which villages use the water. To break the chain of transmission of certain diseases, improved excreta disposal methods must be provided together with improved water supply; the combination of these two measures will frequently be found to be the most effective means of control.

Public health education will almost always be necessary to achieve full health benefits.

Provision of a safe and convenient water supply should help raise productivity as health improves and as less time and effort are spent on fetching water. In addition, the new water supply could help directly such agro-industrial activities as fruit and vegetable processing or fish freezing. But whether potential benefits to productivity are realized or not depends on individual cases. In some villages, the ill health of the labor force seriously affects agricultural development, whereas in others there is underemployment, and benefits may not be realized unless the water supply project forms part of an integrated rural development or similar project providing increased employment opportunities.

It is often argued that better rural water supply should reduce migration to urban areas, relieving their severe housing and other social problems. Even if a slowing of migration were desirable, there is little evidence that better water supply affects the rate of migration. It is possible that improved rural health and lower infant mortality could actually increase migration, unless efforts to secure these benefits are coupled with rural development to encourage people to remain in their villages.

Rural water projects, which usually require subsidies from central government revenues or possibly from more prosperous urban consumers, often lead to income redistribution. Care must be taken that richer farmers do not benefit at the expense of the urban poor.

Although no supporting data are available, it seems likely that community involvement in the construction, operation, and funding of a water system would strengthen village institutions, and help villagers in dealing with other development decisions (3).

### **The Situation in Latin America and the Caribbean**

The Governments of the Americas have recognized the importance of extending sanitary services. They established regional goals for the 1960s in the Charter of Punta del Este, signed in Uruguay in August 1961. When the Ministers of Health drew up the Ten-Year Health Plan for the Americas (1971-1980) at their III Special Meeting at Santiago, Chile, in October 1972, they reviewed the situation and recommended goals for the 1970s. They further strengthened their recommendations at their IV Special Meeting at Washington, D.C., in 1977, when the concept of primary health care was elaborated and emphasized. Since sanitary facilities and their acceptance were strongly incorporated in this endeavor, the ground was prepared for undertaking the water supply and sanitation program of the 1980s.

Primary health care was defined as a strategy for extending health services coverage. It entails a combination of activities designed to satisfy basic community needs. To accomplish this, it is necessary to bring together, at the community's level and in accordance with its socioeconomic and cultural characteristics, those elements required to produce a significant impact on the health, well-being, and economy of its members.

This basic strategy for developing primary health care is equally applicable to the provision of sanitary services and has been used in this

context in several countries. The emphasis is on community participation and on intersectoral action. The Directing Council of PAHO has already recognized that satisfying a population's basic needs requires concerted action by all development sectors and that health programs must advance hand in hand with other community development programs. This agreed principle is, in fact, a charter for the water and sanitation effort for the coming decade.

What is the situation confronting Latin America, where more than a third of a billion people live? The average birth rate of 36 per 1,000 population is high; the average death rate of 9 is low. By the year 2000 the area's population may double, reaching over 600 million people.

Of special interest is the infant mortality rate of 84 per 1,000 live births and the life expectancy at birth of 62 years. Sixty-one per cent of the population is urban, while the per capita gross national product is US \$1,100.

The bare statistics are formidable in themselves, yet they conceal tremendous differences between the countries in the Region. Birth rates vary from a low of 19 to a high of 47, infant mortality ranges from 20 to 157, death rates from 5 to 18, and life expectancies from 48 to 72, for example. These differences point up the complexities of strategy formulation and the need to avoid faulty generalized solutions of limited applicability.

Similarly wide disparities exist between and within countries in proportions of urbanized population, which vary from 15 to 83 per cent. Equally wide ranges—from \$200 to \$3,310—appear in per capita gross national products. Access to safe water shows similarly great differences. The limited listing of any appropriate criteria makes abundantly clear that strategy will actually need to be site-specific.

The challenge now before us is mainly to provide rural and periurban water supply and excreta removal. Although urban facilities are all too often poorly maintained and operated, their problems are highly visible and Governments can correct them if they wish. In addition, money and skills are usually more available and obvious in urban than in rural areas. To rectify rural deficiencies, detailed knowledge of local conditions is a prime requisite. No escape is possible from myriads of microscale construction projects and the equally difficult tasks of operation and maintenance. These in turn will require a new look at stimulating local motivation and innovation, manpower availability, institutional structure, and local resources in money and equivalent labor services.

Underlying these efforts, it is generally agreed that the term "rural water supply" needs to be broken down for a better understanding of its implications, since in different countries it may apply to one or more of the following groups: (1) dispersed populations best served by individual water sources; (2) small villages with distribution through public fountains; or (3) villages with concentrated populations in which water is distributed through public fountains or household connections.

This and many similar classifications emphasize the important differences in density or "geometry" of living and the factors determining the design, construction, operation, and maintenance of facilities.

The prospect for future action in the Americas seems almost intimidating, but the record of past accomplishments should guarantee future success, even though under increasingly difficult rural circumstances. Among the so-called developing regions of the world, the Americas surpass all others in their record of providing sanitary facilities.

The population served with water rose from 66 million in 1960 to 196 million in 1976. During that period, \$6 billion was invested in water and sewerage. It is significant that 70 per cent came from national and local funds and 30 per cent from outside sources. The Inter-American Development Bank invested over \$1 billion in loans, and during 1977 alone it processed 10 loans for more than \$200 million. The World Bank has similarly made loans aggregating hundreds of millions of dollars.

These amounts appear astronomical to some who are unfamiliar with these fiscal processes. They are illustrative of the saying that "where there is a will there is a way." If the past is prologue to the future, what are the principles and methods that must guide us during the next decade of sanitation progress?

### **Motivation and Commitment**

Before one undertakes to provide facilities for great numbers of people in urban, urban-fringe, and rural areas, it is axiomatic that a political will to do so must actually exist. Such motivation, at all levels of Government and within the communities themselves, must be stimulated and accepted in order to materialize. A commitment presupposes understanding, evaluation of health, economic, and social benefits, and a personal and community assumption of responsibility. These essential ingredients are easy to list but most difficult to develop and use.

If and when such purposeful goals in sanitation are accepted, the necessary ingredients for carrying projects out are adequate human, technical, institutional, and financial resources. Determination of local needs is the basis for planning these resources, and it may be assumed that each country is sufficiently aware of its needs to move forward without spending years evaluating them. So much must be done in such a short time that one need not search for perfect data from which to develop grand plans.

The cost-benefit features of water supply and sanitation services have been the subject of endless debate. Advocates of such services have subconsciously assumed that easily available safe water for drinking and washing pays dividends in disease prevention, reduction in lost labor, improved work efficiency, savings in hospitalization costs, more tourism, and general promotion of rural development. Sick people are no asset to

economic or social development, and the death of children are more than a cause for sorrow: their loss ages a community and destroys its future vitality.

Our pressing concern is how motivation and commitment can be upgraded and created. Too often, only national or regional officials try to do so. Important as this is, it marks only a beginning. Even at these top levels, the participation of ministries other than health is a major but neglected requirement. Continuing and frequent dialogue between ministries jointly responsible for local development activities is essential for real progress. It should be common for public works, planning, and finance ministries to be partners in the program envisioned for the 1980s. Without them, national and regional commitment is unlikely to occur.

The most important participants by far are local residents. The hundreds of millions of rural residents require most attention. Some have described the problem as one of "rural development," while others more accurately choose to call it "rural reconstruction." Whichever term is used, the issue remains how the peasant farmer, artisan, or mother can be made conscious of the need for sanitary facilities. What prompts him or her to want, demand, and maintain previously unavailable facilities?

Merely providing facilities does not mean using or maintaining them. Failures are known, even if overdramatized. Successes are less publicized, but equally pregnant with guiding lessons. A few examples are summarized in Appendices I, II, and III as well as IV, a selected bibliography. They merit detailed examination and use by the ministers and their staffs because they provide valuable lessons and choices as to the best courses of action in different countries.

The use of mass education in the move toward our objective is not new. The examples noted herein represent historical approaches initiated in some areas as far back as the 1920s. The techniques of mass education are difficult. Rarely does it come about only through the intent, fiat, or commitment of senior governmental leaders. Its seed is there, but its development is local and rooted in the community.

The early decision of some countries to leave the "ivory tower" and address the problems of the thousands of villages at their level was one made jointly by public, private, and academic professionals. Their mode of action is in principle appropriate to the problems of the Americas.

Sufficient experience has now been accumulated, in the world at large and in the Americas in particular, to warrant listing some general guiding principles. These are paraphrased from recent relevant remarks by Y.C. James Yen, founder of the International Institute of Rural Reconstruction:

(a) Integration of sanitary facilities into positive rural reconstruction requires not only the existence of an overall plan but actual living and working with the people themselves. An illiterate or a sick farmer is a poor producer. The combined correction of both deficiencies brings major dividends.

(b) Poverty in money is not the most serious constraint. An overriding one is finding the right people to work in the villages. One of the long-term, and successful, workers in this field, speaks of the 4 C's—competence, creativity, commitment, and character.

(c) Indigenous leadership is a first requirement. Its importance may be illustrated in the experimental undertakings in Colombia and Guatemala. Both of these may well be training grounds for representatives from other countries. Often the general local structure combines civic leaders, professionals in relevant major disciplines, and educated youths as village-level rural reconstruction workers.

(d) Lessons from failures and successes:

i) Go to the people. The big gap between the educated few at the top and the uneducated millions at the bottom.

ii) Live among the people. "You can't blow in and blow out," like a tourist.

iii) Learn from the people.

iv) Plan with the people—not a dictatorship, but a partnership.

v) Start with what they know, not with what we know. "Peasants may be illiterate, but they are intelligent and practical."

vi) Build on what they have. Many projects have failed because they have lacked roots. They collapse when outside aid is withdrawn.

vii) Not relief but release. Relief in times of disaster is necessary. As a permanent policy it is unjustifiable. Opportunity is lacking to use peoples' potential mental power, productive power, physical power, and organizing power (4).

These seemingly simplistic principles conceal great verities as well as complexities. Acceptable as they are, they inevitably lead to several basic requirements delineated in greater detail below.

## **Management**

Few services are likely to be provided in consonance with economic development unless the will to do so is strong and some kind of institutional structure is created at all levels of society. Continuity of purpose, execution, operation, and financing requires a conscious managerial entity. Without it, local installations will fail.

Most Governments of developing countries and technical cooperation agencies are now aware of the great importance of such structure. The argument for it is well put in a recent statement on the subject by Raymond B. Isely and Jean F. Martin, of the University of North Carolina:

The successes and failures of community development schemes over the past few decades have highlighted the fact that lasting results can only be achieved with the active participation of the community itself. In the health sector as in other sectors, working "on" or "for" people is bound to be less fruitful than working with informed, active participants in the development process. In south-central Cameroon, the participative approach was successfully used to organize village health committees. The accomplishments of the committees—latrine construction,

water source protection, and similar projects—were gratifying in themselves. But equally gratifying was the catalytic effect that community organization seemed to have on other aspects of rural life. The village health committee can serve as a springboard for rural development (5).

Similar experiences have occurred throughout the Americas.

To avoid the pitfalls of earlier community development schemes, organizers are now turning to a combination of good psychology, convincing management techniques, and political skills. Examples of success are now available in objective measurements of the numbers of latrines constructed and used, water sources built and protected, and improved personal hygiene.

The prevalence of village health and other local improvement committees makes it possible not only to increase the acceptance of sanitary facilities, but also to encourage applied health services research, promote good nutritional practices, undertake epidemiologic studies of diarrheal diseases, and provide oral rehydration salts. Institutional structure, often hitherto non-existent, provides machinery for essential local activity while simultaneously linking services with the rest of the community's interests and life. Integration promises more rapid expansion of health services and other facilities in the future.

Planning and motivation, even if available at the national level, do not guarantee that projects will be carried out in the village. The two levels are not synonymous, and in some countries might in fact contradict and be remote from each other. Local preferences need to be identified to determine if they agree with national policy or deviate from it so much that other goals must be sought in the village. It is not always true that people at the top understand the desires and actions of people who are psychologically and geographically removed from them. A national "umbrella" policy is primarily a statement of guiding principles and should be sufficiently flexible to permit sharp deviations at the local level. Local autonomy is valuable in the fields of water supply and sanitation and needs to be reviewed, strengthened, and used.

When such local participation is assured, it will undoubtedly prevent the construction of oversophisticated systems. Past deficiencies, such as lack of expensive spare parts, unavailability of trained manpower, major water losses through leakage, and generally poor overall maintenance and operation, should certainly decrease and perhaps gradually be eliminated. When people realize not only their responsibility but the financial disadvantages resulting from such deficiencies, the number of successes should by far exceed the number of failures.

## **Training**

Training in sanitary engineering and sanitary inspection in the Americas was once adequately sponsored by the countries themselves and by external



aid agencies, and manpower requirements were generally met. Recently such training has not kept pace with the need for it. Although much has been done, especially through continuing education and postgraduate programs, mainly for professional staff, the present number of professional, intermediate, and village personnel is inadequate in most countries. Traineeships and fellowships have been seriously curtailed on the assumption that sufficient effective leaders and workers can be produced locally.

Rejuvenation and expansion of training is a prime requirement. For the most part, this task must be quickly and aggressively pursued. It should be carried out within many of the countries and on occasion at regional centers. Educational resources outside the Caribbean and Latin America may be used to train a few potential leaders.

Even if large sums of money are available from many sources, important as that is, it will not assure success of the programs. Personnel must be recruited, trained for their specific duties, and retained in the program once trained. To accomplish this, Governments must be able to compete for such staff through salaries, job stability, and opportunities for advancement—all unfortunately too often missing in many countries. Yet the experience of the 1940s and 1950s in the Americas shows how these personnel objectives can be attained. The cooperative services of those decades, using their own wage scales and administrative procedures, produced dozens of professionals who are now heads of water and sanitation authorities and consulting firms, leaders in universities, ministers of health and public works, and in one country an assistant to the president. The methods of that era must be recaptured in some countries and newly created in others.

Training unskilled and relatively uneducated people to supervise water and sanitary facilities in rural communities requires special attention. Such individuals are the key to adequate local participation. They have proved to be an invaluable resource in translating purpose into intelligible understanding, acceptance, and use by rural people. The capacities of such vast groups have been insufficiently tapped. The task of the village worker is not only to release these energies for the functions here discussed, but to be responsible for operating and maintaining the system, even if it consists of only one or two hand pumps.

Such training will be difficult and time-consuming. The sooner it is undertaken, the more likely it will be to provide skills essential for present local goal accomplishment.

Educating members of the health team, particularly field workers, to better understand the relationships between health and water supply, excreta disposal, food sanitation, and personal hygiene, as part of the primary health care effort, would go a long way to improve the health of the people. Such training should clarify the role and benefits of primary health care. Methods and procedures need to be developed and applied to communicate this knowledge to local leaders and the general public.

## **Appropriate Technology**

Careful thought must be given to low-cost sanitation technology options. The much used phrase "appropriate technology" should not imply that the sophisticated technology of developed countries is never to be used. It does emphasize that the technology of systems used in developing countries should suit the size, nature, culture, history, and capacity of local people, whether they are rural, fringe, or urban. The choices cover a wide spectrum of methods, materials, systems, and operations. As has so frequently been stressed, generalized formulas or package systems are ill-adapted to disparate conditions.

Barbara Ward recently distilled the essence of these dilemmas in her foreword to a volume prepared for the Canadian International Development Research Center and the World Bank. She said:

So, do we face a painful dilemma—the desperate need for "clean water," the impossibility of getting a needed base for it in sanitation? Happily, there exists a wide range of effective alternatives between the unhygienic pit privy and the Western waterborne sewerage system. These systems are generally far cheaper. Most of them do not demand a heavy use of water. And many make creative use of the nutrients in human waste to fertilize fields and fish ponds or to contribute to biogas production—and can do this without serious risk of returning pathogens to human food or drinking water (6).

Accepting the oversimplifications in this statement, its point is that one should seek out and apply that technology most applicable to the segment of society for which it is provided. The alternatives now being pressed are often those already in use in many developing countries and once widely used in every industrially developed country at the turn of the 20th century. In the latter, such rudimentary facilities were naturally superseded by more complex methods and equipment as growth occurred, money became more available, and facilities grew more hazardous and obsolete. It is important to leave options open for such evolution in the future so that people may gradually move from primitive to advanced systems as their standard of living rises.

The institutional machinery for meeting the commitments of the 1980s should be responsible for distributing pertinent technical information, providing training activities, and arranging the exchange of experienced individuals among countries. These practices are already common and need not be relearned. What is required is that all of the devices and measures available for the program be most widely distributed as early as possible.

There are ample precedents for the actions outlined here in the Region itself and, strangely enough, they existed a century ago in developed countries. Their revival provides a degree of novelty for the present generation. It lends assurance for its validity by a long history of village autonomy,

responsibility, and accomplishment. Its rediscovery is important in order to correct the neglect of the past.

Broad extension services will have to be created as the base of the management structure, and even in small countries these will run into the hundreds. The personnel providing such advisory services represent the rich resources necessary to help local citizens develop their own methods and procedures that elsewhere were demonstrably successful many years ago.

## **Finance**

Those countries that have made the most progress in supplying their people with sanitary facilities have had several characteristics in common. Each had budgeted increasing amounts of money and had firm policies of generating funds from many sources. Each also had cadres of trained and experienced personnel. And perhaps most important of all, water and sanitation activities occurred within a framework of a clearly defined national policy. Financial policies and strategies were an essential part of their accomplishments.

The targets proposed for the decade ahead in Latin America and the Caribbean will require large amounts of capital investment. Per capita construction costs vary widely from country to country and even within countries and from one solution to another. WHO estimated in 1977 that in urban areas a house water connection cost about \$121, a public standpost \$48, sewerage service \$112, and a household system \$35. In rural areas, water supply cost \$26 and latrines \$5 per capita. Regardless of whose estimate is accepted, in the aggregate more than \$10 billion will be needed for urban and \$2.5 billion for rural water facilities in the 1980s.

Excreta disposal will require similarly large expenditures, ranging from \$6 billion in urban projects to simpler installations in rural areas costing as much as \$700 million. The total will approach \$6.7 billion.

The probability of meeting the goals set differs greatly from country to country. In some, a continuation of existing progress will probably be sufficient. Elsewhere, expenditures will have to be greatly multiplied and more time may be needed to fulfill the goals. Efforts under these circumstances should not be reduced. Instead, one should seek ways to ease the financial burden on poorer people. Those countries more economically fortunate have many sources of money.

The major problems in rural water supply programs are those of financing, securing suitable personnel, and developing adequate institutions. Of these obstacles, financing—intimidating as the figures are—is not an impossible constraint. Money, of course, will be required, but many sources can provide it. Failures to seek them out and levy reasonable and adequate charges on water users account for past difficulties and slow installation.

It will be essential to develop suitable financial policies and effective ways of collecting charges. Resistance to such procedures is to be expected since the concept of free water is old and defended, but acceptable local repayment policies can be adopted once they are understood.

Realistic programs must be defined now for the decade 1981-1990. Many projects contemplated in that period will take as long as five years to consummate. Shortening that interval is both desirable and essential, but it will take strenuous activity to accomplish.

An examination of possible sources of money is necessary. Among these are funds from local, provincial or state, and national Governments, foreign governments, international lending agencies, and private organizations. Historically, policies have been developed by lending banks which limit their loans to no more than 50 per cent of total project costs. Their emphasis is on insuring that local fiscal participation is significant. Arranging financial support is ordinarily preceded by an engineering and feasibility analysis of a project and the development of a carefully documented financing plan. In seeking necessary funds, subsidies will be inevitable in some instances, particularly in rural areas. They may range from zero to as much as 50 per cent where local poverty is great. Care should be taken not to make subsidies a universal policy because repayment capital, operation, and maintenance costs guarantee permanent local interest and responsibility.

It is obvious that "softer" loans must be sought for rural and less-privileged areas. Fortunately, both the Inter-American Development and World Banks have recognized this and for some years have lent money at low-interest rates, under repayment periods spanning several decades and delayed during the first five years.

Some countries have also developed procedures for identifying and preparing desirable projects. These have been carried out through national financing of a revolving fund nature and matched by local and international sources of money. With large amounts of money potentially available, it has been possible to require properly defined tariff structures to guarantee sufficient revenue to repay loans, operate and maintain systems, and even to provide for depreciation and replacement of obsolete facilities.

Such orderly machinery for meeting goals is not universally available, but elements of it are adaptable to less economically favored countries. They too may begin activities that have been eminently successful in neighboring countries.

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## Appendix I

### BRAZIL'S NEW NATIONAL SANITATION PLAN<sup>1</sup>

By the mid-1960s, Brazil's leaders, cognizant of the ever-quickenning growth of their urban population, began reorienting and strengthening the country's water supply and sanitation sector. In the rural areas, components of the Ministry of Health—especially the Specialized Public Health Service Foundation—had been responsible for rural water supply and sanitation program development and implementation, a responsibility it retained. The Foundation's contribution in this field since the early 1940s has been significant, especially in the less-developed states.

To come to grips with the urban problem, the National Sanitary Works Department and the U.S. Agency for International Development signed an agreement on 26 April 1965 creating the National Revolving Fund for Water Supply Financing. To administer the fund, the Brazilian Government established the Executive Financing Group, which developed operating policies and mechanisms and invested Cr\$220 million (US\$50 million) from 1965 to 1967 in water supply systems for 16 cities. Even with this increased spending, however, only 22.8 million people (roughly half the urban population) benefited from water supply services and fewer than three-tenths from sewerage.

In 1967, the Executive Financing Group's responsibilities were transferred to the newly created National Sanitation Fund, responsibility for whose operation was assigned to the National Housing Bank. The Fund's financial resources proved inadequate to take care of the sector's needs, however, and so in 1968 the Government created the Sanitation Financing System. The Bank was designated its central organ, with responsibility for regulating and stimulating its activities.

The policy of the Sanitation Financing System was to establish and develop state revolving funds (*fundos de agua e esgôto*) from state and National Housing Bank resources to finance programs carried out by state sanitation companies. Under the new policy, 238 cities in 15 states benefited from water supply systems and Cr\$2.2 billion was invested between 1968 and 1971.

On the basis of its experience and additional studies, the Sanitation Financing System undertook an examination in 1971 of the main variables affecting the development of the country's basic sanitation services. The resulting operational improvements paved the way for the National Sanitation Plan (PLANASA), whose broad objective was to provide basic sanitation services to the people of Brazil.

An agreement between the Ministries of Interior and Health in 1973 established a basis for joint activities. The Ministry of Interior became responsible for promoting and developing PLANASA's activities, while the Ministry of Health established and enforced water quality standards and provided health education, training, and

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<sup>1</sup> This document has been prepared by PAHO on the basis of published information. Its sole purpose is to illustrate the salient and positive features of the program.

technical assistance. In the same year, Brazil and the Pan American Health Organization signed an agreement under which the latter was to provide technical cooperation to the state companies.

To eliminate some of the obstacles to rapid water supply development, PLANASA not only provided financing but also helped develop state companies' infrastructures and in general streamline the logistic support they required. This included technical assistance in institutional development, training, and the production of building materials.

In 1975, the Social Development Council of Brazil, composed of the Secretary of Planning and the Ministers of Education and Culture, Labor, Health, Social Welfare, and Interior evaluated PLANASA's progress from 1971 through 1974. It concluded that water supply development in large and medium-sized cities was satisfactory, but that both water supply and sewerage services in smaller communities needed to be improved.

The Council recognized that accelerated urban development was causing serious health and social problems and affecting the country's quality of life. It therefore recommended to Brazil's President that he approve a proposal for a revised National Sanitation Plan (PLANASA II), which he did on 16 April 1975.

PLANASA II's goals were more ambitious than those of its predecessor in that they were quantified and extended to smaller communities. They included providing potable water for more than 80 per cent of the total urban population in at least four-fifths of Brazilian communities and all metropolitan areas; adequate sewerage to metropolitan areas, state capitals, and larger cities; and simple sewerage services to smaller cities and communities to the greatest extent possible. The target date for all these activities was 1980.

The final step in the consolidation of PLANASA II was taken in 1978 following the justification presented by the Chief of Planning of the Presidency of the Republic and the Ministers of Finance and Interior. The pertinent Federal Law and Decree were formalized on 11 May and 6 November 1978, respectively.

PLANASA has made major progress since its creation in 1971. In December 1970, 28.7 million people (53 per cent of the urban population) received water through house connections (1); by 1977, 49.4 million urban residents (75 per cent of total) were receiving water in their homes, and 46 per cent of the rural population had house connections or easy access to water (2). In 1973, fewer than 600 of the country's 3,954 municipality seats were included in PLANASA; by 1975 the number had jumped to 1,000; and by early 1978 it had reached 2,000. Only 34 per cent of the urban areas had sewerage by 1977, however.

PLANASA II's efforts are now aimed largely at smaller communities since 85.1 per cent of the country's 7,857 communities have less than 5,000 inhabitants.

PLANASA II's basic concept remains the same as when it was created: each state has only one basic sanitation authority linked to the PLANASA system. State authorities are responsible for preparing overall plans for building, operating, and maintaining water supply and sewerage systems and for fixing water rates according to criteria established by the Federal Government.

The new goals emphasize that state governments give state water supply and sanitation authorities adequate technical, organizational, administrative, and financial resources. PLANASA's basic finance mechanism has remained essen-

tially the same over the years, but its interest rate has been reduced from the range of 4-8 per cent to 2-7 per cent. The lower rates are applicable in the less-developed states.

PLANASA's strategy for attacking Brazil's water supply and sanitation problems includes simplifying engineering designs and construction methods and processes, and standardizing equipment, accessories, and treatment units to lower capital and operating costs without adversely affecting water quality. Since it is expected that services in small communities may not pay for themselves, realistic water rates are established throughout each state to offset deficits and insure system financial self-sufficiency. In other words, overall costs are balanced by charging larger consumers higher rates and the poor lower rates. To insure the whole system's viability, provision is also made for federal or state assistance in making up such deficits through loans or other mechanisms if necessary.

Health education is to be introduced in the communities to make them conscious of the benefits of water and to get them involved in helping build and maintain water and sanitation services. The provision of water supply can proceed even with little local participation, however.

The legislation underlying PLANASA II's policy includes new water quality criteria to be drawn up by the Ministries of Health and Interior, water and sewerage rates, financing for water supply and sewerage construction, and coordination and control mechanisms.

The Plan's success will depend to a large extent on getting the population to make maximum use of the services provided. The Minas Gerais plan includes provision of water supply services to most of the state's large and small communities to take advantage of economies of scale, especially in operation and maintenance. Groups of communities around a focal city will operate as a subsystem within the statewide system, and smaller outlying communities will be satellites. Models for administering and maintaining the overall system to derive the greatest benefits are being developed.

Efforts in São Paulo State have been directed toward the gradual incorporation of small communities in the state water authority; 123 were included between October 1977 and December 1978, and most now have new water supply systems. All systems were expected to be in operation by early 1979. The state's planners hold that less costly but still workable solutions must be adopted to solve the problems of small communities. On this premise, standardized engineering designs have been developed and are being applied in most such communities. It was determined that except for identifying and developing water sources, about 95 per cent of the systems can be equipped with standard units. This has resulted in simpler systems, more rapid construction, and lower installation and operation costs.

The water and sanitation authority of São Paulo State has created a specific unit to deal with small communities. It has engineering design and project preparation, construction, and administrative support groups that work in unison to accelerate system construction and operation.

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## Appendix II

### WATER SUPPLY AND SANITATION PROGRAMS IN COLOMBIA: COMMUNITY PARTICIPATION<sup>1</sup>

The objectives of the Colombian Government's Social, Economic, and Regional Development Plan for 1975-1978 included the provision and maintenance of adequate water supply and sewerage services throughout the country. Rural water supply and sewerage activities fall under the National Rural Basic Sanitation Program and include construction of small water supply and sanitation facilities, sanitary units for schools, and latrines.

Colombia's Ministry of Health has two water supply and sanitation agencies. The National Institute for Municipal Development operates in towns and cities of more than 2,500 population, and the National Institute of Health operates in rural communities with populations of between 50 and 2,500. The health services of various departments and private groups also operate in rural areas, and 24 municipal agencies are responsible for water supply and sewerage in the major cities.

The Basic Sanitation Program began modestly in 1963 but gained considerable momentum after a survey of environmental sanitation in the country's rural areas was made in 1968 with the cooperation of the Pan American Health Organization and the Colombian National Institute of Health, which became its executive agency.

The survey, which included population studies, water source identification, and evaluation of existing water supply, excreta disposal, and other sanitation programs and institutions, was the basis for the Program's current activities.

The methodology used by the Sanitation Program comprises five consecutive stages, in each of which there is distinctive community participation. They are: (1) determination of a community's economic, social, cultural, and health characteristics (problems, resources, attitudes, sources, and means of water supply, capacity to pay, and the like); (2) project preparation, including engineering plans, cost estimates, and materials; (3) motivation, promotion, and organization of the community to participate actively in the construction; (4) construction; and, (5) administration and supervision. In the last stage, the operation and management of the service are transferred to a management board of elected community representatives. The Program continues to give the board guidance and advice on the operation and management of its service. The board has the benefit of the continued advice of the promoter who also serves as liaison with the Program's organization in obtaining assistance for repairs, expansions, or other needs.

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<sup>1</sup>This document has been prepared by PAHO on the basis of published information. Its sole purpose is to illustrate the salient and positive features of the program.

A key element in the Program is a well-trained promoter with knowledge and understanding of community organization and cooperation and the technical and financial aspects of rural water supply construction and operation.

Community participation represents about 20 per cent of the total construction costs in labor, local materials, and cash. Based on an assessment of its financial capacity, the community further assumes a loan for up to 40 per cent of the project's costs. Loans are for 10 to 15 years at 6 per cent annual interest. Each family pays a monthly charge which helps to pay off the loan and cover operational charges. The National Institute of Health contributes the remaining 40 per cent of the construction costs. A special characteristic of the Program is the payment of house connection costs in labor or local materials.

The Program's level of activity is illustrated by the following figures. In December 1976 the country had 7,808 communities with populations of between 50 and 2,500, of which 3,509 (45 per cent of the total) had water supplies. Although its budget was limited in 1976, the National Institute of Health completed 215 water supply systems.

Community participation is not limited to rural areas. In Bogotá, for example, mechanisms have been developed to provide services to marginal populations. The first stage is the provision of public fountains for water and latrines for excreta disposal. As a community's organization improves over the next year or two, it requests house connection services. The Bogotá Water and Sewerage Authority draws up an annual program including construction of the water supply system and cooperates with the community in providing house connections. In most cases, the Authority provides funds and recovers them through service charges in about 30 months. Once water is provided, the community requests sewerage service through the same mechanisms. Because of its limited resources, the Authority usually cannot meet all the demands. Those most in need and better organized groups finance their water systems through communal action by providing materials, labor, or money. As neighborhoods advance economically, they usually undertake other works, such as street-paving and storm sewer construction.

The progress made in recent years is seen in the coverage reported in November 1977, when 64 per cent of the total population had water. In the urban areas, 78 per cent had house connections and 9 per cent had public fountains, while 65 per cent had sewerage. In the rural areas, 33 per cent were reported to have water supplies.

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### Appendix III

## EVOLUTION OF RURAL WATER SUPPLY PROGRAMS IN VENEZUELA<sup>1</sup>

The Venezuelan Constitution gives municipalities responsibility for building and maintaining water supply services. Aware of the many problems local governments had encountered in providing and maintaining their own systems, the central Government has given major and ever-increasing attention in the last 30 years to providing adequate services to the population.

One of its early steps was to make the Ministry of Public Works' Bureau of Water and Sanitary Works responsible for national water supply development. This arrangement persisted until 1943 when the Government created the National Institute of Sanitary Works (INOS), which was to give primary attention to towns and cities with more than 5,000 inhabitants.

Because much of the country's population lived in smaller communities, most of which had no water services, the Inter-American Public Health Cooperative Office was established in 1943 with the support of the U.S. Government's Institute of Inter-American Affairs to attend to their water needs. Operating as an arm of the Ministry of Health and Social Welfare, it laid the foundation for the country's future rural sanitation programs. In 1959 its functions were transferred to a newly created Rural Water Supply Section in the Ministry's Division of Sanitary Engineering. A year later the Bureau of Malaria Control and Environmental Sanitation was established and absorbed this program, and in 1961 the Ministry raised its Rural Sanitation Section to the divisional level and developed guidelines for expanding its activities.

The main objective of the program was to provide rural residents an adequate and continuous supply of water meeting minimum physical, chemical, and bacteriologic requirements at a price they could afford. The systems were designed according to new criteria such as provision of house connections, a 20-year useful life, and the use of better building materials. Mechanisms for financing and differential water tariffs were also established.

In 1974, the Division of Sanitary Works was organized and included the Departments of Rural Water Supply, Rural Housing, and Rural Sanitation. The Division's responsibilities are to direct and coordinate the various activities of the national rural water supply program, which is jointly conducted with other national agencies and the state governments.

This progressive institutional development of the rural water supply program and the large investments the Government made facilitated the extension of its

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coverage. The Inter-American Development Bank and the United Nations Children's Fund supported the program in various phases. With these additional funds the program developed rapidly: 3,040 communities with less than 5,000 population were provided with service between 1959 and 1976. The total population in these communities was estimated at 1,946,956, about 85 per cent of whom had household water connections. The total investment was more than \$160 million (712 million bolívars) during the period and 7 per cent of the rural population had sewerage by 1976.

The difficulties in administering the water supplies, for which municipalities were responsible before 1961, resulted in the creation of autonomous management boards in the municipalities where the water supply services had been organized. At the end of 1974 there were 694 boards serving 1,162 communities with 900,000 people and 150,198 house connections. Since some of the difficulties persisted, the Ministry of Health and Social Welfare, after an analysis of the program, created an Office of Rural Water Supply Administration, Coordination, and Control responsible for managing and operating the country's small water supply systems and gradually eliminated the boards. It was felt that this new approach would result in more efficient management and operation of the systems.

In the urban areas, the National Institute of Sanitary Works is responsible for water supply and sewerage disposal. In December 1976, Venezuela reported that 6 million people (63 per cent of the urban population) had house connections, and 3 million (31 per cent) had easy access to water, a combined total of 94 per cent. In the same year, 5 million urban residents (52 per cent of the total) had sewerage.

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