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ACTION FOR ENVIRONMENTAL HEALTH

WHO Says



**World Health Organization
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Achievements?

"The highest priority should be accorded to the strengthening of governmental agencies specifically charged with the responsibility for initiating, promoting, and persisting in environmental sanitation by direct and indirect participation and influence".

The quotation is from the first report of WHO's Expert Committee on Environmental Sanitation held in September 1949. The same recommendation, in a variety of different forms has been repeated by expert committees and by the World Health Assembly many times since. In the Organization's Eighth General Programme of Work for the years 1990-1995⁹² the strategies for WHO's goal for Health for All by the Year 2000 and the principles of Primary Health Care have been fully adopted as approaches to improve environmental sanitation; yet the need to strengthen all the involved national agencies remains a priority issue.

If the expert committee's first objective is still unfulfilled after more than 35 years, what then have been the achievements in respect of the key environmental health issues and problems? Without doubt, advice from WHO has been instrumental in the development and strengthening of Environmental Health organizations in very many developing and developed countries since 1949. More needs to be done; progress brings new problems even while the old ones are being attacked. But, awareness of environmental health issues has grown enormously since 1949, and the influence of environmental health specialists on development programmes, though still below current hopes, is having an evident impact in those countries where strong institutions have been created.

This pamphlet reviews the essential advice and recommendations received from WHO's expert advisory mechanisms* since 1949, and their relation to key environmental health issues and problems, as well as relevant resolutions of the World Health Assembly and Executive Board. In so doing, it cites some of the actions which have been taken over the years by WHO and by governments as a result. The lengthy bibliography will allow readers to pursue individual topics in greater depth, but the aim is to stimulate discussion of the ways in which WHO's commitment to improved environmental health has been reflected in the kind of actions which the Organization has proposed as suitable solutions for the persistently inadequate environmental conditions to which people in all countries are exposed.

¹ The present document has been developed from material prepared by Mr J. N. Lanoix, former WHO staff member.

* WHO Expert Advisory Mechanisms include expert committees, scientific groups, and consultation meetings.

Four decades of resolution

A glance at the chronology of WHO Expert Committees and World Health Assembly resolutions reveals the changing emphasis of environmental health over the years in response to country, regional and international needs and requests.

In the 1950s, the focus was on rural sanitation^{3,45}, on the establishment or strengthening of environmental sanitation services in the national health administrations^{1,44}, and on the training of sanitary engineers and sanitarians.^{2,44}

By the 1960s, the emphasis had shifted to community water supplies^{18,46,47} including activities in rural and peri-urban areas, where the Organization cooperated systematically with UNICEF. It was in 1961 that the terminology changed from Environmental Sanitation to Environmental Health. In 1963, work started in the field of environmental pollution control. Meanwhile, WHO continued to promote the strengthening of environmental sanitation in ministries of health, especially in the newly-independent nations in Africa and Asia. Training of personnel also continued.

In the 1970s, two major developments took place: firstly, top priority was given to a vastly enlarged community water supply programme⁵⁷ carried out in cooperation with other agencies, in particular the World Bank and UNDP.

This programme, part of a new long-term Human Health and Environment Programme^{74,75}, received a major boost in 1977 with the UN Water Conference in Mar del Plata, Argentina, and the establishment of the International Drinking Water Supply and Sanitation Decade (IDWSSD)⁶², which recommended that countries set coverage targets to be achieved by 1990. In the mid 1970s, as a result of the 1972 Stockholm Conference on the Environment, environmental pollution began to attract considerable attention not only in the industrial countries but virtually in all the countries of the world.

Since 1980, the Global Strategy for Health for All by the Year 2000 (HFA)⁹¹, has guided the World Health Assembly's coordination of technical programmes. The Alma-Ata Declaration on Primary Health Care (PHC)⁸⁹, strongly reinforces the concepts and recommendations formulated in 1969 by the Expert Committee on National Environmental Health Programmes.¹⁹ In effect, the PHC and HFA 2000 principles call for a continuation of WHO's environmental health activities in the light of the socio-economic situation of the two last decades of our century.

Expert committees and the World Health Assembly itself have recommended activities in other aspects of environmental health as well: Food Hygiene (1955)⁴; Sanitation in International Travel⁶⁰, including Sanitation in Aviation (1952-58)⁶, Ship Sanitation (early 1960s)⁹⁴, Sanitation in Tourism (mid 1960s)⁹⁶ and Public Health Aspects of Housing and Urban Development (1961-72).^{1,7,12}

The issues

The following sections of this pamphlet describe the problems addressed by WHO's expert advisory mechanisms, and the recommendations made and actions taken, under headings chosen to reflect the major issues in environmental health:

Section 1 - Strengthening of environmental health programmes in government agencies.

Section 2 - Community water supply and waste disposal.

Section 3 - Environmental pollution control, including chemical safety.

Section 4 - Public health aspects of housing and urban development.

Section 5 - Food safety.

Section 6 - Human resources for environmental health.

Section 7 - Promotion of research.

1. STRENGTHENING OF ENVIRONMENTAL HEALTH PROGRAMMES IN GOVERNMENT AGENCIES

1.1 Problems

There are few development activities which do not have some impact on the environment and many which have a considerable effect on the lives of the people involved. Health impacts can be damaging if proper precautions are not taken in planning and implementing new projects, while, on the other side of the coin, properly designed interventions can bring substantial environmental health advantages. The health implications of planned development call for specialist skills and experience - increasingly so as industrialization adds to new types of pollution in an already unsanitary environment.

Governments accept responsibilities to protect their people against environmental threats and to increase public awareness of health risks associated with poor hygiene and inadequate sanitation. Rarely however are government agencies equipped with the resources or the organizational capacity to fulfil their obligations in this field. The problem is two-fold: within the health ministry, environmental health departments, if they exist at all, may have insufficient trained staff, low budgets and little influence on policy; and the health ministry itself may often be remote from the policy-making wings of government when it comes to the environment, with the result that the environmental health implications of proposed development projects emerge too late.

1.2 Recommendations

The first recommendation of WHO's Expert Committee on Environmental Sanitation, quoted at the beginning of this paper, has been echoed many times since by expert committees²⁻³³ and by World Health Assembly resolutions.^{61,66,67,78,80-83} Advice offered evolved with experience and encompassed self-help techniques (1953)³ and community participation (1969)¹⁹ at all stages of environmental sanitation programmes.

The difficulties of planning and coordination in national programmes were recognized in 1969¹⁹ and 1975⁷⁹ and mechanisms were suggested for overcoming the problems. The solutions included establishment of realistic objectives and priorities, development of a strong professional environmental health unit high in the structure of the national health administration and proposals for the design of capital projects. The major problem of intersectoral coordination was the subject of a special study carried out for WHO in 1978-79.⁹³

The 1969 Expert Committee on National Environmental Health Programmes highlighted technological aspects of environmental health and the complex inter-relationships which must be recognized if national programmes are to be effective. It concluded: "Health Agencies, which have a special responsibility in this field, should set a good example by according environmental health a status equal to that of personal health and by ensuring that it is given proper emphasis both in the organization pattern of the relevant ministries and in the general health programmes. Only in this way will preventive efforts receive due attention."

Since 1978, the message has been reinforced by the PHC principles⁸⁹ and the IIFA 2000 strategies.^{90,91}

1.3 Actions

To give visibility and authority to environmental health within a national health authority is not an easy matter in many countries while in some others this concept has been accepted even before WHO was established in 1947. WHO itself set an example in giving priority to environmental health in its programme and in its structure at all levels. In cooperative programmes with Member States, the need for a strong environmental health department is continually stressed along with PHC and HFA objectives.

In the 36 years since the first Expert Committee on Environmental Sanitation was formed, scientific and technological developments, the population explosion, urbanization and industrialization have all intensified, and environmental health approaches have had to evolve accordingly. As early as 1964, WHO sought the advice of an Expert Committee on Environmental Change and Resulting Impacts on Health.⁹ This committee noted that man's capacity for adaptation is great and that there was little justification for pessimistic forecasts being made at the time, provided the principle of "prevention rather than cure" would be applied at all levels. "The future should be viewed with prudence not alarm", the committee concluded, and today critics might argue that this philosophy may have been too lax in the environmental protection field for many years since. Today we know that vigilance must never be compromised.

The need to maintain a proper ecological balance was stressed in 1967 by the Expert Committee on the Education of Engineers in Environmental Health¹⁴ and reiterated in 1969 by the Expert Committee on National Environmental Health Programmes.¹⁹ This latter committee also pointed out the wider scope of environmental Health as compared with the disease-oriented concepts of Environmental Sanitation.

One of the bottlenecks in many countries is the inaction by the national health agencies. While these agencies would all agree that a clean environment is a pre-condition to any health improvement, most of them are not willing to set aside resources in their budget so that they can play their part in environmental health. Even the advent of Primary Health Care has not improved this situation much. The World Health Assembly has on several occasions taken note of this undesirable condition and proposed that Member States correct it.

Also disappointing has been the will of governments to organize intersectoral cooperation for environmental health, an action which is imperative given the fact that resources for environmental health are spread among many national agencies and programmes. Admittedly, in quite a few countries, the individual agencies are carrying out good programmes and often at an accelerating pace. But with more coordination, especially at the planning stage, the overall impact of the total resources available for environmental health could still be increased.

2. COMMUNITY WATER SUPPLY AND WASTE DISPOSAL

2.1 Problems

The first session of the Expert Committee on Environmental Sanitation took place in September 1949, when major pandemic diseases were rampant and public health services, where they existed at all, were still disorganized following the Second World War. Despite enormous efforts over three decades to provide more drinking water and sanitation services, the launch of the International Drinking Water Supply and Sanitation Decade (1981-1990) found more than half of the people of the developing world lacking access to a safe supply of drinking water and three-quarters without adequate sanitation.

Rural communities are especially at risk, with only one family in eight having proper means of excreta disposal, and unsanitary living conditions blamed for the deaths of as many as five million children every year. It has been estimated that more than half of the hospital beds in the developing world are occupied by people suffering from water-related diseases such as dysentery and other forms of diarrhoea.

2.2 Recommendations

The 1949 committee faced a horrifying global situation and called on WHO first to combat diseases caused by an insanitary environment, citing cholera for special attention. The committee also recommended that national administrations should view investment in environmental sanitation as productive capital expenditure, and that WHO should use its influence particularly with the World Bank to promote financial support for sanitation projects. The aim was ambitious - an aggressive, world-wide drinking water supply and sanitation programme, not merely to limit water-related diseases, but also to promote social and economic development. The WHO Executive Board's reaction to the Expert Committee's report,^{1,3} and World Health Assembly Resolutions in 1952⁴⁵ and in 1959,⁴⁶ suggest that the committee's ideas were a full decade ahead of their time. It was at the 1959 Assembly that WHO advocated an accelerated programme for improving community water supplies.

Until then, the special emphasis was on rural sanitation. The third session of the Expert Committee, in July 1953, was devoted exclusively to this topic, and its recommendations have guided rural sanitation ever since. The first basic steps towards provision of a safe environment in rural areas and small communities, the committee said, should be to:

- "(a) provide adequate supplies of safe drinking water;
- (b) provide for the safe disposal of human excreta; and
- (c) control the insect and animal vectors of disease, where they are of significant importance."³

It also stressed the importance of health education, local participation and self-help in carrying out these activities. WHO was asked to encourage and stimulate training programmes for rural sanitation personnel, particularly health assistants, and to prepare manuals of rural sanitation practice.

Based on a 1963 study⁹⁶ supplemented by more up-to-date information, the Expert Committee on Community Water Supply noted in 1968¹⁸ that "in many developing countries the present rate of increase in community water supplies is not even sufficient to make up for past neglect, let alone to keep pace with the population increase". Population growth was then 40% higher in developing countries than in the world as a whole, and in the urban centres, with migration from the rural areas unchecked, the growth was 250% higher than in rural areas. The committee re-emphasized conclusions and recommendations made four years earlier by participants of Technical Discussions at the 17th World Health Assembly on "The influence of Community Water Supplies on Health and Social Progress".⁹⁷ It urged governments everywhere to accord the highest possible priority to providing ample supplies of safe water to all their people. Recommendations dealt particularly with quality and surveillance of drinking water supplies and with organization, economic and financing aspects.¹⁸

The concrete recommendations on economics and finance took particular account of the difficulties of financing rural water supplies, which could not be financially self-supporting because of the limited capacity of small communities to pay the costs of operation and capital amortization. Economic planners should take into account, the committee said, the total value of such projects in terms of improved health, increased agricultural output and similar benefits. "These may amply justify their inclusion in their country's development plans", the experts concluded. As only a health agency could advise on potential health impacts, the economic argument was linked to a powerfully argued reiteration of the case for a strong and influential environmental health department in the environmental health agencies.

The need to link water supply improvements with parallel improvements in waste disposal has been preached repeatedly by virtually all the expert committees^{3,7,10,15,18,19,21,24,26,32,33} but the policy in programme promotion has varied according to views about political practicalities.

The early emphasis on rural sanitation changed from 1959, when the WHO saw community water supply as a trail-blazer for total sanitation packages, claiming that:⁴⁶

"It may be safely predicted, on the basis of experience in many countries of the world, that once a community water supply is available other environmental sanitation activities will follow in its train. One advance in sanitation begets another; but a beginning must be made with the function which has the greatest spread and which makes it possible for people to survive and to develop a sanitary consciousness... It does mean that first emphasis will be upon providing safe and ample piped water supplies to community aggregates. Subsequent efforts in many directions will be persistent and not far behind in bringing community sanitation into being."

1969 saw the policy diluted to some degree, though with water supply still seen as the incentive to more complete sanitation improvements. An assessment by UNICEF-WHO said on the subject of rural sanitation: "It is therefore felt that every effort should be made to obtain acceptance of the simultaneous installation of water supply and excreta disposal but this should not be insisted upon. Where there is a reluctance, for any reason, the water supply alone should be proceeded with, and preparation made for the introduction of the other improvements at as early a date as possible after the provision of water. Where applicable, the problem of waste water drainage should also be considered".⁹⁸

In recent years, the World Health Assembly has modified this approach in line with decisions of the UN Water Conference in Mar del Plata, Argentina, in 1977.⁶² A resolution in 1979⁶⁴ affirmed WHO support for the Mar del Plata commitment to matching water supply and sanitation improvements; the Assembly in 1981⁶² drew attention to the "complementarity of sanitation with water supply development"; and in 1983⁶⁷ urged member States to bear in mind that "improved sanitation should go hand in hand with the provision of safe water".

Governments have reacted well to the Decade. In the World Health Assembly in 1981, 1983 and again in 1986, they have renewed their commitment to improving drinking water supply and sanitation at an accelerated rate. They have been given clear evidence of the need to do so for improving public health and they have set forth a number of approaches by which they intend to maximize the health benefits of the investment which they make during the 1980's for water supply and sanitation.

The importance of proper waste disposal in relation to public health has been emphasized during the past decade by the Expert Committee on Disposal of Community Wastewater²⁶ and on Reuse of Effluents: Methods of Wastewater Treatment and Health Safeguards.²⁴ Among many recommendations to governments are:

- (a) Effective techniques for collecting and reporting data on wastewater disposal systems should be considered as a prerequisite for sound planning.
- (b) An effective organization should be established at the national, state, regional, or local level as appropriate, for the efficient management of the facilities, with the emphasis on a central agency to plan and operate water supply and wastewater disposal systems.
- (c) Health agencies should continue their activities in the monitoring and surveillance of water quality and environmental pollution.
- (d) WHO should encourage the standardization of present analytical methods, possibly through its present network of international reference centres and collaborating institutions.

The health aspects of wastewater and excreta reuse in agriculture and aquaculture have been further reviewed by a meeting of environmental specialists and epidemiologists in 1985 convened by the World Health Organization, the World Bank, UNEP and the International Reference Centre for Wastes Disposal. New information was considered especially on the quality required of treated wastewater for agricultural irrigation and on the appropriate waste treatment methods. Guidelines were set on the treatment of excreta and on future research. It was found that of the various methods available for minimizing health risks of excreta and wastewater reuse, highest priority must be given to the treatment of excreta and excreta-derived wastes prior to their application to fields or ponds. It was further concluded that current guidelines and standards for the use of human waste are overly conservative and unduly restrict project development thereby encouraging unregulated use of the waste.

The Scientific Group on Health Aspects of Wastewater Reuse³³ held at WHO, Geneva, 18-23 November 1987 made a deep and careful review of the available literature, research findings and case studies collected during the last decade by leading organizations and universities of the world. The group of specialists proposed new guidelines which are more appropriate both in terms of health protection as well as in terms of feasibility of attainment even in developing countries. The Scientific Group meeting proposed, in addition, that health protection should be provided by integration and optimization of four basic protective measures: wastewater treatment, crop selection, wastewater application techniques and human exposure control.

2.3 Actions

The early recommendations of the Expert Committee on Environmental Sanitation spawned a programme, in cooperation with UNICEF. By 1969, when WHO began to redirect its rural sanitation activities, demonstration projects involving both water supply and excreta disposal had been completed in more than 80 developing countries, under the technical guidance of the UNICEF-WHO Joint Committee on Health Policy. Following assessment of the joint programme in 1969⁹⁸, UNICEF expanded its own rural water supply and sanitation programme to include assistance to national programmes covering peri-urban areas. WHO produced three rural sanitation monographs which have been widely distributed and are still in use in most developing countries for training sanitarians and for field operations. Pick-up of demonstration projects by governments was disappointing; few duplicated or expanded the projects outside the original demonstration areas, though the techniques developed in these projects had been accepted and found suitable.

A new commitment to community water supply improvements began in 1959 in India with the establishment of a special agency for Metropolitan Calcutta's water supply and sanitation, designed especially to combat epidemics of cholera. Member States and WHO then undertook a large programme for pre-investment planning for community water supply, including engineering, financial, economic and managerial aspects, alongside health considerations.

In 1963, WHO published the second edition of the International Standards for Drinking Water, which, with revisions in 1971, provided a basis for drinking water quality control in both developed and developing countries for the next two decades. The standards have recently been re-organized and re-published as a 3-volume set of Guidelines for Drinking Water Quality⁹⁹ in a form which makes them particularly useful for developing countries wishing to establish their own standards.

The 1969 expert committee's recommendations on economic and financial appraisal of rural water supply and sanitation projects guided the WHO-World Bank Cooperative Programme on Community Water Supply from 1971 to 1984, during which time sector studies and assessment reports were completed for more than 100 developing countries, as a basis for sector planning. These sector analyses have been of crucial importance in planning for the IDWSSD.

In the preparation phase for the launch of the IDWSSD, WHO promoted activities in support of the Decade, guided by an inter-agency steering committee now including eleven UN agencies. As part of the Decade monitoring, WHO has collected statistics on rural and urban water supply and sanitation coverages from most developing countries, for 1980 (the start of the IDWSSD) and 1983, and is producing comprehensive reports on the progress achieved and the constraints encountered in pursuing the Decade's goals.

Prospects for the International Drinking Water Supply and Sanitation Decade were reviewed by the World Health Assembly in May 1986.⁶⁹ A mid-Decade Progress Report by WHO's Director-General stated that no definite global forecast can be made for the end of the Decade in 1990 because of the many variables which come into play most of them with a high degree of uncertainty. Based on monitoring of progress during the first five years of the Decade it was clear however that progress at the mid-point of the Decade was not sufficient. Programmes not only needed acceleration but there was also a need to direct them more to the under-served populations. It was also concluded that in the light of experience in the first five years of implementation, it may be appropriate for some countries to reassess their original targets and adjust them in the light of the situation in 1986. The World Health Assembly recommended that more determined efforts be made during the second half of the Decade and called on Member States to reduce the imbalance in levels and quality of service between the urban and rural areas and between water supply and sanitation.

3. ENVIRONMENTAL POLLUTION CONTROL INCLUDING CHEMICAL SAFETY

3.1 Problems

Under the general heading of Environmental Sanitation, changed in 1961 to Environmental Health, studies and activities on air pollution and water pollution were included as well as on the health effects of exposure of populations to chemicals or other potentially damaging influences including those of ionizing and non-ionizing radiation.

Air pollution hazards began to be recognized in the mid 1950's, but little information was then available about the effects on human health of exposure to low concentrations of pollutants. As knowledge grew and control measures and legislation brought reductions in the particulate pollutants responsible for choking smogs, other problems emerged. Thermal power stations and increasingly complex industrial processes discharged sulphur oxides and other harmful substances into the atmosphere, while automobile exhausts added their contributions of lead, carbon monoxide and nitrogen oxides. Other types of air pollution are a potential additional health hazard, as for example indoor air pollution in developing countries from the burning of biomass in rural dwellings and in developed countries from formaldehyde from urea-based resins.

Water pollution largely parallels air pollution, with the growing complexity of industrial discharges into rivers and waste tipped on landfill sites presenting a continual challenge to those charged with the protection of drinking water supplies or recreational amenities.

Medical research races to keep up, while health administrators struggle to deal with potential health risks, often without solid evidence. In recent years, concern has been growing about long-term carcinogenic, teratogenic and mutagenic effects of exposure to some pollutants, adding to pressures for bans or strict controls until a medical all-clear can be given. Physical factors such as radiation and noise have also provoked concern. The expanding use of radiation in industry and at home, coupled with its potential genetic effects, have emphasized the need to monitor human exposure and restrict that exposure to a minimum.

Developing countries can learn from the experiences of the industrial nations, but to do so they will first have to have the necessary administrative structures and qualified personnel, which again means not only competent environmental protection services but also strong and influential environmental health departments in the national health agencies.

3.2 Recommendations

WHO's first Expert Committee on Air Pollution met in 1957⁵ and found a disturbing lack of knowledge about the effects on human health of pollutants known to be increasing in the atmosphere in many countries. It stressed the need for global research on health effects, on the capacity of the atmosphere to decrease pollutant concentrations by dispersion, on methods of greatly reducing the amount of pollutants discharged from special industrial

processes, and on the use of indigenous plants or other biological entities as indicators of air pollutants. In the less developed countries, emphasis was to be placed on baseline surveys. The Committee saw air pollution control as the responsibility of public health authorities, with assistance from an advisory council of industrial executives, scientists, engineers and public health officials. It asked WHO to help governments in drafting appropriate air pollution control legislation.

An alarming rise in concentrations of sulphur oxides in the air of many industrial cities prompted an urgent call from the Expert Committee on Atmospheric Pollutants in 1963⁸ for an international approach to the problem, especially in view of the increasing use of fuel oils of high sulphur content. Even though studies prior to 1968 had indicated no evidence that lead in exhaust gases produced adverse health effects, the Expert Committee on Urban Air Pollution, reporting in 1969¹⁷ was concerned about vehicle exhaust products as one of many contributors to urban pollution. The Committee specifically suggested that a watch should be kept for possible long-term effects of lead. It also warned that research should begin on possible health effects of photochemically produced oxidants, polycyclic hydrocarbons, and particulate emissions from diesel and petrol engines, some of which were known to produce skin cancer in animals.

Both the 1963 and the 1969 committees saw air quality criteria and guides as important early steps towards the adoption of standards. Though health aspects should be paramount, the committees recognized that economic factors and technical feasibility of control measures had to influence standards. They recommended that temporary standards be adopted ahead of scientific evidence, to be modified as evidence became available later. That meant that governments should not write standards into control legislation, but should incorporate them into regulations which could be amended without further reference to the legislature.

Water pollution was one of the first subjects for study by WHO's Regional Office for Europe (EURO), established in 1952, and by 1958 two of EURO's annual Seminars for Sanitary Engineers had been devoted to the subject.

In 1964, two Expert Committees - one on Environmental Health Aspects of Metropolitan Planning and Development¹⁰ and the other on Environmental Change and Resulting Impacts on Health⁹ - pointed to the major public health problem caused by discharge into water courses of increasing amounts of pesticides, detergents and toxic and non-degradable chemical pollutants. Their recommendation that WHO should collect and disseminate information on latest developments in sewage and industrial waste treatment led to the convening in April 1965 of the first Expert Committee on Water Pollution.¹¹

The Committee aimed most of its recommendations at governments of developed and developing countries. Having discussed assessment of river and effluent quality as a prerequisite for water pollution control policy and legislation, the experts pointed out limitations in the classification of rivers according to their quality and uses. Laws, they said, should be realistic and practical, recognizing that in a world rapidly becoming urbanized and industrialized it is not possible to preserve rivers in their natural condition. Control of pollution should be the aim. The trend towards

a single authority for each river basin, or for several basins, was seen as rational, and the Committee recommended that such authorities should include representatives of all involved interests - public health, water supply, industry, agriculture, fisheries, transport, recreation, and waste disposal - with public health being seen as of prime importance. The same recommendation was extended to international rivers, by implication calling for coordination of different government agencies across international boundaries. Finally, the Committee identified some 24 research topics and urged for a transmission of technical information to areas of need and communication of research results to practitioners as quickly as possible.

In 1967, the Expert Committee on Water Pollution Control in Developing Countries¹⁵ reiterated the 1965 committee's recommendations and also urged public health organizations at the international, national and local level to play a leading role in the development and operation of water pollution control programmes and, where necessary, to supply personnel and facilities for such programmes. It called on WHO to investigate ways in which member countries could be assisted in developing laboratories and training institutions and in improving services for information retrieval. In particular, a resolution of the World Health Assembly in 1972⁵⁹ provided the basis for monitoring of water pollution.

Resolutions of the World Health Assembly^{48,49,50,51,52,53} and of the Executive Board have indicated the health responsibilities in the protection from radiation hazards.

Covering Environmental Pollution in general, the 1973 Expert Committee on Health Aspects of Environmental Pollution Control: Planning and Implementation of National Programmes²⁸ produced advice and guidelines for governments on risk/benefit analysis, standards and guidelines, monitoring and surveillance, and on legislation, planning, institutional arrangements, coordination, evaluation and resources. The Committee also noted the desirability to test all important chemicals for chronic toxicity, before they are introduced on the market, while recognizing the difficulty of achieving such an objective with the complexities of modern international trade.

When the Expert Committee on Environmental Pollution Control in Relation to Development³¹ met in 1983, most developing countries faced a deteriorating economic situation and acute balance of payments problems. The Committee found that financial constraints were restricting allocation of resources to the health and environmental sectors and leading to reduced consideration of environmental impact when promoting desired development. It warned that early consideration must be given to environmental hazards if health problems were to be avoided, and listed ways in which WHO could provide assistance to Member States.

The UN Conference on the Human Environment in Stockholm in 1972, among other things, brought chemical pollution into sharp focus. Involving all the developing countries at once, the Conference recommended programmes for early warning and prevention of deleterious effects of chemicals, singly or in combination, including effects from exposure through food, water and air. Shortly afterwards, the WHO Expert Committee on Health Aspects of Environmental Pollution Control²⁸ identified topics for international research among which the following may be cited as examples:

- (a) The health effects of long-term low-level exposure to environmental pollutants, including carcinogenesis, teratogenesis and mutagenesis.
- (b) The synergistic effects of pollutants.
- (c) The potential effects of pollutants (particularly chemical) on immunological defence mechanisms, including the possible consequence of greater susceptibility to bacterial and viral infection.
- (d) The metabolism of pollutants, including absorption, accumulation, and bio-transformation; identification of target tissues; detoxification and enhancement of toxicity through metabolic processes.
- (e) Epidemiological studies of vulnerable groups in the population.
- (f) The transport, dispersion and environmental reactions of pollutants.
- (g) The effects of pollutants on ecosystems.
- (h) Control technology for gaseous air pollutants; advanced wastewater and raw water treatment and procedures for closed-circuit systems and reuse of wastewater; low-cost methods for environmental pollution control.

On the subject of chemical safety, World Health Assembly resolutions in 1977⁸³ and 1978⁸⁴ emphasized the need for long-term strategies to evaluate health effects of chemicals in food and in the environment and to improve control of toxic and hazardous chemicals through international cooperation. In addition, they called on WHO to provide rapid and effective response in emergencies, and to arrange for mutual assistance between Member States in such events. Subsequently again, in 1979, 1983 and 1985, the governing bodies of WHO came to the conclusion that an International Programme on Chemical Safety was needed and that particular attention be given to both short term and long-term priority needs of all countries in chemical safety and to measures by which the Organization can cooperate with the governments emphasizing the development of manpower and institutional capacity.

3.3 Actions

Once the 1957 Expert Committee on Air Pollution had identified the research and development needs, studies intensified and several expert committees and scientific groups were convened^{8,16,17}. In the 1960's considerable progress was made in developing and testing suitable methods for monitoring air pollution, and many countries achieved dramatic reductions in particulate pollutants (dustfall, smoke density).

The 1965 Expert Committee on Water Pollution generated plenty of research activity, and has yielded positive results in a number of fields. WHO has been able to disseminate technical information for example on: the possible correlation between bathing in polluted waters and incidence of disease; survival rates of pathogenic micro-organisms in seawater, and the validity of coliform and streptococci tests for determining seawater quality; and the possible value of indicator organisms such as coliforms and streptococci in the assessment of water quality in relation to enterovirus contamination.

WHO's long-term programme in the environmental pollution field during the last 15 years has been conditioned by a resolution of the World Health Assembly in 1971, which, among other things, called upon the Director-General:

- (a)
- (b) to establish and to promote international agreement on criteria, guides and codes of practice with respect to known environmental influences on health, with particular emphasis on occupational exposure, and water, food, air and waste, and to obtain further information on levels and trends of these;
- (c) to stimulate the development and coordination of epidemiological health surveillance by methods including environmental monitoring systems, in collaboration with other national and international efforts, in order to provide basic information on actual and suspected adverse effects on human health attributable to the environment; and
- (d) to extend the knowledge of effects of environmental factors on human health by collection and dissemination of information, stimulation, support and coordination of research, and assistance in the training of personnel".⁷⁴

Expert Committees and Scientific Groups resulting from this resolution^{22,28} provided the scientific advice and recommendations which have been implemented by WHO, while other meetings^{23,25,27,29-35} were held to study and advise WHO and Member States on specific problems.

In response to the Expert Committee's recommendations and World Health Assembly requests, WHO has cooperated with UNEP and with a number of collaborating institutions and individual experts around the world to publish and distribute a large number of criteria documents evaluating the risk posed by chemicals and physical factors to health and the environment. Also, following adoption of a resolution of the World Health Assembly⁷⁵ in 1973, cooperation with UNEP and Member States was strengthened and the Organization has assisted in setting up, coordinating and strengthening programmes for the monitoring and surveillance of pollutants (including emission surveys and inventories) in different environmental media as part of the Global Environment Monitoring System (GEMS).

From the Director-General's reports to the World Health Assembly since 1971 on the Organization's Human Health and Environment Programme, the steady application of the recommendations of the expert committees and scientific groups can be observed. Many environmental health criteria documents have been published, as have proposals for better methods for the testing of chemicals and the evaluation of the health risks involved, other work related to the epidemiological aspects of housing and its environment²⁷; considerations of human ecology and environmental health; pesticide residues²⁵, food additives (jointly with FAO)³⁴, and air quality criteria and guides.²²

WHO has promoted international agreement on criteria, guides and codes of practice in ionizing and non-ionizing radiation, and has published joint documents with the International Atomic Energy Agency (IAEA) and with the UN Environment Programme (UNEP). The assessment of environmental radiation hazards has been made possible by the maintenance of a global monitoring network. Following the Chernobyl accident, WHO published guidance on the levels of radionuclides in food, expanded its network of collaborating centres for medical emergency assistance following over-exposure and began to integrate the work of the global monitoring network with that of IAEA and WMO to ensure rapid dissemination of data following an accident.

In response to the 1977 and 1978 WHA resolutions on chemical safety^{82,83}, and following consultation with Member States and other international organizations, an international cooperative programme (the International Programme on Chemical Safety - IPCS) was initiated in 1980. It involves a network of national institutions engaged in coordinated scientific research on chemical safety and has as its priorities: evaluations of the risk to human health and the environment from exposure to chemicals, mixtures of chemicals or combinations of chemicals and physical and biological agents; development, improvement and validation of methods for laboratory testing and ecological and epidemiological studies and other methods suitable for the evaluation of health and environmental risks and hazards from chemicals; technical cooperation with Member States, in particular developing countries; promotion of effective international cooperation with respect to emergencies and accidents involving chemicals; support to national programmes for prevention and treatment of poisonings involving chemicals; and training of the required manpower. The programme is a cooperative effort of WHO, the International Labour Office and the United Nations Environment Programme, and is located in WHO.

The work of the International Programme on Chemical Safety has been expanding rapidly. Besides mandates and guidance received from the WHO governing bodies and those of the other participating agencies, a special Programme Advisory Committee reviews progress and advises on future direction. One conclusion which emerged in this process was that problems of chemical safety are not related to the industrial countries alone, as is often said, but essentially to all countries. In developing countries specifically it was found that manpower and institutional capacity are still inadequate. The programme has accepted the challenge: in addition to the health risk evaluation of potentially toxic chemicals and the development of methodologies for the testing of chemicals and for the evaluation of risks, the programme is now promoting the study of populations at specific risk from chemicals.

4. PUBLIC HEALTH ASPECTS OF HOUSING AND URBAN DEVELOPMENT

4.1 Problems

It has been, and still is, difficult to measure the relationship between housing and health, though it is generally agreed that hygiene, noise, neighbourhood planning, recreational facilities, and numerous other environmental considerations have a significant effect on people's mental and physical well-being. The lack of a useful measure for health in relation to housing quality which has prompted planners to ignore the subject explains why it has received too scant attention within WHO as well.

The need to develop guidelines and monitoring systems for environmental health aspects of urban and rural town planning remains crucial. Mistakes are easy to find; formulae for success may prove harder to identify.

4.2 Recommendations

Concern over housing hygiene pre-dates WHO. Before the Second World War, the Housing Commission of the League of Nations launched an active programme, which included study of the thermal environment of housing, natural and artificial lighting, indoor air pollution, water supply, and the collection and treatment of domestic wastes. "Housing" and "Town Planning" were specifically cited in WHO's Constitution as elements of "Environmental Hygiene".

The first World Health Assembly (1948) called for the inclusion of housing and town planning in future programmes, and WHO's Executive Board recommended "the establishment of a small panel of experts in the hygiene of housing". But with the early priority on rural sanitation, it was some time before the Organization looked more seriously at the health aspects of housing.

An Expert Committee on the Public Health Aspects of Housing was convened in June 1961. It firmly laid at the door of public health agencies a responsibility to be concerned with the problems of the residential environment, "as it is within this environment that many persons receive the greatest exposure to hazards to health and safety."⁷ The committee identified basic requirements for a healthful residential environment and listed suggestions addressed to governments on the physiological, social and physical problems of housing. It also considered the special requirements of rural housing and of housing for the elderly and the handicapped. Twenty-four specific subjects for study and research were listed, including epidemiological aspects, social and family problems and a variety of technical issues.

Four more working groups grew from the 1961 recommendations. An Expert Committee on Environmental Health Aspects of Metropolitan Planning and Development¹⁰ met in 1964; one on the Appraisal of the Hygienic Quality of Housing and its Environment¹² in 1966; in 1971 a Scientific Group took up the Development of Environmental Health Criteria for Urban Planning;²³ and in 1972 an Expert Committee advised on Uses of Epidemiology in Housing Programmes and in Planning Human Settlements.²⁷ Their recommendations stressed the direct participation of public health executives from the very beginning in the formulation of all large development schemes, such as new towns, housing projects or industrial developments. They also sought to promote appraisal of the hygienic quality of housing, as a means of stimulating and activating improved housing programmes, and presented a simple and practical guide for health agencies to implement appraisals.

The 1971 group²³ recommended that specific environmental health criteria should be developed for, among other things, urban climatology, physiological and mental effects of noise, siting of airports and of recreational facilities, and planning of neighbourhoods. It urged active cooperation between health and housing agencies and saw it as most desirable that ministries or departments of health should have direct responsibility for rural housing programmes in areas where communicable disease is inadequately controlled.

These committees suggested further that research be undertaken on such problems as: the epidemiological monitoring of health and prevalence of disease among migrant populations and residents of transitional urban settlements; the establishment of indices for measuring physical, mental and social well being among re-housed urban and rural populations; effects of crowding and its associated psychosomatic disturbances of family life, on health and the prevalence of disease; and the immediate and long-term effects of physical changes in the quality of indoor air, such as those produced by ionizing or air-conditioning. They also saw the need for an annotated bibliography of reference on housing and health, and to undertake a multi-disciplinary investigation on the relationship between housing and its immediate environment, the socio-economic conditions of the occupants, and the resulting effects on their psychological well-being and the causes of mental illness.

4.3 Actions

While these committees have provided a wealth of advice and documentation on the problems and practical solutions in the housing/health field, few of their recommendations have been translated into actual country programmes. Following the 1961 committee, WHO carried out a number of regional surveys and interregional seminars, and contributed to the work of the UN Economic Commissions for Africa and for Europe and in the programmes of the UN's Housing, Building and Planning Division. Two Public Health Papers were published, No 25 (1964) and No 33 (1968).

Some of the research enumerated was undertaken in cooperating with national and regional research centres. Some of the problems identified featured in WHO's contributions to the UN Conference on Human Settlements in Vancouver, Canada, in 1976, and in the Technical Discussions on the subject by the 29th World Health Assembly in the same year. In fact, in 1976, the World Health Assembly took note of the unprecedented growth rate of population, of the surge of rural populations into urban areas, and of the continued lack of tangible improvements in rural areas, particularly in developing countries. It emphasized "the vital need to take into consideration health and environmental aspects in the planning and development of human settlements, using a comprehensive and multidisciplinary approach"⁸¹, and it issued a number of specific recommendations addressed to governments and WHO. WHO published Public Health Paper No 66 on Health Aspects of Human Settlements and an annotated bibliography on Housing, the Housing Environment, and Health (Offset Publication No 27).

The aspirations of the Organization's work in housing and urban development were voiced by Dr H. Mahler, then Assistant Director-General, when he opened in 1972 the meeting of the Expert Committee on the Uses of Epidemiology in Housing Programmes.³⁷ Dr Mahler expressed the hope "that the Report of the present Expert Committee would be valuable in guiding WHO's participation in the (then) proposed international research programme and, most importantly, in helping Member States with the development of new imaginative housing policies and programmes". Regrettably during the period 1976 to 1984 only a limited number of activities were carried out by the Organization in public health aspects of housing and urban development.

Beginning in the 7th General Programme of Work (1984-1989) a new programme was established dealing with Environmental Health in Rural and Urban Development and Housing (RUD). The objective of RUD is to promote human health through measures to improve living conditions recognizing the reciprocal relationship among better living conditions, improved health, increased productivity and viable socioeconomic development. Efforts are directed at preparing sound principles for environmental health as they relate to rural and urban development and housing in countries at different stages of socioeconomic development and also on promoting a better understanding in other governmental sectors of environmental health factors and the impact on people's health and psycho-social wellbeing of housing conditions and of specific environmental factors such as noise, air quality and the disposal of solid wastes. In cooperation with the United Nations Environment Programme (UNEP) RUD has produced a series of guideline and information documents on aspects of housing and urban planning.^{101,102,103,104,105,106,107} An interregional consultation "Housing - the Implications for Health" was convened in 1987¹⁰⁸ which developed and recommended for promotion, "Health Principles of Housing".¹⁰⁹ The Organization made a substantial contribution to the United Nations sponsored "International Year of Shelter for the Homeless" (1987). The World Health Assembly⁸² noted the positive influence that adequate shelter has on the health of individuals and urged Member States to promote human health through the improvement of living conditions and to increase their support for international agencies and nongovernmental organizations involved with shelter and health issues. It also requested the Regional Committees to initiate the establishment of research groups to study the improvements of health conditions that result from adequate housing and the Director-General to maintain and strengthen collaboration with relevant organizations and agencies. A report¹¹⁰ on WHO's contribution to the IYSH was prepared. The Organization will be participating with other international agencies in support to Member States in carrying out the Global Strategy for Shelter to the Year 2000 which has resulted from greater awareness of the deficiencies as well as the opportunities for improved shelter produced by the International Year of Shelter for the Homeless.

Global concerns about massive and severe environmental deficiencies associated with shelter and urbanization and the important and pervasive impact on health are being increasingly voiced among involved national and international agencies. WHO is, and will be, compelled to make an increasing contribution to the collective action of Member States and supporting agencies in respect of the public health aspects of housing and urban development.

5. FOOD SAFETY

5.1 Problems

As early as 1955, WHO took note of the importance of foodborne diseases and convened an Expert Committee⁴ to advise on the problem. However, this work did not gather support for many years. The ubiquitous nature of the problem had made it less visible than the more dramatic but less globally significant outbreaks of certain diseases, which have received greater attention and resources than food safety. In 1980 alone there were more than 1000 million cases of acute diarrhoea in children under 5 years of age in the developing world. Of these 5 million children died. Unsafe food is a major contribution to this tragedy. When one adds to this total other foodborne diseases such as botulism, typhoid fever, and parasitism, as well as the chronic effects of chemical contamination of foods, the number of people affected and the impact of food contamination on health, social and economic well-being are appalling.³⁰

5.2 Recommendations

The Expert Committee on Food Hygiene⁴ recommended in 1955 that, as an important step, governments move on with the establishment of suitable organizational structures and operating procedures in food hygiene*, the dissemination of technical information, and the stimulation of international action. Recently (1983), a committee on the role of food safety* in health and development³⁰ again called, among other things, for the strengthening of national food control infrastructures with a view to effective implementation of food legislation and regulations, and for the set-up of an efficient system for coordination and collaboration among responsible ministries and other authorities concerned. It also considered the integration of food safety into the PHC-delivery system as essential. These recommendations reflect the views of the World Health Assembly, in particular in 1978⁷¹ and the Executive Board, in particular in 1985. The role of the Joint FAO/WHO Food Standards Programme, implemented by the Codex Alimentarius Commission, in health promotion and disease prevention was reviewed by the World Health Assembly in 1987 which passed a resolution⁷² to this effect.

5.3 Actions

In the past 40 years, specific commodities were studied and suggestions made as regards meat (1961), milk (1969), fish and shellfish (1973), and on specific subjects such as food microbiology (1967, 1976, 1982 and 1988), food irradiation (1964, 1969, 1976 and 1980), food additives (yearly since 1956), on pesticide residues (yearly since 1961) and on veterinary drug residues (1987). In 1987, a Consultation on Health Education in Food Safety was convened. Some of the Organization's Regional Offices also convened consultation groups and have formulated plans of action. To support the work of authorities in the development of food safety, a document "Guiding Principles on Evaluation of Programmes to Ensure Food Safety" was also issued, which provides information, suggestions and possible methodology whereby (i) progress in such programmes may be measured and (ii) resource utilization may be maximized. Several publications and documents have also been issued.

* The terms food hygiene and food safety are considered synonymous and are defined as all conditions and measures that are necessary during the production, processing, storage, distribution, and preparation of food to ensure that it is safe, sound, wholesome, and fit for human consumption.

Yet in spite of this effort, reported cases of foodborne illness continues to increase in the world. The reasons for this are not fully understood, but are certainly associated with the relatively fragmented nature of the programmes, the difficulties in convincing national governments of the importance of the problem, and, most significantly, the lack of recognition that solutions require coordinated approaches calling for a wide range of skills, including those practised in economics, sociology, and anthropology, as well as in the more traditional disciplines associated with food safety. It is therefore evident that international organizations must continue to intensify their efforts to cooperate with Member countries in promoting food safety, taking into consideration their particular public health needs, difficulties and constraints.³⁰

6. HUMAN RESOURCES FOR ENVIRONMENTAL HEALTH

6.1 Problems

Almost every one of WHO's advisory mechanisms has made recommendations on the need for training or manpower development. The developing countries themselves see the acute shortage of professional and technical personnel as a major handicap to progress in environmental health. But even where countries have followed the advice and established strong environmental health units within their health administration, lack of suitable staff seriously restricts their effectiveness. In many countries, the capacity for education and training of the professional and technical institutional is not sufficient to meet the extra manpower needs created by the increase in population and technological progress.

The Expert Committee on Environmental Sanitation summed up the problem as early as 1952, when in its second report² it pointed to: "the common fallacy that environmental services in the developing countries can be planned and executed by persons having little or no skill. Countries of minimum resources are most in need of the highest expert service available, both for the diagnosis of need and for planning of solutions. The relegation of these functions to less-adequately prepared persons results from a great misunderstanding of the complexity of the problems in environmental sanitation encountered in areas of low economic level. These problems require for their solution the impact of high intelligence, training and experience, even when the number of persons possessing such qualifications is necessarily a minimum. It is unsound practice literally to send a boy to do a man's job".

Time after time, it was pointed out that planning, management, design and implementation of environmental health activities call for a blend of specialist skills; it is not enough to fill all health posts with medically qualified people, or with those with any other single scientific qualification. The need is for enough people educated and trained in the broad disciplines of environmental health¹⁴, and that requirement is just as true for WHO itself as it is for the governments it seeks to advise.

6.2 Recommendations

As will be clear from the last few paragraphs, there has been no shortage of recommendations about training, education and recruitment of environmental health specialists. Each specialist committee identified its own needs alongside the general plea for more and more education and training.

Two committees dealt exclusively with manpower development, the first in 1952² and the second in 1967.¹⁴ The first, whose powerfully expressed views on the problems were quoted above, pleaded for development of sanitary engineering, alongside other professional disciplines needed for the study and planning of environmental sanitation programmes, to find simple and economic sanitary methods for field applications. Fifteen years later, following the shift in emphasis from environmental sanitation to environmental health, the Expert Committee on the Education of Engineers in Environmental Health looked for revision to the training programmes for what it then described as "the traditional type of sanitary (public health) engineer". The committee saw the "environmental health engineer" of the future as a "good steward" of the environment and proposed that he should be well grounded in the humanities and in social sciences.

Where educational programmes were established, the committee warned that WHO and other sponsors should not assume that governments would be able to take over and run them unaided after a few years of operation. Experience had shown that many years of continuous technical assistance were needed to bring programmes into national university administrative and budgetary structures and before counterpart professors could be trained and laboratories established.

Several expert committees recommended that WHO should produce and disseminate technical material such as manuals, criteria documents and guidelines for use in teaching as well as laboratory and field practice of environmental health.^{1,3,5,15,18,19,28,31}

New needs were identified in 1969, during assessment of the 17-year joint UNICEF/WHO rural water supply programme: "The rural water supply and sanitation programmes in most developing countries involve thousands of small schemes. It is not likely that any country will have enough professional engineers to handle the problem. The tasks are simple enough, however, to be handled by a specially trained corps of sanitarians or sanitary inspectors working under the general supervision of sanitary engineers".⁹⁸

6.3 Actions

In its first 25 years, WHO joined with other international organizations such as UNESCO and bilateral agencies like USAID in carrying out a substantial programme of technical assistance for education and training of environmental health personnel in all regions. Many fellowships were sponsored; educational institutions and training courses were started or strengthened; others were expanded by providing short-term advisory services, teaching staff, laboratory equipment and supplies, and even, in a few instances, transport to facilitate students' field practice.

Sometimes, as the 1967 Expert Committee pointed out, the assistance finished too soon and some of the 1950's education and training projects have since foundered, or have only a nominal existence now. In many cases, however, developing countries are reaping the benefits of well-established environmental health education programmes.

During the past decade, shifts of programme emphasis have curtailed activities in the field of environmental health manpower development, even though the needs themselves are clearly rising. Plans announced by the Director-General in 1971 envisaged four new centres for the training of environmental health personnel, modelled on the Sanitary Engineer Centre of the Mohammadia Engineering School in Rabat, Morocco, set up by WHO in cooperation with the government of Morocco. Within five years, the aim was to create two institutions for graduate and undergraduate studies in environmental health, sanitary engineering, environmental biology and chemistry, and ecology. One institution would train auxiliary environmental health personnel and another would train personnel at all levels for community water supply and waste disposal. The centres would be built around existing training facilities and WHO would extend its cooperation for five to eight years and include development of curricula, teaching staff, equipment and supplies and fellowships. Unfortunately, none of these centres has yet come into being.

WHO has heeded the recommendations on dissemination of literature for use as teaching aids, particularly during the past decade. Some subject areas have not yet been covered, however, and there has been a slow down in the production of French and Arabic text books for the education of sanitary engineers and scientists.

Experience with community water supply programmes during the past decade confirmed the earlier UNICEF/WHO conclusion that it was necessary to distinguish between sanitarians trained to work with engineers and those trained to work with medical staff. In its extensive rural water supply and sanitation activities, countries with the help of UNICEF have not relied exclusively on the contribution of health department sanitarians, but have trained water supply technicians and skilled workers for projects which remain public health activities. The question of the role of health administrations in the training of such technicians is one for future consideration.

Development of institutions and human resources in developing countries has been identified as one of WHO's major potential contributions to the International Drinking Water Supply and Sanitation Decade (IDWSSD). Much material has been produced to assist the countries in their own training and education efforts, and the Organization is providing comprehensive advice and assistance on a continuing basis.

7. PROMOTION OF RESEARCH

7.1 Problems

Four of the first five reports of the Expert Committee on Environmental Sanitation^{1,3,4,5} called attention to various problems requiring research. In its first report, the Expert Committee expressed the view that "many technical problems in sanitation remain unsolved, or else the solutions applied in the western world are inapplicable to other sectors of the world. Both laboratory and field studies in many parts of the world, on problems peculiar to such areas, should be stimulated". An example is the disposal of human excreta in scattered rural areas and newer and cheaper procedures for the disinfection of water, for the pasteurization of milk, and for rodent control as subjects requiring research. The third report³ (1954) dealt with rural sanitation, and stressed the need for research, investigation and technical development on environmental sanitation problems confronting developing countries, pointing out that "no other area of activity provides the possibility for such large returns in terms of the investment required, and that, in the early stages of their development, underdeveloped areas do not have the highly trained staff needed to cope with the research type of problem. In the field of technology, it is important not to copy slavishly existing practice, but to investigate the possibility of new techniques suited to the local circumstances; this requires imagination, an appreciation of the problems, and a concentration of effort". It was said that research is needed in association with an operating programme, intended to make objective measurements of the effects of environmental sanitation on the physical, social, and economic well-being of the population". On the subject of food hygiene⁴, the committee recommended that "new research aimed at developing more efficient and more effective technical methods should be initiated, as for example the preservation of food by its exposure to ionizing radiation". In the fifth report⁵, eight specific suggestions were listed for research into air pollution, in particular on the effects of air pollutants on human health.

Much of this did not fit into the environmental sanitation objective and programmes at that time, nor into WHO's initial plans formulated in 1958-59 for medical research. The only topic considered at that time dealt with research into the development of new insecticides, a subject which was closely related with the Organization's priority for malaria control. An early opportunity had been lost for the active promotion of much-needed research into key environmental health problems.

Valuable suggestions for health systems research, e.g. into the institutional and community factors involved in linking water supply and sanitation to aspects of Primary Health Care, have been made recently by the Director-General in a document on water supply and sanitation in relation to primary health care in 1984.¹⁰⁰ This type of research would greatly help the rational development and the strengthening of environmental health services in governments' health and other administrations concerned.

7.2 Actions

The drawback above cited did not prevent succeeding committees to persist in their calls and suggestions for environmental health research.^{7,31} These calls were heeded in 1968 by the Regional Office for the Americas/Pan-American Health Organization (AMRO/PAHO) which, in collaboration with the Inter-American Association of Sanitary Engineering (AIDIS), established a Pan-American Centre for Sanitary Engineering and Environmental Sciences (CEPIS) at Lima, Peru. The Centre's numerous research activities have covered, since, a broad variety of problems faced by many developing countries in the Americas. Promotion of research is also a part of the objectives and functions of similar centres established in 1979 by the Regional Office for the Western Pacific in Kuala Lumpur, Malaysia, and in 1985 by the Regional Office for the Eastern Mediterranean in Amman, Jordan.

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