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**DEVELOPMENT AND PROTECTION
OF THE ENVIRONMENT**

**Environmental Quality
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Development and Protection of the Environment

"Human beings are at the center of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature." (Principle 1 of the Rio Declaration on Environment and Development, UNCED, 1992)

Introduction

The aim of the present document is to inform the members of the Advisory Committee on Health Research of the Pan American Health Organization (ACHR/PAHO) on research initiatives and actions in the area of health and environment of importance for the XXX Meeting of the Committee, 20-23 April, Salvador, Bahia, Brazil.

The document contains several articles considered to be of importance in attaining the aforementioned objective. The original texts may be consulted during the Meeting as a means of familiarization with the entire range of documents that have served as sources for the excerpts contained herein.

1. Programming Background

The work program of the Division of Health and Environment (HPE) of the Pan American Health Organization (PAHO) is based on document SPP23/3 of 10 November 1994, which sets forth the PAHO Strategic and Programmatic Orientations (SPOs) for 1995-1998, approved by the Pan American Sanitary Conference and by the Subcommittee on Planning and Programming (SPP).

1.1 Strategic Orientations

The SPOs have established Environmental Protection and Development as one of the five strategic orientations formulated to respond to the need for compliance with the global and regional agreements established during the 1992 United Nations Conference on Environment and Development (UNCED) for the preservation, protection, and restoration of the environment, emphasizing the relationship of the environment to people's well-being.

This particular strategic orientation is the only one that does not follow the policy orientations set forth in the Ninth General Programme of Work of the World Health Organization (WHO). The emphasis referred to above justifiably recognizes the crucial importance of the environment and the UNCED agreements for the Member States of PAHO.

This decision has been translated into a regional goal:

"To enable universal access to safe and healthy environments and living conditions."

The bases of this strategic orientation include, inter alia, the following considerations:

- *National work plans* should prescribe specific actions for improving the general environment, the work environment, and housing, giving priority to the neediest groups and to the most urgent problems;
- The topics related to *environmental policies* in the Region are of particular importance in view of the evident concern for this area expressed in the *international agreements* drawn up in the Region and elsewhere in the world, such as: the *North American Free Trade Agreement (NAFTA)*, the *Southern Common Market (MERCOSUR)*, the *Central American Commission on Environment and Development (CCAD)*, and the *Basel Convention on Hazardous Waste*. There has also been an increase in political parties concerned with environmental matters (the so-called green parties) and in the emphasis placed on the environment in other parties and in legislatures;
- The principal thesis of UNCED is that *development should be directed to expanding options for the population and that it be sustainable*. This means that a great deal of attention should be given to the costs of *cleaning up environmental pollution* and treating the *diseases associated with degradation of the environment*;
- In most of the countries in the Region *insufficient attention* is being given to environmental management to ensure *safe drinking water, the protection of public spaces, sanitary waste disposal, and the preservation of air and water quality*. *Urban development* has also been a serious problem, since it promotes increased production, on the one hand, and increases the demand for urban goods and social services on the other;

- Because of the scarcity of *financial and human resources* sufficient to carry out plans of work, the authorities often resort to *reducing budgets*, a measure that results in *low coverage and/or quality of the services and neglect of the environment*;
- A large number of the *social and psychological problems prevalent in urban environments*, such as *mental disorders, drug addiction, and violence*, have frequently been associated with *poor living conditions, housing, and environmental quality*.

1.2 Programmatic Orientations

The Programmatic Orientations of the SOPs prescribe the general areas of work covered by the *agreements for the entire Organization*, including both the *Member States and the Executive Secretariat*. They also enumerate the principal lines of technical cooperation that the Secretariat provides to the Member States.

Two main areas of work and five lines of action have been established for the period 1995-1998 for the Pan American Sanitary Bureau (PASB), the Executive Secretariat of PAHO, to promote *development and environmental protection in the Region*, as follows:

1.2.1 General Areas of Work

1.2.1.a - Basic Sanitation Services: Increasing the coverage of water supply and ensuring that the water provided is of good quality; and increasing excreta and waste disposal services in accordance with the conditions of social and political change prevalent at the time in the countries, particularly with regard to privatization, which evidences the need to ensure universality and equity in providing these kinds of services;

1.2.1.b - Environmental Quality: Ensuring environmentally sustainable development, taking into account the agreements signed at UNCED. This implies guaranteeing participation of the health sector in establishing environmental criteria and limits, and in studying and exercising surveillance of the health problems caused by environmental factors. Since the quality of the environment is a worldwide concern, agreements should be organized between companies, industries, nongovernmental organizations, and the community for sounding warnings on the environmental impact of development activities.

1.2.2 Lines of Action

PASB will orient its technical cooperation to the countries in this area in order to:

1.2.2.a - Ensure implementation of the Regional Plan for Investment in the Environment and Health (PIAS);

1.2.2.b - Develop the managerial, financial, and planning capacity of the sector and its institutions with regard to drinking water supply, sanitation, solid waste disposal, and the protection of water resources;

1.2.2.c - Support technological development, research, and the training of human resources in the areas of environmental risk assessment and control, including the workplace.

1.2.2.d - Promote respect for the principles of universality and equity in providing basic sanitation services and respect for informed consent in organizing labor, industrial, or services infrastructure or any other infrastructure that may cause the deterioration of health or well-being;

1.2.2.e - Support the institutional and organizational development of entities and institutions responsible for the management of natural resources and the environment, including local governments, communities, and other kinds of governmental and nongovernmental organizations.

1.3 Types of Activities

PASB has a constitutional mandate to direct and coordinate international work in the field of health in the Region. In carrying out this mandate, PASB, jointly with the countries, will promote and implement the mobilization of resources, the dissemination of information, training, the development of plans and policies, and technical cooperation among countries.

In the area of research, PASB assumes primary responsibility for its technical programs to promote research, regardless of funding sources. Efforts in this area include, inter alia, the identification of research needs, the development of research protocols, and assistance in identifying sources of financing for research projects.

2. Joint Actions with WHO

The United Nations agencies seek to optimize existing resources. Accordingly, PAHO has established a series of joint activities with other international cooperation organizations. As part of this same endeavor, PAHO has sought to establish stronger ties with WHO in fulfilling global objectives in the Region of the Americas.

PAHO has consequently translated and disseminated documents on the environment and health, in addition to promoting world initiatives for cooperation in this area, such as the International Programme on Chemical Safety (IPCS), the WHO Global Environmental Epidemiology Network (GEENET), the WHO Global Environmental Control Technology Network (GETNET), and the Global Environment Monitoring System (GEMS Water and GEMS Air). These programs also contain specific components devoted to the development of health and environmental research based on WHO principles and strategies in this area.

2.1 Health, Environment, and Development

One of the WHO documents is entitled *Health, Environment, and Development* (WHO/EHE/93.1). Prepared by Dr. Morris Schaefer of the University of North Carolina, it suggests approaches to the preparation of strategies at the country level for human well-being in accordance with the terms of Agenda 21.

This document, which indicates the need to increase knowledge and technology, points out, *inter alia*, the following goals of fundamental importance for health and environmental research:

2.1.a - Improved assessment of environmental risks for which no information is presently available and of risks whose assessment is controversial and tentative—for example, the relationships between effect, dosage, and response of agents that are dangerous either alone or in mixtures; the relationships between urban environments and physical and mental disorders; the differential effects of exposure on various age groups, states of health, and degrees of nutrition; and the combined and synergistic effects of simultaneous exposure to multiple pathogenic organisms;

2.1.b - More rapid methods of assessing risks, especially those that are present in populations too small for accurate epidemiological tests, those in which the adverse

effects of exposure to low doses take a long period of time to manifest themselves, and those for which historical exposure data are lacking;

2.1.c - Additional methods for assessing and managing risks, including more efficient means of prevention, as opposed to treatment, and the adaptation of methods to make them useful in regions with limited resources;

2.1.d - Increased support for decision-making in matters concerning economics, policy, and management, including specific indicators of need, efficiency, and benefits; the relationship of these indicators to financial, social, and health costs; measurements of the environmental state of health of the community; the most effective information support systems; and the exchange of technological information and education.

2.2 Report of the WHO Commission on Health and Environment

In early 1990 the Director of WHO established a Commission on Health and Environment as a totally independent entity, composed of 22 members from various countries. Three working meetings were held, and in 1992 the Commission prepared a series of documents containing in-depth studies of the subject area recommendations that were presented at UNCED. The work of the Commission may be considered to be a follow-up to the 1987 report entitled "Our Common Future."

The Commission provided a number of examples in the documents of needs for research on health and the environment, as follows:

2.2.a - *Water Resources*

- alternatives for satisfying water supply and sanitation needs, taking into account technological, financial, and managerial considerations and consumer behavior;
- alternative and cost-effective technologies for drinking-water treatment and recycling, providing protection against microbiological and chemical agents;
- reduction of waste discharges, contamination of marine and fresh water resources, and their adverse effects on aquatic life.

2.2.b - Energy

- reduction of the use of fossil fuels through alternatives such as waste conversion; solar, wind, and geothermic technologies; and small-scale generation of hydraulic energy;
- nuclear reactors that are intrinsically safe and improved methods for nuclear waste disposal;
- the environmental route and form of environmental contaminants and the extent of human exposure, especially as regards the generation and transportation of energy;
- definitive information on the effects on health of electromagnetic fields;
- reduction of the adverse effects on health of the use of biomass fuels.

2.2.c - Industry

- cause-and-effect, dose-effect, and dose-response relationships in assessment of the toxicity of chemical mixtures and combined exposure to chemical, physical, and biological agents;
- quantitative and reliable risk assessment in situations in which human beings are exposed over long periods of time to low doses of physical and chemical agents;
- assessment of the effects of chemical substances on health prior to initiating their production;
- the dynamics of contaminants in human organisms: physical, genetic, and behavioral reactions, including immune reactions;
- assessment of exposure and total dosage from all sources;
- validated biological indicators that are useful in determining the real effects of human exposure, identification of populations at special risk for the purpose of intensifying preventive measures;
- assessment of the applicability of data on occupational health in industrialized countries in temperate zones to populations in countries in the process of industrialization in tropical zones.

2.2.d - Urban Development and Human Settlements

- practical and appropriate national and municipal statistics systems to support planning, development, and human management;
- indicators capable of accurately measuring intraurban and interdistrict health and environmental conditions in order to identify needs and formulate appropriate intervention measures;
- low-cost technologies appropriate for a variety of surroundings and sizes of human settlements that can assist in providing basic services and reducing the generation of waste, contamination, and exposure to avoidable danger.

2.2.e - Food and Agriculture

- the effects on health of current agricultural production practices and forms of food consumption;
- satisfaction of food requirements and communicable disease control without adversely affecting the natural environment;
- agricultural distribution and consumption practices that support sustainable development of agricultural resources and at the same time improve the safety and nutritional quality of food.

2.3 The WHO Global Strategy for Health and Environment

In response to Agenda 21, established at UNCED, WHO formulated a new global strategy for health and environment, which was approved by the 46th World Health Assembly, held in Geneva in May 1993.

The document entitled "Healthy and Productive Lives in Harmony with Nature" (WHO/EHE/94.1) is an abbreviated version of the strategy document (WHO/EHE/93.1) and of World Health Assembly document A46/11, which specifies the three clear goals of the WHO strategy:

- to achieve a sustainable basis for Health for All;
- to provide an environment that promotes health;

- to achieve increased action and broader collaboration in health and the environment;
- to make all individuals and organizations aware of their responsibilities for health and its environmental basis.

2.3.1 Principal Elements and Priorities

The following principal aspects and priorities in the WHO strategy serve as general guidelines in attaining the goals:

- a broad-based approach to the ties between the health of the population and its physical and social environment;
- identification of the environmental causes of poor health;
- collective responsibility as a basic principle of WHO action;
- risk management founded on correct evaluation;
- strengthening of the capacity to achieve long-term solutions.

2.3.2 Key Components

In order to carry out the strategy, four different but interrelated key components have been established:

- an expanded program to promote environmental health;
- an expanded program to promote chemical safety;
- strengthening of collaboration with other international and nongovernmental organizations.

2.3.3 Research Objectives

Lastly, 12 objectives have been established, of which two are directly related to the subject of research:

2.3.1.a *Research*

Promotion of research on an increasingly sound scientific and technical basis for the broad range of interventions that are required in order to attain the health goals of sustainable development through the following actions:

- Establishment and support of a new program for research on issues that influence health, the environment, and development;
- Improvement of the capacity of governments, institutions, companies, and organizations to perform research; the establishment of priorities for local and national needs; and the formulation of national plans for research on health and the environment;
- Improvement of the communications between investigators, executive personnel, and the people by providing them with knowledge and information in a comprehensible form;

2.3.2.b - *Ecologically Appropriate and Rational Methods and Technologies in the Health Sector*

This objective is aimed at promoting ecologically appropriate and rational methods and technologies for the control, prevention, and effective treatment of diseases and disability by means of the following actions:

- The design of appropriate methods for assessing and monitoring the environmental effects of health programs and providing support for evaluation of environmental impact in the planning of health establishments and programs at the country level;
- The provision of evaluated information on environmentally available methods to combat disease and promote the use of safer chemical substances and alternative methods, including restrictions on their use;
- The development and dissemination of guidelines for the treatment and control of hospital wastes;
- Evaluation and dissemination of information on the possible adverse effects of the application of medical biotechnology to human health and the environment.

3 PAHO Environmental Health Research Priorities

HEP, jointly with the PAHO Research Grants Program, undertook an exercise to establish research priorities in this area. The outcome of these efforts is contained in the document "PAHO Research Grants Program Priorities." The following three general areas were established with regard to the environment:

3.1 Development of policies and initiatives on health, the environment, and development;

3.2 Assessment of the effects on human health and measures to control water, air, and special waste pollutants;

3.3 Assessment and control of risks for workers' health deriving from working conditions.

4. Research Background

One of the areas of research that has undergone the greatest change is the environment. At the present time a great number of new research methods, techniques, and strategies are rapidly being added to the routine work of investigators. Furthermore, as this has taken place in a climate of enthusiasm for this field of endeavor, it has been accompanied by almost immediate application of the results obtained through research.

A clear-cut example of the differences between the developed and underdeveloped countries in exploring the environmental area is the notable contrast that is evident in their abilities to carry out research. The lack of knowledge of the effects on the health of the populations of the countries is clearly evident when priorities are established for environmental improvement that are based on findings pertinent to other places without any certainty as to whether they are the most important priorities for the Region.

Although a great deal of emphasis has been placed internationally on research on the effects on health of chemical and physical agents recognized as environmental contaminants that are used in industrial processes, the traditional areas of environmental sanitation, such as water, sewerage, and solid waste, have also undergone significant changes, mainly with regard to research on new technologies and instruments to control risk factors and ensure the quality of the environment.

4.1 Difficulties for Research

Research efforts in the area of the environment have particular characteristics that many investigators and research projects have had to deal with:

4.1.a The multiplicity of cause-and-effect factors: One of the major methodological difficulties in approaching the environment as a cause of adverse effects on health is the existence of a great diversity of risk factors to health—biological, physical, chemical, and social—all of which are present at the same time in the Region and whose role and direct or indirect interaction in the causality of effects on human health are often unknown;

4.1.b Infrastructure for research: This area has not been given priority attention by the governments throughout the entire process of development that has taken place in the Region. Consequently, human resources, methodologies, and appropriate technologies are lacking in sufficient quantities to carry out the research required; and when they do exist, they often lack a guarantee of quality in the results obtained, particularly in the laboratories;

4.1.c Information for research: Despite all the efforts carried out to promote the dissemination of scientific information in the Region, there are still notable difficulties in attaining timely and broad access to up-to-date information on world scientific output. This is corroborated by examination of the bibliographic abstracts prepared on many research projects in technical reference centers in the Region. Furthermore, certain information on the basic problems of the Region, such as the association between old, endemic health problems and their interaction with new problems deriving from development, is not available simply because the topic is not a research priority in world research centers.

4.2 Research in the Region

Although difficulties exist in carrying out research in this field in the Region, several groups have been organized to carry out health and environment research and traditional groups in the health sector have been oriented toward the field.

The strategy for organizing these groups has centered on the training of human resources at the graduate level, the establishment of research projects jointly with groups

from countries with greater resources and experience for the exchange of technologies and methods, and the search for financing for the installation of adequate infrastructure.

4.2.1 General Health and Environment Research Topics

Research groups in the Region have devoted themselves to a great variety of topics and combinations of topics. Mention should be made of at least the following general groups:

4.2.1.a Adaptation and testing of methods and techniques: Since research in this area normally demands the use of sophisticated and costly resources that are not available in the countries, a large number of investigators have sought to develop lines of research in order to uncover techniques and methods appropriate to the conditions in the countries that generate results of satisfactory and acceptable quality at the international level;

4.2.1.b Characterization and identification of risk situations: Since there is a meager level of knowledge of environmental conditions in the countries and of the relationship of these conditions to the effects on the health of the populations, several groups of investigators have dedicated themselves to carrying out research of a descriptive nature. This has been an element of great importance in supporting the decisions of the governments in the environmental area;

4.2.1.c Applied research: Because of the limited resources available in the countries, most research on the social area is linked to a specific need. Thus, governments and companies are for various reasons obliged to increase their knowledge of a concrete issue and consequently order or carry out research on their own on specific problems. Although this does not constitute development of a line of research, important contributions have nevertheless derived from this kind of work that have served, above all, to generate information that provides a comparative view of the situation in the Region vis-à-vis the world situation in the specific considerations covered by the research;

4.2.1.d Workers' health: This is the area that has produced the greatest number of technical and scientific works, many of which have contributed to emphasizing the importance of the topic and to orienting specific policies in the countries. Many of the results have been also used to orient lines of health and environment research that have been highly useful in characterizing the environmental risks to the populations of

countries or subregions. In the Meeting on Evaluation of Research, in the area of the Program on Workers' Health, it was concluded that:

- a. A high percentage of research is framed in a biologically-oriented, single-cause, and single-factor context—for example, noise and occupational deafness;
- b. Few works focus on multifactorial and multifaceted considerations, showing preference for an individual economic (informal economy) or gender approach.
- c. Very few research projects include risk factors, and even less the organization of work, as study variables;
- d. Applied research accounts for only a small portion of the research carried out, although an increase has been observed in the use of methodologies using worker participation, as in what is known as "participation-action."

4.2.2 Research in the Environmental Area Related to Chemical Substances

The Pan American Center for Human Ecology and Health (ECO) of HEP, in collaboration with the United States Environmental Protection Agency (EPA), the International Program on Chemical Safety (IPCS), and the WHO Global Environmental Epidemiology Network (GEENET), carried out a survey to identify the scientific works produced in certain areas of interest for EPA, such as heavy metals, air, organic solvents, and pesticides. In this effort, 26 scientists from the Americas, divided into four working groups, worked together to compile the information and made the following recommendations for research in the area of environmental epidemiology in the Region:

4.2.2.a - Agreement on infrastructure (to be carried out in the network): a. Training (in research and decision-making); b. Monitoring; c. Policies and regulations.

4.2.2.b - Studies and surveillance: a. Studies on mortality, cluster, capture/recapture; b. Evaluation of exposure; c. Behavior, lifestyle, social and cultural factors; d. Anthropological studies; e. Interventions; f. Surveillance systems: exposure and effects.

4.2.2.c - Laboratory action: a. Quality assurance and quality control; b. Toxicology; c. Biological markers; d. Biological monitoring.

4.2.2.d - Holding of conferences and seminars, and communication between field workers.

4.2.2.e - Certain gaps in knowledge have been recognized with regard to the specific substances studied that required further exploration:

- a. Air pollutants: Studies of mortality, contamination of indoor areas and biomasses, intervention studies, exposure to carbon monoxide.
- b. Heavy metals: Metabolism disorders and chronic toxicity from arsenic, relative contribution of various sources of exposure to lead, characterization of the exposure of mothers and children to mercury.
- c. Pesticides: Studies of the incidence of acute intoxications and intervention procedures employed, chronic neurological effects associated with exposure to organophosphorates, effects on reproduction, exposure to dithiocarbamates.
- d. Solvents: Neurobiological and intervention studies, monitoring of cancer in Brazil, surveillance for the identification of diseases related to exposure.

4.2.2.f - A list has been drawn up of specific research proposals by area:

- a. Air pollution:
 - . Evaluation of the effects on health by exposure to ethanol and aldehydes in the air in cities;
 - . Studies of chronic effects associated with exposure to air pollutants in large cities.
- b. Heavy metals:
 - . Evaluation of exposure to lead mixtures and pesticides;
 - . Studies of the chronic effects on health associated with mercury in Brazil and arsenic in Chile and Mexico.

- c. **Pesticides:**
 - . Evaluation of exposure to pesticides of rural children working in agricultural activities;
 - . Development of methodologies for the study of exposure and effects on poor migrant rural populations;
 - . Studies of the chronic effects of exposures to pesticides, with emphasis on carcinogenic effects.
- d. **Solvents:**
 - . Profile of the solvents industries in Latin America and the Caribbean;
 - . Determination of the level of occupational exposure to solvents;
 - . Study of addiction to solvents by inhalation;
 - . Effects on reproduction of solvents on working women;
 - . Formulation of a list of the most common solvents employed in the manufacture of pesticides for the purpose of studies of exposure;
 - . Evaluation of solvent waste disposal and nonoccupational exposure;
 - . Intervention studies in certain selected industries.

5. Principles of Technical Cooperation in Research on Health and the Environment

In view of the conditions existing in the countries, the recommendation is made to observe certain basic principles in implementing technical cooperation for the development of research:

5.1 Promotion of interregional technical and scientific exchange with the effective participation of scientists in the developing countries, as opposed to the use of the resources of the less developed countries as simple agents for the field work component of research protocols designed to satisfy alien interests;

5.2 Support for the formation of research groups with the academic training and basic resources for the conception, preparation, and execution of research protocols of high quality, as opposed to the execution of protocols prefabricated in circumstances other than those relevant to the countries in the Region;

5.3 Assurance that the few existing research resources in the countries are employed to contribute to achieving country goals, as opposed to the use of these same resources to achieve goals that are not of a priority nature for a particular country's research;

5.4 Promotion of research in the countries on:

- The adaptation of scientific methods to the realities of the countries,
- The effects on health of both the general and the work environments,
- Quality of the various environments,
- Characteristics of exposed populations and high-risk groups,
- Sources of environmental pollution,
- Determination of pathogenic agents in the environment and their ergonomic and psychosocial origins,
- Effects of the interaction between biological, physical, and chemical agents,
- The situation of the basic and environmental sanitation services,
- Adaptation of technologies for environmental management,
- Adaptation of technologies to minimize and control risk situations.
- Expansion of the conceptual framework of research on workers' health to include the organization of work, changes in the labor market, and the composition of the work force as determinants of workers' health,
- The development of alternative models for research on workers' health.

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