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ENVIRONMENTAL PROTECTION

For many years, efforts have been made to provide all people of the Americas with clean water and good sanitation facilities. During the 1970's additional hazards such as urban air pollution, coastal marine pollution, toxic chemicals, the increased risk to the health of workers, and a host of other problems became widespread, to the concern of public health officials and decision-makers alike. There are in fact still more recent worries about global warming, damage to the ozone layer and also several more resource-oriented problems, such as deforestation and desertification, which suggest that our planet may be becoming incapable of providing us with the most basic elements required for health and well being: wholesome food, clean air and water, and shelter.

Protecting and promoting health from environmental hazards has now become inseparable from efforts to deal with the larger forces of social and economic development, population pressures, urbanization, resource depletion, and technological change that impact directly and indirectly on human health. In this document the various issues that have a bearing on the problem of environmental degradation are discussed. They are viewed from a public health standpoint and advocate a dual role for the health sector and PAHO:

- Setting policies and norms that guide and limit public and private activities that shape the natural and man-made environment to prevent damage to health, as well as executing traditional and "new" programs in environmental health;

- Influencing related sectors that make decisions affecting human-environment interactions, and facilitating the enablement of groups and communities to solve problems of development and environmental protection.

There is some urgency now for the health sector to play a more active role in resolving environmental issues. This role should be one of a "social broker," whereby social, health and economic issues can be resolved among various proponents for the attainment of health for all. In the final chapters of the paper, a more holistic approach to environmental health is discussed and a framework put forward for action in the 1990s by the Member Countries and PAHO.

The Executive Committee is requested to review and comment upon the analysis of the environmental health situation and its relationship to development, as presented in this document, the challenges to responding to environmental health needs in the 1990s, and the proposed framework for action for both the Member Governments and the Organization. Special attention should be given to the bases for the development of a regional strategy for action for the remainder of the decade.

CONTENTS

ENVIRONMENTAL PROTECTION

1. PREFACE

Countries in Latin America and the Caribbean are undergoing rapid development, coupled in many places with a rapid urbanization. These developments cause considerable deterioration of the environment both in rural and urban areas, and their potential effect on the health of the people is becoming a major issue on the agenda of governments.

Environmental problems cannot be dealt with easily. They are linked to the need to develop the economy and to improve the well-being of large segments of the population and, of course, to the large external debt. They are also linked to the need to improve socioeconomic opportunity in many countries in order to achieve greater equity and participation for the underserved sectors of the population. Further, they are linked to a need for rapid transfer of information and technology in the Region, if solutions are to be found that accommodate economic growth and protect the environment and natural resources. What has transpired over a 100 years in the countries of the developed world is now taking place in about of 30 years in Latin America and the Caribbean.

This presents an enormous challenge to the health sector, and there is a need at this time to review the situation with regard to the threat from environmental deterioration, its potential impact on health, and the possible changes in demand for health care that may result. Such a review is presented in this document. The timing of the presentation of this document at the start of the 1990s is important in that it proposes that the health sector act not only "curatively," by responding to environmentally related diseases and disabilities as they occur, but also participate "preventively" in the intersectoral process of development. This view requires that the health sector do more than intervene in a clinical sense. Rather it should become involved--involved as a "social broker"--bringing together the various interested groups from government, industry and the public in finding paths to development that are equitable and sustainable.

Such a role for national health sectors, with assistance from PAHO and other agencies, is important if countries are to focus on human health and well-being as the main objective of development. The alternative focus on more economically oriented cost-benefit analysis is neither adequate nor a panacea. In addition, the expected change from high prevalence of communicable diseases to increases of the more degenerative diseases in the Region requires a shift in thinking from single-agent causes of environment-related diseases to dealing with arrays of risk factors that contribute to the incidence and severity of ill health.

This paper first identifies the major environmental changes that impact on health, and proceeds to consider their impacts on health, with special attention being given to certain populations at higher risk. This perspective provides the basis for outlining the necessary response of the health sector and a framework for action in the 1990s.

Difficult as the new tasks may be, there are helpful factors. Among these is the widespread awareness of the Region's population regarding environmental problems. Also, policy and decision-makers of the countries in the Region are increasingly cognizant of the potential short-term and long-term health impact associated with the environment's deterioration, which is apparent from a number of major decisions and declarations endorsed collectively by the Member Countries of PAHO:

- The Plan of Action for the Implementation of Regional Strategies toward attainment of the goal of HFA/2000 was approved by the Directing Council of PAHO in its XXVIII Meeting in 1981 (Res. CD28.R11), and includes control of physical and chemical pollution along with the prevention of adverse health effects of development projects.

- In 1986, during the 97th Meeting of the PAHO Executive Committee, Resolution XVI was approved, putting into operation a Regional Medium-Term Program on Chemical Safety. This regional program was supported by an assessment study carried out in several countries in the Region of the Americas.

- The Declaration of Brasilia by the Heads of State of Argentina, Brazil, Colombia, Mexico, Peru, Uruguay and Venezuela in 1988 emphasized the need to find a balance between socioeconomic development and environmental protection and conservation.

- The Port-of-Spain Accord, adopted by the Ministers of the Caribbean Community responsible for environmental matters, recommends, among others, that all governments of the Community establish arrangements that permit an integrated approach to environmental management at the political, technical and administrative levels.

- Resolution WHA42.21 on "WHO's contribution to the international efforts towards sustainable development" (1989) gives prominence to the interdependence between development, the environment and health.

- The declaration of the Ministers of Health of the Region, who met in Rome in 1989, restated the urgency of dealing decisively with the problems of health, poverty and the environment whose solution affects irrevocably the health and well-being of the people of the Region.

These short statements send a clear message: governments recognize and are resolved to deal with the issues of health and environment, and they are prepared to support action at all levels and in different fora. They also recognize the importance of strong intersectoral cooperation to achieve that goal. The Director of PAHO has taken the initiative to revise the Organization's priorities, giving increased attention to control and prevention of adverse health impacts from environmental deterioration. This will involve restructuring PAHO's role in environmental health and augmenting it, where necessary, to respond more effectively to the needs of the countries.

Thus this paper's subsequent sections are addressed to three major questions:

i) What are particular environmental conditions or characteristics of the Region that will affect the task of improving the health situation? Understanding this is necessary in order to evaluate and choose appropriate strategies for improving the situation.

ii) What are the priority environmental health issues in the countries of the Region? There are many such issues, and it is important to understand how they affect the health of the people and subgroups that are at particular risk.

iii) What are the appropriate response mechanisms for the Ministries of Health, and how should they relate to other agencies involved in environmental work? How can environmental health action make and seize upon opportunities for intersectoral development activities to improve the health of all?

2. STATUS AND TRENDS IN ENVIRONMENTAL DETERMINANTS OF HEALTH

2.1 Processess of Development

In the process of social and economic development, people are now causing severe damage to the very system, our environment, upon which we are dependent. Although with different characteristics, environmental problems occur both in the industrialized and in the developing world. Thus, we face a paradoxical situation whereby patterns of development result in positive indicators of progress and, at the same time, produce environmental problems that offset the positive achievements of development and result in losses that may be long term and irreversible.

Patterns of development differ in the Americas between relatively developed and underdeveloped countries, and also among regions of developing countries. The most striking difference between these two can be characterized as one which is largely consumer-oriented, which relies on the production of an infinite number of products and services organized as an assembly line, versus one which is largely resource-exploitation based, which utilizes agricultural, mining, forestry and other natural assets to raise the standard of living of the people. Both have potentially serious but quite different impacts on the environment.

2.2 Population and Health

Since 1930, the population of Latin America and the Caribbean has quadrupled (Merrick, 1986). The current population of 438 million is projected to increase by 23% by the turn of the century and by 74% by the year 2025. Rapid population growth is likely to continue because of two factors: 1) fertility rates in many countries have not declined as steeply as mortality rates; and 2) the large proportion of young people (38% of the Region's population is under age 15) ensures that population growth will continue for some time even if lower fertility rates are achieved. Thus, it is important to remember that the next generation of parents--and job-seekers and consumers--has already been born.

2.3 Human Settlements

In Latin America rapid urbanization took place several decades ago and it is now by far the most urbanized region (Leonard, 1989). By the turn of the century the developing world will have 37 cities with populations over 5 million; six of them are already that size in Latin America and three more will join their ranks during the next 10 years.

Two thirds of all Latin Americans live in urban areas, and cities of all sizes throughout the Region continue to grow at rates exceeding 4% annually (World Resources Institute, 1988). Fueled by migration from rural areas and high fertility rates, urbanization has brought about profound social and economic changes throughout Latin America. Cities have become the repository for millions of people living at a bare subsistence level. By the end of the 1990s, 90% of the absolute poor in Latin America and the Caribbean will live in cities, according to World Bank estimates.

2.4 Poverty and Environmental Degradation

Poverty is both a cause and an effect of environmental degradation (Schramm and Warford, 1989). The lack of infrastructure and basic services that normally characterize the dwellings of the poor determine various degrees of pollution: human, industrial and agricultural waste increase in impoverished environments. On the other hand, environmental problems and the deterioration of the environment may well lead to the impoverishment of sectors of the population. There are many instances in the Region where urban and industrial pollution have degraded coastal ecosystems to the point of extinction. In other cases soil has been lost and desertification has advanced, brought about by deforestation and the erroneous development strategies appplied. Resulting losses of productivity have meant unemployment and poverty for the communities that lived in those now degraded ecosystems. (Leonard, 1989, 1989a)

2.5 Industry and Energy

Many industrial plants and other facilities, such as power generating stations, petroleum refineries, tanneries, plastic processing plants, and hospitals, produce large quantities of wastes. Industrial wastes include sludge, oily wastes, cadmium, lead, and spent chemical solutions that contain a variety of dangerous substances. Between 1 and 4% of all industrial wastes are estimated to be toxic. In Latin America and the Caribbean, few facilities exist to recycle hazardous wastes or dispose of them safely, and many industries do not treat wastewater.

Energy production and use are essential for socioeconomic development, but they entail some health risks to both producers and consumers. The production of all types of energy is often hazardous to workers: the number of accidents associated with coal mining is well-known, although recent studies have found that the gathering of fuelwood claims more than 10 times more lives for the same energy production (UNEP, 1986). The burning of coal, oil, gas, wood and other organic fuels is a major source of air pollution.

2.6 Food and Agriculture

As the demand for food has grown, efforts to increase crop production, such as large-scale pesticide use, irrigation, and dam-building, have affected the environment in many ways. Heavy pesticide use has produced increasing exposures of agricultural workers and people living near fields to dangerous levels of chemicals. A study in Honduras found that 10% of the agricultural workers exposed to organo-phosphate pesticides displayed clinical symptoms of pesticide poisoning and an additional 30% were asymptomatic but were determined to be affected by laboratory tests. Moreover, in many countries the food chain and the water supply have become contaminated. For example, a study in Paraguay found pesticide residues in meat and fish, and high levels of mercury and arsenic were found on river banks (IIED, 1985). The death toll from pesticide use is substantial: an estimated 19,330 people died from pesticide poisoning between 1971 and 1976 in five Central American countries (Leonard, 1987).

2.7 Natural Resources and Wildlife

About 5.4 million hectares of tropical forests and woodlands in Latin America and the Caribbean are destroyed each year (WRI, 1988). Most of this deforestation is due to clearing land to grow food or foreign-exchange-earning commodities, such as beef. The environmental impacts of deforestation include damaging natural ecosystems and thus promoting proliferation of disease-causing vectors, endangering many rare species of plants and animals, harming soil fertility, and contributing to soil erosion. One example of the rapidity of change accompanying deforestation is the dramatic jump in malaria prevalence in the Amazon region of Brazil--from 51,000 reported cases in 1970 to 560,000 in 1988.

The natural habitats of many animals and plants have been damaged by expanding human settlements, deforestation, logging and agriculture. Protecting animals and plants from extinction is important to human health because of their agricultural and medical applications. Having a varied gene pool can help to breed stronger, disease-resistant animals and plants and could help to ease food shortages by identifying fast-growing, nutritious plants.

2.8 Water Resources, Oceans and Coasts

Despite the fact that Latin America and the Caribbean are among the most water-rich areas of the world, there is a shortage of uncontaminated water supplies for segments of the population. This shortage results from inadequate water treatment and waste disposal facilities, lack of basic sanitation, and improper farming practices. Water supplies are increasingly contaminated with sewage, waste products, heavy metals, pesticides, solvents, garbage, and chemical substances.

In rural areas, widespread and indiscriminant use of agrochemicals and use of wastewater for irrigation contribute to groundwater contamination. Efforts to protect groundwater sources from overexploitation or contamination are rare; others are only in the formative stages. Because it is nearly impossible to clean up contaminated groundwater in a cost-effective manner, such contamination must be considered irreversible. Therefore, prevention of contamination should be a high priority for development, as well as health reasons (CEPIS, 1987).

Despite their ecological significance, oceans have long been the dumping grounds for vast quantities of wastes. Merchant ships and recreational vessels dump garbage and other wastes at sea, which then wash ashore and litter beaches and other coastal areas. Barges often transport trash for dumping in the ocean, and specially designed ships incinerate wastes at sea, where emissions are not as tightly controlled as on land. A major source of ocean and coastal pollution is the discharge of raw sewage and other waste products emanating from municipal areas, resulting in the spread of infectious diseases. Other land-based sources of pollution include cane sugar production and industrial wastes. Plastics now constitute a major environmental threat to marine wildlife. Polluted coastal waters and beach litter can seriously affect the development of tourism--a major source of income for many Latin American and Caribbean countries.

2.9 Air Pollution, Atmosphere and Climate

More than 50 million people living in urban areas of Latin America and the Caribbean are affected by unhealthy levels of air pollution. Major air pollutants include sulfur dioxide, nitrogen oxides, particulates (dust and smoke), carbon monoxide, lead and hydrocarbons. Urban air pollution results from manufacturing, car and bus emissions, generation of electricity, the burning of coal and petroleum products, and service industries. In most Latin American countries, tetraethyl lead is added to the gasoline, resulting in air-borne lead particles. Photochemical reactions in the air create ozone, a highly reactive and toxic substance.

Scientists have become increasingly concerned about the greenhouse effect, in which carbon dioxide, methane, ozone, chlorofluorocarbons (CFCs), nitrous oxide and other trace gases, accumulate in the lower atmosphere and trap heat, which is likely to cause average temperatures to rise throughout the world. Even a slight increase in temperature would cause major changes: rising oceans, loss of farmlands, displaced populations, and the decimation of coastlines and beaches. The potential for natural disasters could also be increased if the level of ocean water rises, since this could alter rainfall patterns and increase the frequency and intensity of cyclones and hurricanes, which could be catastrophic to many areas, including the Caribbean basin and many coastal cities such as Rio de Janeiro, Buenos Aires, Montevideo, Panama, and Guayaquil.

2.10 Chemicals in the Environment

The prevalence of chemicals in the environment has increased dramatically in recent decades. Apart from the problems of agricultural chemicals and toxic wastes, already discussed, chemicals are more commonly used in the home, in food processing, and in other commercial and transportation applications. The problem is many-faceted and includes such elements as:

- Exposures to poisonings, burns and traumas of those, including children and illiterates, unfamiliar with the hazards of chemicals in ordinary use;

- Poor international controls of trade in chemicals, which results in substances that are banned in one country being offered for sale in others; and

- Disasters of varying scales, in which explosions and other massive releases have killed, disabled, and induced serious disease in hundreds or thousands of nearby people.

3. MAJOR INTERACTIONS BETWEEN HEALTH, ENVIRONMENT AND DEVELOPMENT

Environmental factors affect health negatively under the conditions of underdevelopment and under conditions of unsound and unsustainable development. The challenge of addressing both sets of problems would be formidable under the best of economic circumstances, which do not at present pertain, as the economies of developing countries have been dampened by shifts in global trade and by mounting external debt.

3.1 Changing Hazards to Health

Illness caused by pollutants is often difficult to identify conclusively. While there are a few clear-cut cases such as polluted water causing diarrhea, typically people living in unsafe environments are at higher risk of contracting a serious disease or may experience an

aggravation of an existing condition such as asthma, which limits their productivity. Also, diseases such as cancer and emphysema may take years to develop after exposure to toxic substances and air pollution. The connection between lead poisoning and mental retardation may be hard to prove in a particular setting.

The large number of environmental factors that affect health are indicative of the complexity of the situation. Most environmental problems have multiple causes and cut across diverse sectors, including population growth and urbanization, agriculture and industrial development, and the risk-compounding effects of poverty. Because environmental pollution produces a mixture of elements that interact in the human body, an undernourished person with diarrhea, for example, may also be exposed to air pollution that may make him/her more susceptible to tuberculosis.

3.2 Patterns of Disease and Disability

Communicable diseases: Unsanitary disposal of excreta is a major cause of infant diarrheas, gastroenteric infections, parasitic diseases including Chagas's disease and schistosomiasis, whose incidence in some cities is linked to both the importation of pathogens by migrations from endemic rural areas and to the settling of the poor in marshy and flood-prone land. Inadequate drainage of standing waters also encourages vector breeding and contact infections. Public drainage systems, where available, are not always maintained to avoid clogging and breaks that provide vector breeding sites.

Inadequate disposal of solid wastes contributes to the spread of gastrointestinal and parasitic diseases, primarily through the accelerated breeding of insect and rodent vectors. The problem is most acute in urban areas where consumption patterns increase the generation of solid wastes and where municipal administrations lack the resources to collect wastes outside of prime residential areas and to dispose of them other than by dumping in periurban areas amidst squatter settlements.

Noncommunicable diseases and traumas result from inadequate protection against the elements, unsafely designed features of housing, inadequate protection against such natural disasters as earthquakes, hurricanes, and floods, and the use of unsafe building materials, such as lead-based paints, asbestos, creosote, and synthetics that give off toxic fumes.

As air pollution in cities has worsened, its effect on mortality and morbidity can be seen, despite dramatic improvements in overall survival rates. For example, in Mexico City deaths attributed to cancer, influenza and pneumonia have increased six-fold since 1956, and deaths due to cardiovascular diseases have quadrupled. Similarly, deaths to people over age 65 due to bronchitis, emphysema and asthma increased by 12% between 1978 and 1984.

With increasing industrialization comes an increased risk of industrial accidents. Although no registry of chemical accidents exists, available data indicate that there were 34 accidents in Mexico between October 1984 and October 1985. As a result, 271 people were killed and an additional 2,050 people were injured. Most countries lack adequate strategies to minimize the risk of industrial accidents, contain them rapidly, and rehabilitate damaged areas.

Low-level, long-term exposure to hazardous waste can cause serious health problems. Ten chemicals are commonly found at waste disposal sites: lead, trichloroethylene, chloroform, toluene, benzene, PCBs, phenol, arsenic, cadmium, and chromium. Seven of these 10 chemicals have the potential to cause cancer, seven may cause birth defects, and five may inflict genetic damage. An additional 60 chemicals have been identified as potentially harmful (WHO/UNEP/World Bank, 1989).

3.3 Population Groups at High Risk

The poor are often at the interface between industrialization and underdevelopment, and their disease patterns reflect the problems of both. From the first, they acquire a heavy burden of infectious diseases and malnutrition, as overcrowding and underprotection lead to excessive exposure and vulnerability to pathogenic agents. From the second, they derive the wide range of chronic and social diseases typical of urban areas in developing countries. Man-made environmental conditions, including pollution, under-regulated traffic, stress and alienation, lead to cardiovascular, neoplastic and mental diseases and accidents, at work, on the road, and at home. Cardiovascular disease rates in urban areas of the Region are often as high as those of industrialized countries, but without the corresponding resources to deal with them.

Children: The most common of all childhood illnesses is diarrheal disease. In very poor communities, for example, a child may contract a diarrheal infection perhaps six or more times a year with each episode lasting for several days. If the response of the parent is to withhold food and drink, then diarrhea may mean that the growing child is losing rather than absorbing nourishment for a total of up to 40 days in the year, which is enough to affect its normal growth and development. Malnutrition and undernutrition are not only themselves diseases, but have a multiplier effect on other childhood diseases (UNICEF, 1988).

Child health is also increasingly affected by chemical residues, toxic wastes, car exhaust fumes and various synthetic products. This impact can be very significant. For instance, in 1980 in the industrial city of Cubatao, Brazil, 40 out of every 1,000 babies were stillborn, while 40 others died in the first week of life, the majority of these being deformed. Another significant risk factor for pre-school children is environmental lead, which may originate from lead-based paints, industrial emissions and from motor vehicle exhausts. In children, the central nervous system is highly vulnerable and readily damaged by environmental exposure to lead, even in low doses.

Recent studies have concluded that the number of poor households headed by women have expanded rapidly in the urban slums of Latin America. These households were found, on average, to be poorer than other poor households. Also, poverty among women-headed households is usually deeper and more firmly entrenched than overall poverty (Buvinic and Lycette, 1988).

When faced with environmental degradation that reduces the availability of fuelwood or water, or the productivity of the land which produces their food, poor rural women often have no recourse but to work harder just to stay even. This emphasizes the point that the links between environmental destruction and poverty can be particularly severe for women-headed households, and that the burden of compensation for natural resource destruction falls most heavily on women in the poor households.

The health status of workers in developing countries is difficult to determine. Compiling an acurate picture of the incidence of occupational injury is complicated by under-reporting, which is believed to reflect perhaps only 30% of all occupational injuries. Often, the working environment contributes to poor health, either through exposure to toxic substances or to injuries resulting from accidents.

In the Americas the particular risks of agricultural workers requires special attention. The use of toxic agricultural chemicals in the Americas has increased by as much as 25-50% over the past 10 years. (WHO, 1989a; OPS, 1987) By all accounts, this increase has not been accompanied by improved procedures for protecting workers, and, not surprisingly, indiscriminate application of pesticides also affects consumers. For example, it is known that mother's milk contains high levels of several pesticides in areas where food is contaminated.

4. RESPONDING TO ENVIRONMENTAL HEALTH NEEDS IN THE AMERICAS

4.1 Guiding Concepts for Environmental Health in the 1990s

One of the key characteristics of health promotion and public health in the 1990s will be the need for it to have a much stronger ecological perspective. This observation can be readily extrapolated from the last decade during which a new range of health issues emerged. This change can be described as a growth in risk clusters resulting from a wide range of environmental hazards and disasters described in Section 2 of this document. These risk clusters tend to be cumulative and synergistic, have no clear cause, and do not lend themselves to simple straightforward cause-effect explanations.

The social perception of environmental risk is increasing and influencing people's political response. Demands for action at the international, national, state and local levels have emerged, as have proposals for various strategies and consumer movements to support

sustainability. Yet governments seem to have difficulties responding to large numbers of environmental issues, each one having quite complicated social, scientific, economic and health implications. In such a context, intersectoral (horizontal) cooperation needs to optimized, while at the same time an adequate structure needs to be developed that allows for maximum participation in environmental health protection at the local level--one that supports "from the bottom up" participation in policy development and implementation.

Promoting health and protecting people from environmental hazards has become inseparable from these larger environmental concerns. Although developing countries must still strengthen sanitary measures to deal with "traditional" problems of biological pollution, most of them must combat "new" problems of chemical and physical pollution, with their complicated effects on physical and social health states.

Government's role is dual: 1) to stimulate, set the direction and support private and community action; and 2) to itself act directly to solve certain social problems, through coordinated efforts of its sectors and programs. (Hardoy, 1984 and Harpham, 1986)

In the first of these roles, government sets the policies and norms that guide and limit the public and private activities that modify the natural and man-made environments. Government is also called upon to act as a facilitator, to enable communities and groups to themselves solve problems of development and environmental protection (Sumka, 1987 and UNICEF, 1988).

The latter role involves two main functions: to regulate the manner in which the environment is used, and to make those needed investments in infrastructure that require the mobilization of capital and technical resources that other social entities are unable to supply. In addition, governments are called upon to cooperate more actively in solving the increasing number of environmental problems that transcend national boundaries. (World Bank, 1987)

The balance between governmental and private action depends upon the character of each country's political and economic system. In the face of increasing environmental threats to human health and survival, however, it is likely that governments will themselves become more active and will seek to harness more "people power," through decentralizing their functions and involving communities in social development action.

The further challenge is to improve the coherence and coordination of policies and programs, reducing sectoral isolation and organizational fragmentation. Because the problems of human use of the environment are so intertwined and interdependent, the responses to those problems must be correspondingly integrated. (Schaefer, 1981 and PAHO, 1987)

4.2 Environmental Health Leadership

To contribute to such coherent approaches, the health sector must be able to respond with strategies that correspond to the new risk patterns. These strategies need to go beyond the tinkering that occurs within the present fragmented systems and approaches, and they need to find new approaches to local, national and global policies. (Kickbush, 1987) Such strategies will see both environment and health as social resources that society has an overall responsibility to protect.

Such actions should take place within a framework of four basic values that underlie a sound approach to health care: equity and universality of care, participation, efficiency, and integration. (Guerra de Macedo, 1988)

Equity implies a commitment to social justice, to remedy deep-seated inequalities. It requires an effort to ensure that each and every individual in our societies is able to enjoy his or her right to health, by having equal and adequate protection and access to necessary services, which is the most tangible expression of "health for all."

Participation means the establishment of a relationship of mutual responsibility between health systems and the society they serve--individuals, groups, communities, and organizations. This relationship enables the development of civic awareness for health and for the responsibility of each and every one for its preservation. Informed and responsible participation of communities should be fostered and facilitated in decisions affecting the implementation and evaluation of health programs and activities.

Efficiency makes it possible for available resources to be used most appropriately, so that they are adequate to meet the real and growing needs of the population throughout the Region. Viewing efficiency as a value means that it must be understood to be a social responsibility shared by all, and that efficiency is essential for realizing the other dimensions of health in this context.

Integration refers simultaneously to properly relating health measures--promotion, prevention, recovery and rehabilitation, at all levels and with continuity--and promoting health through the development process.

4.3 Functions of Environmental Health Leadership

To control effectively environmental hazards to health, in concert with other sectors and with communities, health leadership must carry out two clusters of functions: core functions to be directly conducted by the Ministry of Health, and advisory functions to be carried out by influencing and supporting other organizations. Core functions generally

speaking tend to be more associated with the identification and assessment of various environmental health risks and hazards, along with resource development, while advisory functions relate more to the management and control of environmental problems. Functions in the two groups obviously overlap, in that core functions (training, provision of situational and scientific information) often support other agencies' contributions to improved environmental health.

Core Functions

The national health authority should have the capabilities required to:

- advocate preventive measures to protect the public's health from environmental hazards, through representing health considerations in the formulation of public policy, increasing public awareness of environmental health issues through education, and other actions that encourage behaviors and environmental modifications that impact positively on community health.

- promote community capacity to foster environmental health, by strengthening the ability of local authorities to carry out decentralized functions and fostering community self-help programs in meeting needs for water supply safety, solid wastes management (including recycling), and hygienic housing.

- carry out health impact and risk assessment, identifying threats to health from existing environmental practices and conditions and from proposed developments and changes relating to shelter, occupation, industrial processes, energy generation, water resources, etc.

- conduct epidemiological surveillance of environment-related diseases, informing decision-makers of health and other agencies, of the situation and trends in the health state of communities and populations with respect to environmental hazards to health.

- train personnel in identification and prevention of environmental health hazards, including public health and medical staffs, personnel in such other sectors as agriculture and labor whose duties enable them to affect safety conditions and the use of chemicals, and community-based auxiliaries and volunteers.

- manage and operate environmental control programs assigned to the health authority and take initiatives to improve intersectoral cooperation/coordination at different decision-making levels in national and community agencies, so as to approach and solve problems from a multi-media, holistic perspective.

- develop and implement emergency preparedness capabilities - response programs to deal both with natural disasters (earthquakes, volcanic eruptions, landslides) and accidents associated with human activities (nuclear plant breakdowns, chemical spills, and large-scale releases of pollutants).

Advisory Functions

Equally, the national health authority should have the capabilities required to:

- participate in the development of norms, standards, and legislation, providing necessary scientific and technical information, organizing advisory resources to the formulation process, and assisting legislative and administrative leaders in the drafting and review of proposals.

- assist in environmental impact assessments, providing information on health aspects of proposed environmental changes and participating in the oversight of implementation.

- conduct environmental data assessments, interpreting the health implications of data from environmental monitoring that is collected routinely or through special studies.

- participate in intersectoral cooperation between public health and economic development authorities, emphasizing the prevention of environmental hazards arising from development projects in various sectors and supporting the development of grass-roots capabilities for social development and environmental improvement.

Although each function has been discussed separately, they interact and are mutually dependent; they form a set. For example, health advocacy is of little value if it is not based on sound information and is not brought to bear widely in various sectors and in communities. And a governmental control program that does not enlist the cooperation and energies of industries and communities can make little more than a token contribution to environmental health.

If the various functions are not to be performed as isolated specialties, their performance should be governed by a comprehensive environmental health strategy that answers the questions: What is to be done? What is to be influenced? How is it to be influenced? What must be enhanced if this work is to be done? The answer to the last of these questions points to the need for a sub-strategy to develop the resources required to enhanced a larger environmental health strategy. This can help make resource development coherent, appropriate and efficient.

4.4 Resources for Environmental Health

A suitable array of resources is required for countries and their agencies, including but not limited to the Ministries of Health, to perform their environmental health functions. In addition to tangible, conventional resources ("people, money, and materials"), performance of these environmental health functions requires a number of intangible resources--for example, appropriate legislation and standards, working agreements between organizations, information, plans, and popular acceptance and trust.

Two additional intangible resources are characteristics of government structure: one in the "horizontal" dimension of intersectoral coordination, and the other in the "vertical" dimension of delegation and decentralization.

The "horizontal" resource is a shared orientation and working mechanism to harmonize the efforts of the many organizations that are responsible for environmental conditions that affect health. Such responsibilities are distributed widely among different sectors of government and the economy. More often than not, for example, the Ministry of Labor has primary responsibility for occupational safety and health, and responsibilities for environmental protection are often assigned to a separate environmental management agency or a ministry of natural resources. In the face of emerging environmental and health problems, the capacity to harmonize specialized activities--within sectors and between them--is an essential resource, one that requires the vigorous activity of an able health authority.

In the vertical dimension, the issue is whether the capacity to act is adequately distributed throughout the country. Some large countries have resources at the central level, but only limited or lacking capacity at the periphery. The problem is especially acute in countries where governmental activities are highly centralized, district and local authorities lack the power to make decisions and to raise revenue, where local government capacity is weak, and where community action is discouraged. In countries with large areas and populations, centralization can impede development in general and can cripple social development, which must permeate the entire societal fabric. (Cochrane, 1983)

4.5 Situation in the Region of the Americas

The inherent complexity of environmental health work makes it difficult to measure the capabilities of countries and communities to perform it. Dozens of indicators can be used for each program, and when these are applied to specific problem areas (water and air quality, ionizing and non-ionizing radiation), more than 100 measurements could easily be made. Laboratory capacity for drinking water quality can be differentiated, for example, from laboratory capacity for air quality assessment or environmental toxicology.

Although PAHO has made country-level assessments using such detailed indicators, presenting an intelligible regional overview requires the use of summary indicators. Such indicators were used in a 1983-1984 global survey carried out by PAHO and the other Regional Offices of WHO, to assess national capabilities in control of environmental hazards to health and, again in 1989, using the summary indicators shown in Table 1.

Table 1

INDICATORS FOR ASSESSING THE CAPABILITIES OF NATIONAL PROGRAMS TO CONTROL ENVIRONMENTAL HEALTH HAZARDS

Indicator	Subject
	Normative Capabilities
LEGISLATION	Policies and authority delegations expressed in codified laws, enabling standards to be set and enforced.
STRATEGY	Policies for pollution control embodied in a broad environmental health strategy for the medium-to-long term.
STANDARDS	Appropriate norms and procedures promulgated.
	Resource Capabilities
ASSESSMENT/ LABORATORIES	Documentation of existing problems, risks and pollution sources, with adequate laboratory services.
ENFORCEMENT/ MONITORING	Adequate monitoring of compliance with standards, along with enforcement and sanctions to correct non-compliance.
STAFFING	Adequate staffing for environmental health work, with provisions for professional, technician, and auxiliary training.
	Organizational Capabilities
INTERSECTORAL COORDINATION	Effective operation of a policy coordination body, providing for liaison of environmental health with environmental management and development administration, together with a technical executing agency.
HEALTH AUTHORITY INVOLVEMENT	Active and capable advisory, technical, and advocacy activities by the national health authority (MOH).
VERTICAL DELEGATION	Appropriate responsibilities and authority assigned to, and executed by, intermediate and local levels.

Data from the two surveys (see Annex 1) suggest the following conclusions about the environmental health capabilities of countries in the Region:

1. About two-thirds of the countries, scored as having "few requirements met," lack significant capabilities in environmental health. This ratio applies both to countries undergoing moderate-to-rapid industrialization and to all the countries assessed. Only one developing country was scored as having "most requirements met."

2. No developing country was scored as "adequate" with respect to all nine of the summary indicators; of 21 developing countries in which detailed assessments were made in 1984 (and 16 thus far in 1989), no more than three were scored as "adequate" on any one indicator. Low scorings were most frequent on the indicators, ENFORCEMENT/MONITORING, STRATEGY, ASSESSMENT/LABORATORIES, STAFFING, and HEALTH AUTHORITY INVOLVEMENT.

3. No more than three national health authorities were assessed as adequately involved in environmental health, and more than half were scored as "minimal" and "lacking." (A comparable 1987 survey on rural and urban development and housing reported (WHO, 1988a) similar results with respect to MOH awareness of health implications of development and MOH involvement in health aspects of housing and socioeconomic development activities.)

4. Comparing data from the 1984 and 1989 surveys, it appears that:

   - changes have taken place within this relatively short span of years. Although most changes are of small degree, they indicate the feasibility of making further positive changes, especially in a period of heightened sensitivity to environmental issues.

   - these changes in capability have been insufficient to raise any country into the "most requirements met" category, although a few countries have advanced from the category of "few requirements met" into the category of "some requirements met."

   - the capability indicators with the most frequent positive changes are STANDARDS, ENFORCEMENT/MONITORING and INTERSECTORAL COORDINATION.

   - fewer countries have advanced with respect to STAFFING, HEALTH AUTHORITY INVOLVEMENT, and VERTICAL DELEGATION, and the advances made on these indicators have been offset by regressions in other countries.

   - a loss of ground has occurred in STAFFING, likely reflecting the straightened financial conditions in many countries and weakness in the institutionalization of supporting resources.

5. Because information supports so many of the capabilities required to assess and control environmental hazards to health, inadequate information and information management capabilities are of special concern. Most countries require major upgrading of their information systems for environmental health monitoring, assessment, and planning. Such systems, further, need to be properly linked with environmental management information systems and with health information systems, both of which require improvement in many countries.

6. Substantial investments are required to provide adequate control capabilities in the face of increasing risks to health. As well as greater commitment of funds, increased capacity to provide expertise through technical cooperation is needed.

5. FRAMEWORK FOR ACTION IN THE 1990s

5.1 Scope and Focus

Environmental health, perhaps more than any other program, is intersectoral in nature in that it concerns all parts of the human environment. Environmental pollution control is but one program area which is concerned with environment and health. There are others, such as water supply and sanitation (linked to drinking-water quality), housing hygiene (linked to indoor air pollution and noise), food safety (linked to food additives, pesticide residues, contaminated soils and water), occupational health (linked to chemicals and physical factors in the work place), all of which emphasize different but specific aspects. Environmental pollution control has linkages to all of these and several others, e.g., environmental aspects of vector-transmitted diseases, environmental factors involved in heart disease, cancer, etc. Also, in the area of resources management many linkages exist, for example, with energy production, agriculture, mining, forestry, tourism, etc. In all cases, however, the emphasis is on the health of populations and the potential threat posed by environmental deterioration.

The delineation of the boundaries of a program area for environmental hazards control and its linkages with others, as outlined above, are not exactly the same at the national level in all countries of the Americas where programs and institutions may be structured differently. This aspect needs to be considered carefully when planning technical cooperation activities at the national level. The strategy for technical cooperation has to take this distinction into account in order that such activities are consistent with national needs and priorities. In practice, of course, there is considerable overlap between the groupings of countries since countries are marked by rather uneven economic development and with different needs at a given time for environmental controls.

The task at hand is the continued build-up of national and local capabilities in the 1990s to enable national authorities to identify and assess existing and potential environmenal hazards as they occur and to

take the necessary preventive and control measures. Naturally, the gradual build-up of national capabilities requires substantive commitment and resources, and long-term planning, all of which are of limited political attraction due to the fact that much time will pass until investments will bear tangible and visible results. Consequently, the design and initiation of a comprehensive national environmental health protection program should bear in mind the ultimate goal of effectively controlling the environmental hazards (air, water, food, etc.) to which populations are exposed. Assessment studies of the various exposure routes and patterns will allow for identifying the most cost-effective hazard control strategy.

Based on the information presented in the preceding sections of this document, it is recommended that the further development of national environmental health programs in the Americas specifically take account of the following factors and considerations:

1. Changes in environmental conditions are having adverse health effects, which are likely to grow worse if not brought under better control.

2. Public health practitioners must learn to think and work in ecological terms, to enable them to join in actions to prevent and/or respond to adverse health effects from the interactions of:

   - population changes and settlement patterns,

   - production processes and their residuals,

   - energy generation and transportation,

   - basic resource depletion,

   - changes in the global environment, and

   - approaching saturation of the tolerance capacity of environments.

3. Joint actions should involve communities and all relevant sectors, at local, intermediate, national and international levels. Actions through projects should be in harmony with goals and policies for sustainable development and human well-being.

4. For national health authorities to play their role--for some aspects a leading role--in such joint action requires substantial strengthening of their operational capacity in environmental health, including the upgrading of structures, processes, and resources.

5. Effective execution of the health sector's role with respect to the environment depends heavily on information, scientific and situational, in order to assess risks, evaluate needs,

advise on the health implications of monitoring data, set priorities, formulate appropriate policies and program interventions, and monitor health states and program effectiveness. Improvement in information and in information management capacities is a key need.

6. Because resources are always limited, priorities must be set, so as to respond to the health problems that are most important in local communities and nations. Priority-setting should be based on adequate epidemiological and environmental information. International support should be geared to such country priorities.

5.2 Objectives

Short-term (1 to 5 years)

a) For all countries of the Americas to have:

- baseline measurements of environmental health problems and needs, to support the setting of priorities and the formulation of strategies to strengthen environmental health in the context of sustainable development.

- improved capabilities to assess risks from environmental factors, to perform epidemiological assessments of local and regional situations, and to communicate such information effectively to decision-makers and affected parties.

- established intersectoral cooperation of relevant public and private agencies at all levels, especially the local level, to carry out the functions of information collection, exchange, and utilization; policy development and review; development planning; programming of governmental, private, and voluntary actions; and the management of program efforts.

- basic provisions for information systems that link appropriate data on health status and trends, environmental factors, and economic activities that impinge on the environment.

- appropriate patterns for community involvement and participation in the planning and implementation of actions for sustainable development, environmental improvement, and health promotion.

- formulated programs for high priority problems, along with projects for national and external funding.

- accomplished the preparation (including necessary training and retraining) of key human resources for environmental health, and to have begun the necessary build-up of staff and auxiliary personnel (with particular attention to competitive salaries, to reasonable career development, and to civil service protections), and of volunteer personnel.

b) For the Pan American Health Organization to have:

- established operational inter-country and regional networks of institutions for support of country programs, organized according to environmental health problem clusters and such key processes as assessment/evaluation and planning.

- sponsored operational research into methods for factor and epidemiological assessment of environmental health risks, for community participation and involvement (including auxiliary and volunteer workers), and community education in environmental health.

- established working relationships with regional and international development assistance agencies, both to strengthen the environmental health aspect of major development projects and to mobilize funding to strengthen environmental health resources and programs of countries.

- progressively modified patterns of technical cooperation with countries, responding to national developments in this field, with increasing emphasis on ecological problems and engagement with socioeconomic development.

Longer-term (5-10 years)

a) For all countries of the Americas to have:

- developed viable, self-sustaining policies and programs in environmental health, responsive to traditional and newly-emerging problems in the environment. This objective implies that the basic capabilities contained in the short-term objectives will have been extended and further developed, including sectoral/intersectoral information systems, risk assessment, health and program monitoring, community involvement, multisectoral action, integration with socioeconomic development, staffing, and community education.

- measurably reduced risks to health from environmental deterioration and from people's misuse of their environment and its elements, together with progress toward improving the environmental resource base needed for the health of future generations.

b) For the Pan American Health Organization to have:

- met country needs for the transfer of scientific, technical, and situational information; for advice and guidance on methods and processes; for ongoing support from institutional networks; and for support in the development of human resources, including the upgrading of training resources and the incorporation of environmental health elements in the basic curricula of related professions and disciplines.

5.3 National Approaches

To attain these objectives, and to carry out the functions identified in section 4.2, national authorities, including health authorities, with the technical cooperation of PAHO, should:

1. Improve their understanding of the problems of countries and of regions that are especially vulnerable to adverse health impacts of the environment. This understanding should, on the one hand, embrace the ecological, environmental, and public health situation, and on the other, the constraints imposed by economic and institutional factors.

2. Formulate environmental health strategies, within the framework of "Health for All," that address these problems over the next decade, including the actions to be taken to establish needed policies, programs, and methods of working with communities and other sectors. A sub-strategy should concern the building up of needed resources (section 4.3). Depending on the state of information in each country, the initial versions of these strategies are likely to be fairly general. As information improves and experience is gained, such strategies can be refined and made more specific.

3. Promote the development of environmental health interventions as part of local health systems (SILOS). Depending on the situation, it would be advantageous if environmental health responsibilities charged to other agencies were appropriately integrated in the planning and work of the SILOS. (OPS, 1984 and 1989)

4. Establish mechanisms to monitor and assess, on a continuing basis, the status of environmental health problems and progress/problems of the environmental health strategy.

5. Progressively improve the information base for environmental health and the capacities of the health system for information management, with the appropriate intersectoral linkages.

6. Mobilize political support for the strategy at all levels of the national society, ensuring official endorsement and financial support, as well as broad acceptance by non-governmental and community organizations, voluntary groups, and the general public, capitalizing on concerns for environmental protection and improvement.

7. Improve linkages with the national socioeconomic development process, working with economists and development leaders in other sectors, and establishing a defined role for health participation in the making of policy and project decisions

and in the assessment of development results. Health representation in the process should be concerned both with preventing and reducing hazards to health through development projects and with advocating greater and continuing attention to needs for social development.

8. Improve linkages with ongoing programs and activities, meshing environmental health work with other preventive activities in the health sector and promoting coordinated intersectoral action with respect to the health aspects of housing, working conditions, transportation, nutrition, energy generation, land use planning, industrial development, and agricultural reform. Linkages should be established between primary health care, and other schemes for community organization and education, with special attention to the potentialities of schools for increasing awareness and promoting positive health behaviors. Building effective linkages will entail the advocacy, information, and training/education functions of the health authority.

9. Equip "core" human resources to perform the necessary social, educational, information management and epidemiological functions, as well as the environmental modification functions, of the environmental health strategy--through training, recruiting additional personnel, establishing competitive compensation schemes and instituting civil service protections, strengthening local capabilities, and rationalizing management structures and procedures toward greater efficiency and effectiveness.

10. Identify institutions (universities and schools, consultants, research insitutes) that would be able to contribute to programming and implementing the strategy and the resource development sub-strategy. Develop agreements on relationships and services, including--as appropriate--provisions for participation in intercountry and regional networks.

11. Sponsor and support operational research into those elements of the strategy (e.g., community organization, influencing other sectors, health aspects of environmental impact assessment) that are problematic in the country.

5.4 PAHO's Role

The Pan American Health Organization can play a four-fold role in fostering more adequate national capacity and international action to control environmental hazards to health.

1. As advocate to countries and international entities: To raise awareness and understanding and to provide information and guidance on the health risks associated with a deteriorating environment. Such advocacy must reach to all decision levels and influence policy-making and resource allocations. In view of the reportedly weak involvement of public health authorities

in this field, ministries of health are a key target for PAHO's advocacy, which should also extend to national authorities and international organizations in environmental protection, public works, economic development planning and management, agriculture and education.

2. As a major provider and facilitator of technical cooperation: To strengthen country capacities to protect the health of all peoples against environmental hazards to health. Countries should be helped to define clear objectives and policies and to develop their institutional capacities in environmental epidemiology and assessment, information management, human and scientific resource development, sound health development planning and administration, intersectoral coordination, and community mobilization.

3. As advocate for, and sponsor of, scientific and technical development in health: To develop and support. Regional and subregional networks in the various aspects of environmental health and its management, properly using the resources of its Pan American Centers, ECO in Mexico and CEPIS in Peru, and facilitating the flow of information and expertise needed by countries.

4. In its responsibility to support international health work: To develop and collaborate in intercountry and interagency efforts to solve environmental problems impacting on human health that transcend national boundaries. Its collaboration with other regional and global organizations is necessary to ensure that the socioeconomic development policies, programs and projects of other international assistance agencies respond to environmental health concerns and that, wherever possible, development projects contribute to the objectives of Health for All. PAHO's traditional function of promoting international cooperation in resource development is likewise important in the current situation. Integral to this responsibility is PAHO's representational function of identifying available external resources of funding and expertise, assisting in their mobilization in support of countries, and facilitating the flow of such resources.

PAHO must necessarily prioritize targets and allocations: 1) between countries at various levels of need, readiness, and capability; and (2) among the various environmental health capabilities to be developed in each countries at specific times. To prioritize requires that information about country needs be constantly updated and that regional programming in environmental health should be based on explicit strategies, formulated interactively with countries and other international entities. This could help ensure that specific and localized projects fit within the framework such strategies would provide and that they will serve identified goals and objectives.

Because not all countries are sufficiently prepared to engage in rationalized planning for the development of environmental health, PAHO should employ a dual approach: a) fostering the formulation of system development strategies in countries where this is feasible; and b) seeking strategic entry points in other countries through discrete projects aimed at building core resources. In this dual approach, it would be necessary to involve countries heavily in formulating a regional strategy and in subregional consultations, so as to:

- draw on a wide range of experience and insights;
- foster a shared awareness and understanding of needs and possible remedies;
- better identify what is realistic;
- promote the concept of systematic development of environmental health capabilities.

As in the past, PAHO's own strategy should allow for a high degree of country variation. Technical guidance should emphasize the factors to be considered and should provide information on options. A uniform regional initiative program is neither desirable nor feasible, if only because environmental health problems are inherently of wide and intersectoral scope, inextricable from trends in socioeconomic development and national governance, and highly dependent upon such readiness factors as state of the economy, degree of political stability, and initial resource capabilities (WCED, 1987). In the Americas, much consideration should be given to the linkage of environmental health work to the subregional initiatives, i.e., Central America, the Andean Countries, the Caribbean, the Southern Cone countries, and others.

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Annex

COUNTRY SURVEY RESULTS

The 1984 general assessments of 34 PAHO Member Countries and four territories resulted in the following categorization:

Number of Countries	Status
3	Most requirements met
9	Some requirements met
26	Few requirements met

Of these 38 member states and territories, 16 countries were identified as undergoing "moderate to rapid industrialization"--that is, countries where changes in the environment were most substantial and where populations could be at special health risk. The status of these countries' capabilities to control environmental hazards to health was roughly proportional to the status of all countries, namely:

Number of Countries	Status
1	Most requirements met
4	Some requirements met
11	Few requirements met

PAHO staff made more detailed assessments in 17 Member Countries (including all the large countries outside North America) and four territories, using a 4-level ordinal scoring. The status of these countries on the capability indicators described in Table 1 (except for RESEARCH/FORECASTING, which was not scored) was as follows:

Indicator	Lacking/ Comprehensive	Adequate/ Limited	Partial/ Negligible	Minimal/ Absent
LEGISLATION	2	8	9	2
STRATEGY	1	1	14	5
STANDARDS	3	6	6	6
ASSESSMENT/LABORATORIES	2	7	10	2
ENFORCEMENT/MONITORING		9	4	8
STAFFING	1	9	11	
INTERSECTORAL COORDINATION		6	5	10
HEALTH AUTH. INVOLVEMENT	3	4	11	3
VERTICAL DELEGATION	3	10	5	3
Total Frequencies	15	60	75	39

Since this detailed scoring of 21 countries is consistent with the gross scores of 38 countries, it is likely that the shortfalls identified in the preceding table reasonably represented the situation in the Region as of 1984.

Preliminary data from the 1989 re-survey have been received on 16 of the 21 countries for which detailed assessments were made in 1984. While only tentative interpretations can be made because of possible measurement errors (scoring by different reporters in some instances), the data show some changes in the intervening five years, including:

- overall scores for four countries were sufficiently higher to move them from the "few requirements met" category to the "some requirements met" category;

- eight countries were scored higher overall, but not sufficiently to change their category.

- four countries had lower overall scores, but the changes were also insufficient to move them into a lower category. With respect to capability indicators, both advances and regressions have been reported. The numbers of countries with changed and unchanged indicator scores is as follows:

Indicator	Number of Countries with Higher Scores	Number of Countries with Unchanged Scores	Number of Countries with Lower Scores
LEGISLATION	5	9	2
STRATEGY	4	12	
STANDARDS	8	6	2
ASSESSMENT/LABORATORIES	8	5	3
ENFORCEMENT/MONITORING	9	5	2
STAFFING	2	10	4
INTERSECTORAL COORDINATION	8	7	1
HEALTH AUTH. INVOLVEMENT	4	10	2
VERTICAL DELEGATION	3	8	5
Total Frequencies	51	72	21