

Environmental Series No. 1

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Environmental Health Activities of the Pan American Health Organization

WATER AND SANITATION DECADE
ENVIRONMENTAL IMPACT ASSESSMENT
CONTROL OF ENVIRONMENTAL HAZARDS
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PREFACE

The protection of environmental health is one of the main areas in which the Pan American Health Organization cooperates with the countries of the Region of the Americas. That cooperation spans a broad range of activities: extension of water supply and sanitation services, safeguarding of food supplies, disposal of solid wastes, protection of workers' health, fluoridation of water supplies, prevention and control of pollution and other environmental health hazards, and assessment of the impact of development projects on human ecology and health. The collaborative strategies of PAHO and the countries in carrying out these activities include cooperative agreements with lending and donor agencies, development of institutions and human resources, promotion of community participation, utilization of appropriate technology, interchange of information, and pursuit of research.

Many individuals and institutions participate in the conduct of PAHO technical cooperation with the countries in protecting the health of the environment. Assurance that their tasks are accomplished requires that everyone involved be kept abreast of significant ongoing activities in the field. That is the purpose of this series of reports,* of which the present publication is the first. It is by no means a comprehensive description, and future reports are expected to be enriched by information from contributors in the country offices and other PAHO units on environmental health developments.

Prepared and disseminated by the PAHO Division of Environmental Health Protection (EHP), the reports aim to provide information to Organization staff—those in the field, at the Pan American Centers for Sanitary Engineering and Environmental Sciences (CEPIS) and for Human Ecology and Health (ECO), and other PAHO technical units. Likewise, it will be sent to key people working in the countries as well as in other international development organizations who are concerned with environmental health activities. Finally, a broader audience will include all those interested in the progress made in improving and protecting the environment in Latin America and the Caribbean. The list of recipients will be increased as individuals who can benefit from this information are identified.

* Presently, no decision has been made as to the frequency of issuing these reports. To a great degree, that will depend on comments from the readers.

The success of every activity, project, and program—no matter what the field—depends on adequate and timely information. By providing this forum for information on environmental health activities in the Americas, the Organization hopes to contribute to both a better understanding and a surer attainment of health for all by the year 2000.

*Frank A. Butrico, Chief
Division of Environmental Health Protection*

The International Drinking Water Supply and Sanitation Decade

Declaration of the ten-year period 1981-1990 as the International Drinking Water Supply and Sanitation Decade stems from a global recognition that clean water and adequate sanitation are two of life's most basic requirements. Lack of them has a direct, constant, and profound effect—unlike any other—on the lives of over 800 million individuals in the developing world who are trapped in abject poverty and living conditions so limited as to be beneath any reasonable definition of human decency. The impact of such conditions on human life is appalling:

- “Two billion potentially productive men, women, and children—half the world's population—are denied the clean water and adequate sanitation necessary to begin to fulfill their aspirations for a fuller, more productive life,” according to United Nations Development Program Administrator, Bradford Morse.
- “The yearly incidence of water- and excreta-related diseases among children is estimated at 3 to 5 billion, and about 15 million children below the age of five die in developing countries every year,” reports United Nations Children's Fund Executive-Director, James P. Grant. He adds that, “The absence of safe water and sanitation plays an important role in those deaths, which could be cut by 50% if everyone had access to water supply and sanitation.”
- “About 80% of all disease in the developing world is related to unsafe water supplies and inadequate sanitation,” according to World Health Organization Director-General, Halfdan T. Mahler.

The Situation in the Americas

In Latin America and the Caribbean, diarrheal diseases alone account for almost 200,000 deaths each year, a number which climbs much higher if account is taken of typhoid fever, hepatitis, and schistosomiasis. Sickness due to water-related diseases—trachoma, malaria, enteric and parasitic diseases—can spell disaster for individuals, families, communities, and entire nations. A vicious cycle evolves as those unable to work lose income, levels of family nutrition drop, personal growth is

stunted, and susceptibility to diseases and death increases. The repercussions in terms of gross national product are devastating. In order to interrupt this cycle, the efforts of the past to provide people water, "the fluid of life," will have to be intensified.

In Latin America and the Caribbean, the Decade goal of providing drinking water and sanitation to as many people as possible by 1990 translates into services for a total of some 338 million urban dwellers and 147 million rural inhabitants. Provision of those services represents a mammoth undertaking: the additional people to be served water are more than double those served at present; the added individuals to be incorporated in excreta disposal systems are more than triple those covered today.

PAHO Cooperation with the Countries

Supplying clean water and adequate sanitation to as many people as possible over the course of the next ten years is a goal closely linked with the principles of primary health care and community development, and its achievement could well serve as the spearhead for the campaign to attain "health for all by the year 2000." Transformation of the set goal into an actual accomplishment will require that governments make the necessary political commitment and apply concerted action strategies in the areas of institutional development, appropriate technology, human resources, and financing.

These areas have been highlighted in *Strategies for Extending and Improving Water Supply and Excreta Disposal Services during the Decade of the 1980s**, which resulted from the Technical Discussions of the XXVI PAHO Directing Council Meeting in 1979. Those strategies, consequently, represent the areas in which PAHO, through the Division of Environmental Health Protection, cooperates with the countries of the Region to extend their peoples water and sanitation services. Features on each one of these aspects—training, operation and maintenance, technology, financing, research, etc.—appear in the pages that follow.

The Division has been involved in consultative meetings of the Decade Steering Committee, which is made up of eight United Nations agencies linked to the sector and whose function is the promotion of external coordination and identification of actions to support national programs. Par-

* PAHO Scientific Publication 390, which can be obtained by writing the Distribution Unit, Pan American Health Organization, 525 Twenty-third St., N.W., Washington, D.C. 20037 USA.

ticipants in the meeting held in Geneva in June 1980 concluded that it was important to: provide information exchange and dissemination on funding sources, evaluate progress of Decade activities, prepare a roster of donor agencies, focus on orientation and training of national personnel, and recognize the role nongovernmental organizations play in the sector.

This coordination among international and bilateral agencies is characteristic of PAHO's involvement in Decade activities. Several cooperative programs are ongoing with the World and Inter-American Development Banks as well as with the German Technical Cooperation Agency. PAHO staff are also cooperating with the Inter-American Association of Sanitary and Environmental Engineering (AIDIS), which promotes the Decade among sanitary engineering professionals throughout the hemisphere (see respective articles on pp. 16-19).

The Decade was formally launched worldwide at a Special Session of the United Nations General Assembly, held in New York on 10 November 1980. The launching in the Region of the Americas took place at an Economic Commission for Latin America meeting of Ministers of Planning and Finance, held in Montevideo from 4 to 16 May 1981. For this meeting PAHO and ECLA prepared a joint working document on the situation in Latin America on the eve of the Decade and prospects for the future. It describes constraints to achievement of universal extension of services and strategies to overcome them. At the meeting, the Director of PAHO, Dr. Héctor R. Acuña, gave an address signaling the factors favoring success of the Decade in the Americas: the inextricable link of the goals to human well-being and productivity, the progress already made toward accomplishing them; and the groundwork laid in the establishing of strategies for the full provision of water and sanitation services throughout the hemisphere.

PAHO also cooperated with the Commission in the preparation of a document on the financial demands of the ten-year program on Latin America and the preparation of a Latin American Seminar on Horizontal Cooperation for the Decade, the aim of which is to identify and define the approaches, mechanisms, and proposals for action in water supply and sanitation. The Seminar was held in Santiago, Chile, from 9-13 March 1981, and directors and senior staff of governmental agencies and water and sanitation companies from South America attended. Among its recommendations were: that governments create national focal points to institutionalize horizontal cooperation in water supply and sanitation that would serve as the basis for a Latin American cooperative network; that

ECLA promote horizontal cooperation toward attainment of Decade goals and coordinate the Commission's activities with those of PAHO/WHO and other international organizations, particularly the conduct of meetings, formulation of bilateral agreements, and exchange of information; that international funding agencies facilitate the preparation of project proposals and the completion of funded works, e.g. through the holding of special seminars; and that water and sanitation agencies assign the resources necessary to assure effective horizontal cooperation. ECLA proposes to hold a second seminar on the same subject for the rest of the countries of the Region during 1981, probably in Mexico City.

Operation and Maintenance of Water Systems

The universal provision of water supply and sanitation services will require systems that work well and prove dependable over time. Thus, operation and maintenance are key factors in the assurance of water quality and continuity, the safeguarding of health, and the protection of sector investments.

In the past, the construction of new water and sanitation systems and the expansion of existing ones received far more attention than operation and maintenance. Often there was little incentive for managers to control the amount of water lost by their systems through leakage, unbilled water, or illegal connections—what is generally called “unaccounted-for water.” Today, many village water supply systems are failing faster than they can be constructed; data collected by one lending institution show that half of the systems built within the past five years are no longer in operation. In some countries in Latin America, intermittent service and the poor condition of distribution systems have resulted in leakage losses in the 40–60% range as well as infiltration of contaminants into systems when negative pressures develop. By comparison, in the United States unaccounted-for water of utilities averages around 10%.

The Organization cooperates with the countries in seeking ways to reduce unaccounted-for water. It is assisting the Water and Sanitation Agency of Trinidad and Tobago to implement a UNDP-sponsored project that includes leakage-control. The Caribbean Basin Water Management project (see pp. 39–40) has developed a manual that considers ways of alleviating this problem. In that regard, the Caribbean Development Bank, the Canadian International Development Agency, and PAHO are collaborating on a leakage-control project that will cover seven Caribbean countries.

In the spirit of technical cooperation among developing countries in the transfer of technology, PAHO has arranged that the unaccounted-for-water optimization techniques that were developed by the Costa Rican Water and Sewerage Authority be transferred to the Panamanian Water and Sewerage Institute.

Strengthening of operation and maintenance is one of the main objectives of a project being carried out by the Inter-American Development Bank, the Peruvian Government, and PAHO, through CEPIS. The project is for technological development of institutions responsible for drinking water supply and sewerage and the treatment of wastewater. Known as DTIAPA, it aims to establish and promote the application of practices and procedures appropriate to the socioeconomic conditions of the countries—particularly in the Andean subregion, where it is being applied first—that will permit rural and urban institutions to provide better service.

Such technological development is based on technology transfer, investigation, and human resource development; accordingly, DTIAPA carries out activities in four basic fields: training, technical cooperation, information, and research. From the beginning the project has been conceived as a means of optimizing institutional efficiency. Its expected results include, among others, the following:

- Establishment of permanent training systems in some of the institutions of the sector and, if possible, of a self-financed national system.
- Development of at least 20 training-of-trainers activities, instructing of at least 500 persons, and production of didactic methodologies and materials that facilitate additional training through the institutions.
- Development of research units in some of the institutions and training of staff in research.
- Conduct of 10 research projects on special studies on subjects related to water supply and sewerage systems.
- Acquisition of equipment for control of water supply and sanitation system operations.
- Definition of areas that require technical cooperation and the conduct of consultantships to improve technological development.

Institutional Development

In environmental health, the development of individual institutions, and thereby of the sector as a whole, is a strategic element in achievement of the objectives of services and programs. Massive funding of projects alone is not sufficient to assure their success. To be effective, institutions responsible for carrying out those services and programs must allow for ongoing adaptation to change and strengthen their management, operation, and maintenance capabilities. Often major investment programs require the introduction of new methodologies and resources to solve existing as well as potential problems in the sector. The strategy used to plan, program, and monitor the process of change in order to attain environmental health goals is known as "institutional development." PAHO promotes application of this strategy through technical cooperation to the countries of the Americas.

Institutional development programs may include such diverse activities as consumer surveys, meter installation, facility and equipment improvement and installation, human resource development, and preparation of detailed studies. This may represent large investments in addition to those allocated only for technical cooperation, depending on the size of the institution and the community or communities it serves. Such activities imply expenditures for which funds, mostly from national sources, must be provided through loans obtained from credit institutions that can be repaid in accordance with the borrowing institution's financial capability.

Planners must recognize what the priorities of an institutional development program are, how actions can be interrelated to achieve the desired results, and whether project activities are both technically and economically feasible. In addition to the physical, social, and technological aspects peculiar to the institution's setting, planning should give consideration to the principal elements of all institutional development programs through a comprehensive analysis of the sector and its institutions. Those elements include: a *systemic approach* that serves as a frame of reference in describing and formulating the various planning, operational, commercial, financial, and administrative functions of an

organization; a *management information system* that integrates the information from the abovementioned functions with strategic planning, management, and operational control, and transactions to provide a basis for decision-making; *programming* of the various stages—diagnosis, analysis, performance models, implementation and evaluation; *financing* that will assure process continuity; *human resource development*, particularly through an instructional program that includes a training delivery system; *legal resources* to solve ahead of time program constraint problems; a *change agent* that works with the staff of the institution to assure successful introduction of necessary modifications in both the organization and its employees' behavior; and *organization mechanisms* through coordinating and working groups and units responsible for approving, supervising, executing, and controlling program activities.

Over the last 15 years, the Division of Environmental Health Protection, through the institutional development program, has cooperated with the countries in improving the technical and administrative capability of their institutions.

Technical cooperation in this area has been expanded from a concentration on individual national units to inclusion of the entire sector through cooperative programs with the World Bank and the German Technical Cooperation Agency (or GTZ) as well as regional activities such as elaboration of general models of organizational and informational systems and training of trainers for institution staff.

As part of the Cooperative Program with the World Bank, 19 sectoral studies were conducted in countries of the Region during 1978-1979. The studies resulted in recommendations regarding the institutional structure of the drinking water and sanitation sector in each country, identification of participating institutions and their interrelationship, and review of constraints and possible strategies to overcome them.

The studies revealed minimal participation of sector officials in national development planning, during which proposed financing and investment are decided. Too often, planners fail to link overall planning with its goals and the specific projects required—including the needed financial, legal, human, and institutional resources. Proper and efficient utilization of resources requires timely economic and financial analysis of projects to assure wise system management, including opportune procurement of materials, completion of facilities, and response to production demands. Two-thirds of the countries are considered to be centralized at the national level, whereas one-third is characterized by a number of institutions at the national, regional, metropolitan, municipal, and local levels.

The sectoral studies also pointed up a lack of established financial systems and mechanisms to guarantee availability and replenishment of resources necessary. To attain the International Drinking Water Supply and Sanitation Decade goal of services for as many as possible by 1990, tariff policies will have to be clearly defined and responsibility for their implementation and control assigned.

The cooperative program with GTZ provides assistance to three countries—Bolivia, Haiti, and Paraguay—in the preparation of their sectoral plan, including analysis and formulation of recommendations and plans of action on institutional structure. The program may extend to three more countries in 1981. GTZ funding is also expected to be used for establishment of a human resource development system in Central America and Panama that will include the training of trainers in institutional development techniques (see p. 16).

The Division of Environmental Health Protection has developed two models of organizational and commercial systems to serve as guidelines for institutional development in the countries. In addition, CEPIS, as part of the DTIAPA project, is developing five modules for the training of trainers in commercial systems. In that connection, the Center is preparing material needed to implement training delivery systems in the agencies, integrated with their institutional development programs. Two modules, on consumer records and commercialization of services, are due to appear in 1981, while in 1982 modules on metering and bill collection will be prepared.

PAHO provided cooperation in the use of sound management techniques to 13 countries in 1980, involving collaboration in organizational and information systems of 34 national and local institutions. Funding sources for these cooperative activities, in addition to PAHO, include the institutions themselves, the countries, and such international lending agencies as the Inter-American Development Bank, the World Bank, and the United Nations Development Program. Individual country projects are described below.

Brazil. The Government of Brazil and PAHO signed an agreement in 1974 for a technical cooperation program (SATECIA) in support of the National Sanitation Plan (PLANASA), focusing on the institutional strengthening and development of 21 state water and sewerage agencies. The SATECIA program was carried out by the agencies themselves with the technical advice of PAHO staff and officials from the National Housing Bank of Brazil (BNH).

The program consisted of five stages: preparation of a diagnostic

manual; diagnosis; analysis of the situation in the agencies; elaboration of models of performance for the planning, operational, commercial, financial, and administrative systems; and implementation of specific models based on the abovementioned general ones and carried out by the agencies themselves with SATECIA collaboration. To complete the last-mentioned stage, each agency established its own institutional development program.

As an outgrowth of the SATECIA program, which ended in 1980, the BNH set up a program for state sanitation agencies (PRODISAN) that provided funding for institutional and human resource development and established a unit within the Bank responsible for project completion. Subsequently, a new two-year agreement between PAHO and Brazil was signed in 1980 to provide technical cooperation to the BNH for implementation of PRODISAN. For the same purpose, namely project implementation, the Water and Sanitation Company of Ceará signed an agreement with PAHO to cover project management and short-term consultantship costs.

A new project agreement between PAHO and the National Housing Bank of Brazil, presently in the drafting stage, aims to assess the capability of the operating portfolio of the Bank's financial system for sanitation (COSAN). Cooperation will focus on analyzing the institutional situation as regards information, evaluation, and supervision so that these aspects can be upgraded to meet growing demands on the BNH resulting from World Bank loans to water and sanitation agencies.

Barbados. PAHO and the Inter-American Development Bank cooperated with the government of Barbados in establishing the National Water and Sewerage Authority. Completed in January 1981, the project included collaboration in development of a new Water Act, regulations, commercial, financial, and administrative systems, the budget, engineering practices, and the organization's manual. The Authority has now been legally established as part of the Ministry of Communications and Works.

Haiti. PAHO technical cooperation continued with the Service National d'Eau Potable (SNEP) of Haiti. The focus of the project is on implementing administrative and operation and maintenance systems and on developing water sources. The completion of bidding procedures that would allow for initiation of works brought provision of water supplies to the country's 10 medium-size cities much closer to realization.

Guatemala. Underway in Guatemala is a project to assist rural water supply and sanitation programs. Begun in 1977, it aims to develop and strengthen the rural water supply program of Guatemala (UNEPAR). Project activities in 1980 included cooperation in implementing the organizational structure of the program's executive unit, promoting community participation and increasing its share of responsibilities in operation and maintenance of community water systems, and developing information systems to assist in decision-making.

Paraguay. Another project to support rural water supply and sanitation programs started in Paraguay in 1977. It involves cooperation to the National Environmental Sanitation Services (SENASA). Activities included efforts to improve the managerial and operational capability of SENASA in executing a \$6 million loan from the World Bank for rural water supply and sanitation; assistance in preparing rural communities for system management, operation and maintenance; and development of technical and managerial tools.

Costa Rica. A project is in preparation for institutional development to strengthen the Costa Rican Water and Sewerage Institute. It will give attention to identification and necessary reformulation of organizational systems, as well as their implementation and development of management functions at the strategic, tactical, and operational levels. This will improve the decision-making process through implementation of management information systems. The project also proposes to better institutional efficacy through regionalization efforts by strengthening coordination at the local and regional levels.

Measures have been taken to expand the program to those institutions responsible for solid waste disposal and pollution and food control. The continuation of the workshop modules for training of trainers at CEPIS will be strengthened with the assignment of a PAHO staff member to be responsible for the activities. Finally, workshops and pilot experiences have been programmed to foster community participation and health education, mainly in the rural and slum areas—activities which are to be integrated into the sector through local institutional schemes.

Appropriate Technology

Appropriate technology implies use of the tools and systems best suited to the size, nature, culture, history, and capacity of a particular community. In some cases advanced technology is indicated, while in others simple, basic technology is called for. In heretofore underserved populations, technology with a social focus best attracts the community participation so essential to village, rural, and slum programs.

The Division of Environmental Health Protection participated in cosponsoring a PAHO symposium on appropriate technology for health in October 1980, the purpose of which was to develop an understanding of where and how various appropriate technologies could be used to further the Organization's goal of health for all by the year 2000. One of the panels discussed integration of the environmental aspects of appropriate technology in efforts toward that goal. Specifically, panelists examined: ways in which low-cost, simplified water treatment could result in provision of more and better water to un- and underserved populations; social and sociological aspects of extending water and sanitation services; considerations regarding use of alternate energies—such as solar, wind, and geothermal energy—in primary health care programs.

The Division worked in the Central American and Andean subregions to develop exploratory projects on how the countries could carry out programs for the use of alternate energies to bring drinking water and sanitation services to people. Staff developed a project document to be discussed with national authorities.

In addition, the Division continued examining the possibilities of conducting a project in which an array of photovoltaic solar cells would be used to provide electrical power to basic village health services (such as pumping water, powering the health post, and grinding corn). Among other activities, staff accompanied a mission of the United States National Aeronautics and Space Administration to Guyana to examine possible sites for such a project.

Likewise in the area of appropriate technology, low-cost, simplified disinfection of drinking water—one of the best defenses against waterborne diseases—was the subject of a project dealing with small drinking water supplies carried out by CEPIS. The Center will provide close collaboration in this area to water authorities in Argentina, Chile, Costa Rica, and Peru.

Fluoridation

Fluoridation is the addition to people's diet of an optimal dose of fluoride for the purpose of reducing the incidence of dental caries. Protection from dental decay is particularly marked if fluoridated water is consumed from an early age and throughout childhood when teeth are being formed. Though other dietary forms of administering the preventive are known, fluoridation has come to be associated primarily with the addition of fluoride to public water supplies.

Fluoridation has an interesting history. F. S. McKay and G. V. Black, at the beginning of the 20th century, initiated studies to determine the cause of discolored, stained tooth enamel, and by 1916 investigation focused on "something" in public water supplies. It was not until 1931, however, that fluorides were identified as responsible for tooth stains. McKay, a practicing dentist, noted in the meantime a correlation in his patients between the stains and resistance to tooth decay. His observation led to large-scale studies which unequivocally demonstrated that, at levels near the optimum, fluoride in water lessened the frequency of dental caries without causing antiesthetic enamel staining or spotting.

For its part, PAHO—at its Directing Council Meetings of 1964 and 1969 and at the III Special Meeting of Ministers of Health of the Americas in 1972—passed resolutions urging adoption by the governments of measures to fluoridate public water supply systems and established goals to be reached in doing so. Those resolutions, in turn, were echoed by the Inter-American Association of Sanitary Engineering Congresses of 1964 and 1972 and by the World Health Assemblies of 1969 and 1975.

Given this mandate, the main objectives of the PAHO fluoridation program are to promote fluoridation through use of various vehicles, primarily water; prepare informational and technical material; train professional and technical personnel in all aspects of fluoridation; offer technical cooperation to the countries for national program development; stimulate, further, and participate in research; and evaluate progress and results.

One of the primary means of achieving these objectives, today as at the

outset of the program in 1967, is the training of PAHO and country engineers in fluoridation techniques so that they can carry out the program at the national level, with support and direction from Headquarters as needed. Two services complement that training effort: the preparation of printed material and sponsorship of intensive short courses. Such courses have been conducted at the national level in all but two of the Spanish-speaking countries and at the subregional level in the English-speaking Caribbean. Two regional-level seminars have served to exchange experiences and knowledge among participating engineers, dentists, physicians, and other professionals. More than 40 short courses have trained some 1,500 professionals in fluoridation.

Estimates of increased coverage of the population with fluoridation since the program began indicate that, whereas 6 million people consumed fluoridated water in 1966, 50 million do today. Sixteen countries in the Region now execute water fluoridation activities, while some of those same and other countries are using additional means of bringing fluorides to people.

Even though fluoridation techniques are simple, dosing equipment and application processes continue to be improved. PAHO is promoting and evaluating appropriate technology in this area, as well as compiling and distributing information on its use. Much of that information is now available in audiovisual material using slides, and in the future television equipment and videocassette reproduction facilities—which are presently being developed—will expedite the information and training processes.

The program has prepared, in cooperation with the DTIAPA project of CEPIS, a 12-hour modular course on fluoridation for the training of trainers. It summarizes all aspects of water fluoridation, with examples of designs of all possible field situations and the four fluoride compounds most commonly used. PAHO engineers will be the first to be so trained and courses in Lima and Buenos Aires for Area IV and VI engineers have been scheduled for 1981, with others to take place subsequently. One engineer in each Area will receive more detailed training, so that he can serve as a consultant on subregional needs. With this training, PAHO engineers will be able to promote national fluoridation efforts, provide technical cooperation and follow-up, and evaluate progress and results.

A basic study for accomplishment of the program's ends is the performance of national or regional surveys to determine the natural fluoride content in drinking water. PAHO has provided service of this nature to nine countries and has made available to eight of them the necessary specific electrode equipment to perform those surveys. Since progress in

this regard has not always met expectations, the training of PAHO and country engineers has been seen as an important contribution to acceleration of fluoridation programs.

Finally, this training will make it possible to determine where the fluoride content is high in natural waters, what populations are affected by dental fluorosis, and the presence of mild and severe fluorosis. In addition, the program proposes to promote measures for partial removal of fluoride and, thus, the avoidance of risk of fluorosis.

PAHO Cooperative Programs

The German Technical Cooperation Agency

The World Health Organization and West Germany are carrying out an Interregional Cooperative Project to support national planning for the Water and Sanitation Decade. Three of the ten countries participating in the project are from the Americas—Bolivia, Haiti, and Paraguay. The German Technical Cooperation Agency (Gesellschaft für Technische Zusammenarbeit or GTZ) has assigned some US\$300,000 to cover PAHO/WHO technical cooperation to those countries including advisory services, development of planning workshops, and partial administrative support costs. General project objectives aim at promotion and guidance in planning to extend water supply and sanitation services to underserved populations and to further the accelerated development of the sector and the increased flow of external resources toward it.

PAHO has signed agreements with the three governments, and in the latter part of 1980 activities outlined in the work plan began. The result of this technical cooperation includes determination of realistic goals for coverage of water supply and sanitation service; formulation of support program proposals including institutional arrangements, training and development of human resources, community participation, service operation and maintenance, appropriate technology, information services, and others; and identification of priority investment projects.

Preparations for a subsequent phase of the GTZ/WHO cooperative project, which covers nine countries throughout the world and begins in 1981, have progressed. It is proposed that support in national Decade planning be extended to Honduras, El Salvador, and Peru. In addition, PAHO has proposed that support be given to the center for training in operation and maintenance of water and sanitation services for Central America and Panama, whose headquarters are located in San José, Costa Rica.

The Inter-American Development Bank

The Inter-American Development Bank (IDB) has been evaluating its activities and programs in the health sector in an effort to strengthen its

cooperation with the countries. One aspect of that evaluation has included discussions with PAHO on identification, documentation, submittal for financing, and implementation of health projects—especially those in the water and sanitation sector.

To that end, the two organizations have reached agreement to carry out a cooperative program. Under that agreement, PAHO staff and consultants will participate in the early stages of proposed arrangements being worked out by the Bank and government beneficiaries of its loans and technical cooperation grants.

The objectives of cooperative water supply and sanitation activities consist of preparation of diagnostic studies and participation in programming and orientation missions to the countries. Specifically, these activities will entail the identification of priority projects, possible financing sources, needs for institutional strengthening, and training. Advisory services will be given to countries on the technical, institutional, financial, and economic aspects of projects as well as on the preparation of project proposals to be submitted for loan considerations. In addition, the Bank and PAHO will collaborate in specific problem-solving tasks to further development of the water supply and sanitation sector.

The World Bank

PAHO and the World Bank are carrying out a cooperative program that has involved preparation of water supply and sanitation sector studies for all the major countries in the Americas, which in turn have served as a benchmark for the regional launching of the International Drinking Water Supply and Sanitation Decade. Moreover, the sector study approach has been extended to the field of solid wastes, and the first of a planned series was prepared for Chile.

As part of the program, technical cooperation was provided to a number of the countries of the Americas. Uruguay received assistance in the field of water tariffs and for the Montevideo sewerage project, the latter expected to cost approximately US\$100 million and to receive funding from the Inter-American Development Bank. Project preparation was given to Argentina for a multi-city water supply project that was to cost about US\$600 million and to be financed by the World Bank. PAHO continued technical assistance for World Bank-financed village water supply and sanitation projects in Haiti, Nicaragua, and Paraguay, which total approximately \$15 million.

With the Caribbean Development Bank, the cooperative program con-

ducted a seminar on project preparation that is expected to expedite the execution of projects.

Close collaboration continued in the health field between PAHO and the World Bank, resulting in exchange of information, reports, and consultative meetings between the technical and administrative staffs of the two organizations.

Other Programs: The Inter-American Association of Sanitary and Environmental Engineering

The Organization collaborates closely with the Inter-American Association of Sanitary and Environmental Engineering (AIDIS) to ensure that the best available resources, experiences, and materials are publicized and shared among those working in environmental health protection. Through AIDIS, which includes engineers working in the public and private sectors throughout the Americas, the countries of the Region can keep abreast of developments ongoing worldwide—which makes the Association an important mechanism for cross-fertilization of ideas.

More than 500 participants in the XVII AIDIS Congress, held in La Paz, 7–12 December 1980, heard addresses on the implications of the International Drinking Water Supply and Sanitation Decade for sanitary engineering and environmental sciences in the Americas. Others attending in addition to Association members were representatives of the World and Inter-American Development Banks, the United Nations Children's Fund, the Pan American and World Health Organizations, as well as the President of the United Nations Water Conference, Luis Urbano Jáuregui.

The Assistant Director of PAHO, Dr. Eusebio del Cid, praised AIDIS for its cooperative role in furthering efforts of the countries to extend sanitary engineering services to their peoples. He was, in turn, presented a plaque in recognition of PAHO's longstanding collaboration in the furtherance of environmental health and sanitation.

The Congress provided PAHO staff an opportunity to elaborate on the general strategies necessary to overcome constraints to achievement of water and sanitation for as many as possible by 1990. The Chief of the Division of Environmental Health Protection (EHP), Frank A. Butrico, spoke to the subjects of what the Decade is all about, why achieving its goals is essential to people's health and well-being, and how the countries—with technical cooperation from PAHO, AIDIS, and other institutions—must proceed to accomplish their ends. Stressing in particular how

AIDIS could contribute to the Decade effort, he noted the following aspects: exchange of information, promotion of national plans, provision of a forum, monitoring of progress, participation in country programs, and support of other regional activities.

EHP and CEPIS advisers spoke on the subjects of operation and maintenance of water supply services, institutional development, technology for water and wastewater treatment, self-sustaining training delivery systems, and political and financial requirements to extend universal coverage.

PAHO environmentalists likewise will be actively involved in the XVIII AIDIS Congress, scheduled to take place in Panama City in 1982. Other activities planned for 1982-1984 include: an inventory of environmental manpower agencies, materials, and resources; studies on how to modify current education and training practices for engineers and operational level technicians in order that they more realistically reflect locally available resources and facilities; and the dissemination of technical information through AIDIS journals, congresses and national seminars.

Solid Waste Disposal

The proper disposal of solid wastes, or what is more commonly called "garbage," represents a growing concern throughout the Americas. Greater socioeconomic development, increased urban migration, and higher living standards bring in their wake an ever-vaster generation of such wastes from agriculture, cattle raising, mining, industry, commerce, and daily life itself. Some of those wastes are toxic, radioactive, and extremely hazardous.

With the imminent industrialization and population explosions projected for the western hemisphere, the disposal problem is likely to become even more acute. That problem, in turn, translates into greater threats to human health and the environment, not to mention the odor and unsightliness caused by poorly handled or unattended refuse. Finally, social and economic factors come into play in considering the importance of solid waste disposal. Prime land that could otherwise be used for agricultural, industrial, or recreational purposes is used to get trash out of the way. Other natural resources such as fish, water, forests, and agricultural lands likewise are jeopardized unless management of solid wastes is properly practiced.

Actually, the health, environmental, and socioeconomic aspects of the solid waste problem are interrelated. Some health risks are indirectly linked to disease transmission through insects (primarily diarrheal diseases), rodents (plague, leptospirosis, among others), dogs (rabies), and pigs feeding off raw garbage (toxoplasmosis). Agricultural wastes—plants, animals, and synthetic materials—constitute threats, and livestock and poultry detritus, in particular, can become the breeding ground of disease-bearing flies and mosquitoes. Solid waste management is the best strategy to prevent such threats. One study carried out by the University of São Paulo demonstrated that proper disposal of garbage could eliminate 90% of flies, 65% of rats, and 40% of mosquitoes.

Direct health risks are possible in the case of wastes originating in hospitals and clinics, fecal material, radioactive wastes, and other harmful matter. The incidence of certain diseases such as hepatitis, cysticercosis, hydatidosis, and trichinosis can be linked to poor solid waste disposal.

Solid waste pollution of the soil, water, and air poses special problems in Latin America and the Caribbean. As estimated 80% of cities dump their garbage, damaging 2,000 hectares of land at an annual cost of \$20 million. Some 15% of all garbage, or 3 million tons annually, are emptied into Latin American waterways making them useless for more productive purposes. Incineration of wastes accounts for an estimated 10-20% of all air pollutants.

The safety of individuals who work with solid wastes is an important consideration, in that the annual cost of professional accidents and diseases, as a result of lost work time in the collection and disposal services of Latin American cities, is around \$17 million.

Moreover, nearly one million people in the Region—human scavengers and their families—whose existence has been conditioned by poverty, unemployment, and ignorance, literally live off garbage. For them, solid wastes are their only means of survival.

Urban areas, the 1,500 cities of more than 20,000 inhabitants each in Latin America and the Caribbean, have special problems in regard to solid waste management. One city, São Paulo, produces more than 8,000 tons of solid wastes every day. Today well over half and by the year 2000 almost 70% of the total population will live in cities—cities where development often goes unplanned, particularly as regards the generation, storage, collection, transport and final disposal of garbage. The most serious problem is in urban-fringe neighborhoods where crowding aggravates collection and disposal service difficulties. To make matters worse, the amount of garbage generated daily is expected to almost triple—from 137,000 tons to 370,000 tons—in the next 20 years.

Rural communities do not generate as much garbage as cities and therefore represent a much less critical need in the sector. Nevertheless, inadequate solid waste disposal results in environmental deterioration, and such services should be included in primary health care programs.

Thus, the demands on the sector in Latin America and the Caribbean, particularly in urban areas, are patently clear. The services to meet those demands, however, are insufficient: 30% of paved streets go uncleaned, 33% of urban garbage is not collected, and 95% of cities of 20,000 or more inhabitants dispose of solid wastes in open dumps.

The countries of the Region have voiced their collective concern at Governing Body meetings of the Pan American Health Organization. PAHO has established the goal of adequate services for solid waste collection, transport, processing and disposal in at least 70% of cities. Many governments have included solid waste projects in national development programs.

In response to the countries' solid waste management needs, PAHO—one of the few international agencies involved in regional programming in this sector—cooperates in development of national policies; formulation of plans, projects, and programs; strengthening and extension of urban collection and disposal services, particularly in fringe areas; improvement of services in rural communities; and safe disposal of toxic, mining, industrial, and other special kinds of solid wastes. Cooperation—provided by two regional advisers located in Washington, D.C., and Lima, country engineers, and short-term consultants—takes the forms of advisory services to several local projects; human resource development through the preparation of material and the conduct of training-of-trainer courses, including a Central American workshop in June 1980 for 28 participants, a regional course at the University of Buenos Aires in October for 26 professionals, a two-week workshop at CEPIS in January 1981 for 40 officials connected with the solid waste sector, and other national seminars and symposia; publication of guides and manuals; and dissemination of technical material.

Recent cooperative activities include a sector study of urban collection and disposal in Chile, which described the situation in 85 cities of more than 10,000 inhabitants. Results showed that 80% of paved streets were cleaned, 91% of garbage properly collected, but 90% of cities dispose of garbage in open dumps.

National urban solid waste management plans are being prepared in Bolivia, Brazil, Costa Rica, Dominican Republic, Guatemala, Honduras, Nicaragua, and Paraguay. The problem in those countries as elsewhere is rising costs to provide extended coverage. One solution has been that applied in Bogotá, where tariff policies were adjusted and income consequently tripled in one year.

Four cities in the hemisphere—Santiago, Chile, Buenos Aires, Argentina, Bogotá, Colombia, and Rio de Janeiro, Brazil—best illustrate the success of well planned solid waste disposal services. In Santiago, collection facilities have been redesigned resulting in doubled service, and three privately run sanitary landfills handle almost all garbage generated in the city. In Buenos Aires, 3,500 tons of garbage are disposed of in an ecological belt that is part of a major land reclamation project. In Bogotá, in addition to the above-mentioned successful financing operations, new sanitary landfills are replacing open dumps. Finally, Rio de Janeiro has continued to offer services to manage 6,500 tons of garbage daily at relatively low costs.

In addition, PAHO has recently provided technical cooperation in the

formulation of basic proposals for the toxic and industrial solid waste control program in Brazil; recommendations for the adoption of regulations and standards for the operation and control of special solid wastes in Rio de Janeiro; and initial steps for the improvement of public collection and disposal services in 14 cities with more than 500,000 inhabitants in the Andean subregion.

Occupational Health

Occupational hazards, accidents, and diseases are often encountered in industries, agricultural operations, mines, and a myriad of other workplaces. Chemical, physical, biological, and psychosocial conditions and factors contribute—individually or in combination—to the environmental stress of workers.

In Latin America and Caribbean, the work force numbers 100 million and the ratio of workers to dependents is 1:1, a fact which emphasizes the importance of occupational health in the Region. Nevertheless, there the incidence of occupational accidents and disease is 6 to 8 times greater than in industrial countries. Even though many of the countries have institutions to protect the environment in general and workers' health in particular, their efforts cannot keep pace with the hazards resulting from the vertiginous growth of industry and the uncontrolled introduction of pesticides and modern equipment in agriculture.

In fact, the environmental and occupational health problems of developing countries may be far more serious than those of industrialized societies, precisely because they are bridging the development gap in a so much shorter, and less evolutionary, period of time. The extremely rapid rate of change in industrial technology, procedures, and practices—projected to increase four or five times over—is not coupled with a thorough understanding of health implications or disease and accident prevention and control. Moreover, not all such occupational hazards result from misuse of new, sophisticated equipment. Traditional tools are often involved as is the case of the machete, which is responsible for over one-fifth of occupational accidents in one Central American country. Also, pesticides, herbicides, and fungicides are posing increasingly serious problems of poisoning.

The extent of the problem of occupational safety and health in Latin America and the Caribbean is unknown due to the lack of significant data, but the incidence of occupational accidents and diseases is considered to be high. A conservative estimate would indicate that in Latin America and the Caribbean at least 10 million occupational accidents occur each year—with more than 50,000 fatalities—and the prevalence and incidence rates of occupational diseases are likewise elevated. Economic losses probably involve more than 10% of the countries' gross national product—in terms of direct

and indirect damages and the affected productivity. Since these losses are usually sporadic and isolated, their impact often goes unnoticed or unduly appreciated. Aggressive and active political commitments to provide prevention and control measures must be taken to reverse both the human health hazards and the economic losses.

Since the early 1960's PAHO, through CEPIS, has provided technical cooperation to the countries in the conduct of activities to protect workers' health by reducing the rates of occupational diseases and accidents. Specifically, the Organization's program includes: collaboration with the health sector in strengthening institutions and in developing occupational health programs; promotion of legislation on professional risks; development of human resource training in the countries and the Region to man the programs; stimulation of the development of national information systems; cooperation in the pursuit of research; promotion of the inclusion of an occupational health component in environmental impact assessments of development projects; collaboration with the countries in the preparation of projects to be submitted to funding agencies for the prevention and control of occupational risks; and establishment of permanent mechanisms for coordination with other international organizations. Recently, this activity has been transferred to ECO in Metepec, Mexico. The multidisciplinary staff at ECO and CEPIS is expected to collaborate with the governments to further activities to protect workers, particularly those concerned with chemical and other potentially toxic hazards.

In addition, PAHO has cooperated in the development of the Institute of Occupational Health and Air Pollution Research in Chile, the Institute of Occupational Health in Bolivia, and programs in other countries. A study of the toxic effects of pesticides was conducted at the request of the Ministers of Health of Central America with a view to providing the necessary background for pertinent control actions. The Organization is collaborating with the Government of Bolivia on an IDB-financed project to determine the prevalence and economic impact of silicosis and to study and propose policies to prevent it. Furthermore, PAHO is collaborating with the member countries of the Andean Pact in the development of a coordinated occupational health program.

The Organization coordinates its efforts with other agencies having responsibility for activities in this field, particularly the International Labor Organization (ILO) and the Organization of American States (OAS). In late October 1980, PAHO sponsored a workshop on occupational health programming in Lima for representatives of the countries as well as such international and regional agencies as ILO and the Andean Pact. The

workshop stressed: the emergence of occupational health as a growing concern in Latin America, given stepped-up socioeconomic development and industrialization in the Region; the need to evaluate the impact on national economies of work-related accidents and occupational diseases; the importance of governments' political support to occupational health services and institutes in their countries; and, especially, the urgency of coordination among multinational agencies in the effective support of national programs. It was recommended that similar workshops be held in the countries to further program development.

PAHO is also collaborating with the Organization of American States, which has created a post for an adviser in occupational health. Both organizations are supporting the Mexican Social Security Institute in the conduct of a course on the subject, and PAHO has contacted ministries of health throughout the hemisphere to promote attendance by officials involved in the occupational health field.

As the focal point for activities in this area, ECO is currently cooperating with several of the countries in the preparation of research proposals as part of a proposed project on the exposure of women to risks in the working environment.

Prevention and Control of Pollution and Other Environmental Hazards

Pollution Prevention and Control

Accelerated population growth, industrialization, and socioeconomic development in general have resulted in increased pollution of the air, water, and soil throughout the Americas. Likewise, chemicals—in ever-greater use in the home, agricultural activities, and industrial operations—presently constitute a major pollutant. Unfortunately, the growing problem has not been coupled with stepped-up construction of pollution treatment facilities or implementation of pollution prevention programs. Since pollution is known to be detrimental to human health and well-being, PAHO provides technical cooperation to the countries in monitoring, prevention, and control activities in this area.

Strong environmental protection programs require a broad approach at the national level and a corresponding commitment in financial support and manpower. Such an approach is being stimulated by individual projects and by the Global Environmental Monitoring System (GEMS), carried out by the United Nations Development Program, Educational Scientific and Cultural Organization, World Meteorological Organization, and WHO. As part of the system, collection of data began in 1978 in the air monitoring program and in 1979 in the water quality monitoring program.

CEPIS serves as the regional focal point for the GEMS air and water quality monitoring programs. As such it relays information received from the network's stations to WHO/Geneva, distributes technical information on monitoring, responds to country requests, and cooperates in system operation and the determination of equipment needs through missions to the various stations.

As part of the GEMS program, the Organization and the United Nations Environment Program are carrying out a project for the assessment—through biological monitoring of the air, water, and food—of human exposure to organochlorine compounds and selected heavy metals such as lead, cadmium, and mercury. Institutions throughout the world—including Mexico, Peru, and the United States in this Region—will par-

ticipate in sample analysis for quality control, collection and analysis of samples for central compilation, planning and review, and training. Expected results of the project include the preparation of staff and the development of national capability to deal with the problems of the pollutants under consideration, especially those that may be of national importance.

PAHO also provides assistance in evaluation and improvement of national pollution control programs, formulation and preparation of project proposals to be submitted to lending agencies, identification of human resources, and terms of reference for air and water quality monitoring activities. Information related to activities in specific countries follows.

Brazil. The Organization has collaborated in the development of several UNDP-funded projects for environmental pollution control in Brazil. In Rio de Janeiro a project for development of the State's environmental control program, carried out by the State Environmental Engineering Foundation (FEEMA) with UNDP financial support for which PAHO/WHO acted as executing agency, was completed in 1980. It recommended the recovery of the Lagoa Rodrigo de Freitas, control of air pollution, management of solid wastes, improvement of the heavily polluted Guanabara Bay, and prevention and control of pollution in the Paraíba do Sul River—the major water supply source for the city of Rio de Janeiro. Many of the recommendations have already been implemented with consequent improvement of the human environment. The total cost of the UNDP contribution was US\$1,234,000. To complement the work an additional small project was financed by UNDP late in 1980 to study the ways to control air, water, and soil pollution due to toxic chemicals.

In support of environmental pollution control carried out in São Paulo by the State Company for Technology in Basic Sanitation (CETESB), the Organization assisted as executing agency in a project for the development of a research and environmental pollution control program for which UNDP provided US\$1,223,000. PAHO technical cooperation included assistance in the institutional strengthening of CETESB, control of water pollution, establishment of a water quality monitoring network, development of mathematical models for water quality forecasting and management, advisory services in development of an air pollution monitoring network and control procedures, studies of solid waste disposal, recommendation of guidelines to control urban noise pollution, and training of approximately 800 students in environmental pollution control methods. Recife was the site in 1980 of a seminar, attended by

Brazilian and international participants, on water resources in arid and semiarid regions, the purpose of which was to analyze short- and medium-term solutions for water resource use in northeastern Brazil.

As a follow-up of the abovementioned project, CETESB and PAHO have signed an agreement for execution of an environmental control program for São Paulo State, to be financed by CETESB. Technical cooperation continues through this project in selected areas of water, soil, and air pollution.

Furthermore, in regard to pollution control in Greater São Paulo, CETESB will conduct an industrial pollution control project, with financing from the World Bank. Its objectives include reduction of emissions of industrial particulate matter, achievement of significant reduction in industrial discharges of toxic substances in area rivers, reduction of health risks, treatment of industrial wastes, and strengthening of CETESB capacity to plan and implement a long-term pollution control program. The cost of technical cooperation for the project, expected to extend three years, is estimated at US\$3 million. Discussions have been held between PAHO and CETESB on the possibility of PAHO serving as the executing agency for the technical cooperation component of the project.

PAHO collaborated also in a UNDP-funded project whose aims were to formulate a plan for recovery of Lake Paranoá, the man-made lake in Brasília, and to maintain the water quality of Lake Descoberto, which was to serve as a source of drinking water. The quality of the water in Lake Paranoá had deteriorated as a result of domestic and agricultural pollution. The Water and Sewerage Authority of Brasília (CAESB) was the national agency responsible for project execution. Technical cooperation to the project included the conduct of bioassays and studies on water chemistry and sediment stratigraphy, sewage treatment methodology, and lake ecology; development of human resources through fellowships, seminars, and in-service training; and equipment of field and laboratory facilities. The project provided guidelines and orientation as to how Lake Paranoá could be recovered and Lake Descoberto preserved. In addition, it established a basis for continued research in Brasília and for the planning and execution of similar recovery projects elsewhere.

Colombia. Several pollution control projects have been underway in Colombia. As part of a project for development of the Cauca River watershed, PAHO facilitated the further training of professionals through travel seminars to industrialized countries that practice watershed management. Also, advisory services were provided on design and loca-

tion of industrial waste treatment plants and use of chromatography equipment for analysis of pesticides.

The Organization provided partial support to another Colombian project aimed at researching, monitoring, and controlling pollution in Cartagena Bay and surrounding areas, particularly attempts to define alternative and economical technical solutions to the problem. Technical cooperation involved limited advisory services, training courses for officials in the city of Cartagena, and provision of some equipment.

PAHO and Colombia signed an agreement for technical cooperation in protecting the Bogotá savanna water resources. Specific assistance included advisory services in the organization required for integrated control and management of the basin of the Bogotá and Suárez Rivers as well as establishment of water quality criteria and standards in accordance with water uses and their impact on health. Collaboration began on studies of pollution caused by industrial liquid wastes, especially those resulting from tanning processes.

A project on wastewater treatment and disposal in the city of Bogotá received PAHO support through advisory services in analysis of alternatives to wastewater treatment and in water chlorination and through the facilitating of travel seminars for five professionals to different countries in Latin America.

Costa Rica. Rapid urban and industrial growth in Costa Rica prompted the government to request PAHO advisory services for recommendations regarding establishment of a national system for protection and improvement of the environment. Technical cooperation has focused on advisory services in the collection of information on water and air pollution and in soil pollution control with emphasis on pesticides and fertilizers.

Venezuela. PAHO executed a UNDP-funded environmental pollution research project in Venezuela, with the objectives of developing and strengthening the national Directorate for Environmental Research. The Organization contributed to establishment of norms, strategies, and actions for environmental preservation, evaluation of the impact of development on the environment, and investigation of pollution. Among the more important project activities were integrated studies on water pollution in Lakes Maracaibo and Valencia, which included, study of water quality and pollution discharge in the lakes and all their tributaries, in situ and laboratory sediment analysis, and a bioassay program to evaluate the process of eutrophication of the lakes. Air pollution in the Caracas Valley, development of a sanitary landfill in Isla

Margarita, research on stabilization lagoons, and environmental impact of petroleum industries were other activities. Decision-makers have used the results of these studies to determine appropriate courses of action. The project provided opportunities for the training of staff in various research centers in the United States and Canada. Consideration has been given to using this Venezuelan effort as a demonstration project for other Latin American countries.

Control of Environmental Health Hazards

Increasingly important in the Organization's work with the countries is study of the exposure of man to environmental agents—chemical, physical, and biological; evaluation of the associated health risks; and cooperation in prevention and control measures. These efforts are to be channeled in part through the International Program on Chemical Safety (IPCS), which is being partially funded by the contributions of individual governments as specified in memoranda of understanding. It focuses on assessment of health and environmental effects of new and existing chemicals, including specific effects such as carcinogenicity, mutagenicity, and teratogenicity; on preparation of guidelines on exposure limits and methodology, on response to chemical emergencies, and on manpower development. The Program will also take into consideration the ongoing activities of the food safety program (see pp. 33-35) in respect to both food additives and contaminants.

Specific program activities in the area of studies and information include the publication of environmental health criteria and toxicological monographs; setting of terms on health effects evaluation and risk and hazard assessment of environmental agents; formulation of internationally recommended health-based occupational exposure limits and harmonization of analytical techniques and control technology for occupational epidemiological investigations; studies of the International Agency for Research on Cancer, particularly as related to occupational exposure, industrial processes, and pesticides; information collection, storage, and dissemination through preparation of data profiles for specific chemicals and updating of national and international lists of priority chemicals.

In the area of methodology, the Program conducts meetings leading to direct publication of monographs, assay appraisals, assessment methods, and general principles of epidemiology. In addition, meetings are held to develop protocols for cooperative studies on such subjects as toxicology and carcinogenesis. Guidelines, risk assessments, and methods for measurement are the purposes of still other discussions.

Finally, in the area of training, IPCS activities consist of: preparation of instructional materials on various aspects of a field, e.g. occupational health; study fellowships; and courses and seminars such as those on occupational health and reproduction, toxicology of pesticides, multiple exposure, mutagenesis, and epidemiology, among others.

Food Safety

Food, it goes without saying, is essential to the health and well-being of individuals. A country, likewise, can only be as self-reliant as its capability to feed its people is adequate. In the Americas there exists that capability: most of the countries are able to produce the wholesome food needed by their citizens to survive and prosper. Food production, then, does not represent an insurmountable problem. It is during the transfer of that food from producer to consumer when difficulties arise. Wastage and contamination in the stages of storage, transportation, and distribution can seriously threaten a nation's ability to feed its own. Food safety, as the countries of the Region are becoming increasingly aware, is the foremost strategy to protect their food resources, assure their people's health, and buttress their economic stability.

In the absence of food safety, wastage and contamination lead to increased disease incidence and weakened national economies. Physical, chemical, and microbiological agents, particularly rodents and insects, are responsible for major food losses throughout the Americas each year. Worse yet, contamination that goes undetected or unheeded contributes significantly to diarrheal and gastrointestinal diseases—diseases which often end in hospitalization that is costly both per se and in terms of patients' lost productivity. Moreover, the morbidity and mortality rates of food-borne diseases are particularly high among the most vulnerable groups of the population.

Added to the impact on human health is the toll that food wastage and contamination take on the economic well-being of a country. Food that is not domestically available for consumption—and the Region's population explosion is straining production to its limits—has to be imported. Furthermore, as the costs of imported food rise, a country's balance of payments becomes increasingly unfavorable, diminishing its potential for capital formation and, thereby, locking it more tightly into underdevelopment.

These health and economic arguments have spurred awareness of the importance of protecting national food supplies. Still, food safety lags seriously in Latin America and the Caribbean. Only a few countries have food safety programs, program development being hindered by lack of

funding, jurisdictional conflicts among governmental authorities, and opposition to inspection on the part of food producers.

Notwithstanding these problems, the ministries of health have demonstrated interest in establishing and strengthening food safety programs. At the regional level, the 1979 meeting of the PAHO Directing Council chose "Sanitary Control of Food" as the topic of Technical Discussions for the 1981 meeting. Preparation of the working documents for the discussions and resultant recommendations has been carried out through the Division of Environmental Health Protection (EHP). Several short-term consultants visited 15 different countries to gather information considered essential to an understanding of the current situation regarding protection of the food supply.

The subregions, particularly the Caribbean and Andean countries, have likewise demonstrated increased interest in food safety, which is particularly understandable given their common market trade agreements. The respective governments—individually and collectively—have asked for more technical cooperation from the Organization in the area of standardization of food safety and control services.

The ministers responsible for health in the Caribbean adopted resolutions during their 1979 and 1980 meetings calling for a food safety policy and strategy for the English-speaking Caribbean Community (CARICOM). The first meeting for the planning and development of strategies for such a program was held in Barbados in September 1980. Participants urged the convening of a food safety conference in 1981 for representatives of the various ministries involved in food supply and control.

PAHO provides the countries cooperation in this field through the EHP food safety program, which focuses on strengthening national food control and analytical laboratory services as well as on planning and preparation of national food protection programs.

In regard to improvement of food control services, emphasis is on bettering food inspection units at both the professional and nonprofessional levels. The increased numbers and improved performances of inspectors have been instrumental in upgrading food wholesomeness in the countries.

The Organization has cooperated in instructional activities conducted with several governments and their national institutions, two outstanding examples being the National School of Public Health in Colombia and the Tulane University School of Public Health and Tropical Medicine of the State of Louisiana, United States. Specific courses on food protection have been held in Chile, Colombia, Costa Rica, Panama, and Peru.

A major constraint to strengthening of food control services is the limited facilities and capabilities of analytical laboratory services. The responsibility for examination of food to detect contamination and adulteration is

diversely assigned and haphazardly carried out. PAHO efforts to strengthen these services include provision of technical instruction and information and of laboratory equipment and supplies. Staff have participated in the assessment of the national, regional, and municipal laboratory systems of Brazil, Chile, and Colombia. They have made site visits to laboratories in Argentina, Bolivia, Costa Rica, Ecuador, Honduras, Panama, Peru, and Uruguay. Several advisers continue to be assigned to the *Unified Food Control Laboratory of Guatemala*.

The aspect of planning and preparation of national food protection programs is projected to include: in Colombia, analysis of the current situation of food production, distribution, consumption, and control; in Ecuador, study of strategy and procedures to follow for improvement of the current situation; and, in Peru, assistance in the preparation of a proposal to solicit funding from an international lending agency to support the national food safety program.

Assessment of the Impact of Development on Health

Unprecedented population growth coupled with technological advances characterize most of the development ongoing in the countries of the Americas. Socioeconomic progress has led to greater industrialization and such large-scale projects as major highways, colonizations, resource exploitation, and river basin development. Growth and progress, however, have created real and potential problems including ecologic imbalances and adverse health effects.

The impact of building a dam provides an excellent example of the cause-and-effect relationship of development, ecology, and human health: the dam is built, the flora and fauna of a large geographical area are affected, the workers and settlers of the project site may be exposed to heretofore unknown vector-borne diseases, and biological and ecological conditions are altered.

Another example of development-related problems is the production of hazardous and toxic wastes: these products result from industrialization and the technification of agriculture, are released into the environment, come into contact with man, and can injure his health. Such wastes are often impossible to break down and recycle naturally. Some 60,000 chemicals are presently in use and as many as 1,000 new ones are marketed yearly—yet the use of only some 200 is subject to health risk standards. While it is known that such chemicals, pesticides, and other toxic substances contaminate the air, water, and soil as well as the food man eats, the extent of the health threat is unknown.

Assessment of the impact of development on human ecology and health is one of the primary mandates of the Pan American Center for Human Ecology and Health (ECO), established in Mexico in 1975 under an agreement between PAHO and the government of Mexico, which provides an annual contribution to cover part of its expenses. The Center serves to advise the countries of the Americas on the need for programs and actions to be taken to prevent or minimize adverse human health effects resulting from environmental causes or changes. ECO's areas of expertise include

human ecology, environmental epidemiology, environmental toxicology, and social anthropology.

Services in this area consist of consultations regarding the environmental impact on human health of such development projects as dams, mines and smelteries, geothermal power plants, colonizations, and regional resource development; review of existing health and environmental impact assessment methods; and study of the relationship between ecologically based health plans and governmental structures responsible for their execution.

The Scientific Advisory Committee of ECO (July 1980) considered the introduction of health and environmental factors in development projects a highly desirable strategy that should be implemented in concert with planning authorities, industrialists, consultants, and the community in general. Moreover, such cooperation is going to become increasingly critical because many bilateral and multilateral funding agencies are requiring, as a prior stipulation to project financing, that developing countries conduct assessment of the environmental and health effects of proposed projects. ECO is assisting in those assessments as well as in compliance with other funding agency requirements.

Specific activities include collaboration with the United Nations Environment Program (UNEP) in sponsoring conferences on health impact assessment of development projects, which is expected to lead to a program on methodologies for that purpose. Such assessment is the subject of a series of guidelines and manuals, being written by staff of ECO and other PAHO Divisions with assistance from UNEP and other international agencies. Among the issues in progress are a guide for use by decision- and policy-makers on the needs, importance, and value of assessing development projects in order to avoid serious environmental health problems; a manual on procedures for assessing effects of dam construction on environmental and human health, in order to minimize adverse effects while enhancing the environment, health, and social well-being of the affected population; and a manual on evaluation, planning, and design of human settlements resulting from immigration or colonization in areas where natural resources are being exploited.

ECO and other PAHO staff cooperated with Yacyretá authority, which is responsible for the construction of a multibillion-dollar dam at Yacyretá Island in the Paraná River between Argentina and Paraguay. The construction will involve 12,000 workers, displace some 45,000 people, and inundate 80,000 hectares of land. A multidisciplinary team from PAHO visited the area to analyze the project's likely impact on human health and the environment.

The Center collaborated with the Salto Grande Authority of Argentina, which with Uruguay completed construction of a \$1.2 billion dam on the Uruguay River during the year. The electricity generated by the dam will increase Argentina's power supply by half and double that of Uruguay. ECO staff gave support to the analysis of the physical, mental, and social health problems of the 8,000-person dam workforce and of the 10,000 people displaced by construction.

Advisory services have been provided to the Bolivian National Colonization Institute in evaluating the health aspects of a settlement project at San Julián in northern Santa Cruz Department. Principal concerns include basic sanitation, vector-borne disease control, adjustment to high altitudes, and general adaptation to a new environment. Bolivia now wants to use the San Julián experience in formulating a national plan for administering colonization activities throughout the country.

In Honduras, ECO assistance centered on the El Cajón dam project that has resulted in relocation of 300 families. Center cooperation involves planning the project's environmental health services, occupational health protection of the workplace, immunization, and vector control.

Special Caribbean Activities

The Caribbean Basin Water Management Project

The Canadian International Development Agency and the Pan American Health Organization signed an agreement in 1975 to cooperate in a water management project in the Caribbean Basin. Canada has provided approximately C\$625,000 in funds for use in ten eastern Caribbean countries. The objective of the project is to develop a self-sustaining training delivery system through courses and workshops, the training of trainers, and instructional manuals using technical cooperation among countries and management training.

Activities during 1980 and 1981 include completion of the training delivery system by consolidating efforts with local training institutions; improvement of trainers' skills; and broadening the base of trained personnel. Each country has nominated a coordinator to further the concept of training in its own water utility, and the water utility of Barbados assumed responsibility for subregional coordination.

An important factor in the progress of the project has been the enthusiasm and support of the countries—both individually, as evidenced in their making available national water utility personnel to advise on the complex human resource development problem, and collectively in accordance with the strategy of technical cooperation among developing countries.

The objective of the training of trainers phase of the project is to provide personnel that are already trained with the necessary communication skills and instructional techniques to carry out training at their respective utilities and to assist instructional programs in their specialties at other locations.

The project designed a series of three workshops and two intervening home study courses to be used in the eastern Caribbean. After satisfying performance requirements, 102 supervisors became certified trainers. Completed in mid-1978, the workshops evaluated each trainee, and those with the most potential were appointed to develop training/job manuals related to their field of competence.

Assessment of the training of trainers program indicates it has been moderately successful, and the spin-off from the series of workshops considerably strengthens the overall accomplishments. Managers, supervisor trainers, training coordinators, and subordinates alike attest to the program's effectiveness.

In the course of the project, 38 Caribbean nationals have developed a wide variety of training materials that have been distributed throughout the ten participating countries and to each of the water utilities. These materials—15 manuals, 7 job aids, and 3 guides—are appropriate to utilities in the Caribbean in general and the eastern islands in particular. Full utilization of the varied range of topics covered in these materials could provide major benefit to most of the countries' waterworks.

The trainers that authored manuals gained a clearer, broader understanding of their areas of expertise, which makes them a resource on training delivery systems to the eastern Caribbean, while producing logical, step-by-step, performance-oriented instructional materials.

The project will be evaluated in 1981 to determine whether it should be renewed.

The United Nations Environment Program/Economic Commission for Latin America Project for Sound Environmental Management in the Wider Caribbean

The wider Caribbean became one of the primary areas for environmental action of the United Nations Environment Program, by designation of UNEP's Governing Council in the mid 1970's. As a result, a project for sound environmental management was launched to identify sector problems in the area, as well as available human and institutional resources and to devise a plan of action. Targeted in the proposed plan are the islands of the Caribbean including the Bahamas, and Guyana, Suriname, French Guiana, the coastal and open water of the Caribbean Sea, the Gulf of Mexico, and the Atlantic Ocean adjacent to the insular Caribbean.

Among the objectives of the plan of action are: improvement in the capability of countries to assess and manage rationally their resource base; strengthening of the monitoring of changing environmental conditions, particularly in coastal and marine areas; consideration and focusing on environmental health-related problems; stimulation of governmental participation in the program; and coordination and technical cooperation of specialized agencies in preparation and execution of the plan.

The Division of Environmental Health Protection provided technical collaboration to UNEP from the outset of the project. Staff presented a study, "Overview of Environmental Health in the Wider Caribbean," at the first interagency meeting on the project (Mexico City, 1978), which later served as background documentation at a project meeting of government-nominated experts to draft the action plan (Caracas, 1980). EHP likewise provided the project and its participants information on chemical contamination and oil pollution in the area.

A second meeting of government-nominated experts (Managua, 1981) considered, among other things, concrete project proposals, the proposed work schedule, and alternative financial and institutional arrangements needed to carry out the plan of action. Two environmental health projects received the highest priority at the meeting: development and strengthening of national institutional capability for improving such environmental services as water supply, water resource, waste disposal, water pollution, and vector control; and improvement of drinking water quality. The meeting also recommended the creation of a trust fund to finance projects of common interest to the governments of the wider Caribbean as well as of a regional coordination unit to oversee implementation of the action plan.

The action plan was subsequently adopted at an Intergovernmental Meeting (Jamaica, 1981). The major issues agreed upon at the meeting were: a target of \$1,500,000 for a regional trust fund; location of the coordinating unit in Jamaica; establishment of a nine-member monitoring committee; and approval of the two environmental health projects discussed at the Managua meeting.

Caribbean Environmental Health Institute

Development of an environmental health strategy for the islands of the Caribbean is an effort in which PAHO and the Caribbean Community (CARICOM) are collaborating. At the request of the Conference of Ministers Responsible for Health in the Caribbean, the Division of Environmental Health Protection has provided cooperation on a study of the feasibility of establishing a Caribbean Environmental Health Institute in Saint Lucia.

Such an institute would serve as the coordinating body for the activities of existing agencies in the countries. In addition to playing an important catalytic role in the promotion of environmental health protection, it would provide the countries—particularly the lesser developed ones—

advisory services and cooperation in the development of manpower, the establishment of information services, and the conduct of applied research.

The United Nations Environment Program has approved a coastal water management project and a pesticide use study to support the establishment of the Institute as a possible collaborating center in the implementation of the action plan for the wider Caribbean (see pp. 40-41).

Training

Trained manpower, combined with appropriate technology and competent management, are essential ingredients to the success of most program areas—including environmental health protection. Without the people to effectively man the programs, no amount of funds will suffice to achieve their targeted objectives. Even after the facilities have been constructed and the operations begun, manpower will be required to continue and expand the services.

One of the most salient problems in the environmental health sector is institutional weakness, and it in turn contributes to and results from inadequate manpower development. It is important that environmentalists be made aware of this problem, oriented to the usefulness of guidelines and operational aids in its solution, and supported continuously by specialized staff.

Two requirements condition the development of manpower in environmental health protection: the participation of national training institutions and the commitment to long-term efforts. The training component of an isolated project cannot be reasonably expected to effect major change. What is required for true progress in the field is sustained effort over many years.

Primary responsibility for manpower development and training in the Americas rests with each of the countries. For its part, PAHO—in the interest of furthering national self-reliance—includes a training component in virtually every environmental health protection activity of technical cooperation to those countries. Cooperation—in the form of motivation, orientation, and advisory services—aims to be both continuous and systematized to create training delivery systems (TDS). Special features on training are included elsewhere in this publication, particularly, among others, those on the Caribbean Basin Water Management project (pp. 39–40), the DTIAPA project (pp. 6, 47), and the Central American water and sanitation training effort (p. 5). At CEPIS, reorientation of these activities has taken the form of a training-of-trainers program for those in charge of manpower development at the country level, which includes preparation of module courses and manuals.

Another manpower development strategy is the incorporation of national institutions as apprentice centers in the training program. The aim is to build a network of collaborating centers in training to meet the enormous demand for human resources required to attain the goals of the Water and Sanitation Decade.

In-service training is another approach to human resource development that is in use both at CEPIS and in national agencies and institutions. As part of that strategy a resident program, to start in 1981, is being planned.

During 1980, analysis of these strategies figured as part of a workshop on evaluation of the training and water treatment program, one on human resources development for Peruvian drinking water and sewerage institutions, and yet another held jointly with UNICEF on drinking water supply and sanitation for rural and periurban areas throughout the Americas.

For its part, ECO conducts no training programs of its own, but Center staff cooperate with governments and academic institutions in designing and conducting courses related to human ecology and environmental health. They have cooperated with the Ministry of Health of Paraguay in the conduct of a workshop-seminar on ecological and epidemiological methods of controlling Chagas' disease. Its purpose was the training of sanitary officers in epidemiological methods in different ecosystems.

The Center has developed a course on epidemiology and toxicology applied to environmental health problems, and preparations have begun on a course related to the ecological aspects of public health.

In Mexico, ECO is cosponsoring with the National Autonomous University a workshop on epidemiological methods for control of chemical contamination. The Center's involvement in this activity aims at design of a modular course or workshop for training epidemiologists in the countries to study new problems arising from increased environmental pollution. Also in Mexico, the Social Security Institute has requested assistance in the development of a training program for workers in industrial toxicology and occupational health.

Information Exchange

One of the most serious obstacles to the development of water supply and sanitation programs in Latin America and the Caribbean is the lack of means to transfer technical information. In 1979, in order to provide such means, PAHO established at CEPIS a Pan American network for information and documentation on sanitary engineering and environmental sciences (REPDISCA). This was made possible through an initial agreement signed between PAHO and the Canadian International Development Research Center (IDRC). The network was the subject of a second agreement between the two organizations in 1980 to carry out the second phase of the project: operations for improving accessibility of information for users throughout the Region.

In this connection, another agreement signed with the International Reference Center in the Hague will support coordination of the two Centers' information programs including identification of national institutions that can serve as information focal points. This coordination—which involves CEPIS and IRC joint assistance—will stimulate development of information infrastructures, inventories of institutions involved in the Water and Sanitation Decade program, relations with Decade national action committees, and national information workshops.

One of the most important facets of international cooperation at CEPIS is the exchange of information and the distribution of publications. That activity includes issuance of **TABCONT**, a bulletin reprinting tables of contents from important journals publishing information related to the Decade that can be used to order photocopies of articles of interest; a basic bibliography of the Decade; the REPDISCA newsletter; and trilingual publication of the microthesaurus on sanitary engineering and environmental sciences.

ECO has developed an information system whose purpose it is to collect source materials—publications, journals, unpublished documents and reports; contribute to implementation of effective administrative procedures aimed at organization of an information retrieval system; and facilitate cooperation on information exchange with other institutions.

Activities in this area include preparation of a list of institutions, programs, courses, fellowships, and subsidies related to research activities in

Why not mentioning the name: "FOETRI"?

human ecology and health. A roster of expert consultants being developed indicates availability of such individuals by professional skills, specific areas of expertise, and regional field experience. Both the list of institutions and the roster of consultants will facilitate regional coordination and cooperation, particularly in the development of training and research activities.

ECO's Scientific Advisory Committee (July 1980) recommended that the Center's information activities be expanded and that the dissemination of information be accelerated by means of existing international facilities such as the Regional Library of Medicine and the Health Sciences in São Paulo.

Research

A primary aspect of the work programs of the two environmental health protection centers, CEPIS and ECO, is research.

CEPIS, in collaboration with the Peruvian government and under sponsorship of the International Development Research Center (IDRC), is conducting studies of wastewater stabilization at the ponds in San Juan, Peru.

Other CEPIS cooperation in the area of research included assistance to the Peruvian Technical Standards Institute for investigations on biogas. Biogas plants—their establishment and research activities—were the subject of cooperation with the Colombian Ministry of Health.

Research was carried out on disinfection units for rural water supply that are to be used by the Costa Rican Water and Sewerage Agency. Of related application, CEPIS and the Sanitary Engineering Division of the Peruvian Ministry of Public Health are developing a new type of chlorinator using macromolecular resins and keratin.

An important experimental program at CEPIS involves technological development of drinking water supply and sewerage institutions (DTIAPA) whose activities include: courses conducted on leakage and waste in water systems and at-home measurements of drinking water; one for operation and maintenance supervisors; and one for engineers on operation and maintenance of wastewater stabilization ponds (see also pp. 6, 43).

Also, the finishing touches were put on a special CEPIS study of the status of water supply to the rural Peruvian population. Additional activities during 1980 included advisory services to the Lima Sanitation Company on the use and control of water meters **and collaboration with the International Reference Center (IRC) at The Hague in a feasibility study to select and establish a Peruvian center to participate in the CEPIS/IRC coordinated information program.**

In addition to individual research projects and assistance to the countries in investigatory activities, CEPIS, as part of the regional program for analytical control of water and wastewater laboratories (PRELAB), completed program planning for an inter-laboratory analytical control study

to detect metal traces in water. This study is to be conducted in cooperation with the Environmental Protection Agency of the United States.

For its part, ECO does not actually carry out internal research, but provides cooperation to the countries in conducting human ecology and environmental health research projects. The Center's Scientific Advisory Committee (July 1980) has recommended that ECO promote international research by identifying key institutions in the countries and, on that basis, forming a network of collaborating institutions.

Specific ECO activities included cooperation with Venezuela in the improvement of epidemiological and laboratory studies of air pollution, an ongoing study of wild animals as indicators of contamination, and an investigation of the use of floating plants for treatment of wastewater.

Disaster Preparedness and Emergency Relief

Almost every year devastating hurricanes threaten the health and environment of people living on the islands of the Caribbean, and 1980 was no exception. Hurricane Allen left death and disaster in its wake and, as a result, the countries called on PAHO to provide technical cooperation in the form of emergency relief. The Division of Environmental Health Protection provided advisory services to Barbados, Dominican Republic, Haiti, and Jamaica including evaluation of disaster requests from the countries in coordination with potential donor agencies; development of schemes for the rehabilitation of water and sanitation facilities; and liaison with other units in the Organization to ensure that the overall response was realistic and deliverable within the emergency period.

The management of environmental health matters during natural disasters implies the involvement of numerous types of professionals in a variety of locations. Many of the countries in the Region have neither the capability of coordinating relief efforts nor the staff to carry them out. Therefore, the Division prepared a manual in English and Spanish on environmental health management in times of disasters. It can be used as the basis for a series of training courses for the purpose of developing a greater pool of expertise in this field.

Another manual is in the works at CEPIS, funded in part by the European Economic Community, that aims to provide guidance to water and sewerage system managers on how to conduct an analysis of the vulnerability of services.