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MAN-ENVIRONMENTAL RELATIONSHIPS IN THE 1970's

ENVIRONMENTAL HEALTH GOALS FOR THE SEVENTIES

A Technical Report on the Interactions of Man and Environment  
with Reference to Recent Achievements in Latin America and  
the Caribbean Countries and the Activities in Prospect

PART I: Projections for the Decade of the Seventies  
PART II: Man-Environment Relationships: A Challenge  
of the 1970's

FOREWORD

The report seeks to define the essence of events related to the environmental challenge and to suggest the shape of such events in the 1970's. Perhaps at no time in recent history has there been such difficulty in predicting the future. In all likelihood there will be a real break in continuity in this new decade. Transitions will not be circumscribed by tradition; extrapolation may well be purely conjectural, and only sheer ingenuity will provide the many benchmarks needed in a new "age of discontinuity."

The report gives strong indication that there is need for breaking down the barriers of provincialism, the prejudices of proprietary interest, and the varieties of narrow hereditary points of view, too commonly shared by so many. It suggests that we broaden our vistas, reconstitute our priorities, and develop a 360° sweep in our vision. It suggests also that we need to open our manuals and tear out many of the conventional references - and rewrite new materials, bold, aggressive, and responsive to the challenges of the times.

The report suggests that the health profession has a clear mandate to discover effective responses to the perplexing questions about environmental trends in order to find solutions to human needs in our evolving society. If the health professions help to point the way to better answers than have been found so far and by persuasion can make them understood, accepted, and applied, then we shall have immeasurably justified whatever efforts are devoted to this task.

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## ANNEX

PART I: PROJECTIONS FOR THE DECADE OF THE 70'S

## INTRODUCTION AND SUMMATION OF GOALS

The Director has the honor to submit this review of health-related problems aggravated by environmental change, together with suggested goals for the 1970 decade. The report, in two parts, is in response to Resolution XXXIV of the XVIII Pan American Sanitary Conference (Annex).

Environment and ecology will be key words in the 1970's, words reflecting key public issues. Across all lands, people are voicing deep concern about environmental abuses, about ecological deteriorations that are now becoming so manifest and extensive, and about the mounting confusions and contradictions as to the character and significance of sequential effects on the fauna and flora of the world. It is quite disconcerting that understanding of environment and ecology should remain so distorted and out of perspective in this age of logarithmic expansions in science and technology. Organized public health must bridge the gaps in epidemiology and in research, with the objectives of clearing out the underbrush of misunderstandings regarding relations of environmental stresses to public health. This will require agencies to apportion much more of their capacities and competences to meet this challenge and to realign approaches and practices more in phase with the rapid pace of change. In short, a realigned and expanded system of predictive epidemiology is needed to assess in some order of severity the array of subtle impacts of environmental change on human welfare.

There are hard choices to be made. Obviously, environmental stresses must be kept below levels which would create serious physiological impairments. Beyond this primary concern, environmental impacts must be equated with the socioeconomic realities of a changing world. For the health administrator, the difficulty is that there are emerging so many subtle stresses to be diagnosed, such as low-level, long-term exposures, combinations, and synergisms. The challenges of the 1970's require that all these matters be put in perspective, with appropriate parameters and benchmarks and with options defined and costed. To the extent this is done, it will assist Governments in determining where public aspirations and public policy might meet. Then the task will be less to resolve conflicts of interest and more to reconcile common, agreed-upon objectives.

The strength of the environmental quality program in Latin America lies in the unprecedented accomplishments with respect to urban and rural water supply services. This development has stimulated the strengthening of national institutions which are the foundation of environmental services. Especially noteworthy are (1) the PAHO-developed network of training centers, based at schools of technology, to carry out continuing education, research, and postgraduate studies; (2) the continental program to improve administrative-management-financing techniques; and (3) the establishment of national governmental systems and authorities. PAHO has geared its modest resources to assist Governments with the major effort of modernizing basic sanitation services, as well as with the more sophisticated environmental problems. Other PAHO supports include the activities of the regional center for

engineering and environmental sciences; the network systems of monitoring and surveillance; and international communication and exchange of intelligence. With the history of experience and accomplishments of the 1960's, and with improved national and international mechanisms, the environmental challenges for the 1970's can be faced with reasonable optimism.

Technologic progress, for all its accomplishments and benefits, disrupts ecologic balances and creates severe stresses. Well-conceived programs can foresee and offset such untoward consequences of the persistent increment of new forms and uses of energy, mobility, and manufacture, although each country will be bound to set its goals within the frame of its own needs and capacities. As rational options, the following goals, both quantitative and conceptual, are suggested for the 1970's as plausible responses to the challenges of rapid environmental change:

#### National Plans

1. Develop national environmental plans with full regard for health considerations, including means of surveillance and evaluation of environmental change and full support for institutions with competence and authority to assure that environmental practices are in balance with broad public well-being.

#### Epidemiology

2. Establish networks of environmental intelligence and systems of predictive epidemiology to assess and anticipate effects of environmental stresses, including those still in early stages.

#### Research Policy

3. Direct research toward identifying the forces most critical to public health, toward development and demonstration of methods most likely to control such forces, and toward formulation of practical indexes of health and well-being.

#### Priorities

4. Define environmental programs likely to do most for public well-being at acceptable cost per capita and assign such programs top priority in allocation of budget, personnel, and other resources.

#### Organization

5. Assign to qualified agencies authority and responsibility for continuous development of an environmental legal code,

financing of environmental programs and facilities, and assuring a good supply of qualified environmental personnel.

#### Education

6. Encourage active cooperation of universities and environmental agencies in the continuing education and utilization of environmental professionals and technicians, in both traditional and innovative forms, identifying manpower needs and preparing personnel for new environmental specialties and including a constant interchange of academic studies and working experience.

#### Systems Analysis and Surveillance

7. Apply modern techniques of analysis to environmental services, studied as systems of successive actions and interactions, with methods most economical and appropriate to the regional conditions, from personal interviews to satellite surveys and remote sensing.

#### Parameters

8. Establish parameters and apply standards of measurement and tolerances essential to monitoring systems and to definition and control of environmental hazards.

#### Occupational Health

9. For occupational health in each country, establish a government-sponsored organization capable of carrying out efficient programs of evaluation, prevention, and control of hazards to health and safety in the working environment. In countries with presently established agencies, protect 75 per cent of exposed workers by 1980; in other countries, protect 50 per cent. Plan for protection against nuisances and threats to community health from new industrial developments.

#### Water Supply and Sewerage Services

10. In urban areas, provide water supply service for at least 85 per cent of the population, with water piped into 70 per cent of the homes.
11. In all water systems, maintain and improve water supply services so as to assure continuous 24-hour service and quality control.



12. In rural areas, provide water supply to at least 50 per cent of the population.
13. In urban areas, provide sewerage services to at least 70 per cent of the population and find satisfactory solutions to the special problems of waste disposal in slum neighborhoods and in rural areas.

#### Air, Water, and Land Pollution

14. In each country, define a national policy for water pollution and water quality control, to initiate a national water pollution control program, and to start control actions in metropolitan areas and other places with seriously polluted waters.
15. In each country, conduct studies to determine the intensity and significance of suspected or potential pollution of waters and to initiate preventive action.
16. Enact a national policy on air pollution control and establish national programs to control air pollution in countries where major cities are affected.
17. Initiate measures to control air pollution in major cities and evaluate and prevent air pollution in other cities.
18. Install new systems or improve present systems for disposal of solid wastes in metropolitan areas and important cities, to increase efficiency of present services, give due respect to protection of the environment, minimize threats to public health, and reduce other offenses.

#### Food Protection

19. Assess the significance to public health of the respective stages of food handling from source through processing, distribution, storage, preparation, and service, according to prevalent conditions in the respective countries.
20. Develop realistic health protection for each stage of food handling, integrate protective measures into practical programs, and foster application of these programs by national, state, and local health agencies.

#### Housing and Area Development

21. Pursue metropolitan or regional planning with regard to the health related aspects of housing, including water

systems, sewerage and drainage systems, transportation, garbage and refuse disposal, and prevention of pollution of air, soil, and water.

22. Assist river basin development with regard for health related aspects of housing, flood control, irrigation, and water quality.
23. Encourage planned rural development with regard for housing, agricultural settlement, and rural community development.
24. Form institutions assigned to improve rural and metropolitan settlements by a system of interdisciplinary planning and a multipurpose approach to environmental factors, with regard for health needs.
25. Draw on environmental engineering expertise for systematic analysis of proposed development programs and studies of health significance of types and patterns of dwelling units and neighborhoods.

#### Modern Stresses

26. Develop criteria for practical regulation of noise and initiation of control measures.
27. Develop criteria for practical regulation of such stresses as vibration, tempo, congestion, and other modern hazards.

### ENVIRONMENTAL POLICY

The projections for the 1970's offered in this document for consideration by the Member Governments of PAHO for their environmental programs were drafted with concern for each country's total needs, because health is much more than repression of disease. Health suggests a people who are vigorous, alert, and prosperous, aware of the wonders of life, and celebrating its joys. As defined in the WHO Constitution, health is ". . . a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity . . ." Every ministry, and not the health ministry alone, must consider how its activities affect the health and well-being of people.

#### The Role of the Health Agencies

What then is the special environmental role of the health ministry? In every government, health officials simultaneously pursue basic health

programs while they provide guidance and assistance to those in charge of related programs. The distinguishing characteristic of health agencies in this relationship is a unique competence to assume responsibility for a population's health. Primarily, health officials seek to define the criteria and establish standards for environmental health, to be watchful of environmental conditions, to evaluate the significance of changes, to report significant changes, and to devise and recommend methods, including educational programs, for preserving and improving environmental health. In executing this mission, health officials work with other agencies in a close and clearly defined relationship expressive of mutual regard for each official's respective expertise and responsibilities.

The policy of interagency collaboration is based on the concept that environmental services apply to all interactions of man and earth. Modern epidemiology with advanced techniques of chemical analysis and biological experiment has made clear that few events are without some relation to human health. At the outer limits of human activity, airplane flights far above the clouds may increase the amount of water vapor ever so slightly but perhaps enough to affect the climate of the earth. At the inner limits, a single molecule may play a role in mental retardation. In remote Antarctica, DDT, thousands of miles from its point of application, turns up in the fat of penguins. Recent snows on that far continent exhibit lead compounds picked up from automobile exhaust in the cities. Conversely, the cities are penetrated by toxic or radioactive elements scattered in the hinterland. Epidemiology will reveal the significance of many environmental challenges. Though many seem trivial now in superficial aspects, all forms of pollution warrant surveillance so that attention may concentrate on pollution with significant effects.

Pollution of the environment is, in its broadest sense, any substance, force, or condition which threatens the health, security, or well-being of people. Such substances, forces, or conditions may produce human stress. All stresses, however, are not injurious.

Stresses may be characterized by their physical nature, mode of action, or effects. Textbooks have been written to describe them all, and none are complete. Until the last few years, environmental health services were concerned chiefly with microbes carried by water, food, air, or insects. Modern technology has aroused health agencies to consider subtle or long-range effects of microchemicals in concentrations as low as a few parts per billion; sonic or mechanical vibrations; ionizing radiations; and electromagnetic waves in ultra-high frequencies. The open sores of society - the effects of urban congestion, faulty communications, and jet-paced transportation, expressed at their worst in disease, injuries, crime, delinquency, addiction, vandalism, poverty, prostitution, and mental breakdowns - become in their turn additional stresses with self-perpetuating effects.

### Environmental Services and Environmental Concerns

Environmental services are those which prevent, control, or moderate environmental stresses or damage - or provide positive benefit. Environmental health services are those which are concerned primarily with the physical and mental well-being of people.

Although the health of the peoples of the Americas depends on services which assure that water, food, shelter, soil, and atmosphere are both safe and sufficient, none of these fundamental services is under the complete control of a health agency. Health officials usually set standards and monitor stresses associated with environmental changes rather than operate environmental services. As environmental stresses grow both in variety and degree, they command ever more attention from governments. Since resources are always limited, each government seeks to provide the most important protective measures possible with the resources available, but the range of stresses is wide.

Although in recent years major gains were scored against mosquitoes and other vectors, they still remain a threat. The risk of infection from other communicable diseases is high where shelter is poor and congestion severe. Concern with nutritive values and food additives or contaminants has led governments to prescribe standards for food with descriptive labeling of food packages. Soil has attracted concern because in many places lands have been degraded by careless management or poisoned by insecticides and other chemicals. Data on cigarette smokers and emissions from industrial stacks and gasoline engines have stimulated interest in the control of air pollution. Greater interest in the working environment has resulted from increased incidence of such occupational diseases as black lung, asbestos fibrosis, and silicosis.

Of the many environmental interests, however, all governments see that water supply services are a prime essential for drinking, bathing, washing, and other domestic uses. For basic health needs, every family must have water piped into the home. In addition, there is also need to provide water for farming, fishing, recreation, power generation, industrial processing, cooling, dilution, and transportation. Not the least of the services associated with water systems are programs that control pathogens and toxic substances, if not a more complete water quality control.

The foregoing and other traditional services are fundamental to a sound environmental protection program. They may be expected to continue indefinitely while new programs to meet new needs are emerging and developing.

### The Changing Environment

Changes in the environment require parallel adjustments in environmental health services. The most conspicuous of the forces of change has been modern technology in a rapidly expanding economy. The impact of this

force, in consuming forests and minerals and generating waste products and stresses, has been to degrade the environment and deplete the natural resources. At the same time, growing populations seeking the benefits of technology burden the environment with their own wastes and demands. The speed of these events intensifies the urgency of protective action.

Prospective population changes include a rapid rate of increase in numbers, especially in tropical America; a shift to urban centers; increased domestic and international mobility; and a rise in heterogeneity within each community, with significant differences in customs, education, aspirations, and alliances.

Although modern technology, for all the good it has done, is undoubtedly the most acute physical threat to the environment, the strongest political pressures are likely to result from rapid changes in numbers, movement, density, and character of populations. In his inability to moderate such changes, man may be his own worst enemy. The need is worldwide to apportion more of the technologic capacity and competence to the task of offsetting the detrimental effects of industrial activity and demographic forces.

#### New Responsibilities for Health Officials

The dimensions and character of changes in environment and changing perceptions of the nature of environmental stresses are converting passive and traditional attitudes of health agencies to active and experimental policies. In dealing with communicable diseases, health agencies can be fairly confident that specific protective measures will avert epidemics. The link between the infectious agent and disease is relatively obvious, once the epidemiologic studies are reported. Few such obvious links are found between technologic stresses and their effects. The stresses created by man rather than by parasitic organisms do not produce in general raging fevers so much as a variety of personality changes, with disorders of function and behavior. Some effects do not emerge for years or even within two generations. Cause is often widely separated from effect, with no simple causative agent but a combination of agents, events, and environmental conditions.

The consequences of an effective response to the newer environmental changes are certain to be profound.

a. Epidemiologic studies will be far-ranging in subject, in time, and in population numbers and character. Predictive epidemiology - the forecasting of health consequences of environmental change - while admittedly difficult, will be of increasing importance.

b. Standards and criteria will anticipate conditions that may possibly develop in the next several generations; those which merely represent a reaction to recent crises will offer too little protection for the future.

- c. Health judgments will be formed and accepted on the basis of incomplete evidence because it will not be economical or even safe to wait until events reach such a state of crisis that the public will approve programs that appear to promise relief. Not only are programs conceived in an atmosphere of crisis likely to be extravagant; they may also be futile. If soil is heavily polluted by certain persistent chemicals, it may be impossible to remove them or to prevent entry of these chemicals into the life stream of the next several generations. Certainly, the injuries from ionizing radiation cannot be corrected. Radioactive chemicals which inflict such injuries will persist according to their half-life or rate of decay.
- d. Given a policy of anticipating stresses, it is all the more important that public health programs have a sound grounding in basic knowledge derived from scientific research and international systems of exchange of scientific information. Health agencies will draw both on their own research capabilities and on expertise available in associated enterprises. As health agencies contribute guidance on health conditions, others will contribute information on regional planning, financing, industrial design and technology, legal implications, comparative legislation, and methods of assuring compliance with or enforcement of standards in conformity with health requirements.
- e. Health agencies will assist operating and regulatory agencies to pursue corrective, remedial, or preventive actions to avert environmental threats. In this process, health officials will act as counsellors for the people. They may initiate suits in the public interest, or they may testify as expert witnesses on compliance with environmental health standards developed with all interests represented.
- f. Health services will give increasing emphasis to ecologic factors. Research will investigate environmental chain reactions. Maternal and child health services will encourage family planning for an optimum population. Vector control programs will seek biological substitutes for insecticides. Training programs will build up cadres of environmental technicians. Nutritionists will promote defenses against gratuitous and uneconomic food additives. Statistical services, including registration and the national census, will seek data on environmental circumstances of vital events.

In effect, health services, in cooperation with many other agencies of government, will coordinate environmental programs with national plans.

#### The Integrated Systems Approach

The systems concept may serve any environmental program which has a perceptible flow of materials or personnel through successive actions or interactions, in the village or in the urban complex. It applies to planning and construction as well as to operation and maintenance. For example, the act of collecting and distributing water automatically implies the need of systems for predicting and managing the supply of water; its quality as

well as quantity; its multiple uses; its treatment, before and after use; its interactions with nutrients, soils, channels, estuaries, population growth, climate, and so on; and above all the influences of its uses and condition on human health. The success of such predictions will depend in large part on success in recording and utilizing data critical to the management of environmental services, and both the data and their uses depend on authorities with clearly defined responsibilities for environmental health services, backed with essential legislation, sufficient funds, and trained personnel. Various patterns of national environmental systems are evolving in many countries of the world. Where there have been legal authority, funds, and personnel to function effectively, new patterns have been set for environmental health services in the Seventies.

### National Plans

Hopes for environmental protection and improvement are more likely to be realized when the environmental programs are linked to a national development plan which in turn is in phase with international activities. Development and continuing evolution of a national environmental plan is therefore to be considered as a general goal for each Member Country. In keeping with this goal is the development of systems, structures, services, or facilities which satisfy the objectives both of the national development and environmental plans.

Elements of a National Plan. In general, basic elements common to national development plans and national environmental programs include:

- Definition of a task
- Enactment of enabling statutes
- Assignment of authority
- Authorization of works and services
- Declaration of realistic goals
- Assembling essential data
- Training of personnel
- Financing

The elements listed are not rigid or exclusive. They do not happen necessarily in the sequence given. All are subject to constant revision and refinement.

In the absence of adequate information, the choice of goals, priorities, and elements of environmental plans may have to depend to a great extent on personal judgments, observations, experience, and professional advice. Often such judgments may be more reliable than conclusions drawn from information assembled from biased or incomplete data. Nevertheless, the ultimate base of reference of a rational plan is a system of information.

Information systems in essence consist of facilities for generating data and information; collecting, collating, classifying, and indexing information; storing, searching, retrieving, replicating, and distributing information. Modern technology has contributed electronic methods that simplify and expedite these functions.

Looking to the future, it is to be hoped that, in parallel with economic development, each nation will acquire the basic data that it needs to support rational and practical decisions, goals, and standards for environmental health.

International Relationships. Nothing in a national plan needs to obstruct relations with other governments or international agencies. To the contrary, the presence of a national plan will facilitate negotiation of bilateral or multilateral agreements. Simply by the act of identifying goals and defining tasks, a government establishes a basis for finding common ground with others. A national plan will take note of (a) activities which will benefit from multinational agreements, such as standards of measurement, nomenclature, or classification, and (b) activities which require collaboration with at least its immediate neighbors, such as developing an international water basin, connecting highways, or exchanging data of common interest.

PAHO Services and National Plans. The national plans of the Member Governments will determine the nature of PAHO/WHO programs in the years ahead. The proposals offered in the following pages aim to suggest goals for consideration by the Member Governments. The programs approved and adopted by the Member Governments in effect will determine what services they expect from PAHO. It will be evident that many proposals imply evolutionary advances from the base of services and structure characteristic of PAHO/WHO in the last few years. Fortunately, PAHO/WHO is flexible. It stands ready to adjust to the requirements of the next decade as the Member Governments perceive them.

## RESEARCH, STANDARDS, AND SURVEILLANCE

### Research

The orientation of environmental research in the 1970's will differ radically from the past. While interest continues in traditional areas, increasing concern is felt for the external effects of industrial technology, such as the exhaustion or degradation of resources essential to support human life, and for the internal effects of the presence or absence of critical chemicals in food, clothing, water, or atmosphere.

For the health agencies, the selection of environmental studies which have the most significance to public health will continue to receive priority.



These studies will be geared to demographic, cultural, and technologic developments. With populations growing at a rapid rate, concentrating in urban agglomerations, expectations for environmental health services have risen sharply. Systems of mass production and distribution for international markets impose further demands on public health agencies to improve and adapt methodologies for the inspection and regulation of food, drugs, and other consumer products.

It has become necessary to assess the physiologic effects of thousands of chemical compounds, especially those of high potency or wide use. The concentration of such compounds through the food chain can build up to damaging dosages. Low concentrations in water may be accumulated successively by plankton, insects, worms, fish, birds, or mammals until they amount to a significant ingredient in food. For example, shellfish concentrate DDT to a point 70,000 times as high as in their feeding waters. Similarly, plants, fowl, and cattle may deliver a concentration higher than the levels distributed in water or soil. Past studies have demonstrated such concentrations of strontium-90, mercury, DDT, and other products of industrial technology.

Unless there is a strong sense of a mission to protect public health, there may be insufficient emphasis on epidemiologic studies of concern to human life. A unified approach will in any event encourage teams of investigators - biochemists, engineers, epidemiologists, physicists, biometricians, clinicians, economists, sociologists, and others - to work together both in categorical studies and in general review. As they share specialized knowledge, a clearer understanding of the ecologic process may ensue.

In some areas of research, developing countries have a substantial advantage in the sense that others have already invested heavily in environmental studies. In recent years, environmental research budgets have exceeded US\$50,000,000 a year. The health advantages and economic savings through the application and adaptation of new environmental technology to Latin American conditions are substantial. Discoveries that can be applied both to existing and new treatment plants are but one example.

Other important subjects demanding research are those relating to economic development. A key economic question is whether a developing country can afford the cost of controlling pollution. This is a question that cannot be answered in general. Separate studies are needed for each major form and source of pollution in each country or even specific area to fit special circumstances. Such studies need to take into account political as well as economic considerations, and should consider popular attitudes and policies as well as actual costs. In this way public and private officials - and the public itself - may gain the information regarding environmental benefits and costs.

Programmed research will contribute to establishing primary and secondary criteria and standards for environmental health, to predicting effects

of environmental forces and changes in the nature of these forces, to determining the processes which result in environmental damage and human injury, and to finding where to intervene to prevent injuries to health. Programmed studies will contribute also to the technology of reducing pollution and protecting health. In addition, they will heighten public awareness of the constantly changing environmental hazards.

### Standards

Studies by scientists and others have yet to establish specific limits of tolerance for exposure to many forms of environmental stress. Determination of such limits is essential both to the intelligent statement of standards and to reasonable control measures. The health agency has the duty to conduct epidemiologic and other studies necessary to develop criteria, to set health standards, and to monitor compliance with the standards.

Developed countries have already produced a large body of literature on standards for many familiar hazards and some less well known. The main task for developing countries is to provide for evaluation and application to local conditions.

On this basis, developing countries may be in a position to bypass intermediate stages of technology in the application of some standards, to move rapidly into advanced stages, and to apply methods that experience elsewhere has proved to be economical and rational. For example, they may immediately apply standards for exposure to X-rays that others reached in slow, successive stages over a period of 70 years.

There is a strong trend to develop health standards in at least two levels, primary and secondary. Primary or basic health standards are those which protect life or which avert a real and specific danger to health. Secondary or supplementary standards aim to protect the quality of life, rather than life itself; they serve convenience and esthetics or they tend to moderate stresses which do not have obvious direct effects on health. Primary standards for atmospheric health, for example, would apply to concentrations of carbon monoxide, asbestos fibers, sulfur dioxide, or cigarette smoke, but secondary standards might apply to merely noxious fumes or odors.

National, international, or regional standards tend to discourage violators from moving their activities from one local jurisdiction to another where standards are weak or absent. They also formalize agreements among regions or nations seeking to avoid offense to their neighbors. Local authorities sometimes supplement national standards with their own stricter standards: a region dependent on tourism may be more protective of water and air than one which depends on manufacturing. In such a situation, it may even be desirable, though not always possible, to maintain conditions in a natural state.

Standard-makers sometimes choose between performance standards or what may be called descriptive standards, although they often use both at once. Descriptive standards specify dimensions, design, materials, or procedures, whereas performance standards deal mainly with results or effects. Because they tend to freeze an approved design, material, or system of operation, descriptive standards are relatively difficult to revise.

Enforcement of standards depends upon the application of statutory or common law with the support of police authority and public opinion. Ideally, it is linked to a system of educating all interested parties in the nature and the purpose of standards and in the methods and reasons for their enforcement.

A combination of enforcement functions with standard-setting is not essential but usually desirable.

### Surveillance

The surveillance and monitoring of environmental or human conditions of probable importance to health is a major activity of health agencies. In this report, monitoring is defined as the parametric recording of data obtained by systematic observation of indicators of health and environmental conditions. Health surveillance is defined as the collation and interpretation of data obtained from monitoring and other studies for the purpose of detecting and predicting health events.

Like research, the functions of surveillance and awareness in the environmental program are elements of the information system, in that they obtain, interpret, and distribute information. Since information is not gathered for its own sake, the surveillance system is responsible for alerting officials and the public to take preventive or protective action. Surveillance yields a harvest of awareness.

The principal functions of surveillance are:

- a. To relate environmental forces to effects on human health by methods of measurement and analysis that serve to establish criteria and standards of tolerance or permissible exposure.
- b. To establish baselines for purposes of measuring change, for determining trends, and for purposes of prediction, so as to assist in the application of control measures.
- c. To enable officials and the public to recognize impending or prospective hazards or dangers to health so that they may prepare necessary protective programs.

Parameters presently in use for measuring the state of personal and community health and environmental conditions may not suffice to serve the needs of the future. New ones must be developed, tested, and applied.

Although different governments may not employ quite the same surveillance system, all may benefit by using standard parameters for interchange of information. However, each will be guided by its individual needs and capabilities in doing what is necessary, dependable, and productive.

A national or international system of surveillance, embracing a range of readings, including physical, chemical, and biological conditions in water, air, and soil, offers many theoretical economies. These potential economies of an integrated surveillance system deserve consideration, especially since it should be possible to develop simultaneously information of interest to biologists, agronomists, hydrologists, meteorologists, geologists, epidemiologists, and others - and have the information analyzed in an integrated and much more productive way.

Through the cooperation of governments conducting stratospheric flights and launching satellites in outer space, it is now possible to obtain observations of the surface of the earth which eventually may assist all countries in observing changing conditions that effect their economy and health. For this purpose, personnel could be trained by governments to coordinate ground observations with information obtained through serial observation by remote sensing.

## OPERATION PROCEDURES

### Enabling Legislation

Common law and legislative statutes provide most governments with authority to execute national health plans, including those related to the environment. Continuing review of the law serves to refine definitions of individual and public rights, jurisdictions, and public powers. As yet, few governments have codified environmental laws, and consequently there are not many precedents in the form of model codes or model legislation.

### Policy

A declaration of policy usually accompanies legislation. It may include official statements by the head of state, a legislative resolution, or a preamble to a statute. The administrative structure builds on this foundation.

### Assignment of Responsibility

Responsibilities and duties of specific agencies may be stated in legislation or assigned by executive action or decree. The latter course strengthens the executive authority and permits considerable flexibility. The former course preserves the independence of the legislative body and makes the executive agencies responsible to the legislators.

Assignments include definitions of the respective powers and responsibilities of each ministry, department, and office. Ideally, authority and responsibility for each agency are defined to coincide.

Some authorities believe in fitting new programs into established agencies with experienced staffs. Others prefer to assign new programs to new organizations specifically created for the purpose.

### Structures of Organizations

Old or new agencies have a choice of organizing programs by function or by mission. That is, various functions, such as research, enforcement, and training, are organized as separate units; or each mission, such as water services, air pollution control, or sewerage services, may set up its own research, enforcement, and training units. Some structures incorporate both principles.

One national environmental agency is experimenting with a structure that divides its functions into research, standard-setting, monitoring, and enforcement activities which serve several environmental missions, such as water supply and air pollution.

Seeing their total needs and anticipating the effects of industrial development, a few Member Governments have established institutions found perhaps nowhere else in the world; they have national water and sewerage authorities with broad responsibilities and powers that give them a decisive role in national policy planning and execution.

### Financing

Environmental programs may be financed ultimately either by direct revenues such as licenses, fines, or fees for service or by appropriations from the general budget, funded for the most part by taxes on income, property, or business transactions. The large sums required for the capital structure usually come in part from private investors, banks, and national or international development funds. Although developing countries in the West have themselves provided the capital for more than half of the water systems they installed in the past ten years, they have depended on international development funds for the balance.

International financing of economic and social development has been shifting from policy agencies to predominantly financial institutions. The latter in turn are interested in investing where they have reasonable confidence that the projects are practical and the borrowers capable of repaying the loans. For this reason, careful planning of environmental projects, with accurate and sufficient data on costs and benefits, population, trade, and prospective revenues, will brighten the prospects for loans. Technical financial assistance may be obtained from international institutions for preparing project plans and for developing the essential supporting data.

The health agency can provide valuable assistance in the preparation of environmentally-related requests for national and international financial assistance.

### Manpower

Development and growth in the years ahead imply increased demands for qualified personnel both in the traditional fields and in areas related to new responsibilities in the management and control of the environment. In addition to the expert professionals responsible for basic designs, plans, and management, there will be a heavy demand for allied personnel capable of performing daily technical operations and maintenance. Most countries require an examination of knowledge and skill before they issue a license to drive an automobile. Ironically, employees are hired with inadequate instruction and indoctrination to maintain and operate sophisticated water and waste processing plants, costing millions of dollars. Consequently, even in advanced countries, many treatment systems operate deficiently. In impoverished regions even village water pumps fail in service. Such failures are costly to public health. Obviously, more effective educational programs are required to prepare technicians for important public responsibilities. Good technical education programs can prepare people for new open-end careers, instead of dead-end jobs, assuring continuing and progressive advancement to all who qualify by study and performance.

Among the sources of manpower are technicians who have been temporarily displaced by scientific or economic upheavals. Other programs should be designed to keep technicians current with new knowledge and new methods in their present occupations.

The health agencies are responsible for preparing the health technicians needed for environmental health services. In addition, they should support strongly the educational programs of agencies responsible for health-related aspects of other environmental services. All agencies should make full use of universities and similar resources in these educational programs.

### PROPOSED PROGRAMS AND GOALS

Whatever environmental activities they may pursue in the 1970's, health officials will continue to pledge heart and conscience above all else to public health, to the well-being of people. This characteristic distinguishes health agencies from all others seeking a niche in the environmental universe.

In setting goals for the decade, with clear and specific objectives, governments may ask what specific conditions of our peoples and their environment are to be sought? What specific activities will bring these conditions near? What are the time sequences? What must be done first and next?

Man's environment is both internal and external, fed and sustained by life systems and life-support systems. These systems are the channels of direct and indirect insults to public health. Man is the victim when the environment is degraded by whatever processes. None too friendly at best, the environment grows increasingly hostile to man's aspirations when he ignores the side effects of his efforts to improve his life.

The total of environmental-health services is greater than the sum of its parts. The parts include engineering, epidemiology, toxicology, economics, law, sociology, architecture, biochemistry, physiology, and other disciplines. Individually, their contributions are significant; collectively, they provide solutions not possible through individual actions.

To take full account of the inadvertent or secondary effects of economic development and population growth, all national and international mechanisms will be needed in the 1970's, to continue and extend the outstanding progress in environmental health accomplished in the 1960's.

This is a propitious time to take a hard look at present activities, to appraise the progress, to consider present needs and emerging stresses, and to revise and remodel environmental programs.

Such revised and updated programs may require alterations of traditional attitudes and practices in public health, but the key to such change is action, action in a broad spectrum of environmental activities from epidemiology and monitoring to regulation and control. No aspect of the environmental program can be completely dismissed; each is essential in some degree.

Assertion of responsibilities of health agencies in the 1970's may take aggressive forms, as follows:

- a. National environmental programs may be prepared and synchronized with national economic and social plans, and they may have the concept and built-in mechanism for joint action, not only by several agencies of one government but by two or more governments. This cooperation is particularly important since pollution seldom respects jurisdictional boundary lines.
- b. Regional networks for monitoring major environmental impacts may be established and operated by health agencies. These networks may link global networks having common bases for sampling, analysis, and interpretation of data.
- c. New technology may be introduced to developing countries effectively and extensively. Critical reviews of literature may produce "summaries of knowledge" and "state of the art" documents in each program area or sub-area

(such as air pollution monitoring, water treatment, or industrial hygiene surveys). Manuals of reference, handbooks, and other technical information materials can be produced. As necessary, research can be conducted or supported to adapt basic knowledge developed elsewhere to regional conditions. Technical consultation can be available on problems of unusual difficulty.

d. Mechanisms for action, such as river basin development projects, can be supported and utilized by the health agencies. These projects offer excellent opportunities for incorporating necessary health programs in overall basin development.

e. Internal and external resources of finance may be sought vigorously. International agencies can provide valuable assistance to countries in obtaining external support for facilities and services. Included in such assistance would be the development of basic information for loan applications, pre-investment studies, determination of the optimal periods of design, and programming of construction to make maximum use of loan funds, technical education, research, and others. The same type of assistance can be provided to Member Governments in developing applications for UNDP funds, bilateral assistance funds, and support from foundations and other institutions.

Because the action program must be specific, yet broad enough to cover a multitude of programs and administrative arrangements, the blueprint for the 1970's herein also suggests approaches to goals for the decade, in the more traditional areas submitted for consideration by the Organization's Governing Bodies.

No single pattern of priorities can be expected to meet the needs of all countries in view of the wide divergence among them as to environmental needs and resources. It is expected, therefore, that each country will continue to adjust program content to its facilities and requirements. Accordingly, a specific country may use the ideas suggested to prepare the country program for the decade. Also, the methods and organizational structure may differ from country to country.

Whatever approach may be selected, however modest the goal, little can be accomplished without personnel capable of working independently, supervising, or assisting, as the job demands. There must be enough qualified personnel to reinforce and support one another, men and women who have learned their duties both by formal instruction and by practical experience. Education of large numbers can be expedited by beginning with a small number of especially capable prospects who will in turn teach others to tutor still others. Continued support must be provided for the development of university graduate centers for teaching technical studies and research. Study, research, and fellowship programs assisted by PAHO have extended their influence with the use of manuals provided for each of the courses. Such courses not only develop basic skills and knowledge, but they also help to form teams who learn how to work together and to develop their abilities. The spirit of such teams is



often critical to the success of an operating system. The future progress of Latin America in improving the physical environment will depend in significant measure on the quality of its university centers for environmental sciences and engineering.

One of the most valuable contributions of the university faculty could be to participate in practical environmental programs, to provide expert knowledge and judgment to the solution of practical problems. The multidisciplinary talents of the university can open a new dimension in plans for economic and social development. Whether or not the university is currently in a position to offer such aid, the likelihood is that the faculty will be called on to do so by the governing authorities.

In the pages that follow, it will be evident that a great variety of occupations, many of them new to the Region, are required by the proposed programs. The programs offer opportunities for rewarding careers.

#### Water Supply

The development of water and sewerage services in Latin America and the Caribbean countries has been most spectacular in recent years. At the beginning of the 1960's, these countries had 209 million inhabitants; 102 million lived in urban communities and 107 million in rural areas. Of those in the urban areas, 60 million, or 59 per cent, had water services, whereas less than 8 per cent of the rural population received potable water either on the premises or through public fountains. Sewerage was available to only 29 million, or 28 per cent, of the people living in the urban areas; there were no data on latrines or compatible facilities in rural areas.

In 1961, the Governments of Latin America in the Charter of Punta del Este committed themselves to provide water supply and sewerage to 70 per cent of the urban population and to 50 per cent of the rural inhabitants by 1971. Also in 1961 the Advisory Committee on Environmental Sanitation of the Pan American Health Organization studied the implications of the Charter goals on national, economic, and social development plans and drew guidelines for meeting the objectives. Thus, the Charter of Punta del Este provided the countries with clear-cut goals and the Advisory Committee on Environmental Sanitation defined a Continent-wide strategy.

To most of the countries, these goals presented a tremendous challenge at the time, 40 million of the urban population had no water supply service in their homes, and by the end of 1971 the urban population would gain another 46 million.

The prospect for the rural areas was less certain, but the goal implied a supply of water for 10 million or more rural households.

Despite the magnitude of the task at hand, with the decided support of the higher levels of government and the collaboration of the national and international financing and technical assistance institutions, the program was fulfilled in the main. Although rural goals had been too high for complete realization, a strong base was built for future rural progress.

In line with the expressed desire of the Governments, the international lending agencies devoted a significant part of their loan funds to water supply, particularly the Inter-American Development Bank (IADB) and the International Development Association (IDA) of the International Bank for Reconstruction and Development (IBRD). As a result of these policies, in the period 1961-1970, international loans for water supply and sewerage in Latin America committed some US\$729 million, with national matching funds of more than US\$1.3 billion, provided mostly by local authorities.

The Pan American Health Organization, responding to resolutions of its Governing Bodies to assist the Member Governments to meet the goals of the Charter, initiated several steps to expand community water supply activities in keeping with the desires of the countries of the Region. Particular attention was given to the instruction of technical personnel, the organization and management of national water supply and sewerage authorities, the preparation of requests for international finance, the organization of countrywide programs, and the establishment of revolving funds; projects which benefited from PAHO's technical assistance and advisory services were provided in many of these areas.

Periodic reviews at various stages of the program through the decade confirm the satisfactory progress and reaffirm the need for its continuation at an accelerated pace. In April 1967 the Presidents of the Americas declared:

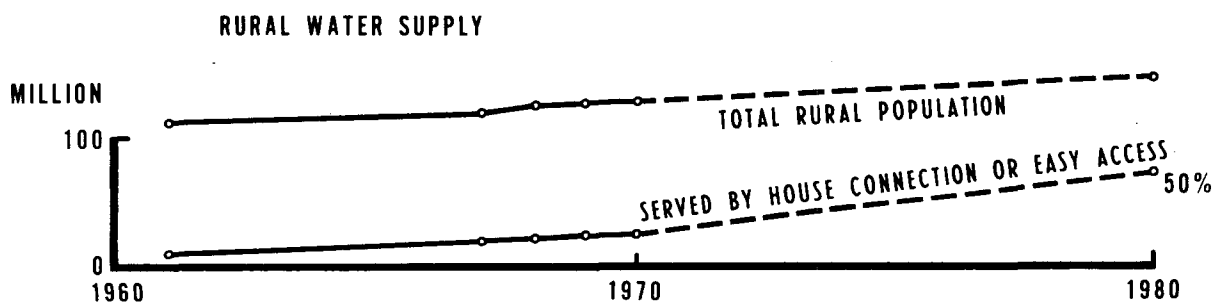
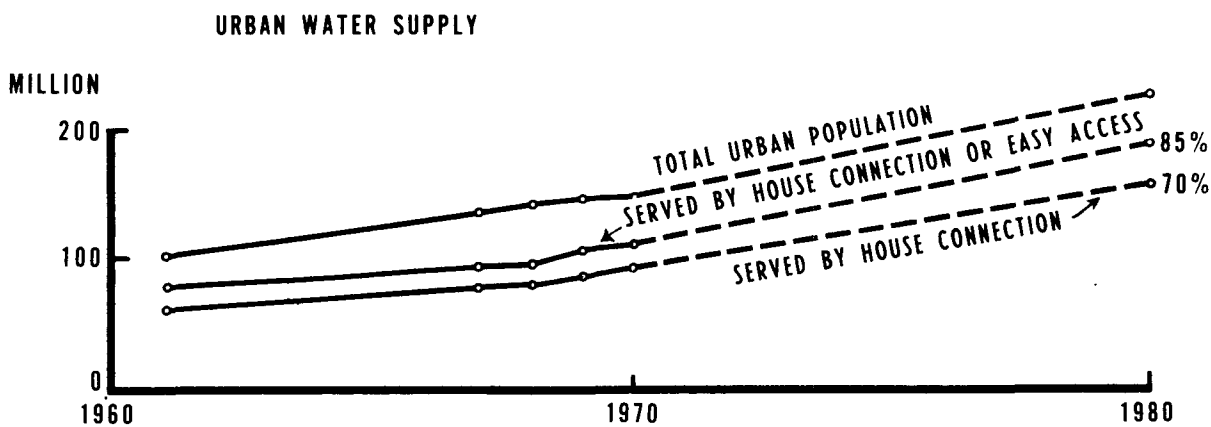
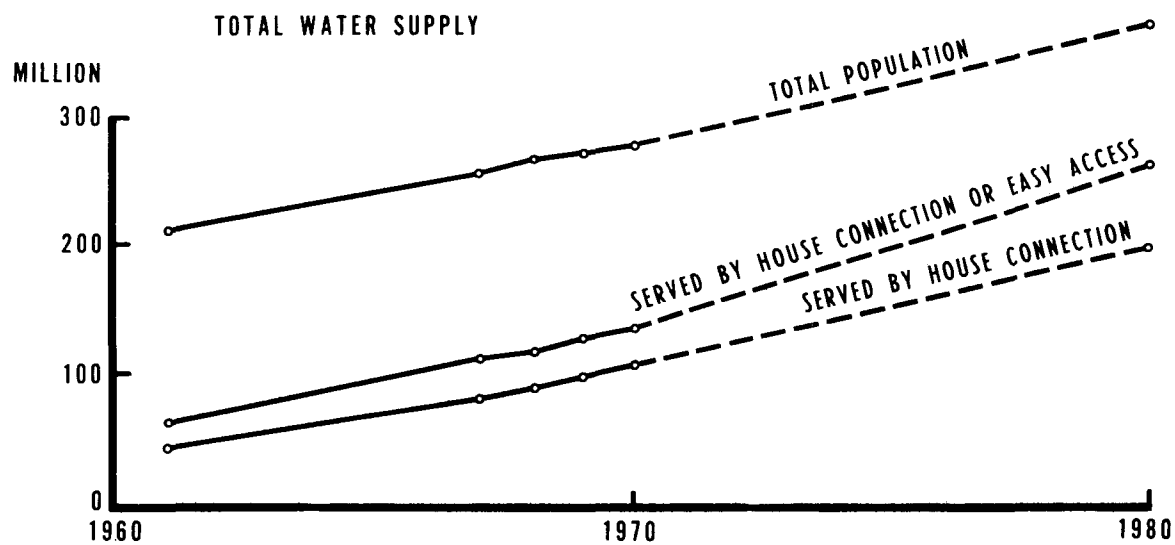
Improvement of health conditions is fundamental to the economic and social development of Latin America.

Available scientific knowledge makes it possible to obtain specific results which, in accordance with the needs of each country and the provision of the Charter of Punta del Este, should be utilized to obtain . . . acceleration of programs for providing drinking water supplies, sewerage, and other services essential to environmental sanitation in urban and rural areas, giving preference to the lower income groups. On the basis of studies carried out and with the cooperation of international financing agencies, national revolving fund systems shall be used to assure the continuity of such programs.

The results obtained at the end of 1970 clearly indicate the success of the program. Out of the 275 million inhabitants of Latin America, 133 million had piped water supply. More than 110,000,000 people, 75 per cent of the total urban population, were provided with water supply service, either through house connections or public hydrants (Figure 1).

FIGURE 1

**COMMUNITY WATER SUPPLY SERVICE IN LATIN AMERICA  
AND CARIBBEAN COUNTRIES**



The rural program made substantial headway by more than doubling the water supply service to the rural population in the nine years involved. The rural population served in 1970 is estimated at 23 million, 18 per cent of the total rural population (Figure 1).

Many countries of the Region have reached and actually surpassed the goal of providing water supply service to 70 per cent of the urban population. However, their achievements are no cause to relax, as about 25 per cent of the urban population still uses for domestic purposes water sources which normally do not meet basic sanitary requirements, either in quality or quantity. Even in areas which now enjoy piped water supplies, there is urgent need to insure a reliable and safe supply of water in the dwelling units.

By the year 1980, out of the 370 million people predicted, it is expected that some 225 million will be in the urban areas and some 145 million in the rural areas. Although there will be a substantial increase in population, it appears reasonable to seek further improvements. An increase of the water supply target of Punta del Este to 85 per cent for the urban population, while the targets for sewerage and rural water supplies are maintained, seems within reach of most of the countries (Figure 1).

Urban Water Supply - Goals for the 1970's: Considering many factors, the following goals proposed for the decade appear to be feasible:

- To provide water supply services for 85 per cent of the urban population with water piped into 70 per cent of the homes.
- To maintain and improve water supply services so as to assure continuous 24-hour service and quality control.

These goals imply an intensified effort in medium-sized cities, small towns, and low-income neighborhoods which for various reasons earlier have had limited opportunities to share in the major water programs. Future programs may be tailored to permit these communities to assure themselves a continuing water supply.

The goals proposed will require the following activities:

- Intensive preparation of pre-investment studies and collection of other information needed to qualify for internal and external financing.
- Institutional improvement or reorganization of the administrative, management, and technical capabilities of water authorities.
- Development of national or regional plans for water supply linked with national plans for economic development.

- Development of programs to set standards and control the quality of the water supplies, with sufficient laboratory staff and facilities.
- Application of modern technology for water supply as a means of lowering the cost of providing water services and increasing both effectiveness and efficiency of the total process.

Rural Water Supplies - Goals for the 1970's:

- To provide water supply services to at least 50 per cent of the rural population.

The following activities responsible for the progress made may be pursued and intensified:

- Utilization of the "mass approach" using standard equipment and logistics for rural supply programs, considering each community as a unit in the system, with a committee of residents responsible for the continuing production and distribution of water.
- Utilization of revolving funds as a mechanism for financing rural water supply programs.
- Preparation of loan applications, pre-investment studies, and other documentation required to qualify for internal or external financing.
- Development of new techniques, equipment, and materials with the objective of lowering the cost of rural water supply systems.
- Strengthening of programs for operating, maintaining, and managing the production and distribution of water, including the development and implementation of systems to provide managerial and administrative support to attain the objective.

Progress in supplying water to rural dwellings has clearly established the wisdom of areawide programs which rely on active participation of the people served. Despite the large deficit at the initiation of the program in 1961, success with standard designs for rural water systems and standard procedures for projects based on a self-help system and the establishment of effective administrative structures promise rapid advances in the 1970's.

Success with the creation and application of revolving funds and the installation of managerial and economic skills in rural water undertakings give confidence in the ability to fulfill the rural goal, given national support for areawide rural programs.

## Sewerage

Although the goals for sewerage services in the urban areas were the same as for water supply, it could be expected that, in view of the need to have water before providing sewerage, the development of sewer systems would be delayed. Nevertheless, in view of the fact that in 1961 only 29 million people, 28 per cent of the urban population, lived in homes with outlets to sewers, the progress has been substantial: in 1971 sewerage services accommodated 60 million people, 40 per cent of the urban population (Figure 2).

The difficulties of providing services to the large squatter settlements holding as much as 25 per cent of the urban population require urgent attention, as infections that originate in these quarters may be shared by an entire city.

Present rate of sewerage construction in the decade of the 1960's, large as it is, if left unchanged will not keep pace with the increase in urban population.

Urban and Rural Sewerage Services - Goals for the 1970's: In the light of progress to date, the targets of Punta del Este appear realistic for the decade of the 1970's, as follows:

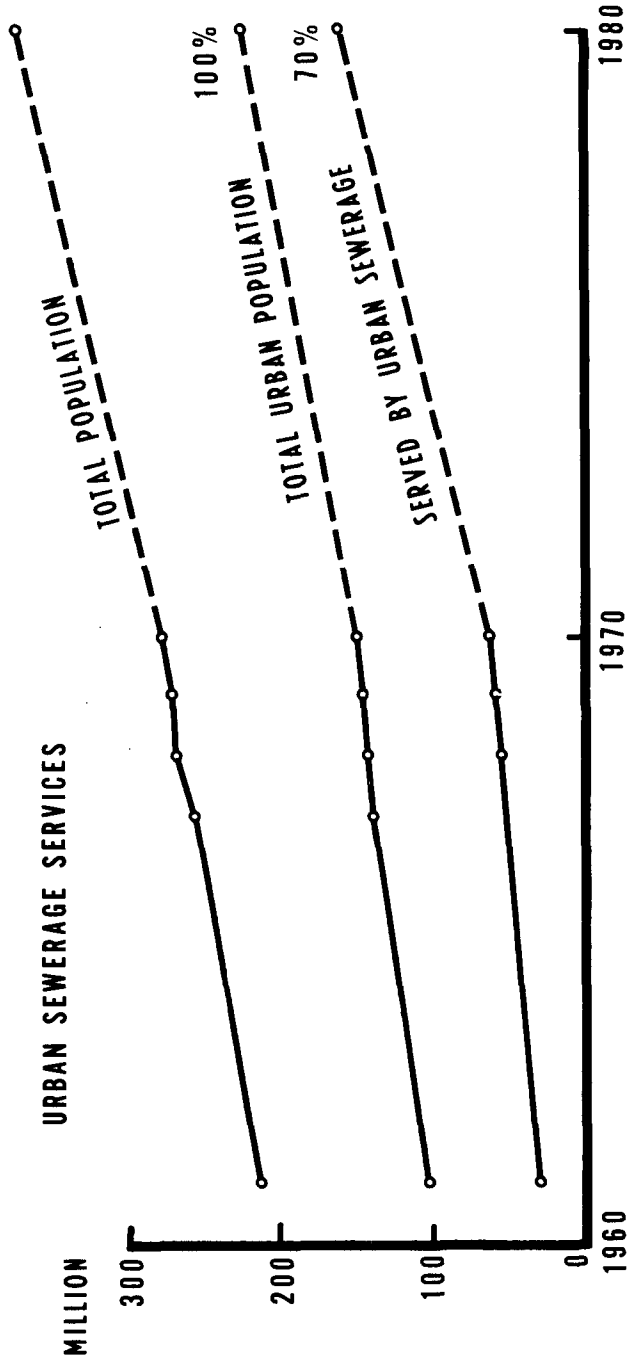
- To provide sewerage services to at least 70 per cent of the urban population and find satisfactory solutions to special problems of waste disposal in substandard neighborhoods.

Major activities to be pursued in urban areas include:

- Application of the same principles of organization, management, financing, operation, and maintenance of the services which have proved effective for urban water supply. (Single authorities to administer both water supply and sewerage systems have proved successful in some countries of the Hemisphere, to their distinct benefit.)
- Development, wherever possible, of regional or national plans for sewerage services in line with corresponding regional or national water supply and economic plans.
- Preparation of loan requests, preinvestment studies, and other information required to qualify for national and international financing.
- Strengthening of programs for administering, operating, and maintaining sewerage disposal systems.

FIGURE 2

### COMMUNITY SEWERAGE SERVICES IN LATIN AMERICA AND CARIBBEAN COUNTRIES



Major activities to be pursued in rural areas include:

- Development of programs for the disposal of excreta and other wastes.
- Experimentation with new methods for disposal of wastes from small communities and substandard housing areas.

### Water Pollution Control

The rate of growth of population in Latin America is around 3 per cent per year. The average in urban areas is 4 per cent, with some places reaching 7 per cent or more. In general, the urban population is expected to double in the next 15 to 20 years. Sewerage services are needed immediately to carry the wastes of at least 30 million urban dwellers who now benefit from water supplied to their homes but are not served by sewerage systems. Another 60 million have no water pipes in the home and no access to sewers. The population increase will place further demands on sewer services.

So far, the construction of sewage treatment plants and other measures to control water pollution have been in abeyance. In the year 1962, it was estimated that less than 10 per cent and probably not more than 5 per cent of the sewer systems provided any form of sewage treatment. The situation has changed little since. There are few treatment plants in operation. Sewage from more than 50 million population is discharged untreated into streams. Of the 60 million urban dwellers served by sewers, fewer than 10 million are served by a system that provides any treatment to reduce pollution.

Rapid industrial development, experienced in most countries in Latin America, creates heavy demands for water as a raw material, processing fluid, coolant, and waste carrier. Industries vary widely in their requirements for quantity and quality of water. Frequently these requirements surpass residential needs. At the same time, industrial uses may add seriously to the burden of pollution in the streams. Many industries of great consequence, notable for the size of their operations, their requirements for water, and polluting characteristics, grew substantially between 1959 and 1967 and seem likely to continue to grow at the same rate, if not higher, in the decade of the 1970's.

Annual rates of growth were, for the fish meal industry, 23 per cent; chemical and wood pulp, 18 per cent; steel, 13 per cent; and petroleum products, 12 per cent. Other industries which may produce pollution include meat processing and packing, canneries and frozen foods, distilleries, milk and milk products, plastics, rubber, textiles, and sugar.



Industrial pollution is not readily characterized or evaluated. A first approximation of its effects can be based on the assumption that quite limited treatment is performed and that industries which produce pollution discharge their wastes in various bodies of public water. Admittedly, each individual industrial outfall has its own characteristics, usually quite different from those of domestic wastes. Nevertheless, to describe order of magnitude for industrial pollution in Latin America, the load of the major industries is estimated as equivalent to that of 40 to 50 or 60 million people. Small industries may also contribute a significant additional load. In total, the pollution load of untreated industrial wastes is comparable to the wastes of a population of some 100 million. This pollution load is likely to increase as industrial development progresses.

In the absence of pollution control or water quality control policies and programs, the prospects for Latin America can be judged by experience in advanced nations where uncontrolled water pollution has created almost unbearable economic burdens. In the United States of America alone, it is estimated that some two billion dollars a year is required over the next decade to abate even a part of the pollution without assurance that water quality will improve to the levels desired.

The information available on water pollution and water quality in Latin America, limited as it is, clearly indicates that water pollution is not merely a potential threat. Costly pollution is occurring today on a significant scale; it is on the increase and has already reached levels which concern responsible authorities. Ad hoc actions have been taken in some critical spots. These experiences have confirmed the need to proceed rapidly with broad control programs. Further, they indicate how governments may shape policy and legislation for urgently needed water pollution control and water quality management. The authorities still have an opportunity, before it is too late, to consider the dynamic character and consequences of industrialization, urbanization, and environmental degradation; to define the programs, designate responsible officials, allocate necessary resources, select priorities, and establish control measures. In doing this, it is logical to assume that the overriding criteria will be those related to providing water in sufficient quantity and of satisfactory quality to satisfy the human needs of health and well-being.

The characteristic quality of the water needed will depend on the uses approved. Under continually changing requirements of a developing country, a first step towards organizing a program of water quality management is to record and collect up-to-date information in a form that can be processed, searched, retrieved, and utilized, employing standard parameters which characterize water quality and measure the variable factors that are responsible for its changes.

In the absence of conclusive technical information and until appropriate permanent government authorities on water quality are established or

designated, governments may, as an interim measure, create a mechanism to initiate water quality management on the principle of the best practical means; that is, use of temporary standards to maintain as far as possible the present quality by preventing further deterioration until carefully formulated quality policies, standards, and guides can take effect. Simultaneously, government officials may lay the base for a permanent water quality management operation. Since most major industrial processes have been characterized both qualitatively and quantitatively, as have the types of wastes normally produced, this authority could also study effects of specific industrial wastes and their economic implications in order to determine the most appropriate course of action, including recommendations for location of industries and treatment requirements for the wastes to be discharged.

Water Pollution Control - Goals for the 1970's: It is proposed that for the 1970 decade realistic goals would be:

- To define for each country a national policy for water pollution and water quality control, initiate a national water pollution program, and start control actions in metropolitan areas and other places with seriously polluted waters.
- To conduct studies to determine in each country the intensity and significance of suspected or potential pollution of waters to initiate preventive action.

These goals imply:

- Establishment of basic policies and legislation for the control of environmental pollution and particularly water pollution control, including designation of responsible authorities and allocation of resources.
- Development of water pollution control programs in urban, industrial, and agricultural areas that require urgent action and their inclusion as part of the corresponding development plans, local or regional.
- Establishment of information systems to determine water quality and water quality trends, forecast quality and quantity demands, evaluate program performance, and develop and adjust plans for prevention and abatement in compliance with regulations.
- Evaluation of advanced and practically proven industrial technology and treatment processes about which information can be obtained, and application of this technology as a means of preserving quality and curtailing pollution.

- Support for research in low-cost treatment methods, such as lagoons for disposal of municipal and industrial wastes.
- Investigation and study of specific sources, processes, consequences, and restraints of water pollution having broad significance.
- Establishment of a water quality management operation for the administration of water quality.

### The Ambient Air

Knowledge acquired in developed countries has made it evident that Latin America cannot be spared the consequences of air pollution associated with urban and industrial growth unless the Governments take timely measures.

The main sources of pollution in Latin America, as elsewhere, are the combustion of fuels and the discharge of waste products from industrial processes. As the number of gasoline-powered vehicles increases in the Region, so does their contribution to air pollution, estimated by the Los Angeles Air Pollution District as being 3.2 tons of carbon monoxide, 400 to 800 pounds of organic vapors (hydrocarbons), and 100 to 300 pounds of nitrogen oxides, plus sulfur and other chemicals, per 1,000 vehicles per day. (This may be greater with older cars, poor maintenance, and poor grade fuels.)

Although information on the effects of air pollution on human health is limited, available data have led scientists to conclude that it is particularly harmful to special risk groups such as the young, the old, and the debilitated. It is suspected as a cause of some forms of cancer and eye diseases and has been definitely linked to ailments of the respiratory system, such as emphysema. If air pollution in relatively high concentrations is the cause of acute respiratory illnesses, there may also be many long-term effects from unsuspected air pollutants in low concentrations. Certainly more epidemiological studies are warranted. Other physical effects of air pollution include destruction of vegetation, impaired visibility, corrosion, skin disorders, and soiled clothing, furnishings, and buildings. Unfortunately, far too little attention is given to the health and economic costs of air pollution associated with industrial development.

The health authorities of Latin American countries have been concerned with air pollution. In the 1950's, several took measurements of concentrations of air pollutants as an initial step toward control of the most offensive sources. Evidence of significant and rapid deterioration of air quality indicated that control programs were needed urgently.

In response to the concern of the Member Governments, PAHO contributed to several actions. In 1961, it was instrumental in setting up the Institute of Occupational Health and Air Pollution in Chile. PAHO consultants helped to train staff for air pollution control in the countries concerned. Advisory

services, both for the organization of general programs and in the solution of specific problems, was provided to cities such as São Paulo and Rio de Janeiro in Brazil, Mar del Plata in Argentina, Kingston in Jamaica, and others.

In 1965 the Directing Council requested the Director of PASB to give due attention to programs to abate pollution of water and air. In 1966, the Member Countries approved the development of the Pan American Air Pollution Sampling Network, which began operations in 1967. There are now 33 stations installed in 18 cities of 13 countries. At least an equal number of stations are operated outside the network and provide valuable information. By the end of 1971 there will probably be 50 stations of the network functioning, and 100 by the end of 1972. With this number it should be possible to appraise the trends in general quality of the atmosphere over major metropolitan areas of the Region.

Most immediately affected by air pollution in Latin America are certain cities, notably Buenos Aires in Argentina, Rio de Janeiro and São Paulo in Brazil, Santiago in Chile, and Mexico City.

Of the cities with obvious need to control air pollution, only three have active programs, although their present actions appear insufficient to reverse the trend. Activities elsewhere in Latin America are limited to the measurement of air pollution levels, usually through a station of the Pan American Air Pollution Sampling Network.

As to countrywide programs, no Latin American government has a national air pollution control organization, although at least four have approved legislation and one has begun an active campaign against pollution sources. A few other countries have programs in planning stages.

Various experiences in the Region have demonstrated that legislation on air pollution, either on a local or national basis, has to be provided or updated in most countries as the first step towards national control. The costly effects of air pollution in developed countries can be avoided in Latin America if Governments take steps to define the task and to control unacceptable situations.

The approach to air pollution control from country to country or even from area to area will depend on variables such as the scale of application, the nature of the sources of pollution, or the policy decided by the responsible authorities. In general, two main approaches are employed:

- a. Prevention of increased air pollution without regard to guides or standards, but with the aim of preserving the existing quality of the atmosphere as far as possible; or

b. Control of pollution on the basis of guides and standards of air quality assumed to insure public safety and well-being.

Undoubtedly each approach has its merits. In the initial phase of control, it may be necessary to take practical action to restrain new and present major sources of air pollution until standards of air quality can be established.

The Ambient Air - Goals for the 1970's: Practical and realistic goals for this decade could be:

- To enact the national policy on air pollution and establish national control programs in countries where major cities suffer from air pollution.
- To initiate measures to control air pollution in major cities and to evaluate and prevent air pollution in others.

A program of the nature proposed implies, among other actions:

- Definition of the country policy, approval of legislation, designation of responsible authorities, and allocation of resources as a minimum.
- Elaboration of guides and regulations to control new sources of pollution and existing major offenders and to prevent further deterioration until air quality standards can be prepared and enforced.
- Expansion of the regional air pollution sampling network and of local monitoring and information systems as guides to control programs.
- Planning of air pollution control programs as an integral part of corresponding local, national, and regional development plans where such plans are evolving.
- Adaptation or development and incorporation, where applicable, of modern industrial technology and air pollution control processes as a means of reducing pollution and the cost of its control in industrial centers.
- Execution of programs on the basis of the best practical means of control and gradual development of control of air quality by regulations, criteria, guides, standards, and procedures by legally authorized organizations.

### Land Pollution and Solid Wastes

The soil, and the plants and animals the soil sustains, suffer serious damage from household, commercial, industrial, municipal, and, occasionally, agricultural wastes, including insecticides, fumigates, and herbicides.

Wastes, particularly solid wastes, traditionally have been discharged to the soil with little concern for their eventual effects. So long as the quantities were relatively small and scattered, they were no serious threat to the farm, to the economy, or to human health. The growth and concentration of population, associated industrial development, and the increasing use of highly toxic and non-degradable products, however, are capable of doing significant social, environmental, economic, and physical damage in Latin American cities, where it is estimated that 1 kg of solid waste per person per day is presently produced and that, by 1980, solid waste may be expected to increase at least 50 per cent over 1970 (Figure 3). The quantity of refuse increases as economic conditions improve. In the United States of America in 1970, it was more than 5 kg per person per day.

Critical situations of waste disposal are particularly noticeable in metropolitan areas and large cities. Their traditional systems for collection and disposal are seriously strained. They must manage loads that grow from year to year and cover increasing distances to collection and disposal sites. The limited availability of acceptable disposal sites is a major difficulty.

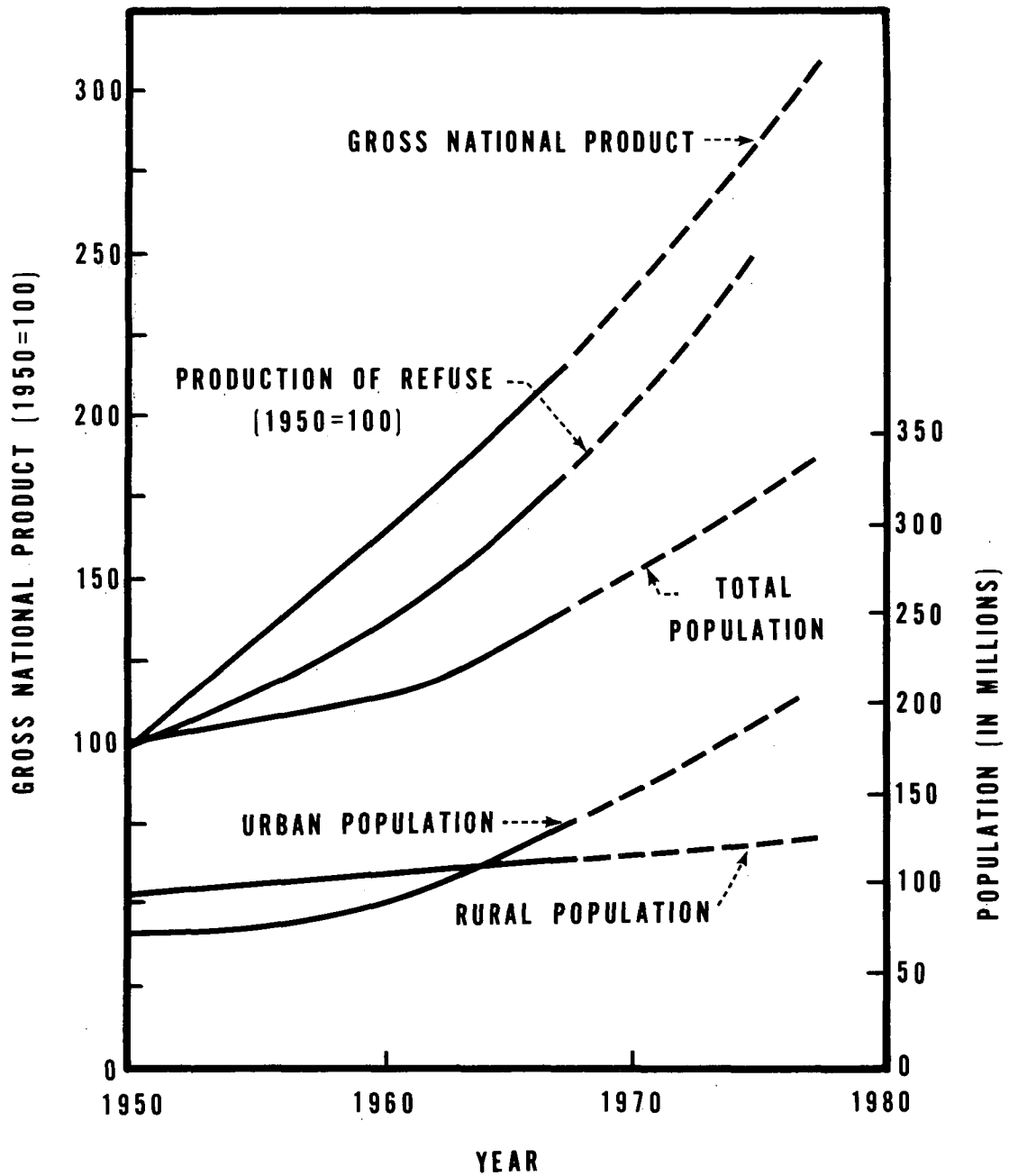
Typically, the management system for solid wastes in urban and rural communities in Latin America and the Caribbean countries is a directly administered municipal responsibility, not unlike the water supply and sewerage systems 10 or 20 years ago. Most municipalities have sufficient legal powers to regulate the process of collecting and disposing of the solid wastes within their political boundaries, but metropolitan and other urban conglomerates are only on the verge of establishing policies appropriate to the scope and responsibilities of a systematic technical and administrative approach demanded of them.

The concern of the health authorities about solid waste management was expressed when the XII Meeting of the Directing Council of PAHO, on 20 August 1960, urged the ministries to provide leadership in the field and stated that the Department of Engineering and Environmental Sciences of PAHO should provide assistance for refuse disposal comparable to that for water supply and sewage disposal. In response, several countries requested the Pan American Health Organization to assist in the evaluation of existing conditions and tutoring of staff. As a result, methods and practices for refuse disposal in several cities materially improved.

Although detailed and comprehensive information on solid waste disposal in Latin America is still not available, it is evident that solid

FIGURE 3

### PRODUCTION OF SOLID WASTES IN LATIN AMERICA



waste disposal practices have not been satisfactory, even in highly developed countries. In the United States of America, out of 6,000 disposal sites investigated, only about 300 were considered acceptable, and even these were not necessarily sanitary.

Studies of a few countries of the Region confirmed the opportunity for substantial improvement of disposal systems. Methods of procurement and maintenance of equipment needed strengthening no less than techniques and facilities. Operation and administration of the services were insufficiently recorded or reported. Although about 75 per cent of the population had daily collections, the final disposal of wastes was critical. In all 13 systems studied, the waste went to open dumps, although four cities, mainly the larger ones, incinerated a part of the refuse and two produced some composting. Sound management, administrative, and financial policies, engineering studies for planning an entire system, feasibility studies for financing, and efficient operation and maintenance techniques can materially improve solid waste disposal in most cities.

Funds for the operation of the services generally come from the coffers of the municipalities; as much as 40 per cent of the municipal income pays for waste disposal. The cost of a satisfactory service is not necessarily low. In the United States of America, on the average, the cost is about US\$22.50 per person per year. In the larger cities of Latin America and the Caribbean islands, the average cost is around US\$3.00 to US\$4.00, in some instances going as high as US\$14.00. The low figures reflect in part low salaries and less modern equipment, as well as low quantities of wastes produced.

All cities realize that this service is necessary and have already invested a substantial part of what is required for a satisfactory service, but cities are only beginning to appreciate how proper disposal practices add to the quality of living.

#### Solid Waste Disposal - Goals for the 1970's:

- To install new systems or improve present systems for disposal of solid wastes in the metropolitan areas and important cities of the Region, increase efficiency of present services, give due respect to the protection of the environment, minimize threats to public health, and reduce other offenses.

The goals proposed require:

- Provision of a legal and administrative framework for a national approach to the disposal of refuse in metropolitan areas and important cities.



- Institutional improvement or reorganization of the services to assure sound management, financing, operation, maintenance, policies, and practices.
- Preinvestment studies to qualify for internal and external financing of the improvement of the system.
- Application of modern technology for solid waste disposal and the expenditure of the funds necessary to eliminate major environmental offenses associated with improper and inefficient refuse disposal practices, particularly in large metropolitan areas.

### Occupational Health

The incidence of industrial injuries and occupational disease in the Latin American and Caribbean countries is from six to ten or more times the incidence in highly industrialized countries. In 1970, the labor force in Latin America was approximately 94 million. Of this number, about 44 per cent were employed in agricultural pursuits, nearly 20 per cent in industry, and 36 per cent in commerce and services. An investigation of workers in lead storage battery factories and another study of those employed in lead metallurgy showed, respectively, that 66.9 and 60.3 per cent of the exposed workers suffered from toxic concentration of the metals. Studies in two other plants found arsenic poisoning in 86.5 and 88.7 per cent of the workers exposed. A study of workers exposed to chromium found that 50 per cent suffered dermatitis and 10 per cent a serious ulcer of the septum which eventually was perforated. Of a sample of workers exposed to solvents, 11.4 per cent experienced occupational disabilities. Deaths of workers exposed to pesticides are rising in some countries to an ominous degree.

In addition to the hazards of toxic chemicals, workers are exposed to excessive heat, cold, pressure, noise, dim lighting, or glare. A generally poor working environment impairs industrial efficiency and productivity no less than the well-being of employees. The operation of the so-called "labor-saving" complicated machinery by unprepared workers in developing countries multiplies the risk and incidence of costly breakdowns and serious personal injuries.

Studies find that economic losses from industrial disabilities amount on an average to approximately 18 per cent of the national income of developing economies. In addition to these costs, there are expenses of providing cash bonuses, reduced working hours, extended vacations, and early retirement for workers exposed to well-established hazards at their jobs. Unfortunately, the cost to health, the cost to society, and the cost to the employer of neglect of occupational hazards is too seldom considered in economic development programs; otherwise, all governments would support strong programs for industrial health and safety.

At the beginning of the 1970 decade, there were 14 national programs in industrial hygiene in Latin America and the Caribbean countries. These were at various stages of development and effectiveness. Only four countries are considered to have reasonably sufficient services, three are fair, four have limited services, two have incipient programs, and in one country the occupational health program is carried out by a private industrial association on a part-time basis. Even in the countries that have reasonably sufficient programs, the needs of industry and the employers exceed the services available. Occupational health services will contribute optimally to the economic and social development of the Region as soon as enough employers and public officials recognize the great opportunities. Member Governments have asked PAHO to contribute to occupational health by collaborating in the establishment in 1961 of the Institute of Occupational Health and Air Pollution in Chile, by providing advisory services, and by assisting in the training of technical personnel through short courses, fellowships, and field studies.

The experience gathered in the 1960 decade by countries where programs are in progress gives confidence in future programs. The results obtained so far demonstrate the soundness of the approaches followed and provide examples of how to control industrial hazards. The success of the past predicts the future capability.

Occupational Health - Goals for the 1970's: A realistic goal to be accomplished in the 1970's would be:

- To establish or improve in each country a government-sponsored organization capable of carrying out efficient programs of evaluation, prevention, and control of hazards to health and safety in the working environment.
- In countries about to establish programs of occupational health, protection should be extended by 1975 to 25 per cent of the working population exposed to risks and, by 1980, to 50 per cent.
- In countries which have already established occupational health programs, protection should cover at least 40 per cent of those at risk by 1975 and 70 per cent by 1980.
- Economic development plans and funds for new projects should provide for control of environmental stresses which present a risk to the health of the community or which are likely to be a chronic nuisance. Some part of these funds should be allocated also to prepare staff to recognize and control occupational risks in the interest of economy and efficiency.

- In general, efforts to prepare technicians and professionals in occupational health services should be intensified to provide special knowledge to risks in specific industries.

To achieve the objectives, each nation may employ the following procedures:

- Define occupational health needs in the country on the basis of preliminary surveys of a representative sample of work places.
- With the knowledge of the size of the task, establish the necessary organization and program, including preparation of legislation, designation of responsible authority, allocation of resources, preparation of regulations, identification of priorities, and description of procedures.
- Initiate action to meet the objectives as defined in the program.

#### Food Protection

Although it is a primary concern of health authorities that food should be sufficient and nutritious for all people, the possibilities of contamination and spoilage also are of high importance to health protection. Not much attention is paid to incidents of acute illness related to toxins or pathogens in food. Still less is known about excessive spoilage and waste of food or about the chronic or long-term effects of hormones, antibiotics, and preservative chemicals used in foods prepared, stored, and distributed in mass for commercial markets.

Acute effects of food contamination in the Region typically are associated with dairy products, especially those touched by unclean hands and allowed to incubate at room temperature, but the potential of harm from commercially processed food can be appraised only with knowledge of the full cycle from production to consumption. Chemical hazards may be found in the original soil, in the method of fertilizing, cultivating, or harvesting. The ingredients added for flavor, color, or preservation may act in unsuspected modes. Enough has been learned about such hazards in the commercial foods in developed countries to justify watchful surveillance and regulation. In the absence of sufficient control systems, foods and medicines banned as dangerous in some countries may be sold freely in other countries.

Central American and Caribbean countries have established programs for instructing technicians in such surveillance, to serve either as food

inspectors for the government or as supervisors in commercial food processing plants. Some countries also have given legal force to food hygiene standards prepared with the assistance of PAHO. They are preparing to register and monitor the hygienic quality of all commercially processed food products. A major phase of hygienic surveillance includes laboratories to analyze foods for possible hazards and reference laboratories to assure the validity of the methods used and the findings.

The most effective safeguards against acute or chronic illness caused by commercial foods may be created by the industry itself for the purpose of protecting its markets and reputation no less than the public health. In that event, food merchants and manufacturers will strive for quality and safety in their products at the same time that they pursue economy, volume, or profit. They will consult competent professionals in every aspect of production and distribution and see that both their staff and line employees are competent to eliminate the risk of injury to the public and the associated cost of liability suits and civil or criminal sanctions. In the process of feeding a rapidly growing urban population, the food industry has developed many techniques of increasing yields, reducing waste, and assuring the effective storage and efficient distribution of its processed products: canned, frozen, dried, extracted, compressed, or pickled. Having demonstrated its technical capabilities in production and marketing, the industry can be expected to master the technology of food hygiene.

Food Protection - Goals for the 1970's: It would be realistic for Member Governments to consider these goals for the decade of the 1970's.

- To assess the significance to public health of the respective stages of food handling from source through processing, distribution, storage, preparation, and service, according to prevalence in the respective countries.
- To develop realistic health protection for each stage.
- To integrate projective measures into practical programs.
- To foster application of these programs by national, state, and local health agencies.

In pursuit of this goal, health officials may be expected to:

- Design, conduct, or support epidemiological studies of microbiological and chemical contaminants (including additives) in food, and the health significance of food handling operations.
- Translate epidemiological findings into practical preventive and monitoring measures.

- Train personnel at the professional and other levels in the techniques of preventing food-borne illnesses, including surveillance and monitoring.
- Devise special programs for alerting people to the hazards of foods and for protecting them, especially against the more serious food-borne illnesses such as hepatitis, the dysenteries, typhoid fever, and undulant fever.

### Housing and Area Planning

Housing is a highly complex subject and one that is surrounded with many misconceptions. Housing is actually a phase of a complex social and economic function, rather than an aggregate of individual shelters. Housing standards and requirements differ greatly between developed countries and developing countries; between temperate climates and tropical climates; between industrial economies and craft economies - with respect both to quantity and quality of housing.

In 1965, the United Nations predicted that Latin American countries would need to build 3,200,000 new houses every year to meet the needs of their growing population. Total construction in those countries is nearer 500,000 a year. The deficit in housing spirals at a rate of 2,700,000 annually. If the housing deficit were to be met by houses built at the lowest conceivable cost, US\$500 a unit, the demands for credit to build these houses would exceed US\$13 billion in 10 years. Actually, the average cost per unit, based on existing housing construction programs, is more likely to be at least four times that much.

Developed countries speak of rationalizing building methods to save 5 to 10 per cent of conventional building costs. In Latin America, the need is to build housing for only 5 to 10 per cent of the cost of conventional housing. Without such a solution, there can be no satisfactory supply of housing for the great mass of families in need of shelter. With these limitations, health considerations in the broadest sense become critical to housing programs. Increased attention needs to be given to the effect of the various factors, such as patterns of dwelling units, sources of water, waste disposal, and others.

Neither market methods of housing nor those adapted by official programs will, for the foreseeable future, satisfy the need for acceptable shelter. In one relatively affluent country, the national housing agency has not so far attempted to provide housing for families earning less than US\$1,400 a year. As a result, the majority of families have to find shelter as best they can.

In 1960, half of the population of Latin America received only 16 per cent of the total income. According to the Economic Commission for Latin America (ECLA), in the post-war period the average annual income per inhabitant was US\$120, and the median is below the average (E/CH.12/659/Add.1). Most of the Region's population, about 90 per cent, cannot therefore be expected to afford the cost of housing that satisfies modern standards.

The improvement of conditions in most dwellings can be achieved on a significant scale if emphasis shifts from construction to planned development programs based on the organization of community facilities, mutual help, self-help with public assistance, and the use of inexpensive building materials. A suitable plan, for example, would allot parcels of land with satisfactory access to transportation, electricity, and the basic sanitation services - water supply, sewers, and solid waste disposal.

Construction of the house would be up to the family, according to its own means and its own pace. But the availability of public services, which makes the crucial difference between disease-ridden slums and acceptable living conditions, will need strong support from authorities and the public.

As a side benefit, large-scale development of public services will generate employment in construction and related industries while it produces long-lasting social benefits for the entire population.

Institutions of learning and professional organizations can address themselves seriously to the need to develop expertise in urban affairs. Those who have done so already recognize that urban housing in many countries reflects social and economic adversity, both rural and urban. They see that urban survival is linked to the slowing of the flight from rural areas. The primitive living conditions in many rural areas of the Americas have contributed to migration to urban centers. Tolerance of this movement is associated with the notions that rural migration is inevitable, that it is a by-product of the mechanization of agriculture, that economic growth requires the migration of a rural labor force for urban industry, and that the growth of cities is essential to social and economic development. Many planners maintain that migration to cities is an irreversible process and that the only practical course is to guide it into positive channels.

Whether or not these assumptions are sound, they have led to false conclusions when applied indiscriminately and with indifferent timing to developing regions. They have distracted attention from the rural stagnation which motivates the exodus.

By slowing down migration and by diverting it to smaller urban centers, the pressure on the bigger cities can be alleviated.

A better regional distribution may help to reestablish the impaired urban-rural balance.

The Ministers of Health of the Americas, meetings at Buenos Aires in 1968, spoke of:

" . . . the awareness of the 100 million persons living in the rural environment who have remained outside the mainstreams of progress. They have been stigmatized as idle and irresponsible. Yet whenever they have been given incentives to carry out community projects they have shown themselves willing and able to cooperate and contribute to the welfare of others. Agriculture will long remain of major importance in the economy of the Americas, and it is therefore essential to accelerate the modernization of rural life, including the essential health services."

The necessity to modernize rural areas was also emphasized in the consecutive Charters of Punta del Este. Among other things, the increase of agricultural productivity was recognized as the basic structure accompanying regional development programs.

The foregoing analysis suggests three distinct areas of action which may produce the highest returns in social and health benefits:

- Metropolitan planning
- River basin development
- Rural development planning

Metropolitan planning covers urban as well as rural areas. Its emphasis is on urbanization, but within a regional approach which considers the surrounding area of influence and its rural population as a coherent whole.

In view of rapid growth, metropolitan planning has assigned priorities to urban interaction with water supply and water distribution; sewerage and sewerage disposal; drainage; transportation; garbage and refuse disposal; and air, land, and water pollution. Most of these are health-related public responsibilities.

An example of such integrated metropolitan planning is the program being developed by the Regional Corporation of the Savanna of Bogota and Valleys of Ubaté and Chiquinquirá (CAR). In this area of 6,100 square kilometers with three million people in 47 municipalities, the objectives are to conserve, manage, and coordinate the use of natural resources for which substantial investments are being made in electrification, roads,

erosion control, reforestation, and control of floods and water quality. PAHO provides advisory services initiated in the fields of:

- Sanitary engineering, particularly in studies on water pollution control as related to the principle uses in the region.
- Systems analysis, for developing the decision models for the management of the region's water resources.
- Physical planning, with a view toward the improvement of the region's human and physical infrastructure. Other aspects of planning include the zoning of industry, agriculture, residence, and recreation, in accordance with the optimum use and management of water resources.

River basin development is the planned development of a region defined by geographic criteria. By using geographical rather than political or administrative boundaries, it has been possible to plan for optimal use of natural resources in harmony with the environment.

Some of the environmental health aspects as related to river basin development can be exemplified through PAHO participation in the development study of the Guayas River Basin in Ecuador. With nearly 34,000 square kilometers, the biggest river basin on the Pacific coast of South America, it produces the major part of the country's export crops. Half of its population of two million is in Guayaquil (about 750,000) and smaller rural towns. The others live in small hamlets or isolated shacks.

In 1965 the Comisión de Estudios para el Desarrollo de la Cuenca del Río Guayas (CEDEGE) was established in order to prepare prefeasibility projects for the agricultural and socioeconomic development of the basin. Although the project was conceived as an integral and comprehensive development, it became patent that the economic benefits of mechanized farming would eventually create unemployment and associated social and health deficiencies. Another consequence would be accelerated migration to the nearest urban centers, and especially to Guayaquil, already marked by slum settlements.

The advisory services were expanded to include the whole range of environmental health and engineering, and plans for the first pilot irrigation project covering more than 11,000 hectares are being drawn. As a result, physical planning for the settlement of 1,100 family farms will be incorporated in the irrigation district.

Rural development planning and housing can be dealt with both in an isolated manner and in relation to other specific health-related aspects, such as water supply, nutrition, health services, or eradication of disease vectors. PAHO advisory services to agrarian reform, agricultural settlement, rural community development, housing, and community planning have as



a main focus the health and well-being of the individual and the community. Examples of PAHO collaboration in rural development planning include such programs as the Multinational Demonstration Pilot Project in Rural Housing and Community Facilities in Colombia, Ecuador, Trinidad, and Venezuela. This project is coordinated by an interinstitutional committee, with the participation of the OAS, UN, IADB, and AID. PAHO covers the areas of physical planning and environmental sanitation.

Another example is the FAO/UNDP preinvestment study of the Huallaga River Basin in Peru. Work is carried out in the fields of nutrition, sanitary engineering, regional and physical planning, and others. Specific projects for settlements were designed so as to create villages with family-size holdings in a concentrated pattern which would improve the efficiency and economy of village functions and services, including environmental services.

Housing and Area Planning - Goals for the 1970's: Quantitative goals for housing at present are not so realistic as qualitative changes and planning programs. It is hoped that the following goals will prove helpful in tying physical planning and other environmental sciences together. The entire Region may benefit from the example and experience of individual countries which elect:

- To pursue metropolitan or regional planning with regard to the health-related aspects of housing.
- To assist river basin development with regard for housing, agricultural settlement, and rural community development.
- To encourage planned rural development.
- To form institutions assigned to improve rural and metropolitan settlements by interdisciplinary planning and a multipurpose approach.
- To draw on environmental engineering expertise for systematic analysis of proposed development programs and for studies of health significance of types and patterns of dwelling units and neighborhoods.

#### Noise Pollution

Damaging noise, formerly an occupational hazard, now assaults the ears wherever there are motors or amplifiers. The effects of noise on sleep, hearing, and mental health are well documented: apart from loss of hearing, there are data that suggest that stressful noise may impair health

or at least diminish efficiency. One estimate is that entire city populations may be deafened in 30 years.

Noise control is, as a rule, a municipal responsibility. Municipal regulations, however, for technical or administrative reasons often are difficult to apply. A review and updating of these regulations and other legal dispositions and ordinances could be useful, especially as they relate to acoustical engineering.

Direct control of excessive noise at the source is in a first approach a satisfactory way to initiate action. The banning of horns and open mufflers in automobiles, the replacement or muffling of noisy machines, acoustical insulation of walls and floors, and individual protecting devices can reduce the disturbance. A comprehensive approach would seek a definition of the significant sources and effects of noise through research. By this means it will be possible to agree on appropriate standards and codes. Meanwhile, provisional guidelines and standards for control of noise can be set on the basis of current information, with actions tending to establish the basis for comprehensive programs.

Noise Control - Goals for the 1970's: Member Governments may wish to consider as a major goal:

- To develop criteria for the practical regulation of noise and initiation of control measures.

In preparation for meeting this goal, health agencies may:

- Assess the harmful effect of noise on human health and well-being with respect to both individual and community exposure.
- Evaluate noise sources in major urban areas and industrial complexes and the methods available to reduce noise.
- Elaborate guides and regulations, or revise existing ones, and apply them to programs to reduce noise or its effects on human health.

#### Other Stresses

Certain environmental stresses formerly limited to small foci today affect large populations. In the near future, according to present trends, certain stresses are expected to double or triple their effects.

The effect of extremely high levels of congestion, vibration, or tempo have been studied to some extent in occupational settings, but little has been done to assess these stresses either at less extreme intensities

or in domestic settings. As exposure to such stresses is growing, however, it is important to gain enough understanding of these effects so that criteria for their control may be established and applied.

Within the decade, a common aim could be to develop criteria for the practical regulation of such stresses as vibration, tempo, and congestion, based on their effects on health and well-being, along with experimental application of control procedures.

With such goals in mind, health officials may elect, in collaboration with other interested agencies, to study congestion, tempo, and similar characteristics of urban living, report their effects on physical and mental health, and identify preventive and corrective measures; to identify and examine prevalent sources and forms of vibrations affecting workers and the public and to set criteria for exposure; for other physical hazards, such as lasers, ultra-high-frequency waves, and ionizing radiations, to keep abreast of uses and of literature regarding hazards, so that protective measures may be instituted as necessary; to develop criteria for chemical exposures and their effects, singly and in combination, in occupational health, cancer, and chronic disease programs and to study and report combined effects of environmental chemical exposure and mass consumption of medication such as aspirin, tranquilizers, antihistamines, and alcohol; and to provide, via medical education programs, for basic instruction of physicians and allied personnel in the use of X-rays and radionuclides so that justifiable exposure to diagnostic and therapeutic radiation will be no more than necessary.

#### FUTURE ENVIRONMENTAL ASSISTANCE BY PAHO

In anticipation of prospective demands for environmental services, the Governing Bodies of the Pan American Health Organization are certain to review the support required to modify its structures and programs. The past and present structures and programs of the Organization are described in general terms under Part II of this Report. These have provided a solid foundation for the work which PAHO will be called upon to do in the future. The present Organization is flexible enough to adjust to future needs as it has done in the past.

Possible changes would permit emphasis on environmental functions in all general services of the Organization, in proportion to the demand. That is to say, the emphasis on environmental work in fellowships, research, advanced education, technical instruction, statistics, and others could reflect the desires of the Member Governments for assistance in this field. In addition to water supply, sewerage, refuse disposal, and shelter, PAHO's environmental activities concern nutrition, the zoonoses, food hygiene, control of vectors of disease, and sundry stresses.

The facilities and mechanisms of PAHO will permit the continuation of the ongoing activities, but due attention will have to be given to the emerging problems of the environment.

The collaboration of PAHO is at the disposal of the Governments for the preparation of the more detailed country programs and goals.

PART II

MAN-ENVIRONMENT RELATIONSHIPS: A CHALLENGE OF THE 1970's

This part, published originally as Agenda Item 25 (CSP18/10) of the XVIII Pan American Sanitary Conference, describes the background and philosophy which prompted the Conference, in Resolution XXXIV, to ask for specific program suggestions. The objectives suggested in this Part were the basis of goals and projections described in Part I.

## MAN-ENVIRONMENT RELATIONSHIPS: A CHALLENGE OF THE 1970's

PAHO/WHO - Program and PlansPreface

Rapid population growth and accelerating technological advances in urbanizing societies are creating unprecedented impacts on man's total environment. The speed, magnitude, and complexity of these forces intensify traditional problems and create a host of new stresses, many of which go beyond the indices and parameters commonly used to reflect the general state of public health. Thus the gap widens between the diagnosed and the undiagnosed health implications of environmental change. Considering the broadening dimensions and rapidity of such change, it would be prudent for health agencies, national and international, to reshape and sharpen analytical methodologies in order to update practices; to assess health impairments; and to measure, quantitatively, the effects on the physical and mental well-being of man. Health administrators should initiate effective monitoring of the environment to provide scientific understandings; to project trends to furnish the basis for appropriate corrective measures; and to guide emergency actions needed in environmental crises. For peripheral problems not within their jurisdiction, health ministries should encourage and assist actions by allied agencies.

Taking note of the increasingly complex and broadening implications of the changing environment and recognizing the difficult decisions which face ministries of health in making major program adjustments, the Director has the honor to present this background document for consideration by the Organization's Governing Bodies. The document provides insights on man-environment relationships; it discusses ongoing environmental programs in Latin America; and it sets forth realistically constructive courses of action for the 1970's.

Background

A complex orb of externals - forces, influences, and conditions, some hostile, some friendly - make up man's environment and contribute to his total life. Patterns of human diseases and infirmities reflect man's responses to his environment. Hippocrates recognized this linkage some 2,500 years ago when he emphasized the relationships between human health and "the airs...the waters...the seasons...the places." By the 19th century, scientific inquiry had clarified the etiology of the more prevalent communicable diseases and the behavioral patterns of pathogenic agents in human ecology.

Well documented are the health achievements of the 20th century - in reducing infant mortality, in suppressing childhood diseases, in controlling germ spawned afflictions of the adult, in devising industrial hygiene techniques, and, where feasible, in making efforts towards disease eradication. These achievements have made practical concentrations of peoples in urban complexes - practical at least with respect to microbiological contamination.

In man's interactions with his environment, his greatest ally has been the extraordinary resilience and adaptive capacity of the human organism, especially when time and isolation have controlled the equations of change. Today - in terms of interpersonal relationships - time telescopes, isolation becomes academic. The quarantine sign is a forgotten symbol in history texts.

Currently the variables of change are infinite. They cross time and space. In the dimension of time, decades are colliding. The tempo is so rapid that it is extremely difficult to grasp the full significance and to understand the impacts; to keep the delicate scales tilted in the favor of man - that he understand what he is doing, that he do better in understanding himself, that he retain his mental equilibrium and a balanced perspective, and that he be master, not victim, of his machines and of his technology. This is the hallmark of the current era - a dramatic break with the past. Technological industrialization now spirals upward under the impetus of a logarithmic expansion of knowledge.

A whole array of economic, social, political, and technological upheavals sweep the earth. Throughout history, various peoples have lived in states of development centuries apart. The difference now is that people everywhere are struggling for admission to the 20th century - for a piece of the action and for a share in the amenities. And this goal is within man's grasp, if he can but balance the human equations in a changing world.

Analysis of man-environment relationships must consider this historical setting, this background of paradoxes: an age of wealth and insecurity, of leisure and unrest, of competences and anxieties.

For the health administrator, the task of statesmanship is to recognize and anticipate the directions and extent of these emerging forces. He must evaluate their effects and devise programs, and the devices for administering such programs, that are in harmony with the needs of the people and with the trends of the times. The extent to which programs and services evolve in response to these forces and needs marks the difference between dynamic and static services.

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#### The PAHO/WHO Region

PAHO/WHO is the international health tool of 28 Member Governments in the American Continent. The Region embraces a wide variety of cultures and social patterns, as well as of economic and political structures. This youngest of

the world's civilizations presents an interesting contrast of the very old and the very new. The Region, with a combined population of about 500 million, has some areas which are economically advanced and others which are undeveloped. Both continents, paradoxically, include ultra modern urban centers - with sophisticated industrial complexes and systems of transport, energy use, and related facilities - and urban centers only partially covered by even such basic services as water supply and waste disposal. The Hemisphere contains rural areas well housed - with power, water, and related services - and rural areas almost as they existed a century ago. Population growth in South America is the fastest of any continent, about three per cent per year. Urban growth rates are much higher, almost six per cent per year.

PAHO/WHO programs focus primarily on Latin American and Caribbean countries. These countries have traditionally looked northward to observe health practices, structures, and administrative patterns. This is particularly true in environmental sanitation. Engineers and scientists - professionals, students, and scholars - have intermingled in the Hemisphere. More than a thousand sanitary engineers from Latin American countries have studied in universities and schools of technology in North America. Latin American practices in sanitary engineering have closely followed those of North America.

In the past decade, South Americans have begun to ask not only about progress in the north and the escalation in standards of living, but also about the nature and the price of such progress. Progress, they found, was measured almost exclusively by production and the use of goods and services, and the price was extreme and accelerating degradation of the environment.

At the same time, a north-to-south look is developing as the north observes the growing numbers of metropolitan industrial complexes in South America poised for technological take-off and wonders how the professionals there will meet their destiny in human ecology.

Latin America will find the answers not simply by observing ill advised actions of northern neighbors and passing laws to avoid them. South America, like North America, is wedded to the concept of an urbanized, technologically oriented society. Already the major urbanized/industrialized areas of Latin America are showing the same signs of environmental deterioration so prevalent in North America. In both regions the reason is the same: the skills and resources used to develop and support technological progress have not been utilized to develop and support mechanisms to control the wastes technology produces. The tragedy of the north must now be faced in the south.

The look from the north and the look from the south may soon begin to merge in hemispheric unison in recognition of the fact that many environmental problems are intercontinental, even global. A closer professional union should emerge in the 1970's to develop the understanding and the monitoring systems to obtain data so desperately needed in this Hemisphere - data which will, in time, be needed in global monitoring structures.

### Environmental Health in Transition

During the early decades of this century, health agency resources were heavily committed to the task of strengthening barriers against the spread of communicable and infectious diseases. Basic sanitation services are essential to such a mission. For the Americas, sanitation has become a way of life, and the accomplishments are clearly reflected in the health histories of North and South America.

Environmental sanitation covers the health related problems of the physical environment. Clean air, adequate potable water, safe disposal of human waste, uncontaminated food, and suitable shelter - including protection against the elements and against insect vectors - are basic to health and well-being. Concern about widespread air, water, and land pollution (particularly from chemical pollutants) has emerged with economic progress. As technology spreads across all lands, it leaves in its wake a new array of environmental problems to challenge the capacity of the health disciplines, the environmental engineer and scientist in particular. A major difficulty is that epidemiological intelligence, especially with respect to non-living contaminants, has not kept pace with the times.

History rarely sets off specific eras by convenient dates. What has gone on before affects the present. The past is prologue. However, the phenomenal transformations in the environment of man date from about mid-20th century. In the 1940's, man successfully split the atom and controlled the results. He began manipulating the molecule. These developments and the expanding potentials did for technology what, a generation earlier, the assembly line had done for the logistics of industrial production. They provided unparalleled impetus and new dimensions to evolving technology, and changed the world.

As the tempo of change accelerated, the physician remained largely pre-occupied with the biological environment; the engineer, with the physical and chemical; and the sociologist, with the social, the least understood of all. As technological advancements shrink the world, there is need to deal with the environment in its totality, as the complex ecosystem of man. However, a practical system for doing this is yet to be devised.

These fantastic changes in the total environment of man have been paralleled by significant changes in the established traditional functions of public health agencies. This transition, too, results from new forces and new demands that emerge with the changing patterns of societies. The organization, distribution, and delivery of medical care facilities and services are high priority concerns. The structural and administrative blending of preventive and curative medicine is a global trend with overall governmental responsibilities assigned to the health sector. In the resultant competition for limited health resources, pressures always favor medical care over preventive measures. This is particularly true with respect to environmental problems. A practical reason is the complex logistics and huge cost of providing sanitary services. Moreover, the responsibility for the design, construction, and management of such facilities requires a public works type of governmental structure.



The accelerating nature of environmental change requires flexibility in approach and practice in order to deal with today's problems with greater effectiveness and, at the same time, to meet the evolving needs of tomorrow. In a true sense, the problem requires maximum forward momentum, with minimal inertia, in order to make continuing adjustments. This can be accomplished only through vigorous, aggressive, and competent national institutions. Additionally, this approach gives strength to essential communications and to collaboration, nationally and internationally.

#### Influences Affecting Environmental Change - PAHO/WHO

There are clear indications that the 1970's will see widespread recognition, understanding, and intensified efforts with respect to man's changing environment and its interregional and intercontinental significance. In the 1960's, a number of environmental determinants, already highly significant in North America, were becoming increasingly so in Latin America. Examples:

1. The rural-urban accelerates, stimulating the growth of gigantic metropolitan complexes. Within these complexes, some of the most urgent problems relating to mental health and to protection against communicable diseases will arise. This is the environment within which problems of providing adequate water supply and sewer services and solid waste management will intensify, and the increasing impacts of toxic contaminants will be felt. Of importance will be health related considerations of slums, poverty, and filth; of ignorance, drugs, delinquency, and crime; and of the effects these have on the total well-being of people.

2. Economic growth amid rapid advances in technology leads to such rapid development of industrial processes and products that their composite effects on health and on the deterioration of the environment are not adequately evaluated. The production and use of chemicals broaden the health problem. Other stresses include tensions, noise, congestion, accidents, and poisoning.

3. The expanding use of ionizing radiation introduces to the air, water, and land resources a pollutant with new terms and new dimensions. The effects of radiation are irreversible; there is little or no accommodation in the human organism. Cells escaping damage in one radiation assault are left with no immunity or tolerance against future exposures. There is an awesomeness about radioactive contamination. It is not detectable by the physical senses, and, to most, it is associated with great destructive forces.

4. New populations - with growing needs, loftier aspirations, and higher standards of national demand - tax hemispheric resources for consumer goods and services. As a conglomerate effect of urban growth and expanded industrial production, problems of air, water, and land pollution become more urgent - as does the problem of noise pollution. That the health threat created by these forces will become increasingly more acute is clearly predictable. Health concern about environmental pollution, formerly centering

largely around microbiological contaminants, now broadens to include pollutants which have their origins in microchemical substances. This raises questions of toxicity: Which of such pollutants are toxic to humans? At what levels? How toxic? How important are additive effects, combinations, and synergisms? These questions are pertinent and timely. Compared to pathogens, microchemical contaminants are more subtle, with the cause-and-effect sequence more widely separated.

5. The competitive nature of industrial enterprise promotes exploitation - human, natural, and environmental. The expanding types and the character of industrial production place heavy demands on industrial hygiene and industrial health practices. Industry must use natural and environmental resources conservatively. It must develop recycling and salvage techniques. The superb technological competence that is producing such fantastic progress in goods and services can, if applied with intelligence, keep detrimental effects within safe limits.

6. The pace of living continues to accelerate in a mechanized society. Mechanization, combined with speed and automation, is a significant source of tensions, of monotony, and of accidents in travel, in business, and in the home. At the same time, in the industrial world, the steady rise and output per man-hour produces an increase in leisure time; in the growth of sedentary occupations; and in a decline of physical activities. Such long range trends have significant implications for physical and mental health and for the general well-being of peoples.

Taken together, these and related influences constitute, in fact, a description of the manner in which man's changing environment is affecting his physical and mental well-being. These influences are pervasive and important. Their full significance is more clearly reflected when viewed as a whole, in terms of the full implications of tense, highly productive, competitive, socially unstable, and technologically oriented economies such as are emerging in the Americas.

Considered together, these influences constitute an homogeneous and powerful conceptual center around which a major health program can and should be oriented, a program geared to problems created by the rapidity of change and the resultant effects on the welfare of all peoples in the American Hemisphere.

In the early 1960's, the Director, taking note of these transitional developments and unprecedented changes, began an orderly adjustment in the use of the Organization's environmental health resources, to provide better support to Member Governments. For traditional problems, greater responsibilities were assigned to field staff at zone and country levels to expedite actions on the growing number of requests for technical assistance. For the

more sophisticated problems, the Pan American Center for Sanitary Engineering and Environmental Sciences was established in Lima, Peru. The Organization expects to meet with greater dispatch requests for consultation on the more complex aspects of environmental health, as well as fulfilling commitments on the more traditional problems. The Alliance for Progress and its Charter of Punta del Este added inspiration and gave impetus to a major effort for improving basic sanitation services for all peoples in the Americas.

#### Environmental Activities, PAHO/WHO - Ongoing Programs

By the mid-1960's, the Organization formulated its environmental program strategy. There were two major objectives: (a) to update traditional sanitation services, facilities, and practices, with special attention to sanitation needs in rural areas; and (b) to devise structures and to strengthen national institutions to cope with new environmental stresses and evolving problems. In 1961, the Organization applied about 95 per cent of its manpower resources and facilities to traditional problems and about 5 per cent to emerging problems. By the end of the decade, this ratio had shifted to about 80 per cent for traditional updating and 20 per cent for new problem areas.

The Governing Bodies have fully supported this shift in emphasis in the planning and use of PAHO/WHO resources. Most countries now have the institutional structures and competencies to carry out national programs of basic sanitation. In fact, the only reason the Organization still applies a large percentage of its resources to this problem area is to meet requests of Governments for assistance on problems of administration and management; on mass approach techniques; and for assistance with training, systems operation, and finance. In rural areas, special attention is being given to community organization, to self help techniques, and to revolving fund mechanisms.

The Zone Offices constitute the key operations point for the environmental programs. The zone engineer and his staff are thoroughly familiar with problems in the countries of the zone and are able to provide prompt and effective support to the Country Representatives and the country engineers. In instances where requests from Member Governments involve a highly specialized problem beyond the capabilities of the country engineer or the Zone staff, back up support is available from the sanitary engineering center or from the Washington Office.

The following, in outline form, are examples of ongoing environmental programs in Latin America:

1. Community water supplies: The continental program of community water supply was selected as the spearhead activity for the 1960's. The rationale for this emphasis was a great public demand for improved domestic water services and the significance of potable water as a basic health necessity. In

the Alliance for Progress Decade, the signatory governments, by the Charter of Punta del Este, pledged themselves to specific and ambitious goals, including the provision, within the decade (1961-1971), of potable water and safe sewage disposal for 70 per cent of the urban and 50 per cent of the rural populations. This set the targets and stimulated imaginations.

The continental water supply program was based on the simple rationale that fresh water - to satisfy human needs - is nature's most precious substance. Community systems of water supply and sewerage are basic essentials to the health and the economic and social well-being of peoples. Reasonable amounts of safe water available in homes, together with sanitary waste disposal, will reduce enteric infections and related illnesses; will promote cleanliness of the people, of the home, and of the community; and will engender self-respect and enhance the dignity of man.

The community water supply program has been supported with great effectiveness by the several international lending agencies and by the bilateral aid programs of the United States of America and Canada. The establishment and implementation of the Inter-American Development Bank (IADB) and its loan supports have been a major factor in the fantastic success of the Latin American water supply program. The first loan approved by the IADB was for the construction of water supply facilities.

Since 1961 Member Governments in Latin America and the Caribbean countries have committed about US\$1.7 billion for water supply improvements. These improvements benefit 70 million urban and rural peoples. While the success of this program has been more spectacular in urban areas, the program in small towns and villages continues to gain substantial momentum throughout Latin America.

The continental water activity involves much more than the mere installation of pipes and valves and pumps. Such public works, engineered to local conditions, involve high capital investments for cities and to a lesser extent for smaller communities. These works require complex systems of maintenance, of operation, and of management. Fully aware of these requirements, the Governments of Latin America have called on PAHO/WHO to assist in technical and economic aspects; to aid in strengthening institutional and administrative capabilities; and to collaborate on education, training, and research programs. The services that have been provided include the planning and developing of sound projects; counsel in the preparation of successful applications for international financing; and the broader use of teams of experts assigned to assist in setting up realistic rate structures, advising on administrative and management problems, and implementing mass approach techniques.

2. Sewerage services. In the last half decade, provision of sewerage services gained momentum. In 1968, for example, more than eight million additional people were served by sanitary sewers. As the community water supply program moved ahead, the need for municipal sewer services became more urgent. As water supply systems were completed, professional attention and financing

became available to design and construct sewerage systems. The efficient organizational structures developed for water supply improvements enabled the sewerage program to move ahead more rapidly.

3. Administrative management program assistance. In the early years of the Alliance Decade it became apparent that special attention was needed to improve organizational structures and administrative procedures so important in the management of water supply and sewerage systems. To meet this need, the Organization developed a specialized technique for using teams of highly trained specialists to analyze needs and to mold structures and practices to meet these needs. These consultant teams work from two to six weeks in a country with their national or municipal counterparts. Their work covers all aspects of administration and management practice pertaining to the operation of water supply and sewerage works.

The administrative management program has received strong support throughout Latin America. While the normal programs undertaken by the Organization include administrative management assistance in all countries, the specialized team approach has been used in 14 water institutions in Latin America. The Organization's experience has been set forth in operating manuals for wider application and use.

The cost of the administrative management programs obviously far exceeds the resources and facilities of PAHO/WHO. Accordingly, the recipient Governments reimburse the Organization for consultant team costs and for related expenses. Such reimbursements have already exceeded \$2 million since the program's inception in 1963. Member Governments' willingness to use their own financial resources for this technical assistance is indicative of the program's success. This activity has received strong support from the international lending agencies, including IADB.

4. The Pan American Center for Sanitary Engineering and Environmental Sciences. The concept of this Center, which became operational in 1969, is to render expert technical and scientific assistance to Member Governments, with emphasis on the more complex environmental problems arising from technological developments and from urban and industrial growth. The Center serves as an international reference and information source. The preparation and distribution of technical information materials are important functions which serve to extend and multiply the Center's technical assistance services. In addition to these activities, it is anticipated that the Center will, in time, play a key role in the support of training and research activities.

The professional staff now at the Center covers the fields of air pollution, water supply, water pollution, housing, urbanization, physical planning, industrial hygiene, and rural community development. During its first year of operation, advisory services in the fields of specialization covered by the Center were rendered to 14 Member Governments. Among the fields in which the Center has been particularly active are:

a. Air pollution. In the decade of the 60's there was clear evidence that air pollution was increasing in metropolitan areas. PAHO initiated its air pollution control activities as part of its assistance to the Institute of Occupational Health and Air Pollution Research in Chile. The new center is coordinating development of the Pan American Air Pollution Surveillance Network. At present, 22 stations are operating in Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay, and Venezuela. By 1972 the network will have about 100 stations in operation. The first annual report of network data was published in 1968.

b. Industrial hygiene. The Center carries out a number of activities in industrial hygiene. Special assistance has been given to new programs in Argentina, Cuba, Ecuador, and Panama. Technical support has been given to nine other countries. The Organization has served as the executing agency for the United Nations Development Program assistance to the Institute of Occupational Health and Air Pollution Research in Chile.

c. Housing and physical planning. As directed by its Governing Bodies, the Organization has provided support and assistance in improving housing conditions, especially for low income groups in urban and rural areas. In addition to the zone and country staffs, a regional adviser in housing has been available for specialized problems. Expanding populations and rural-urban migrations have combined to make housing a serious problem and a high priority need throughout Latin America. It is most encouraging that building and loan associations are being established in many countries of Latin America and are contributing significantly to the private financing of housing units. However, this source of help does little for the very poor. Hence, governmental subsidies and assistance are of vital importance.

PAHO's housing program emphasizes adequate site drainage and the provision of potable water and waste disposal. The Organization is working with national and international agencies on mass approach techniques that will provide adequate housing within economic realities. The program also covers a wide range of related problems such as orderly urban development, community facilities, and physical planning. Special attention is being given to community organization and the self help concept as a means of improving substandard housing.

5. Water resource developments and water pollution control. Joint river basin planning and development have become more important as competition increases for the use of water resources. Countries in the Rio de La Plata Basin, fully aware of the changing character of environmental problems, have established an intercountry commission for a comprehensive approach to basin problems. PAHO/WHO is contributing consultants for this task and is sponsoring seminars and training courses for professional and technical personnel.

The Santa Lucia, a sub-basin of the Rio de La Plata, has been the subject of a special joint study by the Organization of American States, PAHO, and the Government of Uruguay. This study was designed to meet a dual purpose: it will provide a specific plan for the maximum use of the basin's water resources, and, secondly, it will serve as a model. Member Governments have requested similar types of assistance from the Organization in other river basins such as the Guayas in Ecuador, Lerma in Mexico, Bogota in Colombia; Huallaga in Peru, and two major drainage areas in Brazil affecting Rio de Janeiro and São Paulo.

The upward surge in economic development in the Region is significantly altering water and land uses and values. Water resource development and water pollution control are becoming major problem areas. Water quality management grows in complexity with economic development. The following factors are examples:

- a. Water pollution is a by-product of economic development, an unenviable symbol of technological advancement. Effluents from municipal and industrial sewers, surface run-offs from streets, and drainage from construction and agricultural areas all combine to disrupt biological balances and to deteriorate waters.
- b. The concept of minimum treatment and maximum assimilation is outmoded in North America and will become so in Latin America. This concept must give way to a changing scale of water and land values as development proceeds and affluence increases. Traditional parameters and indices must be modified to include proper emphasis on thermal pollution, on effluent nutrients, and on chemical contaminants.
- c. Water quality control should be an integral part of comprehensive river basin development, with costs and benefits appropriately quantitated and documented.
- d. In most developed areas, public opinion and demand for pollution abatement is ahead of professional actions and plans. This does not imply that the public clearly understands the cost-versus-benefit factors; it does, however, imply that public aspirations are on the ascent. Needed are full national appraisals, by watersheds, of the range of pollution control potentials, with a corresponding price tag attached to each indicated stage of protection. With these data, and with public understanding of costs and values, it might indeed become more apparent where public aspirations and public policy should meet.
- e. In densely populated, highly industrialized complexes, traditional waste treatment technology is reaching the point of inadequacy. An appropriate question: Is our research effort sufficient in magnitude

and properly focused to correct this deficiency? Water pollution control will require increasingly larger amounts of the public works investment. These huge expenditures should be based on sound research, on updated monitoring methods, on effective treatment practices, on good operation, and on water quality needs and costs. For most countries, this is an economic necessity.

f. The relationship of water pollution to public health is changing in concept. Traditional concern has, in the past, centered on the biological aspect. Standards were viewed to be essentially the same for both fresh and marine waters. Epidemiological evidence is now providing the basis for differentiating between the health hazards in fresh and marine waters. Biological water quality standards for drinking, swimming, and food production have been similar and stringent. Chemical standards have been related principally to inorganic chemicals. Conventional water treatment practices are not designed to remove such pollution. This adds emphasis to the question of toxicity.

g. Water pollution control in Latin America is meeting stiff competition. Resources are critically needed to stimulate economic expansion. Industrialization is essential to meet unemployment in cities, to produce export capital, and to meet internal consumer demands. In this urban milieu, water systems and sewer systems can meet the competition. Pollution control works generally do not. Usually, only the measures necessary to prevent gross danger to health, or serious interference with economic progress are taken. In short, there seems to be no simple equation or policy which can be applied uniformly for water quality management in developing countries.

6. Solid wastes. The collection and disposal of solid wastes is a major economic problem for all metropolitan areas. The cities of Latin America spend up to 40 per cent of the municipal budget for this service. The PAHO/WHO program of assistance began in the 1960's. During the decade, requests for technical assistance exceeded resources. Preliminary studies and evaluations have been made of existing conditions, and short courses and seminars on the subject are being held in universities in a number of countries. Technical assistance has been given to more than 30 cities in Argentina, Barbados, Bermuda, Brazil, Chile, Curaçao, Dominican Republic, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Venezuela, and a number of border cities with the United States of America. Eight short courses or seminars have been held on subjects related to solid wastes management in Argentina, Brazil, Chile, Mexico, Panama, Peru, and Venezuela. Most of the Organization's effort has been directed to providing assistance for improving managerial and operational methods and procedures.

7. Insect vectors. Health related problems involving insect vectors are obviously important in many areas of Latin America. A specialized program for malaria eradication is being carried out by PAHO/WHO in close collaboration with the global malaria eradication effort. Chagas' disease is widespread,



requiring specialized control efforts. The staff working on rural and urban housing assist with this problem. Bilharsiasis is also widespread and is becoming more significant with the development of river basins and the expansion of irrigation systems. Aedes aegypti control is also a specialized activity under a Region-wide program of eradication.

8. Education, training, and research. In the early years of the 1960's, it became apparent that the massive continental programs of water supply and sewerage and the broadening nature of environmental controls would require trained manpower in numbers and types far in excess of what would normally be mobilized, and would require service laboratories and related facilities not then in existence.

Responding to this need, PAHO/WHO initiated aggressive actions on two broad fronts: strengthening schools of engineering (especially in sanitary-engineering curricula) and establishment of a continental network for professional and technical training. Both actions involve close collaboration with and between universities, and both have been quite successful.

The program for undergraduate education integrates sanitary engineering curricula into schools of civil engineering. This practice is now being followed at 28 universities throughout Latin America. Nine universities now offer graduate programs in sanitary engineering. An interesting by-product has been the growth in full-time faculty at schools of engineering, from less than ten in 1962 to about 50 at the present time.

Three projects (Brazil, Chile, and Venezuela), funded by the United Nations Development Program, are pioneering major advances on the education and research front. Six additional projects of this type are in various stages of processing.

Concurrently with these developments, a coordinated system has evolved for continuing professional education. This system also provides technical training for sub-professional personnel. The favorable response to this program is indicated by its growth and expansion. In the first year (1963), four refresher courses were conducted at two universities, financed largely by PAHO. There are presently 37 universities in 22 countries in this network; they are conducting 60 to 70 training activities benefiting some 2,000 professional and subprofessional personnel annually.

These brief references to program operations and to education and training are cited to illustrate the range and magnitude of the tasks in Latin America and in the Caribbean Area, and the efforts being made to maintain order and balance within the overall mission.

With respect to research needs, the gaps in intelligence relate to the technical, social, and economic factors in massive programs of water and

sewerage and other environmental measures. Response from governments and institutions to the education and training effort has created an atmosphere of optimism as to what might now be stimulated and accomplished in the field of mission oriented research.

Thus far the research effort has concentrated on the application of basic principles to the problems and conditions in Latin America. For the immediate future it seems impractical to expend much energy on fundamental inquiry, since the per capita drain on modest resources for the improvement of living standards and the well-being of peoples is so great. These programs - together with those for water pollution and air pollution control, for river basin development, for housing, solid waste disposal, industrial hygiene, and related environmental needs - will require complex engineering works involving huge expenditures (about \$3 billion over the next decade). We believe that the influence and the modest resources available to PAHO/WHO might better serve the peoples if they are used to further the programs rather than being submerged in basin research.

There are reasons for being optimistic about the research potential in Latin America. The continental training network has stimulated an extremely close liaison between the ministries responsible for health and public works and the university systems. In many instances, these ministries are supporting service and teaching laboratories which function under the jurisdiction of the universities. In other instances, they are supporting full-time faculty members and providing student fellowships. Three ingredients - full-time faculties, laboratories, and students - operating in newly formed frameworks of graduate education, not only make research possible, but provide the driving force for it.

The next logical step, it would seem, is to demonstrate the capacity of the university structure for sound investigative work. To assist in this, PAHO is now providing modest support for research training and for 20 research projects embracing a wide range of environmental engineering problems.

It is likely that the day is not too distant when many universities will serve as an applied research arm for governmental agencies responsible for providing, operating, and maintaining environmental facilities and services. In instances where universities respond with quality work, they will undoubtedly attract broader internal sources of support, just as they have already done with the training and education networks.

At Lima, Peru, the new Center for Engineering and Environmental Sciences constitutes the third extremely important cog in the PAHO machinery for training, education, and research. In addition to its other functions, the Center's mission includes a major role in the development of the research potentials of the universities. It will continue to assist Member Countries in establishing and developing quality research and teaching centers.

For the next few years, PAHO/WHO plans to gear its actions to support practical research; to clarify design criteria; to devise approaches and practices within the bounds of the administrative capacities and the economic realities governments must face; to strengthen central intelligence on emerging problems in this technological age; and to provide clearer perspectives of the physical, mental, and social impacts being created by the rapidity of change. If this can be accomplished effectively, a much needed service will have been rendered the peoples of the Americas.

Foci of basic research will emerge in Latin America. This is inevitable - and it is proper. The extent to which such foci emerge will of course depend upon the dedication, competence, and capacity of individual investigators. Such individuals should not be discouraged, rather to the contrary. In fact, the association of biologists, chemists, physicists, and other scientists with engineers in the solving of practical problems in our environment will stimulate their imaginations to conceive the basic questions to which they and their colleagues will be seeking answers.

The same fundamental principle followed in the network for education and training is now being applied in research to stimulate rather than to underwrite the development of indigenous, self reliant institutions. Thus concepts, approaches, and motivations take precedence over international dollar supports.

An overview of trends shows that health related problems of the environment are still being viewed largely in terms of morbidity and mortality rather than in the context of their broader health, social, and economic significance. To the extent that this is true, the cardinal principle now followed seems not only realistic, but imperative.

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The foregoing comments - particularly those concerning "education, training, and research" - are set forth because they discuss the "heart" of the PAHO/WHO ongoing environmental programs. Although the comments reflect, for the most part, the experiences, trends, and conditions in the PAHO/WHO Member Countries, it would seem that there are common denominators among all regions of the world. PAHO/WHO's mission is to stimulate, support, and assist Member Governments with programs which will improve the health and well-being of their peoples. We must constantly remind ourselves that the WHO definition of health is quite broad, extending as it does beyond the mere control of communicable diseases and preventable infirmities. Authority and responsibility for programs rest exclusively within the national governmental structures. Thus it would seem imperative that PAHO/WHO resources be used primarily for the development of sound organizational structures; improvement of administrative practices; strengthening of national institutions, especially those responsible for education, training, and research; and development of appropriate systems of international liaison and informational exchanges. The keystone is technical assistance, provided on request.

### Some Observations Relating to PAHO/WHO Activities

The magnitude and complexity of environmental change will most likely continue to be more pronounced in North America than in Latin America. For the predictable future, the time factor favors Latin America, since the rate of change is at a slower pace. Obviously, this is a continental generalization. In some areas in Latin America, environmental degradation is about as severe as in North America. There is merit in the general observation that overall levels of environmental pollution follow the trends of economic development. As affluence increases, so does air, water, and land pollution, since the potential for per capita pollution follows the standard of living.

There is increasing concern about the changing patterns and character of environmental influences and the resultant impacts on the general health and well-being of peoples. The task of statesmanship will be to set forth clearly and emphatically the positive and negative influences of environmental determinants and to provide aggressive leadership in attaining an optimum environment.

1. Parameters of environmental stresses. Modern environmental stresses now require new parameters to assess total effects. The status and progress of public health have long been expressed in terms of such traditional parameters as life expectancy, infant mortality, and the statistics of mortality and morbidity as they relate to communicable diseases. These parameters and related indices do not measure the health related effects of environmental impacts, with the exception of such broad generalities as water supply, waste disposal, food sanitation, and general cleanliness. In urbanized, highly mechanized societies the impacts on people of many environmental stresses are subtle, with a wide separation of cause and effect.

For environmental factors relating to disease transmission and certain toxic effects (principally inorganic toxicants), there are well established indices.

2. Pollution potentials. Considering the speed of change and the character and magnitude of environmental pollutants, there is a real need to develop methods which will predict pollution potentials, based on projected growths.

Pending development of realistic methods of measuring environmental hazards, general indicators will have to be used. Pollution of the environment and resultant deterioration involve all of man's activities and the wastes resulting from these activities. Parameters for predicting pollution potentials must take into account such factors as the affluence of the area. In other words, a simple index might be expressed as some exponential of the product: population multiplied by the standard of living expressed perhaps as per capita energy consumption. For a major area, such a product is a crude expression of industrial and personal pollution potential.

By way of example: If the population of a given country is expected to double in 25 years, and if the projected standard of living is expected to increase by four, then the potential for environmental pollution will rise by at least 800 per cent. This, in turn, means that an overall corrective or remedial action, reducing the pollution impact by 90 per cent, would be required just to stay even. As we ponder such realities, we must keep in mind that we are dealing with a pollution removal base which is becoming increasingly difficult to achieve - in terms of efficiency and economy - since these figures represent all-encompassing pollution contributions, not just those which are discharged through sewers, smokestacks, and vehicular tail pipes. Another point: Since PAHO/WHO interest is hemispheric (largely Latin American), advanced technology for developing countries will increase by as much as several orders of magnitude, so that an additional multiplication factor will need to be applied.

The purpose of inserting this concept is that, in the future, environmental degradation must be approached on a systems analysis basis; it must take into account the fantastic rates of change; and it must consider the environment in its totality. Furthermore, problems such as noise pollution, tensions, congestion, and the like will increase in approximately these same ratios.

Organizational structures and administrative policies are also important in considering environmental factors. Health agencies are most likely to be effective in achieving their aims when they are adroit and flexible in adjusting their working relationships and when their actions are relevant to economic and political realities.

3. Channels of communication. It is obviously important to follow established channels through which international agencies operate. PAHO/WHO's channel for responding to Member Governments' requests for assistance is the ministry of health concerned. In most countries, however, programs to regulate or control environmental hazards are under the purview of ministries other than health. Over the past decade, PAHO/WHO established, via its zone and country staff structures, effective working relationships with a series of agencies, boards, and ministries having regulatory responsibilities over developments affecting the physical environment.

Throughout the Americas, health ministries have been most adept in using the PAHO/WHO mechanism. The strength of PAHO/WHO's environmental programs has been its ability to use all appropriate channels of operation to move forward with its mission.

Man now has within his grasp some of the technological potential not only to mold his environment to human needs, but to mold nature itself. Thus far this potential has been sparsely applied to conservation of environmental resources - or even to avoid excessive degradation. Advancing science and technological capacities are being applied primarily to pioneer new frontiers; to change matter; to broaden and speed up transport and communications services; and to expand global production and distribution of goods and services.

Man's restless preoccupation with the emergence of new technologies and his insatiable thrust to probe, discover, and exploit new natural resources have now far exceeded the applications to protect and conserve his irreplaceable environmental resources.

4. Environmental coverage by the health sector. Sharp debate continues among health professionals on a proper and realistic course of action for organized health structures to take on the changing problems of the human environment. First, it must be remembered that there is no single environmental problem; rather, there is a multiplicity of questions, some of which are localized or national in scope; some are international, even global. There is a growing awareness that environmental change must be considered in the totality of the world's ecological system.

Over and beyond geological considerations, the health professional must keep in proper perspective the biological, physical, chemical, and social components of man's environment, and their respective roles in the ecosystem shared by man and other living organisms. For the most part, health agencies have grappled with peripheral issues, principally the biological components of the environment, avoiding confrontations with core problems. To broaden the influence of health professionals, the health administrator, within the area of jurisdiction, must first assess the true nature and magnitude of environmental change, both for the present and the future. He must equate these findings in terms of effects on the health and well-being of peoples and other urgent health needs. While he must define well-being as more than the mere absence of disease, he must nevertheless avoid devising programs in hasty response to the hysteria of unwarranted and unrealistic pressures. This is not a simple task to accomplish.

5. Stress induced diseases. About mid-century and earlier, before the rapid advances in immunization and drug therapy, man threatened the community by spreading infectious diseases such as tuberculosis, venereal diseases, and so forth. Today, with the advances in vaccines and drugs, man does not threaten the community. Instead, the community threatens man by air pollution, noise, poor housing, radiation, et cetera. Thus the cycle of disease transmission has been reversed.

During the 1970's the patterns of diseases, now rapidly changing from infectious to stress induced phenomena, will reflect our changing environment. The stress induced diseases - some due to the pressures and hysteria of the present time, others produced by an increasingly complex chemical environment - are going to take a relatively larger toll. At a time when a synthetic environment defying assessment in terms of its biological significance is being created, a generation is coming into being whose total life span will have been spent in technologically created surroundings. The little evidence available, largely through classical approaches, indicates that this is not all good. There is a need to enlarge the role being played by the life scientists who are now probing the secrets of the cell; who are mapping the genetic structures of chromosomes;

and who are advancing understanding of the cell's chemistry and biology. Recent studies have shown how the in vivo addition of a chemical may alter the sequence of nucleotides in the DNA molecule. These scientists will soon begin to manipulate genetic material, guided, we hope, by social needs. Such skills, applied to the questions raised by chemical and physical technology, should provide highly sensitive and powerful tools with which to measure the near and long-term biological impacts of the changes we are now undergoing and will be facing in greater measure in the future. It is a foregone conclusion that such types of guidelines are urgently needed.

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The ongoing programs of PAHO/WHO - quite broad, with rather extensive coverage - are moving in reasonable order. Actions taken by the Organization's Governing Bodies have strengthened and supported approach. Accordingly, PAHO/WHO is in a position to pursue, with vigor, whatever specific program directions its Governing Bodies might prescribe.

There are hard choices to be made. In terms of the environmental challenge, the choices are coming to us now with alternatives heavily disguised. For those who would restrict the health sector to environmental problems of known personal health consequences, there is the disturbing question, "Can we wait for the suspected agent, be it chemical, physical, or biological, to be proven guilty beyond reasonable doubt?" For those who opt for a complete environmental utopia, there are very obvious questions of reality. Needless to say, the selected choices will vary among countries. Overpopulation, economics, and other hard facts of life will influence decisions.

## Blueprint for the 1970's

### General Analysis

Whatever set of environmental activities health agencies choose to pursue in the 1970's, the focus must continue to be on people - on their health and on their well-being. This is the characteristic which distinguishes health agencies from other agencies seeking their "ecological niche" in the environmental universe.

In setting goals for the upcoming decade, the objectives need to be clear. What is the specific condition of peoples or of environment that is to be obtained? What are the specific activities through which the goals can be attained? What are the time sequences? These are the kinds of specifications necessary. Some hard choices are involved in their determination.

Man in his environment constitutes a vast continuum, as broad as the horizon and stretching as far as the galaxies. The spectrum of possibilities for meaningful activity is vast, from providing a glass of clean water to providing almost, quite literally, a utopia of physical and mental well-being.

The total of environmental health is greater than the sum of its parts. It embraces engineering, medicine, economics, law, sociology, and many other disciplines. Individually, their contributions are significant; collectively, they cannot be measured precisely, adding up to an indefinable quality of life.

Man's environment is both internal and external, fed and sustained by life systems and life support systems. The health insult may be direct or indirect. In either case, however, man is the target and the victim of the degradation of an environment increasingly hostile to his aspirations for a better life.

In PAHO/WHO, the ongoing programs for environmental quality control are broad and soundly based. Through the 1960's, Member Governments responded aggressively and effectively in achieving this unprecedented progress. National institutions were strengthened and close liaison established between the several national ministries involved in control activities. As indicated in the report, the foundations for education, training, and research are well established and working smoothly.

Needless to say, all of these national and international mechanisms will be needed in the 1970's. Outstanding progress in environmental health is being accomplished; national and continental programs are staffed; and the operational machinery is flexible.

What is needed is the development, adoption, and commitment - including financial and human resources of physicians, engineers, and other professionals - of a definite action program, complete with tangible, practical sub-programs.



This will entail a change in attitudes of all concerned as well as alterations of traditional ways of doing business in public health. But the key word is action - action in a broad spectrum of environmental activities from epidemiology and monitoring to regulation and control. No aspect of the program can be played off against another, each is essential.

If public health is to survive as an entity, and, more particularly, if environmental health is to survive within it, some aggressive actions need to be taken:

Regional networks for monitoring major environmental impacts need to be established and operated by health agencies. These networks should be linked to global networks having common bases for sampling, analysis, and interpretation of data.

National plans for environmental programs should be synchronized with national economic and social plans, and they should have the concept and mechanism for inter-country joint action built into them. This is particularly important since pollution, most often, does not respect boundary lines.

PAHO/WHO should make integrated use of its resources to achieve maximum impact. For example, in a given program area such as water supply the Washington Office staff, the zone and country staffs, and the sanitary engineering center staff should be used in a coordinated fashion to achieve jointly developed, and commonly understood, program goals. The PAHO/WHO-sponsored, university based training, education, and research network should be used to its full potential, and fellowships should be programmed with other resources.

New technology must be brought to the countries more effectively and more extensively. Critical reviews of literature should be made to produce "summaries of knowledge" and "state of the art" documents in each program area or sub-area (such as air pollution monitoring, water treatment, industrial-hygiene surveys). Manuals of reference, handbooks, and other technical informational materials need to be produced. As necessary, research should be conducted or supported to adapt basic knowledge developed elsewhere to regional conditions. Technical consultation should be available on problems of unusual difficulty. The Center for Sanitary Engineering and Environmental Sciences should provide the leadership in bringing new technology to the countries and in providing expert technical assistance.

Continued support should be provided for the development of university graduate centers for teaching, technical training, and research. A modest research training grant program should be reestablished. The future progress of Latin America in improving the physical environment will depend, in significant measure, on the quality of its university centers for environmental sciences and engineering.

Mechanisms for action, such as river basin development projects, should be supported and utilized fully by the health agencies. These projects offer excellent opportunities for incorporating necessary health programs in overall basin development.

External resources should be sought more vigorously. The Organization should provide greater assistance to the countries in obtaining external financial support for facilities and services. Included in such assistance would be the development of basic information for loan applications, pre-feasibility studies, determination of optimum period of design, and programming of construction to make maximum use of loan funds. The same type of assistance should be provided Member Governments in developing applications for UNDP funds, for bilateral assistance funds, and for support from foundations and other institutions.

Because the action program must be narrow enough to be specific, yet broad enough to cover a multitude of programs and administrative arrangements, the Blueprint for the 1970's herein is expressed in terms of "approaches" and goals for the decade, all submitted for consideration by the Organization's Governing Bodies. In view of the wide divergence among the countries as to environmental control needs, it is expected that each country will continue to adjust program content to its facilities and requirements. Accordingly, a specific country may use ideas from each of the three suggested approaches.

One approach might be to concern ourselves with the hard core of the environment, the physical environment. In concept, this approach would be a continuation of the traditional role of public health agencies. In dimension, however, the approach would be greater; in content it would be more varied and more intricate. The principal elements might be considered somewhat as follows:

a. Basic activities

Water supply  
Sewerage  
Solid wastes  
Food protection  
Occupational health

The basic epidemiology of these environmental determinants is fairly well delineated. Refinements are needed in the assessment of the chemical segment and in the viral segment.

b. Supplemental activities

Air pollution  
Water pollution  
Hygiene of housing  
Ionizing radiation

For these, the epidemiology is less well delineated, except of course with respect to microbiological contaminants. The significance of chemicals, especially complex organics, in air and water pollution; the health effects of substandard housing; and the damage caused by lower dosages of radiation over longer periods of time also need better quantification.

c. Total well-being in an optimal environment, esthetically pleasing surroundings, open space, and leisure time facilities. In sum, restful, stimulating, or vigorous conditions at fingertip control.

If such an approach were selected, primary emphasis would be placed on activities in (a) and (b). The existing structure, provided with appropriate resources, could do the job.

A second approach would be to pursue a broad attack, viewing environment as a pervading factor in each of the several programs of PAHO/WHO. In this case, a major change in concept would be involved. Environment would become the conceptual center around which activities in the categorical programs would revolve. Significant changes in structure, especially to achieve coordination, would be required. Unless major increases in resources were provided, the effort would be thinly spread across a broad front. This would leave health agencies vulnerable to the criticisms by other agencies sponsoring strong programs in separate categorical phases of environmental control.

In order to implement this approach, it would be necessary to examine each program to see how environmental considerations should be incorporated into it. Specific program activities would need to be planned and resources provided. Some sort of overview would need to be established to coordinate the separate program elements.

If this second approach were selected, heavy initial emphasis should be placed on defining health relationships; on assessing health effects; and on developing the criteria necessary to plan and carry out preventive or corrective measures. This is the greatest gap in environmental programs today, and is a main reason why the health agency has become a progressively weaker partner in the environmental business. The key to regaining a position of influence lies in relating environmental conditions to the health and well-being of peoples, in a quantitative way. It is in this area that the health agency should be the expert and the unquestioned authority. Entailed in this is a clear definition of the term "health."

A third approach is a compromise, giving primary emphasis to the physical environment as the hard core program, but beginning to build environmental considerations into other programs, wherever significantly applicable. This approach would require minor changes in structure, principally to provide a coordinated effort. The additional resources required for this alternative would be less than for the second approach.

The medical programs should give major emphasis to defining the health effects of environmental conditions and in assessing such effects. In view of the rapidity of change, environmental epidemiology must be both retrospective and prospective.

International health agencies by their very nature are obliged to consider health problems from both a regional and a global point of view. For a regional organization such as PAHO/WHO, there is the primary responsibility to look inward at the health problems and needs within the Hemisphere and, secondarily, to look outward at the relationships between regional health and world health. These latter relationships are reciprocal: Activities of the Region can affect health both intra- and inter-regionally. Conversely, activities outside the Region can affect health within the Region. There are imperative obligations to be met in each case.

### Program Objectives and Elements

**FIRST APPROACH.** This approach focuses on what is the hard core of any environmental program, the physical environment. It proposes that major resources be devoted to the most basic and better understood elements of activity, with descending orders of resources devoted to the elements less well defined epidemiologically. An outline for this approach follows:

Water Supply, Urban - Objective for the 1970's: Piped water under continuous pressure for each dwelling unit.

#### Major activities:

- Extend to medium sized and smaller cities the assistance that has been provided to larger cities.
- Assist Member Governments to conduct pre-feasibility studies and assemble other information needed to obtain external financial assistance.
- Encourage and assist in the development of national water supply plans, in relationship to national development plans.
- Add executive administration to the administrative management training program.
- Develop and provide training for water treatment plant engineers and operators.
- Stimulate water quality monitoring through laboratory controls.
- Bring new water treatment technology to the water supply industry.

An example is the new technology of water treatment which can save millions of dollars by expanding the capacity of existing treatment

facilities through relatively low cost modification of sedimentation, filtration, and coagulation processes.

Water Supply, Rural - Objective for the 1970's: A community water supply in each place where "centers for community services" exist or are to be established. Support should be given to the concept and design of community service centers where the basic requisites for modern rural living are provided. A secondary objective would be to provide off premise water supplies for the use of dispersed rural populations.

Major Activities:

- Continue to improve, and assist in, the installation of "mass-approach" rural water supply programs.
- Develop and publish information on simplified, low cost rural water supply systems.
- Evaluate revolving fund mechanisms and incorporate improvements based on experience. Assist in the establishment of new revolving fund systems.
- Develop basic information guides for use in preparing applications for external financial assistance.

Sewerage, Urban - Objective for the 1970's: Water carried waste services for each dwelling unit in the consolidated and incorporated urban areas, and a minimum of sanitary latrine services to unincorporated urban areas.

Major Activities:

- Sponsor the application of the same principles of organization, management, finance, operation, and maintenance which have proved effective for urban water supply services. Promote the concept of a combined water supply and sewerage administration.
- Encourage and assist in the development of national plans for sewerage services.
- Assist in obtaining financing.
- Provide training according to the most urgent needs in each country.
- Translate and publish industrial waste treatment guides for all major industries.
- Sponsor research into the adaptation of sewage lagoons and other low cost treatment methods.

Sewerage, Rural - Objective for the 1970's: Water carried waste systems for all new "community service centers" parallel with the provision of community water supply and for 75 per cent of existing ones; a minimum of sanitary latrine services for dispersed and unorganized dwelling units.

Major Activities:

- Develop low cost sanitary waste disposal systems for rural communities.
- Develop a "mass approach" for such systems, and a revolving fund mechanism to sustain financing.
- Develop information for use in obtaining external financial support.

Solid Wastes - Objective for the 1970's: Regular waste collection and sanitary disposal systems for all large and intermediate sized cities; regular waste collection and regulated disposal systems for other cities.

Major Activities:

- Assist in the development of sound and self-supporting institutional structures for providing solid waste services.
- Assist in obtaining initial financing for such services.
- Bring new solid waste treatment technology to countries.

Occupational Health - Objective for the 1970's: A viable national occupational health program, geared to industrial development in each country. (Smaller countries might wish to pool certain services and facilities, such as laboratories, or to obtain services from larger countries.)

Major Activities:

- Assist countries which do not have programs in preparing them - including legislation, structure, staffing and other resources, training, sequence of program activities, and methods of financing.
- Develop technical manuals and other materials for making surveys of industrial hygiene problems, for sampling and analysis, for control methods, and for evaluation.
- Conduct, upon request, evaluations of ongoing programs.
- Design and sponsor training programs.
- Seek the support of institutions financing industrial development in providing occupational health protection as a condition of such assistance.

Food Protection - Objective for the 1970's: Assessment of the health significance of the respective stages of food handling from source through processing, distribution, storage, preparation, and serving under conditions existing in the respective countries; development of realistic health protection for each stage; integration of these measures into practical programs; and sponsoring their adoption by national, state, and local agencies.

Major Activities:

- Design, conduct, or support epidemiological studies of microbiological and chemical contaminants (including additives) in food, and the health significance of food handling operations.
- Translate epidemiological findings into practical preventive and monitoring measures.
- Train personnel at the professional and other levels in the techniques of preventing food-borne illnesses, including surveillance and monitoring.
- Devise special programs for alerting tourists to the hazards of foods, and for protecting them especially against the more serious food borne illnesses such as hepatitis, the dysenteries, typhoid fever, and undulant fever.

Air Pollution - Objective for the 1970's: A viable national air pollution program for each major country and an active control program for each major and intermediate sized city having a significant air pollution problem.

Major Activities:

- Develop and demonstrate the use of a manual for making a municipal air pollution survey.
- Sponsor an expanded regional air pollution surveillance network and continue to assist in the establishment of national and local monitoring systems.
- Continue to develop and distribute manuals for sampling and analysis of air pollutants.
- Bring new air pollution control technology to the countries.
- Sponsor seminars and assist in the design and conduct of technical training courses.

Water Pollution - Objective for the 1970's: A viable national program in each major country and an effective pollution control program in each large and intermediate sized city having a significant water pollution problem.

Major Activities:

- Prepare and distribute guides for conducting water pollution surveys.
- Develop and make available model laws and ordinances for water pollution programs.
- Prepare industrial waste guides for each major industry.
- Encourage and assist in the development of comprehensive water quality management plans geared to national development goals.
- Assist in the development of university water pollution control curricula.
- Encourage and support studies and investigation of water pollution problems, especially those having broad significance.
- Sponsor a regional water quality network, with associated analytical laboratories.
- Prepare and distribute a manual on sampling and analytical procedures for network participants and others interested.

Housing - Objective for the 1970's: Determination of the health significance of various kinds and arrangements of dwelling units and neighborhoods and, on this basis, development of a program in housing appropriate to the health agency.

Major Activities:

- Conduct studies of the health significance of housing to determine the order of importance of the several elements of housing to the health and well-being of the occupants, as judged by the occupants.
- Develop mutual self-help manuals containing simple drawings, illustrations, and instructions for making improvements which will substantially overcome the unhealthful and undesirable features of inadequate housing.
- Develop mutual self-help programs for the progressive improvement of housing units in an order of priority framework that is synchronized with the availability of resources.



- Participate in pilot-scale projects for demonstrating the mutual self-help approach under several prototype situations, and varying degrees of guidance and assistance.
- Assist in planning, and in obtaining financial support, for housing improvement programs.

Noise, Vibration, Congestion, Tempo, and Other Physical and Social Stresses - Objective for the 1970's: Development of criteria, based on effects on health and well-being, for the practical regulation of these stresses and the initiation of control measures.

Major Activities:

- Assess the harmful effects of noise, and recommend criteria for individual and community exposure.
- Examine the more prevalent types of industrial vibrations and other vibrations to which workers and the public are exposed, and set criteria for exposure.
- For other physical hazards such as lasers, ultra-high frequency, and similar radiation, keep abreast of uses and of literature regarding hazards, so that proper protective measures may be instituted as necessary.
- In collaboration with other social agencies, study congestion, tempo, and similar characteristics of urban living, with a view to understanding their effects on physical and mental health sufficiently to identify preventive or corrective measures.
- Provide, via medical education programs, for basic training of physicians and associated technicians in the use of X-rays and radiography so as to minimize possible human radiation exposure.
- Develop criteria, via occupational health, cancer and chronic disease programs, for chemical exposures and their effects, singly and in combination. The combined effects of environmental chemical exposure and mass medication (such as aspirin, tranquilizers, antihistamines, and perhaps alcohol) should be studied.
- Define the housing and spatial arrangements necessary to promote mental health. The effects of tempo, congestion, and delinquency should also be defined.

In summary, the several categorical health programs should be engaged extensively in epidemiological investigation and research to define qualitatively and quantitatively the health effects of environmental conditions. The health agencies should establish the criteria, if not the standards, for human health. This would do much to reestablish the environmental health leadership in the health agency. In the absence of such actions, the health agency can expect to be progressively less influential in the environmental health arena.

SECOND APPROACH. This approach - namely that of pursuing a broad attack on the environment and man's interaction with it - would retain the physical environment as the hard core. Added to the first approach would be a set of activities aimed at an optimum environment for human growth. The second approach would provide the best balanced and most effective environmental program. It will require new coordinative mechanisms, substantial additional resources, and interdisciplinary approaches with all professionals participating on a parity basis. Most important of all, medical leadership will have to support fully the concept and philosophy.

The second approach would emphasize better knowledge about the man-environment relationship. Instead of the "crisis" concept, in which action is taken only when a situation reaches serious proportions, the program would feature preventive action based on better intelligence of cause-and-effect relationships. In order to acquire such intelligence, a series of well-designed studies will need to be conducted, in some cases extending over a number of years. The difficulty of designing and conducting such studies should not be underestimated. For example, assessment of concurrent exposures to chemical contaminants through air, water, food, and occupation is a difficult research task. Larger numbers of modified chemical structures are annually coming into production and use. Until research can provide definitive information, best professional judgments will have to establish criteria. Both activities, however, are clearly the primary responsibility of the health agency.

In implementing this approach, each major health program would need to examine the impairments to man resulting from environmental stress. Some examples may serve to illustrate:

1. Communicable disease programs would need to establish more clearly the conditions under which viruses are conveyed to man through water, food, or other preventable circumstances. For example, infectious hepatitis, now widely endemic in a number of areas is an increasing threat to native populations and may have increasingly important economic consequences, insofar as tourism is concerned.
2. Nutrition, communicable diseases, and environmental sanitation programs need to study jointly the loss of efficiency of food utilization through preventable diseases such as the dysenteries and other bacterial or parasitic diseases.

3. Medical care programs should be the source of information on the hospitalization burden resulting from preventable water- and filth-borne diseases and should be an active participant in the prevention of such diseases.

THIRD APPROACH. This approach is a compromise between the other two and is the one recommended. It implies essentially the same commitment to the physical environment as the hard core program of the first approach but a less intense commitment by the other categorical health programs.

Minor changes in structure are indicated to achieve coordination. Additional resources requested would be much less than for the second approach. Each categorical program would examine the environmental implications for its activities; would take cognizance of the implications by initiating specific measures in areas of greatest significance; and would plan a continuing program to accomplish the most important tasks in a reasonable period of time. This might be considered as a multi-stage approach, geared to available support. Its tempo would be in phase with its resources.

#### Regional Imperatives

As national and regional economic and social developments change, and as research and technology produce new problems and new means for meeting them, the international health agency must also change. It must change not only its technical procedures, but it must also be prepared to change its concepts, its institutional form, and its basic philosophies.

Perhaps the most important question - for environmental health as well as for the other categorical programs - is whether public health can survive as a significant entity in the medical care world, or whether, like the Mayan civilization, it will disappear in the jungle.

RESOLUTION XXXIV

MAN-ENVIRONMENT RELATIONSHIPS

THE XVIII PAN AMERICAN SANITARY CONFERENCE,

Having considered the Director's special report on man-environment relationships (Document CSP18/10) and having reviewed Resolutions WHA23.59 and WHA23.60 of the Twenty-Third World Health Assembly;

Recognizing that rapid population growth and accelerating technological advances in urbanizing societies are creating unprecedented impacts on man's total environment and that the speed, magnitude, and complexity of these forces intensify traditional problems and create a host of new physical and mental stresses;

Bearing in mind that the characteristic which distinguishes health ministries from other agencies in the environmental field is their focus on the health and well-being of peoples and the significance of environmental change to man; and

Observing with satisfaction the aggressive and effective measures taken by the Member Governments to strengthen national institutions and to meet the goals in the Charter of Punta del Este related to a quality human environment,

RESOLVES:

1. To commend the Director on the report on man-environment relationships (Document CSP18/10) and on his initiative to keep Governments informed on evolving problems of environmental health.
2. To recommend to the Director:
  - (a) That the Organization intensify its program of assistance to Governments in developing new or more effective approaches and techniques for controlling environmental hazards.
  - (b) That the Organization continue its activities to collaborate with Governments in the strengthening of the continental networks for education, training, and research; to develop and implement practical systems for monitoring of environmental pollution; and to improve the organization and administration of environmental services.
  - (c) That the Organization continue to give special attention in its programs to the health needs of rural peoples, with emphasis on community organization, self-help concepts, and revolving-fund mechanisms to support mass-approach techniques for providing water supplies, sewerage services, housing, and related environmental improvements.
  - (d) That he continue his commendable efforts, in collaboration with both bilateral and multilateral international agencies for the purpose of making available financial and technical support to assist Governments in providing a healthful environment.

3. To request the Director to develop, for submission to the XX Meeting of the Directing Council, environmental-health projections for the 1970 decade, including specific and realistic proposals with long-range goals and design of programs that the Organization and the Governments might undertake to monitor pollution trends and to implement essential control and remedial measures.

(Approved at the tenth plenary session,  
8 October 1970)