

**ORGANIZACION PANAMERICANA DE LA SALUD**

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**REGIONAL CONFERENCE ON WATER  
SUPPLY AND SANITATION**

**Evaluation of the International Drinking  
Water Supply and Sanitation Decade  
and Projections towards the Year 2000**

Puerto Rico, 4-6 September de 1990



**ACTION OF THE PAN AMERICAN HEALTH ORGANIZATION IN THE  
INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION  
DECADE 1981-1990**

**ENVIRONMENTAL HEALTH PROGRAM REPORT**

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**ACTION OF THE PAN AMERICAN HEALTH ORGANIZATION IN THE  
INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION  
DECADE 1981-1990**

**ENVIRONMENTAL HEALTH PROGRAM REPORT**

**AUGUST 1990**

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## P R E F A C E

On the occasion of the Evaluation of the International Drinking Water Supply and Sanitation Decade that will take place in San Juan, Puerto Rico, September 4-6, 1990, the PAHO Environmental Health Program is pleased to present this document, which offers information on the task carried out by the Organization in collaboration with the countries, in their efforts to achieve the goals set for the Decade.

At all times, PAHO has traditionally cooperated with the countries in the promotion and support of the development of water supply and sanitation services. On occasions when governments agreed on regional pronouncements such as those that emanated from the Charter of Punta del Este, Uruguay, 1961, and the III Special Meeting of Ministers of Health of the Americas, Santiago, Chile, 1972, the Organization oriented its program of work to make it more effective with regard to the action of the countries committed to such goals.

This occurred at the beginning of the 80's when the countries agreed jointly to develop the IDWSSD. The Environmental Health Program in Washington which incorporates the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS) and the Center for Human Ecology and Health (ECO), organized the regional action directed toward favoring the cooperation of PAHO at the national level which is carried out through its Country Delegations. The Delegation Offices in the various countries incorporate among their personnel, a sanitary engineer who maintains close contact with the sector institutions realizing such cooperation with the national programs.

The document presents a summary of the chief areas of action to which PAHO cooperation was directed, including the conceptual aspects that were promoted to facilitate and make more effective the national task.

One of the functions of PAHO cooperation is to disseminate the experiences of the countries, thus contributing to increased understanding and improved approaches to, in this case, the problems of water supply and sanitation. In this regard it is important that the cooperation of the countries provides the inputs so that the Organization can fulfill this task. This concept has been stressed during the Decade and has contributed to strengthen the joint work. The Organization also promotes and supports cooperation among countries and institutions.

On this occasion we desire to recognize the work of the personnel of dozens of water and sanitation institutions in the countries of Latin America and the Caribbean to whom fell the task of implementing the national programs of the Decade, something that has favored international cooperation. Equal recognition is given the personnel and staff members of related institutions, universities, and others who worked with devotion during this period.

Finally, in behalf of the Environmental Health Personnel of PAHO, we express the fervent hope that in the future the provision of water and sanitation in the countries of the Region will be built upon the broad experience already earned in the countries in favor of comprehensive attention to water and sanitation services, thus contributing to the health, the well-being and the development of our countries. PAHO reiterates and commits its continued support in the actions that will be fulfilled beyond 1990.

Guillermo H. Dávila  
Coordinator  
Environmental Health Program

## ACRONYMS

AyA	Costarican Institute of Water Supply and Sewerage.
AIDIS	Interamerican Association of Sanitary and Environmental Engineering.
BMZ	Ministry of Economic Cooperation of the Federal Republic of Germany.
CAGECE	Water and Sewerage Company of Ceará (Brazil).
CAPRE	Regional Coordinating Committee of Drinking Water and Sanitation Institutions of Central America.
CARICOM	Caribbean Community.
CEDAT	Center for Development and Technological Applications.
CENAGUA	National Center for Water (Colombia).
CEPIS	Pan American Center for Sanitary Engineering and Environmental Sciences.
CIDIAT	Interamerican Center for Integral Development of Water and Soil.
DIECA	Division of Education and Training of AIDIS.
DTIAPA	Project for Technological Development of Drinking Water and Sewerage Institutions.
ECLAC	Economic Commission for Latin America and the Caribbean.
ECO	Pan American Center for Human Ecology and Health.
ERIS	Regional School of Sanitary Engineering.
FINNIDA	Finnish International Development Agency.
GEMS/Water	Global Environmental Monitoring System/Water.
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit.
HABITAT	United Nations Conference on Human Settlements, 1976.
IAWPRC	International Association on Water Pollution Research and Control.
IDB	Inter-American Development Bank.
IDRC	International Development Research Centre (Canada).
IDWSSD/ DECADE	International Drinking Water Supply and Sanitation Decade.
INAPA	National Institute for Drinking Water and Sewerage.
IPEA	Institute of Economic and Social Planning.
IRC	International Reference Centre for Community Water Supply (Netherlands).
MOGGOD	Mixed Oxidants Generated On-Site for Disinfection.
PAHEF	Pan American Health Foundation.
PAHO/WHO	Pan American Health Organization/World Health Organization.
PRELAB	Regional Program of Laboratories for Water and Effluents Analysis.
REPIDISCA	Pan American Information and Documentation Network on Sanitary Engineering and Environmental Sciences.

SENAPA	National Water Supply and Sewerage Service (Peru).
SENASA	National Service of Environmental Sanitation.
UNDP	United Nations Development Programme.
UNI	National University of Engineering.
UNICEF	United Nations Children's Fund.
UNIVALLE	"Universidad del Valle", Cali, Colombia.
USAID	United States Agency for International Development.
WB	World Bank.
WTP	Water Treatment Plant.

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# **ACTION OF THE PAN AMERICAN HEALTH ORGANIZATION IN THE INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE 1981-1990**

## **INTRODUCTION**

The International Drinking Water Supply and Sanitation Decade (IDWSSD) arose from the United Nations Water Conference held in Mar del Plata, Argentina, in 1977. At this meeting, a recommendation that governments worldwide had adopted at the United Nations Conference on Human Settlements (HABITAT) in Vancouver, Canada, in 1976, was examined and approved. The recommendation urged achieving the universal provision of potable water and adequate sanitation services by 1990.

The "Decade" declaration was in response to a recognition of the fact that potable water and the sanitary disposal of excreta constitute two of the most fundamental needs of mankind and that their absence has a direct, profound, and constant deleterious effect on the lives of millions of people in the developing countries.

The Decade was proclaimed globally on 10 November 1980 in an Extraordinary Session of the General Assembly of the United Nations.

For the countries of Latin America and the Caribbean, fulfilling Decade goals meant providing 254 million additional persons with potable water and expanding excreta disposal services to cover 390 million more between 1981 and 1990. At 1978 prices this represented an investment of more than US\$50,000 million.

In 1980, to initiate the WHO Global monitoring of the Decade, 25 Latin American and Caribbean countries set national goals to be attained by 1990, which on the average meant expansion of coverage of water supply to 87% of the urban population and to 62% of the rural population; and in the case of sewage or sanitation to give service on the average to 79% of the urban population and 37% of the rural population, which required an approximate investment of US\$30,000 millions.

At the beginning of the IDWSSD, 10 agencies of the United Nations formed a Decade Directing Committee to coordinate activities aimed at optimizing their participation and support of national programs. The World Health Organization (WHO) acted as the Secretariat of the Committee and was responsible for monitoring the implementation of the IDWSSD and reporting on its evolution.

In the Americas and the Caribbean, PAHO worked within this framework and in accordance with the mandates expressed in Resolution XXII of the XXVI Meeting of the Directing Council of PAHO (1979).



To support achievement of the IDWSSD Goals PAHO and WHO, identified the obstacles of the past and defined a new approach and action strategies which were incorporated by the Directing Council of PAHO in 1981. Accordingly, at the Regional level, PAHO devoted special attention to:

- promote and support national programs for the Decade through technical cooperation;
- concentrate technical cooperation in strengthening of national capacity to generate dynamic, self-supporting programs;
- promote technical cooperation among the countries of the Region, and
- foster external financing of national Decade activities.

At the national level, the applied approach took into account that the activities of the Decade should contribute to the implementation of primary health care and considered:

- the complementary development of environmental sanitation and water supply;
- priority attention to rural and urban-unserved populations;
- development of model programs for self-sufficient and self-sustaining action;
- employment of socially adapted systems within the reach of the population;
- community participation in all the phases of the projects;
- coordination of water supply and of sanitation programs with other sectors; and
- linkage of water supply and sanitation with other health improvements.

Based on the stated approach and strategies, PAHO through its Environmental Health Program dealt especially with:

- promoting and supporting the preparation of plans and national programs, identification and implementation of projects, and the strengthening of the capacity of national institutions and possibilities;
- the exchange of information, especially concerning appropriate technology, and other means to facilitate the technical coordination and cooperation;

- monitoring evaluating progress; and
- the mobilization of external resources, especially aimed at the preparation and implementation of national plans and programs, the strengthening of institutions, and the training and improving of human resources.

This coordination and technical cooperation involved many diverse activities, the most important of which are referenced in the following sections.

To give order to this presentation illustrative examples of the work that has been carried out have been grouped under subtitles that are representative of aspects directly or indirectly related to the Decade. This is mainly to maintain the order of the presentation, even though it can be observed that by their nature some activities could appear in more than one of the items, in which case they have been placed in the one on which they had greatest impact.

## **1. PROMOTION OF THE DECADE**

PAHO played a very active role in the promotion of the objectives and goals of the Decade in the Americas and the Caribbean giving impetus to the activities, needed to facilitate the fulfillment of the established Decade goals.

Promotion of the Decade was implicit in all of PAHO's activities organized for specific ends. This was exemplified in the meetings that were held in the countries for the preparation of their national plans of action for the IDWSSD, which included in addition promoting the Decade among institutions and professionals of the countries of the Region. Also, the regional advisory meetings with agencies of international cooperation, which were held to encourage their financing of project identified in the country plans were also used to advise them of the IDWSSD objectives and to motivate them to support their fulfillment.

Among PAHO's most significant actions to specifically promote the Decade the following stand out:

### **1.1 Regional Symposia Pre-AIDIS Congresses**

Traditionally during the week preceeding the AIDIS Congress, PAHO has organized symposia of relevant topics of Sanitary and Environmental Engineering. During the IDWSSD four of the five symposia were devoted to this topic.

The first symposium associated with the XVIII Congress of AIDIS was held, in July 1982 in Panama, and had the theme "Human Resources for the IDWSSD", and attracted 150 participants from 29 countries of the Region of the Americas and 17 observers from international organizations.

The second symposium with the XIX Congress was held in Santiago, Chile in November 1984, focused on "Water Supply and Disposal of Excreta in Urban-Fringe Areas", had 105 participants from 22 countries of the Region.

The third symposium affiliated with the XX Congress in November 1986 in Guatemala, focused on the topic "Water Supply and Sanitation: An Element of Primary Health Care" was attended by 120 participants from the countries of the Region attending.

There will be a "Regional Conference on Water Supply and Sanitation held in association with the XXII AIDIS Congress, September 4-6, 1990 in Puerto Rico. This has the objective of evaluating decade achievements and projection for the year 2,000.

## **1.2 Participation in the AIDIS Congresses**

In the Congresses that AIDIS organized during the Decade, PAHO made presentations about Decade activities, and the results of the previous symposium. These presentations began in December 1980 in the XVII Congress AIDIS held in La Paz and continued in all the following Congresses.

## **1.3 Publications**

The publications that PAHO produced in support of the activities of the Decade also had a significant impact.

Also important was the launching of "Environmental Series" in 1981, of which eight titles have already been produced. Other publications include the documents that resulted from the symposia mentioned in the previous item; guidelines for the preparation of national plans of the IDWSSD; guidelines for the evaluation of Decade activities, as well as the translation, publication and distribution in the Region of numerous documents prepared by WHO in order to orient the activities of the Decade.

#### **1.4 Sub-regional and Country Meetings**

The support that PAHO gave to some sub-regional and country activities, produced important positive results in Decade promotion, for example:

- the first meeting of the advisory committees on environmental health for "Convenio Hipólito Unanue" of the Andean Pact, held in Lima in 1980;
- in November of that same year, in Barbados, environmental health professionals of the English-speaking Caribbean countries met with representatives of the Caribbean Development Bank and US AID, and prepared concrete guidelines for Decade action;
- in January 1981, the Directors of Environmental Sanitation Divisions of the Ministries of Health of Central America and Panama met in San Jose, Costa Rica and defined strategies to attain the goals of the Decade;
- in 1980 and 1981 meetings were held to obtain political support for the Decade in several countries, among them: Argentina, Bolivia, Colombia, Guatemala, Jamaica, Nicaragua and Peru.

#### **1.5 Support to other institutions**

PAHO collaborated with ECLAC in the planning and conduct of two "Seminars for Horizontal Cooperation for the Decade" which had the objective of identifying and defining criteria, mechanism and proposals for technical cooperation among developing countries in their effort to provide water and sanitation. The seminars were carried in Chile (1981) and the Dominican Republic (1982) attended by decision making level official from government agencies and water supply and sanitation institutions.

PAHO also collaborated in the programming and participated in the ECLAC Meeting to mark the culmination of the International Drinking Water Supply and Sanitation Decade held during the Twenty-third Session in Caracas, Venezuela, 3 to 11 March 1990.

## **2. PLANNING**

Other of the first PAHO actions was to provide the basis for planning and programming of IDWSSD activities.

Also, support was given to sub-regional initiatives and generation of actions to serve the urban-fringe and rural areas.

## 2.1 Specific Activities to Support Planning

- In 1978, by way of preparation for the Decade and under the guidance of PAHO, rapid evaluations were made of the water-supply and sanitation situations in Argentina, the Bahamas, Belize, British Virgin Islands, Cayman Islands, Chile, Colombia, Costa Rica, Dominica, Ecuador, Guatemala, Guyana, Haiti, Jamaica, Montserrat, Nicaragua, Panama, Paraguay, Suriname, St. Kitts-Nevis, Turks & Caicos.

The results obtained made it possible to understand: a) the readiness of the countries to carry out accelerated development of the sector, b) the difficulties which could limit development, c) the actions necessary to prepare national plans for the Decade 1981-1990, d) the need to secure external funds and international cooperation for the preparation and development of Decade plans.

- In 1978 and 1979, within the framework of the cooperative program PAHO/WHO/World Bank, 17 countries prepared sectoral studies which included an analysis of the principal limiting factors, financial ramifications and infrastructure; 26 countries prepared data bases for the Decade, and 11 countries prepared summaries of sectoral information for use of the external financing agencies.
- In 1980, twenty-five countries defined their national goals for the Decade and 15 countries organized national interagency action committees; in addition, technical support committees which included external agencies for cooperation, were established in seven countries.
- In 1980 the inter-regional WHO/PAHO/GTZ project was initiated with the objective of cooperating with regional governments in the formulation of their respective National Plans for the Decade, which included: the definition of national goals, the identification of programs and priority investment proposals, and the formulation of support programs such as institutional development, human-resource development, community participation, operation and maintenance of services, appropriate technology, and information systems. The project initially included Haiti, Bolivia, and Paraguay, and in 1982 Honduras and Peru joined in. PAHO and each of these Governments signed a two-year collaboration agreement, a period during which the plan was prepared and the national process of sector planning was initiated. In order to coordinate the action for the Decade, each Government created an Interagency Planning Committee. In addition to the national plans for those five countries, this project produced a methodology of innovative planning that was also applied in Brazil, El Salvador, and Guatemala, countries that prepared their national plans for the Decade with their own resources.

- In order to orient the countries in the formulation of their national plans for the IDWSSD, PAHO prepared a "Guideline for Decade Planning", which was distributed to all the countries of the Region.

## **2.2 Sub-regional initiatives**

PAHO placed special emphasis on promoting subregional cooperation in water supply and sanitation. Significant achievements were obtained in Central America and Panama, the Andean countries and the community of countries of the English-speaking Caribbean.

- In Central America and Panama support continued for the meetings of Ministers of Health as a form of providing a framework for the planning of IDWSSD activities.
- An important achievement was the establishment of the Regional Water Committee (CAPRE) formed by the water and sanitation institutions of Central America, Panama and the Dominican Republic. PAHO and the German Agency for Technical Cooperation (GTZ) supported its consolidation and strengthening. During the Decade CAPRE developed information and training activities, and is initiating activities in control of losses in the drinking water systems and in the supply of water-treatment chemical. It also made progress in the preparation of research, development, and water-source protection projects. The UNDP, GTZ and the Agency FINNIDA of the Government of Finland jointly supported these activities with PAHO were.
- In the Andean countries, PAHO also supported Ministerial meetings and promoted the planning of Decade activities. In 1990 the Ministers agreed to include the topic of environmental health in their plans, confirming their interest to routine actions carried out under the Hipolito Unanue Agreement with which PAHO had collaborate.
- In the Caribbean countries, PAHO cooperation has been carried out within the framework of the initiative of "Cooperation in Health for the Caribbean", that has as objectives: to identify priority areas and initial actions for a more productive use of their resources; to develop specific projects as vehicles for improving health and simultaneously to resolving critical problems in the health sector; to mobilize national resources and direct them at the most important problems of the groups and sectors most in need; and to improve technical cooperation in health in the Caribbean, promoting cooperation among countries, agencies and institutions.

- The governments of the English-speaking Caribbean entrusted PAHO and the Caribbean Community (CARICOM) with the coordination of the development of this initiative, as a part of which numerous activities in the field of water supply and sanitation have already been carried out, some of which we will mention in other items of this document.

### 2.3 Peripheral Urban Areas

The growth in the second half of the present century experienced by the peripheral urban areas, with marginal districts deficient in public services as well as the quality of their dwellings, constitutes an unprecedented phenomenon in the Region. The Decade, recognizing the social implications of the existing situation for the population living in these areas, assigned priority attention to these population groups. In its desire to collaborate with the governments and with engineering of the Region in the attention of this important topic, the Program for Environmental Health of PAHO developed multiple activities. In the following paragraphs we will mention those that they were directed toward in an in-depth analysis of the problem.

- From 19 to 23 October 1981, at the CEPIS facilities a regional workshop was held on water supply to marginal urban areas, with the purpose of analyzing the problem, the factors for its solution, as well as the strategies that could be applied. Twenty-two persons from Argentina, Bolivia, Brazil, Chile, Haiti, Peru, the Dominican Republic, and two UNICEF representatives attended. Important recommendations were made and were disseminated in the Region through a Periodic Letter of the DTIAPA Project.
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- From 5 to 9 November 1984, in the week prior to the XIX Congress of AIDIS in Santiago, Chile, the "Regional Symposium on Drinking Water Supply, and Sanitary Disposal of Excreta in Marginal Urban Areas" was held. Taking part were 105 persons from the Region and from 9 bilateral and international agencies. Also collaborating in this effort was the "International Association on Water Pollution Research and Control" (IAWPRC), and support was received from IDB, WB, IRC, USAID, ECLAC, and AIDIS.

The outstanding point of the Symposium was the consensus that the solutions for the water-supply and sanitation problems in low-income settlements require a new sociotechnical approach, in which community participation should be understood in the broadest possible sense. It also was recommended that the water and sanitation companies existing in the cities assume the responsibility of providing these services to fringe areas.

- Beginning in 1985 CEPIS, with financing from GTZ, developed studies on the bearing of these services on health in several marginal areas of Metropolitan Lima.
- In 1989, in order to assess the progress achieved in the Decade and what was being done to meet the problem, it was deemed desirable to support the development of case studies in a representative sample of countries of the Region. "Case Studies" were selected as a research and teaching method, as it was proving difficult to apply formal and traditional solutions in low-income settlements. The studies were carried out in Brazil, Colombia, Guatemala, Honduras, and Peru; in all of them, water-supply and sanitation in the urban fringe areas were evaluated, special attention being given to the identification of strategies, methodologies, organization and applied technologies, with socioeconomic and cultural aspects being researched as well.
- From 12 to 15 June 1990 a "Regional Workshop on Water Supply and Sanitation in Urban Fringe Areas" was held at CEPIS. Meeting on this occasion were the people who had developed the case studies mentioned in the previous item, so that they might present the studies carried out and discuss the solutions applied jointly with professionals from CEPIS and the Environmental Health Program in Washington, D.C.

The workshop was organized to obtain a basis on which to evaluate the water supply and sanitation situation in the marginal areas of Latin America at the end of the IDWSSD, as well as to discuss possible solutions that could be applied in the Decade of 1990 to face the problems that had been identified.

### **3. MONITORING THE PROGRESS OF THE DECADE**

PAHO developed a system of evaluation and regional monitoring, following the format adopted by WHO. This system was oriented to serve as a catalyst in strengthening the information management process in the countries, to support the acquisition, analysis and dissemination of information necessary for Governments to improve the management of the Decade programs.



To orient the countries in this process guides were developed, published and sent to each country. The monitoring support actions that produced the most significant results were:

- The rapid evaluation of the sector situation at the start of the Decade which permitted knowing the water supply and sanitation coverage of each of the countries of the Region. This served as a basis for establishing their natural goals and preparing a national plan.
- the evaluation of the mid-decade achievement made it possible to determine the advances, the constraints, and the general situation of the sub-sector, to better orient the activities over the following five years.
- the final evaluation of the achievements of the Decade is presently in progress; outstanding actions carried out so far include:
  - . The distribution to all the countries through PAHO engineers guidelines and forms for collecting pertinent information, as well as promotion of the respective process.
  - . Performance of preparatory events for the evaluation of the Decade in most of countries of the Region, including in several cases, financial support for the preparation of the report of national evaluation meetings.
  - . Preparation of national evaluations of the Decade by the countries of Latin America and the Caribbean.
  - . Preparation of a regional document, from the information obtained, which will be presented in a Regional Conference on Water Supply and Sanitation in Puerto Rico, from 4-6 September the week prior to the XXII AIDIS Congress.

In addition to the actions oriented toward evaluation of the IDWSSD, both WHO and PAHO, have directed efforts to the determination of strategies to be adopted after 1990.

A world "Collaborating Council" composed of external support entities, has been established to promote a sequence of events designed to lay the groundwork for a meeting that will be held in September 1990 in New Delhi, India for determining such strategies. For this purpose, the PAHO Program for Environmental Health has promoted two meetings of managers of water and sanitation services. The first of these meetings was held from 20 to 24 May, 1989, in Washington, D.C. in which the advances of the Decade and the existing constraints were reviewed, outlines for future action were agreed upon; participants were representatives of

Argentina, Brazil, Bolivia, Costa Rica, Colombia, Chile, Guatemala, Mexico, Peru, and staff members of IDB, WB, ECLAC, GTZ, PAHO, UNICEF, and USAID. The second meeting which had similar characteristics was carried out from 1 to 3 November 1989 in St. Kitts and it included all the countries of the English speaking Caribbean.

Also in 1989, in collaboration with the Caribbean Development Bank, PAHO participated in a meeting for directors of institutions of the sector in the Caribbean and in the XVIII Conference of Water Engineers of the Caribbean, which were held out in Trinidad and had as a theme: "Water in the Caribbean Beyond 1990."

#### **4. MOBILIZATION OF RESOURCES**

One of PAHO's more important strategies to support the countries in achieving the goals of the IDWSSD was the mobilization of resources. This was promoted through the development of activities directed toward both international cooperation agencies as well as the countries. Among the activities carried out those noted below stand out.

##### **4.1 Catalog of International Cooperation**

This catalog was prepared in 1983 and updated in 1985, by the Water Supply and Sanitation Unit of the Environmental Health Division of WHO. It contains information on all the donor agencies or organisms, banks, international agencies, volunteer services and governmental organizations that give assistance to the water supply and sanitation sector.

In 1986, for the purpose of collaborating with the governments of the Region of the Americas in the management of financing for their IDWSSD projects, as well as to improve the process of communication between the international cooperation agencies and the governments, PAHO translated into Spanish, published, and distributed the catalog to the governments of the Region, a task that was carried out by CEPIS.

##### **4.2 Meetings of Consultation of the IDWSSD**

During the Decade, PAHO and WHO sponsored several meetings of consultation and coordination, in which took part the international and bilateral agencies of technical and financial support at work and interested in the countries of the Region. In the countries, these meetings stimulated the updating of their drinking water and sanitation plans and projects and permitted their presentation and/or discussion with the international cooperation agencies, which facilitated financing.

Among the meetings held were the following:

- "Regional Advisory Meeting of External Support for the Mobilization of Resources for Drinking Water and Sanitation in the Americas", held in Washington, D. C., USA, from 21 to 24 April, 1986. It was sponsored by IDB, WHO/PAHO and the Ministry of Economic Cooperation of the Federal Republic of Germany (BMZ).
- "Advisory Meeting of Peru", developed in Lima, Peru, from 30 June to 2 July, 1986. It had the auspices of the German of Technical Cooperation (GTZ) and PAHO/WHO, with the Peruvian Government being responsible for its realization and follow-up through the National Drinking Water and Sewerage Service (SENAPA).
- "Sub-regional meeting of Consultation for Central America, Panama, and the Dominican Republic". This was held in Guatemala City from 28 to 31 October, 1986. It had the support of GTZ, PAHO/WHO, the Committee of Water for the Region (CAPRE) and the Governments of the Member Countries of the CAPRE.
- "Advisory Meeting of Bolivia", which took place in La Paz from 29 August to 1 September, 1988. GTZ and PAHO/WHO were the principal sponsoring agencies, with the Ministry of Housing and Urban Affairs as organizer.

#### **4.3 Cooperation with External Support Agencies**

During the IDWSSD, PAHO and WHO played an important role in establishing relationships between the countries and international cooperation agencies.

- PAHO and IDB collaborated in the preparation of investment proposals in the basic sanitation sector, that were included in the official programming of IDB. The four stages of the project during the IDWSSD amounted to US\$6.3 million, of which IDB contributed US\$4.2 million and PAHO US\$2.1 million.
- PAHO collaborated in the development of various projects subsequently financed by the World Bank. The following had significant positive impact:
  - "Plan of Studies, Technical Assistance, and Institutional Reorganization of the Sub-sector of Rural Sanitation of Brazil", funded for US\$47.5 million, was administered by PAHO through an agreement in March 1986 with the Government of Brazil, to provide technical cooperation to the Institute of Economic and Social Planning (IPEA) and to the Ministry of Health. PAHO cooperated in the development of national policies and standards of basic rural sanitation; in the development of studies of basic rural sanitation at the national and state levels,

which encompassed institutional, economic-financial, and technological aspects, human resources and community participation; in the performance of diagnoses of conditions and formulation of the appropriate /programs for basic rural sanitation; and in the preparation of basic rural sanitation projects for approximately 600 communities of the Brazilian northeast.

- . Under the PAHO/WB agreement on "Information and Training in Low-Cost Technologies for Water Supply and Sanitation", CEPIS adapted, translated into Spanish, published and disseminated a set of 46 audiovisual training modules developed by the World Bank. PAHO also assisted, the Brazilian Association of Sanitary Engineering in the production of a Portuguese version of the modules; the use of low-cost technologies was promoted among the decision-making and the professional levels of the Region by means of six events in which the modules were used; and 55 instructors on these technologies were trained through two courses, one at CEPIS for educators of the Region and another at the Regional School of Sanitary Engineering of Guatemala, for its educators. The trained instructors can work in the census that the World Bank may organize in the future as part of the International Training Network in Water Supply and Sanitation.
- . "Rural Water in Paraguay". At the beginning of the 1980's the Government of Paraguay, through the National Service of Environmental Sanitation (SENASA) and with the collaboration of PAHO, formulated a program for construction of rural water-supply systems, which was financed by the World Bank. The project made important contributions in the extension of coverage, the establishment of local administrative boards, and the institutional development of the SENASA. It was carried out with PAHO Collaboration and was completed in 1986.
- Technical cooperation between GTZ and PAHO that commenced with the beginning of the Decade and continues to the present deserves mention. Action by both institutions has permitted them to optimize their capacities in their work of collaboration with the countries. The joint action permitted the development of numerous activities related to: the planning of the IDWSSD in the countries; the institutional strengthening and the development of the human resources; the improvement of the operation and maintenance of water supply and sanitation systems; the development of research and demonstration pilot projects, and others. As a result of this relationship GTZ is extending its support to the strengthening of CEPIS and ECO themselves in order to increase technical cooperation to the countries. The collaboration of GTZ is detailed in several chapters of this document.

#### 4.4 Support of Water and Sanitation Projects

During the IDWSSD, PAHO carried out projects financed by IDB, WB, GTZ, UNDP, IDRC, and other international cooperation entities, with a positive impact in the beneficiary countries.

The following projects are examples of this effort:

- **Water Supply and Sewerage of Cochabamba (Bolivia).** With a contribution of US\$820,000 from IDB, technical assistance was provided in water treatment (simplified plants), sewerage (reduced cost), and wastewater treatment by means of stabilization ponds.
- **Master Plan on Water and Sanitation in Bolivia.** This was developed for 10 urban areas of Bolivia with an IDB contribution of US\$500,000.
- **Water Supply and Sewerage in Tarija, (Bolivia).** An IDB contribution of US\$480,000 financed technical cooperation in sewerage and wastewater treatment by means of stabilization ponds.
- **Water Supply for Tijuana (Baja California, Mexico).** IDB agreed to finance a program for the improvement of the water-supply service of the City of Tijuana. The technical cooperation component aimed at institutional development of the local company, including a program for control of losses, was given to PAHO. The program was launched in 1987 and is still under development.
- **Project for Trujillo, Ica, and Pisco (Peru).** This project had as its objective the proposal of economical solutions for the disposal of wastewater in the listed cities. It was financed by GTZ, and PAHO took care of conducting the respective studies. In addition, in relation to the interests of the farmers of the nearby areas the type of most adequate treatment and the program for planting of high-profit agricultural products were determined.

#### 4.5 Support for the Institutional Development of the Inter-American Association of Sanitary and Environmental Engineering (AIDIS)

PAHO has collaborated with AIDIS from its foundation. In 1986 an agreement for PAHO/AIDIS technical cooperation was signed, in order to reorient PAHO cooperation, from the paternalistic position maintained in the past to one of support directed toward the institutional development of the association and the strengthening of its activities.

The first action, that was taken within this Agreement, was the contracting of a specialized consultant to conduct a study of AIDIS and to formulate a plan for its institutional development. The report was adopted by AIDIS and has given rise to the formulation of the "AIDIS Plan of Action 2000" which is being implemented. As initial results include the adoption of policies for financial life of the Association and the establishment of a first Permanent Secretariat, which was installed in 1989 in Sao Paulo thanks to the support of the Government of that State.

A second cooperative action with AIDIS was the launching of a program for the joint preparation of technical papers, two were produced: "Financing of the National Water Supply and Sanitation Programs in Latin America and The Caribbean", and "Sanitary Engineering and National Development", which were distributed by AIDIS to the highest executive and legislative spheres of the countries, so that they would have updated elements to review their own policies in the water and sanitation sector. Other volumes are in preparation.

## **5. INSTITUTIONAL DEVELOPMENT AND OPTIMIZATION OF THE INSTALLED CAPACITY**

To reach the goals of the IDWSSD was a great challenge for the institutions of the Sector. PAHO, knowing the limited resources available, considered that improvement of the performance and productivity of these institutions would constitute a valuable tool for optimizing existing resources and, therefore, facilitate the fulfillment of the Decade goals. Thus, PAHO devoted much effort promoting and supporting institutional development of the entities of the Sector, understanding as "Institutional Development", a planned process of change through which the institution is adapted so that it is able to achieve its objectives.

### **5.1 Institutional Development**

As a way of facilitating institutional development, PAHO urged the adopting of a systemic approach which implies that in order to fulfill its objectives every institution should carry out certain basic functions arranged in groups known as systems, which interact and permit a harmonious development of the institution. In the publication "Modelo de Gerencia de Operación y Mantenimiento de Sistemas de Agua Potable y Saneamiento" (Serie Ambiental No. 4, 1986) this concept is presented. This was disseminated by the countries by normal PAHO cooperation, through project execution and in specific meetings.

During the five first years of the Decade, PAHO provided technical cooperation to eight countries for institutional development programs, at a cost of close to US\$13 million, which came for the most part from extrabudgetary sources. In 1989, twelve countries of the Region were already carrying out projects of institutional strengthening, including the development of human resources.

In the Decade, PAHO has given direct assistance in this field to institutions or companies in Bolivia, Brazil, the Caribbean, Central America, Colombia, Ecuador, Mexico, Paraguay, Peru and the Dominican Republic. In some of these countries technical cooperation agreements existed and in others the advisory services were specific. Among projects developed or ongoing are the following:

- Administrative and operational strengthening of the National Housing Bank (Brazil).
- Institutional Development of the Ecuadorian Institute of Sanitary Works (Ecuador).
- Institutional Development of the Municipal Sewerage Utility of Guayaquil (Ecuador).
- National Program of Control of Losses and Efficient Use of the Water (Mexico).
- Institutional Strengthening of Tijuana (Mexico).
- Development of the Census of Users of AyA (Costa Rica).
- Institutional Development of the INAPA (Dominican Republic).
- Institutional Development of CAGECE (Brazil).
- Project of Studies, Technical Assistance and Institutional Reorganization of the Sub-sector of Rural Sanitation (Brazil).

## **5.2 Program for Control of Losses and Efficient Use of Water**

The concept of "Control of Losses", that encompasses physical and commercial losses, was developed in Brazil with the participation of PAHO and was implemented at the pilot level in Sao Paulo. Considering the results that were obtained, PAHO adopted "Control of Losses" as the strategy par excellence for promoting the implementation of institutional development programs in the water companies of the Region.

Complementing this, the concept of "efficient use of water" that includes elements related to rational consumption, reduction and control of leaks, and reduction of waste and the conservation of distributed water and its source of origin.

Applying the strategy of mobilization of national resources for the identification of problems, their solutions, and the political decision that backs the introduction of the respective plans of action, CEPIS established a "Technical Nucleus for Control of Losses", comprised of

technicians from the countries that already managed programs for control of losses or that were in the process of implementing them.

During the Decade this technical nucleus held four meetings (Brazil, 1984; Mexico, 1986; Peru, 1987; and the United States, 1988). In the meeting of 1988, contact was established with international financial agencies (IDB, WB, USAID, etc.) in order to provide them with the overall focus of the program.

Other means used to diffuse the concept of control of losses and efficient use of water were seminars and conferences. CEPIS coordinated and participated in 25 events in eight countries that were attended by an average of 30 participants per event: Argentina (1), Bolivia (2), Brazil, Colombia (6), Honduras (1), Mexico (3), Peru (8) and Venezuela (2).

Supplementing this task of diffusion, eight "Hojas de Divulgación" and seven manuals were prepared and distributed; the former dealt with the control of losses and the latter met the need for teaching materials for personnel training in this field. The topics of the manuals are: pitometry, macromasurement, control of leaks, commercial system of the companies, micromasurement, and equipment maintenance.

In 1986, PAHO entered an agreement with the Government of Mexico for the development of a "Project for Control of Losses and Efficient Use of Water", which has produced results that already are being transferred to the countries of Central America. Among the material produced stand out 20 technical documents that contain methodologies for the preparation of the diagnosis of water systems, of the program for control of losses and of all the projects that compose it. These are in press and then will be distributed in the Region.

Nine courses directed toward professionals were given by CEPIS, in Colombia (4), Mexico (3), and Peru (2), on the subjects of pitometry, macromasurement, control of leaks, and operation of water-distribution networks, which a total of 185 participants Courses, which as part of the "project for development of human resources in Central America", were given to train personnel of the units of detection and control of leaks of the participating institutions in the project.

As research support for this Program, CEPIS is concluding the development of software for a management information system, and for the project of preventive and corrective maintenance, both designed to be menu-driven for use in IBM XT, AT, or compatible microcomputers, which will soon be at the disposal of interested institutions.



As a result of the efforts in this field, in addition to the program in Mexico for control of losses Panama, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala and the Dominican Republic, have already formulated their national loss-control programs. These countries will be supported in their implementation of the plans through an Agreement financed by GTZ, which will be carried out by CEPIS.

## **6. HUMAN RESOURCE DEVELOPMENT AND TRAINING**

### **6.1 Conceptual Aspects**

The greatest challenge posed by the IDWSSD to the top management, was the appropriate training of the human resources, limited in many of the countries.

Aware of the importance of this topic, PAHO devoted special attention having considered that training constitutes a strategy for institutional development. Within this context, PAHO considered three lines of action:

- 1) Support for the companies in the sector with the aim of developing their institutional capacity and self-reliance to carry out its programs for human resource development, 2) Strengthening of the institutions for training of human resources, as well as support for the improvement of sanitary and environmental engineering education, and 3) support for specific training activities in the sub-regions.

### **6.2 Cooperation with the Sector institutions**

In accordance with the foregoing, PAHO support in this field to the countries during the Decade, was directed toward improvement of the performance of the institutions by means of the development of their human resources, placing special emphasis on generating and/or strengthening the self-reliance of the institutions in order to carry out their training programs.

#### **Support for specific training activities in the countries and/or sub-regions**

Specific activities were carried out in almost all countries of the Region within the technical cooperation of PAHO with each country, and respond to existing and potential needs.

Although PAHO's participation ranges from the presentation of a conference in courses up to total responsibility for the activity, that is, its organization and development, it is always carried out in cooperation with the national institution. Generally the support provided includes

first the cooperation of the PAHO offices and sometimes of regional level in Washington and the Centers ECO and CEPIS. The statistical information that follows gives an idea of the magnitude of this training courses on water supply and sanitation.

<u>Year</u>	<u>Number of Events</u>	<u>Number of Participants</u>
1985	123	2,036
1987	185	5,806
1988	168	5,271
1989	163	5,748

The following actions were noteworthy:

**6.2.1 The project for development of human resources in the countries of the Caribbean,** had as a basic objective, developing a local and sub-regional capacity in order to train human resources in the field of water supply and sanitation. In the first years of the Decade the project was carried out by PAHO through a project manager and later it was managed, administered and partially carried out and financed by the participating countries themselves, with the Caribbean Development Bank assuming the managership. Currently the project operates in 13 countries, each of which has its training team, maintains a process of cooperation with the other countries and carries out the required training activities. PAHO continues to cooperate technically in the planning of their activities, as well as in the development of some of them, especially those of sub-regional character.

**6.2.2 Project for Technological Development of Drinking Water and Sewerage Institutions (DTIAPA)**

This project was designed to contribute to the technological development and adoption of appropriate technologies used to improve the efficiency of services of the drinking water supply and sewerage institutions. It was carried out from 1979 to 1983, in accordance with an Agreement subscribed to between the Government of Peru and the IDB, which assigned its execution to PAHO/CEPIS.

The DTIAPA project was primarily directed toward institutions of Peru, however, several of its activities, especially training, also benefitted other countries of the Region. Its cost was of US\$2,300,000; US\$1,300,000 from IDB and US\$1,000,000 by PAHO/WHO.

There were four lines of action: research, training, dissemination of technical information, and technical cooperation with the institutions of the sector. It included ten research and 36 training projects; 918 persons participated, 658 from Peru and 260 from other countries. The topics included: institutional development, administration, operation and maintenance, potable and wastewater treatment, distribution and collection networks, pumping stations, wells and rural water supply systems.

The experience acquired and the material generated served as basis for the preparation of 16 manuals, which were distributed among the institutions of the Region that are responsible for water supply and sewerage services.

**6.2.3 The project for the development of human resources in Central America, Panama and the Dominican Republic,** was directed toward strengthening the institutional capacity of mid-level technical human resource development in the drinking water and sanitation agencies.

This project was initiated in 1984 with financing of the German of Technical Cooperation (GTZ) and of the Inter-American Development Bank (IDB). PAHO had management responsibility and until 1989 it had a manager directing the project activities, with CAPRE, acting as a coordinator.

The project enabled the training of 1,738 persons before 1988, strengthened or created training units in the participating institutions, provided audiovisual and computing equipment, as well as promoted the control and detection of leaks in said institutions, having acquired the related equipment and trained the required personnel. In 1989 the participating institutions, now having the trained personnel and the required equipment, were charged with expanding the training of personnel in the field of detection and control of leaks, with PAHO monitoring the actions carried out. The first phase of the project concluded in June 1990. GTZ financed a second phase which is being directed toward development of a Program for Control of Losses and Efficient Use of the Water, which will have the advisory services of a CEPIS specialist.

**6.2.4 National training plans.** Within the country Decade plans, training aspects were considered. To promote and foster the development of these activities, PAHO supported Bolivia, Brazil, and Peru in the formulation of specific training plans for the drinking water supply and sanitation sector, and in Colombia provided advisory services in the initial phase of the CENAGUA.

**6.2.5 Program for young professionals of CEPIS.** This program was launched in 1985, receiving each year an average of nine professionals from different institutions from the countries of the Region. They stayed for 10 months in CEPIS (Lima, Peru) with the objective of expanding their knowledge on matters that are useful to their institution through their participation in the activities of CEPIS under the orientation of its consultants.

To date, officials from Argentina, Brazil, Colombia, Cuba, Mexico, Peru, the Dominican Republic, and Venezuela have taken part in the program.

### **6.3 Strengthening of Local Human Resources Training Institutions and Support of the Improvement of the Sanitary, Environmental and Public Health Engineering Education**

In view of the need to strengthen the capacity in the environmental health field in the Region, PAHO directed its actions toward the universities that were conducting courses in sanitary, environmental and public health engineering with the aim at contributing to improve the quality of the professionals that were being prepared. In a first effort PAHO, with the cooperation of the countries proceeded to prepare a Directory of the programs that were being conducted, to later on compatibilize them with the needs of the institutions utilizing such professionals. Then PAHO proceeded to foster horizontal cooperation among the identified institutions in the various countries.

Among the most significant actions we can mention:

#### **6.3.1 "The Directory of Educational Programs in Sanitary and Environmental Engineering in Latin America and the Caribbean"**

The Directory contains the main information on the sanitary, environmental and public health engineering programs, both at graduate and post graduate levels. The information collected allows to make a diagnosis of the situation and provides elements to orient actions for improving education and to identify possible areas of cooperation.

Offers critical information on the teaching of sanitary engineering in the Region. The first version, produced in 1986 identified 46 formal courses in sanitary engineering in 10 countries. The data bases have been updated for the 1990 version of the Directory, incorporating courses not identified in 1986.

### **6.3.2 Cooperation among sanitary, environmental and public health engineering schools**

To foster horizontal cooperation among the institutions, PAHO organized regional meetings of professors of sanitary, environmental and public health engineering. During the Decade, PAHO conducted three meetings. The first was organized around the aforementioned Directory, was held in July 1987 in the School of Public Health of the University of Sao Paulo. Nineteen schools participated, analyzing the problems facing sanitary engineering education and the possibilities of contributing to its improvement. It was agreed to initiate activities to define a basic curriculum of sanitary, environmental and public health engineering. The desirability of creating a Latin American Association of Schools of Sanitary and Environmental Engineering that would facilitate communication and cooperation among the areas of teaching, research, and bibliography was recognized.

The second meeting in September 1988, in tandem with the XXI AIDIS Congress in Rio de Janeiro attracted forty-seven professors from 10 countries. The commitments of the previous meeting were evaluated, and agreements of cooperation between several universities were generated. The form of implementing a permanent mechanism for future meetings was discussed, contact with AIDIS was established so that its Division of Education and Training (DIECA) could contribute to future meetings.

Following recommendations of the previous meeting, PAHO convoked for August 1989 the First Pan American Meeting of professors of sanitary, environmental, and public health engineering, held in Washington, D. C. with the participation of 42 representatives from Latin America, the United States, and Canada. The strengthening of the mechanisms of academic training in the countries of Latin America, including the planning and evaluation of the teaching programs was discussed, and bases were prepared for the establishment of technical cooperation agreements among universities at the regional level. At the end of the meeting a workshop was held to discuss and explore the possibility of incorporating the subject "Disaster Preparedness", in environmental engineering and environmental sciences curricula.

Consequently, Programs and Agreements of cooperation were made between universities of the following countries: Mexico-Guatemala, Peru-Brazil, Argentina-United States of America, Brazil-Colombia, Ecuador-United States of America, Guatemala-Spain.

### **6.3.3 Other activities**

In almost every country, collaborative efforts for training and human resource development were carried out, among the following were more significant:

- Support to the Sanitary Engineering Institute of the University of Buenos Aires to carry out a post graduate course in sanitary engineering as part of a joint technical cooperation program with the University of New York, Buffalo.
- In Paraguay, collaboration was provided to the National University of Engineering to initiate a sanitary engineering course (post graduate level). Also collaboration was given to carry out several courses of a short duration.
- Cooperation with the "Universidad Mayor de San Andrés" in the formulation of a proposal for the creation of a sanitary engineering course to a post graduate level, to be implemented soon. Also support was given to carry out several training and continuous education activities in the different fields of the sanitary engineering.
- Collaboration to the Public Health Schools of São Paulo and Rio de Janeiro in the preparation of human resources programs in sanitary and environmental engineering, emphasizing water supply and sanitation. The Catholic University of Curitiba received collaboration for the execution of several research programs applied to the sanitation in marginal urban areas.
- In Colombia collaboration was given to the sanitary and environmental engineering programs of the Universities --Nacional, Javeriana, Boyaca, La Salle, UNIVALLE, Bolivariana and Antioquia--for the strengthening of teaching and research, as well as carrying out national meetings with the responsible party of these programs. Also support was given to training and continuous education matters.
- Support was given to the "Escuela Politécnica Nacional of Ecuador" in the strengthening and conduction of its sanitary engineering program at graduate level and in conducting several training and continuous education programs in the different institutions of the country. Also, support was given to the strengthening of the sanitary engineering programs that will be given in the civil engineering schools of the country.
- Support to the Regional School of Sanitary Engineering (ERIS) of the University St. Carlos of Guatemala for an average of seven short courses per year, and, in addition, cooperative agreement with international agencies and other countries were successfully fostered.
- In Mexico the "Universidad Nacional Autónoma de México, Instituto Tecnológico de Monterrey and Universidad Autónoma de Nuevo León" were supported in the effort

to strengthen their sanitary and environmental engineering programs, as well as collaboration in the creation of the National Association of Sanitary and Environmental Schools. Also collaboration was given to carry out several national meetings.

- The National Engineering University of Nicaragua, through CEPIS, was assisted in the structuring of its master's program in sanitary engineering and provided with bibliographical support.
- In Panama collaboration was given to the "Universidad Tecnológica de Panama" in conducting a technicians' course in sanitation and its research program applied to treatment processes.
- The National Engineering University of Peru, received support from CEPIS for the development of its first master's program in "water treatment and reuse of wastes" in the presentation of five full courses, and orientation of graduate students in research work conducted in CEPIS and through a 3 month course given by a rotating team of consultants sponsored by PAHO.
- Collaboration was given to the "Instituto Nacional de Tecnología de República Dominicana" for the formulation of a formation program of sanitary engineering to be established with the technical support of the Central University of Venezuela.
- Support to the Central University of Venezuela, "Escuela de Malariología y CIDIAT" for the strengthening of their creation and research programs in sanitary engineering. Also support was given in carrying out national meetings of sanitary and environmental programs with the participation of the major sanitation agencies of the country.

CEPIS launched a "program of technical updating of university professors", in which the participant serves a two to three month residence in CEPIS, reviewing and updating his course program with advisory services of the CEPIS consultants and support in the REPIDISCA data base and the CEPIS library. Six professors from the School of Environmental Engineering of the UNI, Peru have taken part. Anticipating extension to universities of other countries, financial support has been requested from GTZ.

CEPIS prepared manuals and training modules in water treatment, pitometry, and macro- and micro-measurement of potable water consumption and translated, adapted, and published audiovisual training modules on low- cost technologies for water supply and sanitation produced by the UNDP/World Bank. CEPIS also trained 45 educators from universities of the Region as instructors in these technologies.

In addition, PAHO has prepared and distributed various technical documents to help strengthen and develop human resources including a manual on costs of sewerage systems, a study of review and reformulation of design criteria, a manual on selection of appropriate technologies, models of operations and maintenance management and a manual on human-resource development. Other important contributions are numerous technical documents produced in the projects conducted by PAHO, as well as others whose preparation was supported by the countries.

## **7. TECHNOLOGY**

During the IDWSSD, PAHO oriented its efforts toward increasing the ability of the Member Countries to absorb technology, to carry out the local adaptation of technologies and develop capacity for technical innovation. The strategy employed involved encouraging self-reliance in the countries to develop or test, analyze and adapt existing technology and to meet local needs in this field. It also encouraged technically advanced institutions to direct high level technology towards simple sustainable solutions for developing countries.

### **7.1 Development of Technology and Research**

Many of the technologies used in developed countries fail to be sustained when they indiscriminately applied in the developing countries, owing to cultural obstacles, to lack of technical capability, but mainly to inadequate supporting infrastructure and their high cost of operation and maintenance. It is for this reason that PAHO became concerned with supporting research, as a tool that would permit not only an appropriate adaptation and transfer of these technologies but also the development of appropriate technologies for the environment where they would be applied, as well as to train local personnel and develop a sense of confidence in their own ability to solve problems. As an overview of what has been carried out is presented below.

During the first years of the Decade, CEPIS collaborated in research for designing simple and economical water treatment systems in Brazil, Costa Rica, Honduras and Peru; the development of disinfection devices in Argentina, Colombia, Costa Rica, Chile and Peru; and sewage stabilization ponds in Peru. A large number of specialty courses in various technologies were conducted by CEPIS providing training to hundreds of participants from 20 countries of the Region. PAHO provided direct technical assistance to 11 countries in windmills, hand pumps, photovoltaics, hydraulic rams, water treatment, ocean outfalls, low cost sewers and disinfection and cooperated with six countries in forming a special unit for appropriate technology.



In 1982, CEPIS published a two-volume technical document titled "Modular Water-Treatment Plants" and organized workshops on this topic with the participation of 14 Latin American countries.

With GTZ financing, the following activities were completed. In Bolivia a research proposal was prepared for stabilization lagoons to serve El Alto, La Paz to derive design parameters and recommendations to reduce contamination in the Lake Titicaca basin. In Peru, CEPIS carried out research on gravel pre-filters combined with slow sand filters, the results of which were employed in designing three water treatment installations to demonstrate three classes of pre-filters and the construction and evaluation of such a treatment facility for the community of Azpitia. A demonstration to improve drinking water quality in a marginal urban area of Limon, Peru was initiated; a socio-cultural study relating the use of waste water in agriculture was conducted; a conceptual study of different methods of water supply and sanitation for marginal urban areas, hygienic habits and the relation with health status was conducted; and a project in collaboration with SENAPA of Peru is under way concerning the use of stabilization lagoon effluent for agricultural purposes.

In Mexico research was begun on low cost options to reduce the excessive concentrations of fluorides and arsenic in the drinking water in the city of Durango. Efforts were continued to promote the adoption of a simple technology for water fluoridation in Argentina, Uruguay, and Venezuela and to extend of this measure to others four countries.

The Organization cooperated in the development of 10 research projects on the utilization, accessibility, efficiency, and effectiveness of the health sanitation services, and in 1985 six of these proposals had their financing approved within the Program PAHO of research grants.

CEPIS carried out three research projects on the evaluation of stabilization ponds in San Juan de Miraflores (Peru) and the recycling of treated liquid wastes for agriculture and hydroponics, financed by the International Development Research Center (IDRC-Canada) and GTZ. In 1985 began a project on "situation, trends, and promotion of research on water supply and sanitation", financed jointly by the IDRC and PAHO in nine Latin American countries. Undertaken as part of this project were: surveys in the participating countries, eight workshops on research policies and priorities and publication of a document with the compiled information.

With the financial support of the IDRC of Canada, CEPIS developed in Peru a project on toxicological and microbiological aspects related to the use of waste water in agriculture. It also supported Mexico for research in this field.

A research proposal was completed on "disinfection of rural water supply", which was financed by the Pan American Health and Education Foundation (PAHEF) in collaboration with Argentina, Colombia, Costa Rica, Chile, and Peru, and the results were discussed in an international symposium held in CEPIS at July 1983.

There was cooperation with Colombia, Mexico, and Peru in the development of appropriate technologies for waste water treatment, including criteria for design of stabilization ponds and anaerobic reactors of rising flow, a study being initiated on recovery of the biogas generated in these reactors. In the Caribbean, Colombia, and Peru workshops were held on development and transfer of appropriate technologies.

## **7.2 Disinfection of Drinking Water with a Mixture of Gas Oxidants Produced in-situ (MOGGOD)**

PAHO promoted the development and use of technology for on-site generation of mixed oxidants for disinfecting of drinking water supplies in small or remote communities of Latin America and the Caribbean.

In December 1986 with financial support of the UNDP, the first phase of a demonstration project was undertaken, introducing to agencies and institutions of the Member Countries the technology MOGGOD, and to obtain their cooperation in developing and adapting this technology to the Latin American situation.

This phase included the acquisition of more than 40 prototype devices that were sent to various countries, where they were submitted to laboratory and field tests. A particularly noteworthy program to develop this technology has been implemented by the Center for Development and Technological Applications (CEDAT) of the Ministry of Health of Mexico.

Although additional experience is needed, in results obtained indicate that MOGGOD disinfection has several advantageous characteristics:

The equipment uses only salt and water as prime materials; its energy requirements are small and can optionally be provided by photovoltaics and miniturbines; its operation and maintenance are simple. Both laboratory and field tests indicates that this method of disinfection equals or exceeds the efficiency and effectiveness of chlorine against several pathogens.

## **7.3 Pan American Network for Information and Documentation in Sanitary Engineering and Environmental Sciences (REPDISCA)**

REPDISCA is a regional computerized technical information system developed by PAHO in response to the sector's identified need for technical information. It received technical and financial assistance from the International Development Research Center (IDRC) of Canada until July 1986.

The main objective of REPIDISCA is to identify, collect and offer specialized information on sanitary engineering and environmental sciences. The Regional Coordinating Center of REPIDISCA is CEPIS and a Network of participating institutions, (National Coordinating Centers) are responsible for the development of the Network in each country and Cooperating Centers in cities of Latin America and the Caribbean. These institutions identify and enter the information and distribute the products and services of the Network.

Currently REPIDISCA has 513 Cooperating Centers in 23 countries, 249 are active Centers that contribute documentation, and the remainder receive the services of the Network. Its data base has 40,000 bibliographical references with an average annual increase of 5,000 units.

During the Decade a series of manuals was developed with the methodology utilized by the Network and were distributed to the Cooperating Centers and courses on documentary techniques of REPIDISCA and Information Units were automated in 20 countries, with some 850 staff members of the Centers attending.

Among the products and services given by REPIDISCA are:

- **REPINDEX:** Published quarterly since March 1982, is a computerized index of the data base that has 700 references in each issue.
- **TABCONT:** Published every two months, presents the table of contents of journals in the field and identifies the Cooperating Centers that have them.
- **SPECIALIZED REPINDEX:** Stabilization ponds, control of losses, reuse of waters, and solid waste.
- **Collective catalog of serial publications:** Published annually, beginning in 1984, identifies the titles of journals and the Cooperating Center that have them.
- **Bibliographical research services,** copy of data bases in CD-ROM, photocopy, and on microfiche of documents in the data base.

## **8. WATER QUALITY**

With a view to providing the countries of the Region with the necessary technical assistance so that they may succeed in achieving the goals of the IDWSSD concerning safe water supply, PAHO carried out activities in the following:

## **8.1 Improvement of the quality of water for human consumption**

In 1980 a Regional Program devoted to this topic was launched. It was directed by CEPIS and had as its goals the training of professional personnel of the Region in identifying problems inherent to drinking water quality, and the preparation of plans and programs to solve problems of design, operation, maintenance and management of water treatment plants with the resources available.

The strategy employed to fulfill this objective can be synthesized in the following actions:

**8.1.1 Training of human resources through short courses in the countries:** in the period 1980-1984 seven courses were given on evaluation of water treatment plants (Colombia, Costa Rica, Guatemala, Mexico, Panama, Peru, and the Dominican Republic), six courses on the design of preliminary plans for water-treatment plants (Colombia, Mexico, Nicaragua, Paraguay, Peru, and the Dominican Republic); five courses on operation and maintenance of water-treatment plants, two at the professional level (Costa Rica, Colombia) and three for supervisors (Peru).

In the period 85-89 the program continued through the instructors trained in the previous period; two courses in Evaluation of Water Treatment Plants (WTP), five courses in design of provisional drafts of WTP, and four courses in operation and maintenance of WTP, which were given in Bolivia, Mexico, Peru, the Dominican Republic, and Uruguay.

**8.1.2 Direct advisory services and residences in CEPIS:** from 1980-1984, 15 direct advisory services were given to institutions in Colombia, Costa Rica, Cuba, Chile, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, and Peru for the preparation and development of programs for evaluation, design of WTP, and solution of specific problems.

**8.1.3 Preparation of manuals and specific information:** In the first two years of the Decade 58 teaching modules were prepared and were used in the aforementioned courses. Among the published documents are: modular water-treatment plants in the rural environment, Guidelines for the design of slow filtration plants, Manual on evaluation of WTP, Manual for supervisors of WTP.

## **8.2 Water Quality Standards**

The three volumes of the WHO/1985 Guidelines for Drinking Water Quality, were translated into Spanish and distributed to all the countries of the Region in the appropriate language. To encourage and facilitate the application of these standards in national programs for improvement of water quality, two regional workshops were held, one for the countries of the English-Speaking Caribbean in St. Lucia and another in Spanish at CEPIS (August 1985).

In the following years, for the purpose of promoting the revision of national standards and actions to improve drinking water quality, a series of national workshops (Bolivia, Brazil, Colombia, Ecuador, Honduras, Mexico, Paraguay, Peru) and two regional workshops in the Caribbean, were held.

There also was collaboration with Argentina, Brazil, and Peru in studies aimed at the definition of standards on permissible concentrations of toxic substances in bodies of water.

## **8.3 Surveillance and Control of Water Quality**

PAHO, with the support of the US Environmental Protection Agency (USEPA), cooperated with the countries in a study of the analytical quality of the water in the laboratories of the Region. Samples of several control parameters were sent to 50 national laboratories that are collaborating with GEMS/WATER, as well as to the participants in the Regional Program of Laboratories for Water and Effluents Analysis (PRELAB) coordinated by CEPIS. There are 23 laboratories of different countries involved in this study.

Among the activities carried out with this purpose, CEPIS has collaborated with the Ministry of Health of Peru in the "National Program of Surveillance of the Services of Water for Human Consumption."

In 1989 technical information was sent to all the countries of the Region on a new method known as COLILERT, which makes it possible to determine rapidly the presence of coliform bacteria indicators of fecal contamination; Honduras and Montserrat have already begun an evaluation of this method.

ECO cooperated in the development and conduct of national workshop-seminars for the control of drinking water quality with emphasis on the contribution of toxicology in Argentina, Brazil, Mexico, Peru and Venezuela.

In 1989 in Brazil, program's for control and surveillance of drinking water quality was implemented in five states through the agency of the Division of Ecology and Human Health of the Ministry of Health.

#### **8.4 Chemical Contamination of Surface Water and Ground Water Aquifers**

CEPIS established two technical nuclei in 1985, one for the evaluation and control of surface-water contamination by toxic substances and another for ground water. The technical nucleus that studies the contamination of surface water is made up of professionals from Argentina, Brazil, Colombia, Cuba, Mexico, Peru, and Puerto Rico. It has held meetings for coordination and evaluation of the progress of the studies it is developing in 1985, 1986, 1987, and 1989, in which specialists from other countries have also participated. The nucleus has already developed a methodology for evaluation and management of these pollutants which has been published in six volumes and, it is carrying out studies of pollution of the principal rivers of Argentina, Brazil, Colombia, Cuba, and Mexico.

In the technical nucleus for the evaluation and control of chemical substances in ground water, Argentina, Brazil, Canada, Colombia, Cuba, Ecuador, the United States, Japan, Peru, Puerto Rico, and Venezuela are taking part. The nucleus has met in 1985, 1986, and 1988, already has produced two "Action Guidelines" and an "Alert" pamphlet directed at the political level in order to raise the level of awareness on the importance and the danger represented by the pollution of ground water. These documents already have been distributed to the countries of the Region. CEPIS is also devoting attention to the problem of eutrophication through its Regional Project to Develop Simplified Methodologies for Evaluation of Eutrophicates of Tropical Lakes.

### **9. TREATMENT, DISPOSAL AND REUSE OF WASTEWATER**

#### **9.1 Diverse Activities**

Under this topic, PAHO cooperated in training and research, especially on appropriate technologies; the development and application of standards for the use of wastewater in agriculture and aquaculture; the organization of advisory meetings to evaluate the situation of the sector and/or to mobilize financial resources, and direct consultantships to collaborate in the solution of specific problems in the countries. Below, mentioned in chronological order, are some of the activities carried out.

- December 1983, in Washington, D. C., a meeting on transportation and disposal of sewage sludge, in which the potential environmental health risk of sludge and the benefits it offers for agriculture were evaluated.
- April 1985, in Antigua, a sub-regional workshop was held on wastewater management and reuse in which problems of wastewater in 14 countries of the Caribbean were analyzed and recommendations to improve management made.

- In 1985, a regional study of the existing situation in wastewater disposal, using Bolivia, Brazil, Colombia, Chile, Guatemala, and Peru. The results were presented at a consultative meeting with specialists, held in December of the same year in Sao Paulo. This meeting was organized to obtain a basis on which to orient PAHO/WHO cooperation and accelerate the extension of coverage in regard to the wastewater. As a result the publication "Wastewater Disposal and Excreta in Latin America and the Caribbean" was prepared.
- A meeting for development of criteria and standards of water quality for agricultural irrigation with wastewater in Mexico, was held in Cutzamala, Mexico in April 1988 with participation of the Environmental Health Program through consultants from Headquarters and its Centers (CEPIS, ECO).
- In September 1988, in Barbados, a workshop was conducted on collection, treatment and disposal of wastewater, in which professionals from the countries of the Eastern Caribbean took part.
- An advisory Meeting for the Development and Financing of the Sewerage Sector in the Caribbean, was held in June 1989 in Port of Spain, Trinidad and Tobago. This activity was sponsored by the Caribbean Development Bank, CARICOM, ECLAC, PAHO and the Government of Trinidad and Tobago.
- Technical review and translation to Spanish of the "1989 WHO Guidelines on the use of wastewater in agriculture and aquaculture." These Guidelines were presented and discussed in a Central American meeting on appropriate technologies in collection and disposal of wastewater, held in Guatemala in October 1989.

## **9.2 Activities in Support of Training and Research in this Field**

With the purpose of mobilizing national resources toward the treatment, disposal, and reused of wastewater, CEPIS participated in eight seminars each with an average attendance of 30 professionals. In addition, 11 courses were given in six countries: Antigua (1), Colombia (2), Ecuador (1), Saint Lucia (1) and Venezuela (2), with the participation of some 250 professionals.

Research, in this area was directed toward appropriate technologies with special attention given to stabilization ponds and upflow anaerobic reactors. In addition, with the financing of international cooperation agencies, CEPIS carried out five research projects that encompassed the sociocultural aspects related to the use of the wastewater in agriculture and hydroponics.

Finally, mention should be made of two programs that CEPIS is conducting in this field: the "Research Program Developed in the Stabilization Ponds of San Juan de Miraflores" (Lima, Peru), and the "Program for Submarine Outfalls."

### **9.2.1 The Stabilization Ponds of San Juan Miraflores**

In 1961, the Peruvian Government constructed 21 stabilization ponds in 20 hectares of a desert area to the south of Lima. Currently this complex receives the wastewater of three neighborhoods of Lima, with a population of more than 200,000 inhabitants of which only 59% have sewerage services.

Since 1977, CEPIS has collaborated with the health authorities of Peru in numerous field and laboratory studies for the purpose of establishing design and efficiency parameters for the treatment of stabilization ponds and to identify and evaluate the risks to human health of the reuse of the effluents of these ponds.

The results obtained have shown the effectiveness of stabilization ponds as a method of wastewater treatment and that the resulting effluents, in principle, meet the water-quality requirements for irrigation with respect to levels of fecal contamination, enterobacteria, and to the elimination of helminths and parasites. The evaluation of the quality of the agricultural products obtained with reuse, from the microbiological and toxicological point, made it possible to establish sanitary criteria in order to prepare a program for quality control of the wastewater and agricultural products; from the toxicological point of view, a potential hazard in the reuse of industrial wastewater could be perceived.

Currently, a demonstration aquaculture project is under development. The reuse of the effluents of the San Juan ponds has served to promote in that area: silviculture, through the creation of green areas; irrigation of recreation parks and the recovery of contiguous sanitary landfills; aquaculture for fish and prawns and the production algae used for chicken feed.

### **9.2.2 The Underwater Outfalls Program**

This program was launched in 1983 for the purpose of developing studies and material that could guide the countries of the Region on the use of underwater outfalls for wastewater disposal, as a substitute for conventional treatment or in combination with it.

Among the products generated by this program, are a manual directed toward the water and sewerage institutions of the Region, which aims at providing basic knowledge of the design requirements for underwater outfalls and developing the capacity of these institutions to prepare



terms of reference in order to contract such projects, as well as to review adequately the quality of the work during the proposal and execution phases.

#### **10. DIRECT TECHNICAL COOPERATION**

In the delivery of technical cooperative by PAHO to the countries, the country offices of PAHO play a most important role. The sanitary engineer assigned to the countries act in line with the cooperation agreements. The personnel of the Environmental Health Program in Washington and that of the Centers ECO and CEPIS complement actions in support of Country Offices and also offer direct technical cooperation within national and regional programs. In addition, PAHO acts as executing and cooperating agency for projects financed by external support agencies, that in some cases require the assignment of specific staff. The majority of the above efforts during the Decade were devoted to activities in support of water supply and sanitation.

