

THE RELEVANCE OF ENVIRONMENTAL HEALTH

TO

A.I.D. OBJECTIVES

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This staff paper by the TAB Office of Health reviews in brief the most prevalent environmental health problems of the LDC's, and explains their potential relationships with A.I.D. sectoral program areas and objectives. Evidence is presented to show that failure to recognize and resolve such problems could obstruct the attainment of A.I.D. objectives. Suggestions are offered for actions that would assist in countering such obstacles.

The definition of environmental health has been deliberately limited to consideration of the traditional facilities and conditions that are associated with lack of development. Problems stemming from urbanization and industrialization, as encountered in the more developed countries, are not treated in depth since they are not of primary concern to the masses of people in the LDC's who seek a better quality of life outside the urban centers.

There are numerous economic and sociological obstacles to the correction of basic environmental health deficiencies, but technology is available to proceed without delay in satisfying the essential needs. In the meantime, there is need for research and investigation in such areas as: (a) cost-effectiveness of environmental health programs; (b) indicators for measuring the impact of environmental health improvements on development; (c) obstacles to the acceptance of environmental health improvements, etc. Answers to such questions could facilitate progress toward the attainment of A.I.D. objectives.

THE RELEVANCE OF ENVIRONMENTAL HEALTH TO A.I.D. OBJECTIVES

I. The "Practical" Environment of Man in the Developing World

The typical rural family of the less developed countries receiving A.I.D. assistance does not share the industrialized nations' concern with the broad spectrum of environmental deficiencies. The people are preoccupied with problems of subsistence under primitive conditions of poverty, malnutrition, illiteracy, overcrowded and crudely built shelters shared with animals and insects; with arduous daily trips for drinking water, bathing and laundry; debilitating disease and parasites that kill as many as one-half their children before age 5 and sap the energy of survivors; health care facilities that are limited and remote, if available at all; and no provision for excreta and other waste disposal.

The UN Economic Commission for Africa (ECA) described the situation as follows (1): "The rural areas of Africa, where most of the population live, have inadequate agricultural infrastructure, they lack proper water supplies for human and animal consumption and people have to walk several miles per day in search of water; the level of nutrition is low, both in quality and quantity---. Health facilities are meager as shown by acute shortage of doctors and supporting staff as well as hospitals and dispensaries."

Hughes and Hunter, in their study of disease and development in Africa (2), quoted Thomas (3): "---(man) is more heavily parasitized in the African continent than in any other part of the world--- (There) are on the average two infections per man. Schistosomiasis is the dominant form, affecting nearly half the population."

The IDC rural families who migrate to urban centers in search of jobs and a better quality of life too frequently find their new environment more antagonistic than the conditions they sought to escape. As reported by Dr. B. R. Seshachar, President of the Indian National Science Academy (4), the urban settlements of developing countries like India are faced with overcrowding, accumulations of refuse, lack of adequate water supply, pollution on an intensified scale and breakdown of services.

The populous squatter settlements common to the larger cities in developing countries actually present more serious threats to health and well-being than the rural poverty that drives so many to the cities and which accounts for much of the urban growth rates of 4 or 5 percent a year.

The urban migrant environment in Africa is described by the ECA as follows (5): "This depressed rural environment has led to an exodus of the rural folk into urban centres which have, in turn, found themselves unable to cope with masses of people who migrate in search of work. Housing construction has not kept pace with this

increase in urban population, resulting in overcrowded rooms; construction of slums both in urban and peri-urban areas; overstretched eager water supplies; congested sewage facilities and/or lack of them altogether; alienation and loss of identity; juvenile delinquency and all the social ills associated with these poor living conditions like congested transport systems; discharge of human waste into lagoons and rivers. All this is aggravated by rapid rise in overall population which African countries have been experiencing."

It is recognized that the bulk of the world's population is still faced with basic environmental problems, largely of microbiological nature. Dr. Howard (6) has shown that "infectious diseases and parasite infestations, either separately or in combination with malnutrition, affect the well-being of developing populations on the order of fifty to ninety percent." Progress in environmental sanitation has not expanded on a sufficient scale to cover more than 10-15 percent of the developing population. Basic environmental health measures that have been shown to be effective in combatting many of the most prevalent communicable diseases are needed to overcome those conditions in the LDC's that contribute to the high rates of infant mortality, lowered production capacity, school absenteeism and drop-outs, and poverty due to such common communicable diseases as diarrhoea and enteritis, dysenteries, cholera, schistosomiasis, onchocerciasis, malaria, filariasis, trachoma, tuberculosis and others. The communicable diseases also account for as many as

one-half of all hospital admissions. Among the environmental health problems commonly found in the "practical" environment of man in the LDC's are the following:

1. Lack of potable water supply for drinking, personal hygiene and household use. According to Dieterich and Henderson (7) less than 10 percent of the population of 75 developing countries were supplied with piped water in their homes in 1962, and it was estimated that at least 70% of these populations had no access to piped water at all within reasonable distances.

One serious consequence of growing importance is the resort to natural bodies of water, stock ponds and irrigation ditches for bathing, laundry and household water, thus contributing directly to the transmission of schistosomiasis. In this manner development measures are involved in the spread of disabling illness that is currently estimated to affect 180 to 200 million persons.

As stated by Dr. Howard (8), while extended irrigation systems make possible greater production for development, the people do not gain in well-being or quality of life since their health is chronically impaired, even though their death rate may not be substantially increased.

2. Lack of provisions for sanitary disposal of human wastes, with resulting soil pollution (hookworm), contamination of water sources (cholera, typhoid, schistosomiasis, enteric infections, etc.), polluted drainage ditches (filariasis, malaria).

3. Inadequate (if any) facilities for sanitary disposal of garbage and refuse, accounting for the breeding, harborage and feeding of insect and rodent vectors of disease.

4. Inadequate, overcrowding and unhygienic housing. These conditions are deplorable in the urban fringe squatter settlements, and contribute to the high incidence of tuberculosis, enteric diseases and infant mortality.

5. Prevalence of insect, rodent and other disease vectors, attracted by insanitary practices of waste and refuse disposal.

6. Urbanization, with inadequate sanitation services, overcrowding, pollution, lack of recreational facilities and many other problems.

Dr. René Dubos offers this forecast (9): "It can be taken for granted that industrialization and urbanization will soon become almost universal human phenomena. In view of the speed at which social and technologic changes occur, many of the environmental stresses that plague the affluent countries today are likely to spread to the rest of the world in the near future. In this regard, it is hardly an exaggeration to state that the future begins today even in the least developed countries. Wherever a new industry is established, there will soon be pollution of the water and the air, occupational dangers for the workers and their families, changes in nutritional habits and in other social practices, emotional upsets arising from unfamiliar working conditions and from disruption of ancestral customs.

Unless carefully watched and controlled, these disturbances will add their deleterious effects to those of malnutrition, tuberculosis, malaria, schistosomiasis, etc., and will create new kinds of physiological misery in the areas of the world undergoing industrialization."

7. Unhealthy and unsafe working conditions for those fortunate enough to find employments.

The World Health Organization in a 1967 report on the World Health Situation (10) named environmental deficiencies as the most important group of health problems, based upon reports and comments from 147 countries and territories for the period 1961-1964.

In order to develop adequate plans for correcting these problems, factual data and information on the extent and nature of the specific problems and their causes and the resources required for their solution will be needed for each country. A logical approach for obtaining this information would be a comprehensive analysis of the environmental health sector. A recommendation is included in Chapter IV, paragraph 7, that guidelines be developed for carrying out this type of sector analysis.

II. What is Meant by Environmental Health

Environmental health has been broadly defined by an expert committee of the World Health Organization (11) as "--the control, modification, or adaptation of the physical, chemical, and biological

factors of the environment in the interest of man's health, comfort, and social well-being."

Fredericksen (12) has recognized that concepts of environmental health problems differ in relation to the "state of society":

<u>State of Society</u>	<u>Environmental Health Problems</u>	<u>Predominant Patterns of Disease, Mortality, and Fertility</u>
Traditional	Largely rural environment with contamination of water and food; proliferation of insects and rodents; periodic food scarcities.	Endemic infections, parasitisms, infestations, nutritional deficiencies. High death rate and high birth rate.
Early Transitional	Largely rural environment with contamination of water and food; proliferation of insects and rodents; adulteration of foods and drugs; food scarcities.	Endemic infections, parasitisms, infestations, nutritional deficiencies. Intermediate death rate and high birth rate.
Late Transitional	Rural environment still resembles that of traditional society, whereas the urban environment resembles that of modern society.	Endemic diseases prevail at reduced levels in rural areas, whereas the disease patterns of urban areas resemble those of modern society. Low death rate and intermediate birth rate.
Modern	Largely urban environment with pollution of air, water, and food, plus hazards from use of cigarettes, alcohol, food additives, new drugs, and narcotics.	Bronchopulmonary and cardiovascular diseases, malignant neoplasias, mental illness, accidents, obesity, low death rate and low birth rate.

In terms of the "practical" environment of man in the LDC's, we are concerned primarily with the interactions between man and the more traditional factors of the environment which directly affect basic survival and protection against disease and morbidity; in other words,

those conditions that must be overcome to maintain man's health, postpone death and assure some of the minimum comforts and amenities of living (as enumerated in Section I).

As economic development progresses in the LDC's the scope of environmental health problems is expanded. Agricultural and industrial development are likely to introduce new pollutants to the waters, the air and the land, and all too often may contribute to increases in the prevalence of disease.

Sanitary engineers have long been in the forefront of programs to correct the environmental deficiencies that contribute to the spread of enteric, vector-borne and parasitic infections which make up the leading causes of death and disability in the LDC's. The APHA's first establishment of a Section on Sanitary Engineering was in 1911. As Dr. John A. Logan explains (13), it is "the civil and sanitary engineer who pioneered such innovations as water-borne sewerage, municipal water treatment and distribution, sewage treatment, vector control, and air pollution abatement---. The civil engineer has been traditionally public works oriented, the sanitary and public health engineer has been essentially disease oriented."

The sanitary engineer receives his basic education in civil or chemical engineering, supplemented by graduate education in sanitary chemistry and biology, bacteriology, epidemiology, communicable disease control, public health statistics, public health administration, municipal and rural sanitation, hygiene of housing, etc. Specialized

curricula are also offered in Water Quality Control, Air Pollution Control, Solid Waste Management, Occupational Health, Radiological Health and others. More recently the discipline of Environmental Health Engineering has evolved, with the environmental engineer serving as a leading member of the multidisciplinary team of specialists required to cope with today's environmental health problems.

Environmental health engineers are, according to Logan (14), "well-being oriented," and should be "well grounded in the humanities, mathematics, the engineering sciences, and public health, with a sound understanding of their professional responsibilities and able to design and execute environmental control works using a broad system or resource-development approach." Environmental health engineering differs then from sanitary engineering in that adequate provision is made to take into account the economic and social consequences of programs and projects affecting the environment.

Mounting public interest in the quality of man's environment, generated initially in the industrialized countries, is now receiving broad stimulus through the preparations taking place for the U.N. Conference on Problems of the Human Environment, to be held in Stockholm in June, 1972. The agenda for this Conference is so broad and all-embracing, however, that it is unlikely to fully recognize that the focus on man, his health and well-being, is the distinguishing orientation that characterizes environmental health as a fundamental concern of most people.

III. How Environmental Health Problems May Impede the Attainment of A.I.D. Objectives

A.I.D. Administrator Dr. John A. Hannah offers this advice (15):

"The well-being of people is central to the objectives of U.S. foreign assistance. Well-being depends, of course, upon a number of important and closely linked factors. Jobs, education, security, and sense of participation are all vitally important, but none have much significance without basic good health. Today, in the developing countries, progress is being hampered by a failure of many people to understand how to adapt to the world of disease and insecurity in which they live. Health programs, based primarily on transference of Western curative medicine, have not done much to reduce this basic problem. A new focus is needed where health efforts can do the most for the peoples of the poor countries - covering such fields as family planning, nutrition, preventive medicine, and environmental sanitation."

Paul G. Hoffman, long-time Director of the United Nations Development Program, made this observation recently (16): "I also did not fully appreciate, in 1959, the direct relationship between health improvement and economic growth. Healthy people can produce more than they consume. Sick people consume more than they produce. And while major improvements in disease prevention and medical treatment have been realized by the low-income countries, this remains a major problem area,----." "Yet I firmly believe that there is no irreconcilable conflict between development and environmental protection. Quite to the contrary, they can and must be mutually supportive."

A.I.D. support of the modernization objectives of developing countries is, as a practical procedure, focused upon intermediate goals of sectoral development programs, i.e., agriculture, education, nutrition, family planning, health, industry, public administration, etc. The Key Problem Area (KPA) rationale by TAB (17) is an effort to "identify the most pervasive and important impediments to improvement of the well-being of the peoples of the LDC's, given their known wants". The KPA's selected for concentration reflect consideration of mutual support between KPA's and program sectors. It is in this context that environmental health problems merit critical examination --- how they impede program objectives, and what the environmental health activities and services are that could make positive contributions to the attainment of program objectives. Following are some examples of relationships to A.I.D. sectoral programs:

1. Agricultural Development

This sector is fundamental in the LDC's to economic and social development. Health and food production are so closely interrelated as to be interdependent. Adequate nutrition aids in production and resistance to disease, and conversely disease inhibits productivity and nutrition, due partially to food loss and wastage. Environmental health measures that reduce the incidence of endemic disease and prevent increases in disease transmission will contribute to increased productivity, improved nutrition and well-being of the peoples involved.

WHO calls attention (18) to the situation that, "In many tropical and subtropical areas, water development schemes are the key to economic and agricultural development. However, in increasing the number of breeding-sites of insect vectors, in attracting masses of migrant workers from or to infected areas, and in creating new agricultural communities, these projects are contributing to the spread of parasitic disease, particularly the water-related conditions of schistosomiasis and onchocerciasis." The A.I.D.-sponsored symposium on The Future of Schistosomiasis Control at Tulane University in February 1972 (19) submitted these recommendations, among others: "Schistosomiasis control should be a constituent element in the feasibility analysis of any major proposed water resources development scheme in tropical areas," and "Conscious environmental control of schistosomiasis should be an integral part of all water resources development schemes,--", also "Water supply and excreta disposal merit more attention as control measures."

The prevalence of preventable vector-borne diseases such as malaria, trypanosomiasis, schistosomiasis and onchocerciasis prevent optimum utilization of large areas of potentially arable land in many developing countries. Dr. Howard has cited some examples (20):

Malaria : Historically this disease has precluded land development where natural conditions permitted the breeding of mosquitoes under conditions which permitted a high potential for transmission. Anti-malaria programs have reclaimed the foothill area of north India and agricultural productive plains in Thailand.

Major settlement population in the inland hilly malarious areas of the Philippines has been possible only since major reduction of the parasite reservoir occurred within the general population.

Trypanosomiasis: Much of the Central African land is unused due to the tsetse fly and the sleeping sickness which it transmits. Agricultural efforts at vector control are being attempted because of the adverse effect of the fly on cattle.

The problem, far from solved, requires more effective methods of treatment and prevention. Research in this direction is limited.

Onchocerciasis : Forty million West Africans are precluded from farming fertile river valleys because of the Simulium fly and the filaria-like worm it transmits. The frightening complication of this disease, which has very little mortality, is blindness from migration of the parasite into the eye.

Dr. Howard concludes (21) that solutions to the problem of inefficient use of food energy due to widespread infections and fevers "--lie in improvement of man's environment through water protection, waste disposal, and public education regarding the consequences of continuous contamination of food, water, and soil with human intestinal wastes."

Programs to assist in agricultural development in the LDC's should take into account the environmental health and disease implications - in conducting sector and sub-sector analyses, in program planning, execution and evaluation. Consideration should be given to not only

the incorporation of safeguards against disease transmission, but as in water resource development projects, the provision of potable water supplies for adjoining communities.

Continuing research is needed to obtain more effective and economical measures for the control of diseases associated with agricultural development, i.e. schistosomiasis, onchocerciasis, trypanosomiasis, etc. The research program recently initiated, to study measures for reducing food wastage and energy losses due to intestinal infections, should provide information of value to the agriculture and nutrition as well as the health program sector.

2. Nutrition

The World Health Organization has summarized the relationship between malnutrition and certain parasitic diseases (22): "A relationship exists between malnutrition and such parasitoses as ascariasis, trichuriasis, ancylostomiasis, and schistosomiasis. Parasites of the intestinal tract live and grow in the human body at the cost of body protein, part of which is thus wasted. Widespread anemia due to bleeding from the intestines or bladder, often accompanied by hypoproteinemia and other signs of disease associated with *Ancylostoma* or *Schistosoma* infestation, clearly indicates that protein loss in the inhabitants of countries afflicted with these parasites adds up to a problem of global significance."

A WHO Expert Committee on Nutrition and Infection has observed (23): "The evidence now available indicates that systemic and enteric infections are of major significance in precipitating acute nutritional diseases, such as kwashiorkor and keratomalacia. In most areas, infectious diarrhea makes a far greater contribution to morbidity than the intestinal helminthic infections, both as a primary cause of death in malnourished children and in precipitating kwashiorkor and other fatal malnutrition states."

Woolley makes the further point (24): "The relationship of malnutrition to enteric infections is a vicious cycle: The enteric infections themselves cause and intensify the malnourished state by means of malabsorption, altered food consumption, fluid losses and increased metabolism.---The addition of parasitic infections further burdens the already debilitated state of the population. The end result of this is manifested in excessive childhood disease and death, poor growth and development and ultimately decreased intellectual and physical productivity of the population."

René Dubos expresses his concern (25): "Both malnutrition and diarrheal diseases create medical problems that are especially dramatic in the young age groups. In fact, these disorders account for a very large percentage of infant mortality in destitute populations. But the importance of malnutrition and infection greatly transcends the damage revealed by mortality statistics. Children who have suffered from nutritional deficiencies or from prolonged infectious processes

during the early stages of their development commonly fail to grow into healthy, vigorous adults. Not only do the pathological experiences of early life tend to depress physical and mental activity during youth and the teen-age period; very frequently the unfavorable effects persist through adulthood and appear indeed irreversible."

The linkage of environmental health deficiencies with malnutrition is aptly stated by Dr. Howard (26): "The pollution of soil and water with human wastes, and the subsequent contamination of food and drink, produce infection which, in combination with malnutrition, lead to the largest single category of disease in children," and-- "The problem of malnutrition in developing countries, to be understood in true context, is a process which, most frequently in preschool children, is precipitated by environmental factors other than the availability of food."

Dubos also believes in the interrelationship between nutrition and environmental health factors, as suggested in this quote (27): "There are indications that general dietary improvement, better practices of infant feeding and handling, and simply an abundant supply of water would be a far more effective and less costly approach to the control of many intestinal disorders than are prophylaxis and treatment with drugs and vaccine".

Those environmental health facilities and practices widely recognized as essential in reducing the toll of enteric and parasitic infections, especially among children, are thus seen as a tool for achieving improved nutrition. A country nutrition sector analysis for strategy would be more meaningful if it included examination of the incidence and causes of childhood mortality and morbidity, and measures in process as needed to combat these conditions. The TAB Office of Nutrition has selected one KPA to focus on reaching pre-school children, to be tied in with MCH programs in the health and family planning sectors. These efforts afford an excellent opportunity for education of families in personal hygiene and basic sanitation of household premises.

3. Family Planning

Dr. Howard has postulated as one of the health problems that impede development (28): "The continuing high burden of disease and death in infants and children is an effective obstacle to the rapid acceptance of family planning services." Howard reminds us (29) "--that 30,000,000 out of the world's total annual deaths of 60,000,000 occur in children under the age of five. The high infant and child mortality indicate only a small fraction of the illness created by the twin forces of malnutrition and infection," and cautions that "to expect rapid progress in family planning acceptance

by those who are faced with the high levels of morbidity and mortality in their own environment is to discount the reality of experience. Fertility and infant mortality usually show a close positive correlation."

Notestein, Kirk and Segal support this with their observation (30): "No efforts of social-economic development can be useful in a disease-ridden population, nor will a desire for small families be likely to emerge. Better health and improved chances for survival of the individual child lie at the root of the motivational change we are seeking."

The noted ecologist Barry Commoner is reported to hold that (31) "---humans tend to view the procreation of several children as a kind of guarantee of immortality. 'What makes human populations turn off?' He asks. 'If a father knows that his sons will survive, perhaps he will not feel the need for so many successors.'"

The report of the World Bank Commission on International Development makes the observation (32): "---the desire to have fewer children is closely linked to the conviction that they now have a better chance to survive."

Acceptance of the validity of these views, which are supported by many other authorities, leads to the logical conclusion that effective environmental health measures to reduce the childhood morbidity and mortality due to enteric infections could contribute to reducing the influence of this impediment to the acceptance of family planning.

Education and assistance to promote home sanitation and personal hygiene, by MCH workers engaged in family planning services, could be one of the most productive techniques for resolving this obstacle. There is a definite need for applied research to develop more effective methodology for the motivation of individuals and communities toward improved personal hygiene and acceptance of sanitation measures.

4. Public Health

The following is extracted from Dr. Howard's discussion of the High Burden of Disease, as one of the biological barriers to development in the LDC's (33):

"The early stage of development of statistical services precludes accurate data on illness, but there is already enough data to suggest that infectious diseases and parasite infestations, either separately or in combination with malnutrition, affect the well-being of developing populations in the order of fifty to ninety percent. The following estimates illustrate the magnitude of disease prevalence:

Illustrative Magnitudes of Infectious Diseases

	Developing countries (order of magnitude)
Helminth (worm) infestations	3,500,000,000
Hookworm	700,000,000
Schistosomiasis	200,000,000
Onchocerciasis	40,000,000
Tuberculosis	40,000,000
Malaria	25,000,000
Leprosy	10,000,000
Trachoma (with 1% blindness)	400,000,000

Enteric diseases (intestinal infection plus malnutrition) occurs as repeated episodes in over half of the children in developing countries. Together, the malnutrition/infection combination accounts for approximately 15,000,000 of the total 30,000,000 children under five years who die each year.

Although disease reduction is a desirable end within improved levels of living, further decline is unlikely until modern knowledge and services are distributed beyond the average 10 percent of populations which have regular access currently to some form of health-producing service. Further progress will depend on solving problems in such categorical problem areas as poor environmental sanitation, inadequate water supply, lack of health education, malnutrition, inadequate health delivery systems, limited manpower, rapid population growth, and limited resource availability. Solutions to these problems, in turn, relate inevitably to progress in other key development sectors such as agriculture, education and public administration."

The A.I.D. Task Force on Cholera in its Interim Report of June 17, 1971 reported among its conclusion (34): "Cholera vibrios are transmitted from person to person principally by fecal contamination of drinking water and food; therefore, the major preventive effort must be directed toward improvement of water supplies and excreta disposal supported by health education which emphasizes personal hygiene."

Environmental health measures have been shown to be effective in reducing the toll of debilitating and killing diseases that constitute the major health problems of the LDC's, as in these accounts by Woolley (35) of improvements produced by the provisions of safe piped water supply: "...There are numerous examples that demonstrate the extent to which water-borne disease can be reduced by supplying safe piped water to areas where drinking water has formerly been obtained from unsafe sources. In Japan, a survey in 30 rural areas revealed that after installation of safe water supplies the number of cases of communicable intestinal diseases was reduced by 71.5% and that of trachoma by 64%, while the death rate for infants and young children fell by 51.7%. In Uttar Pradesh, India after waterworks sanitation, the cholera death rate decreased by 74.1%, the typhoid fever death rate by 63.6%, the dysentery death rate by 23.1% and the diarrheal disease death rate by 42.7%. Similar experience in reduction of intestinal disease rates following water supply development has been observed in Latin America, notably Cuba, Peru and Columbia.....The problems of secondary malnutrition could be reduced if clean water and sanitary means of excreta disposal were available to the population. If the load of parasitic infections and enteric infections could be reduced, the nutritional state of the population could be remarkably improved by simple dietary manipulation. This is not possible so long as these infections persist.....".

Dubos offers his opinion of the merits of environmental health measures in this quote (36): "Allow me to express here my deeply felt conviction that the extent of health improvement that ensues from building ultramodern hospitals with up-to-date equipment is probably trivial in comparison with the results that can be achieved at much lower cost by providing all infants and children with well-balanced food, sanitary conditions, and a stimulating environment."

Wolman makes these comments about the problem of environment-related diseases (37): "In spite of significant downward trends in some communicable diseases in some parts of the underdeveloped world, environmental-borne and associated diseases still remain among the leading causes of disability and death.---The obvious disease disabilities are so wide and deep in extent that refinements of attitudes and policies might well be deferred for a while. In the meantime, scientific knowledge and technological tools have long been sufficiently abundant to proceed apace with the modifications of the environment upon which the tens of millions of people wait with amazing patience and even docility!"

Environmental health is a critical basic component of the three Key Problem Areas in Health that have been accepted by A.I.D. for program support. The studies of methods to improve local health delivery systems should afford high priority to environmental health measures, many of which could be implemented or aided by MCH, agricultural extension or other workers trained for multi-purpose functions. Education and public works programs can also make significant contributions.

A national environmental health sector analysis will find widespread relationships with many other development programs, which in turn will prove useful in health program planning.

5. Industrial/Urban Development

The UN Economic and Social Council (ECOSOC), in defining problems of Human Settlements preparatory to the UN Conference on the Human Environment, had this to say (in part) about urbanization and industrialization (38): "For many countries, urbanization and industrialization have been a normal way of life for decades. The problems associated with these processes occur in an acute form in developing countries, where an economy based on agriculture and animal husbandry is being supplemented or replaced by intensive industrial development. Migration towards the towns is influenced by the prospect of employment, high rates of growth and large increments in rural population, educational and health facilities which are presumed to exist there, and by a desire for family reunion and company."

"In most developing nations, it has rarely been possible to provide in advance the urban planning and design that would lead to a rational arrangement of space for living, working, transportation and recreation, or to provide rapidly enough housing, water, sewage disposal, education, or the other necessities or amenities of urban life. The very time factor involved in development of urban facilities is a major aggravating factor. Migration into the cities is often associated with the importation of disease such as trachoma, tuberculosis, parasitosis and skin diseases. The influx of people tends to bring enormous

pressure on water supplies and the arrangements for waste disposal, with the consequent appearance of diarrheal diseases. Overcrowding of premises and sites is typical. Inadequate housing accommodation is accompanied by shanty type construction and further, unsatisfiable demands are made upon water supply and waste disposal facilities. Food supplies may be inadequate, badly distributed, or prepared and sold under unhygienic conditions. Malnutrition is not uncommon and in association with bowel infections is a common cause of death in young children born and living under those unsanitary conditions. Propinquity and overcrowding encourage upper respiratory infections and venereal diseases. This pattern in the propagation of disease overtaxes the whole medical care organization."

"In urban areas, pollution from human wastes is of primary concern in developing regions. However, pollution of other types is a problem that grows more severe as developing nations move toward their goals of economic development. Often the devices and regulations used in developing nations to control pollution are not applied to industrial processes in developing nations with equal efficiency or stringency. In the effort to provide increased economic well-being, the environmental safeguards are thus neglected. Water supplies are not only contaminated with human wastes, but grow increasingly toxic as they receive the effluent from burgeoning industries. Air pollution

increases with the material well-being of the urban population and derives from power plants, industries, space heating and the growing number of motor vehicles."

The AID/TAB Office of Science and Technology conducted a survey through USAID Missions in March 1970 of dominant environmental problems in 35 developing countries. The summary report included this statement about urban problems (39): "The survey of 35 developing countries revealed a close inverse relationship in nearly all the developing countries between human population pressure and urbanization on the one hand, and the quality of the environment on the other. In at least half of the countries, rapid urbanization has been associated with inadequate or non-existent sewerage systems, inadequate water supplies, air pollution, and crowded and badly deteriorated housing. The pollution of beaches and water systems commonly was attributed to municipal waste, industrial waste, and, in some cases, to oil and other wastes from coastal shipping. An objectionable level of urban noise was mentioned in a few instances."

Similar observations were reported by the Ad-hoc Committee of the National Academy of Sciences on Environmental Aspects of Foreign Assistance Programs in January 1970 (40): "Unprecedented population growth and the technological revolution have brought about a large scale migration from farm to urban areas in many less developed countries. This rapid urbanization has almost overwhelmed the sewerage, water supply and transportation systems, and the housing

capacities of the cities in these countries. One of the results has been a sharp increase in pollution of land, water and air. This growth of pollution has been intensified by industrialization."

The World Bank (IBRD) has recently expressed concern over the impact of economic development projects upon the environment and the health and well-being of people (41): "Economic development cannot be achieved without some disruption to man's environment. Economic development can, however, be carried out in a way that would minimize deleterious effects both upon the environment and upon the public health and welfare of man-kind... and the developing world is now somewhat less convinced than before they must face the Hobson's choice between pollution and poverty..... It is also the policy of the Bank Group that careful and studied attention must be given in the planning of its development projects, for the consequences to the environment and to the health and well-being of affected peoples."

A.I.D. has throughout its history provided assistance (financial, technical, training, research, etc.) to projects and programs designed to improve environmental health facilities and services in both urban and rural areas. Recent years, however, have seen support for these programs declining to the near zero level, with an accompanying decline in technical personnel in this field. Yet, as Dr. Howard points out, at this time (42): "On the average, less than 10 percent of the populations in the developing world have ready access to health facilities or to the benefit of safe water and sanitation."

Since enactment of the U.S. National Environmental Policy Act in 1970, A.I.D. has initiated measures to mitigate possible undesirable effects on the environment of capital development projects or commodities financed under the Foreign Assistance Act (43). Implementation of these measures is apparently proceeding with minimal participation by environmental health specialists, which raises some questions as to the efficacy of these measures in assuring adequate treatment of the most vital and fundamental facet of environmental quality - the health of man.

It would appear that the TAB Office of Health has an obligation and a responsibility to assure due consideration of environmental health implications of all A.I.D.-supported programs, including technical as well as capital assistance. Similarly A.I.D. program managers and decision makers should invite environmental health input in the review and evaluation procedures.

6. Education

The importance of improved education, qualitative as well as quantitative, to national development is well recognized by A.I.D. as demonstrated by the allocation of about 1/3 of technical assistance funds (excluding population) to this field. The TA Bureau has selected for concentrated effort Key Problem Areas in Education designed to lead to solutions of the major problems to be overcome in education in LDC's (44). These KPA's are obviously addressed to high priority approaches to more effective delivery of better

educational services to more people. A close look at the other side of the coin might disclose significant obstacles to effective education in the form of impaired receptivity due to malnutrition and debilitating infections. As pointed out earlier this combination, so common among the people, especially children, of the LDC's is responsible for depressed vitality and lower productivity, including ability to learn, in comparison with people in good health. It may also be informative to ascertain what percentage of school absenteeism and drop-outs at early ages is due to illness among school age children and their families. Evidence has been cited earlier that a large majority of childhood infections in the LDC's are environmental-borne or associated, and susceptible to known environmental health control measures.

Dr. Howard has emphasized the critical role of health education of the public in combatting a broad range of health problems related to environmental deficiencies. In discussing malnutrition due to malabsorption and loss of nutrient intake caused by intestinal infections, he concludes (45): "For this problem it would appear that solutions lie in improvement of man's environment through water protection, waste disposal, and public education regarding the consequences of continuous contamination of food, water and soil with human intestinal wastes."

In arguing that man's ability to adapt to his environment is handicapped by ignorance of disease causation and prevention, Dr. Howard maintains (46): "Enteric disease exists because much of the world

doesn't know that there is such a thing as a germ. Cleanliness, personal hygiene, prevention of food and water pollution can be taught."

Further, in his description of environmental pollution problems, Dr. Howard suggests (47): "Without waiting for these changes, however, major change in disease reduction can occur with effective health education, both as a specific activity of national health systems and as a component of the general education system."

A.I.D. has long recognized and continues to utilize health education as an important element of health programs such as malaria control, nutrition, family planning, etc. The dearth of public knowledge of the elementary environmental health measures and practices would seem to present an excellent opportunity then for the integration of this subject area into the OE/KPA approach. The transfer of relevant information whose effects in improved health could be observed by the subjects within a reasonable time period should help to elicit public support for this approach.

The key problem area of non-formal education presents an opportunity for research and pilot programs to promote numerous approaches in environmental health; i.e., supplementary training to develop multi-purpose workers, refresher training of paramedical personnel and health auxiliaries, instruction of homeowners in the construction of sanitary facilities, control of insect vectors, and others.

IV. Action Program Potentials in Environmental Health

Introduction

It is proposed that A.I.D. adopt an action program in environmental health, keyed to the modification of impediments to A.I.D. program objectives. The design of such a program should also take account of potentials for positive contributions to the attainment of sectoral program objectives. Environmental health should more appropriately be treated as support services and activities, and should not be isolated as a program sector within AID/TAB. The evidence previously presented clearly indicates the need to acknowledge the interrelationships to be fostered for environmental health programs to be most effective. A second basic principle essential to the maximum effectiveness of environmental health measures is the multidisciplinary character of staff requirements, i.e., engineers, epidemiologists, social scientists, human ecologists, biostatisticians, medical entomologists, parasitologists, biochemists, economists, and others, working closely with educators, nutritionists, agriculturalists, development planners, etc. As a practical measure it would appear that much of this requirement could be satisfied by developing close working relations with sectoral program specialists in A.I.D.

Summary of Actions Proposed

In view of the multidisciplinary nature of environmental health problems and the sectoral relationships within the A.I.D. framework,

it is considered to be of interest to list the actions being proposed for Agency consideration, followed by a narrative discussion of the significant element involved.

1. Implementation of the recommendations of the Task Force on Cholera Control (48), with modifications so as to include LDC's on a worldwide basis and to make them applicable to control of the entire group of enteric diseases transmitted as a result of poor sanitation.

2. Implementation of the recommendations in the "Work Shop" report (49) on environmental control of schistosomiasis at the Symposium on the Future of Schistosomiasis Control, Tulane University - 1972, and strengthening these proposals by adding the following to the five recommendations presented:

Adoption of all possible measures (1) to prevent human excreta from entering water courses, canals, ditches, etc. and (2) to prevent human beings from entering snail infested water areas.

3. Establishment of a research project to study the possibilities of developing suitable designs for low-cost water treatment and distribution systems as well as for satisfactory low-cost excreta disposal facilities. A similar recommendation was included in the report of the Cholera Task Force.

4. Extensive use of health education techniques and devices as a means of promoting and increasing the effectiveness of environmental sanitation measures. The establishment of a pilot project is proposed

to evaluate current procedures, develop new techniques as needed and to devise methods for adapting health education measures to the cultural patterns of the LDC's and synchronizing those measures with environmental sanitation programs.

5. Establishment within A.I.D. of a policy calling for review of all capital development and technical assistance project proposals by qualified personnel (staff, consultants, or PASA) for the purpose of appraising environmental health implications.

6. Promotion and support of Regional Environmental Health Institutes with multidisciplinary staffs for scientific research, field studies, pilot projects, etc., relating to endemic environmental health problems in the respective regions.

7. Undertaking by A.I.D., possibly in cooperation with WHO and PAHO an in-depth study of environmental health problems, resources and needs for assistance in LDC's. As a first step, it is suggested that the in-depth study include the elaboration of guidelines by the Office of Health, TAB for a comprehensive environmental health sector analysis. Multilateral agencies such as WHO and PAHO should be invited to collaborate in the preparation of these guidelines.

8. Creation through university contracts of a program for "exporting" U. S. developed special training programs for inclusion in the curricula of educational institutions in selected LDC's, to make possible the training of environmental health personnel at the local or regional level.

9. Development of a program for assisting in establishing and improving monitoring and surveillance of environmental hazards in LDC's.

10. Close coordination of environmental health planning and activities with related sectoral programs: As an example the normal procedure of ongoing project evaluation in all program sectors might include an assessment of impact on environmental health.

Narrative Discussion of Elements Involved in Actions Proposed

1 (a) Cholera and the Cholera Task Force

Recognizing that acute diarrheal diseases are prevalent and constitute one of the most serious health problems in the LDC's and that effective control of these diseases is dependent on the provision of safe water supplies and the safe disposal of human wastes, it is proposed that the Health Office, TAB/A.I.D. undertake studies through pilot projects and research looking toward developing innovative approaches and new techniques for the control of those diseases which take such a heavy toll in morbidity and mortality. One of the more serious of these diseases is cholera which is endemic in various countries of Asia and the Middle East and which frequently occurs in epidemic proportions.

In September 1970, a Task Force was created by A.I.D. to study the world cholera problem and to suggest methods for preventing its epidemic spread which in recent years has taken the disease across

two-thirds of the world with cases occurring in countries in the Far East, Middle and Near East, Southern Europe and Africa and an advance to the Caribbean Islands and South America predicted unless effective control measures can be instituted.

Following are measures relating to the environment and to health education suggested by the Task Force for use in cholera control (50):

- a. "Sanitary surveys of existing piped water systems, including plant operation, quality and quantity of water delivered and condition of systems in countries where cholera is epidemic or threatened with invasion.----"
- b. "Research program for the design of efficient low-cost water treatment and distribution systems for small towns and hamlets."
- c. "Research programs for the provision of safe water supplies in rural areas."
- d. "Research programs for the design and development of an efficient and economical method for the disposal of human excreta in urban and rural areas."
- e. "Evaluation of the effectiveness of sanitary measures as related to cholera control."
- f. "Evaluation of health education methods and procedures for motivation of individuals and communities toward improved personal hygiene and the acceptance and use of sanitary measures."

- g. "Appropriate health education programs which emphasize proper personal hygiene and the acceptance and use of sanitary installations."
- h. "Educational programs for all levels of government and health personnel which emphasize the necessity of and the benefits to be derived from the development and efficient operation of programs of environmental sanitation for control of acute diarrheal diseases, including cholera."

It should be recognized also that the above measures as recommended by the Cholera Task Force would likewise be applicable to the control of other intestinal diseases, which although not generally possessing the degree of severity of cholera, nevertheless are much more widely prevalent and which cause extremely high morbidity and mortality in most if not all the LDC's. Among this group are the diarrheas and dysenteries which are so notoriously responsible for exceedingly high infant mortality rates in areas where proper sanitary facilities and good personal hygiene practices are lacking.

1 (b) Enteric Diseases in General

This program is concerned with the full spectrum of the enteric diseases and their occurrence in the LDC's in all regions of the world. Preceding sections of this paper explain the significance of enteric disease control to A.I.D. program objectives and to Key Problem Area Programs including those in Agriculture, Education, Family Planning, Health and Nutrition.

In relating the activities proposed by the Cholera Task Force to the control of enteric diseases in general, extensive use of evaluation and research techniques is recommended. It is considered important to alter or avoid methods that past experience has proved to be unproductive, to recognize and continue to utilize those which have proved effective and to explore through utilization of pilot projects and other research techniques, the development of new approaches, more economical facilities, and more efficient ways of attaining the desired goals. These activities naturally will require an extensive review of reports and recommendations prepared by others working in this field. This approach hopefully will lead to eventual implementation of valid recommendations and will promote coordination with and support for related programs and projects of multilateral organizations, such as the World Health Organization.

2. Schistosomiasis

Many factors are involved in the transmission of schistosomiasis, a water related disease which affects an estimated 200 million people living in various parts of the world. Recently a symposium on the Future of Schistosomiasis Control was held at Tulane's Department of International Health at which time six Workshop reports (51) were prepared. One of the reports covered environmental control of schistosomiasis and includes recommendations by the Workshop group.

In addition to the five recommendations given it may be noted that safe disposal of human excreta to prevent contaminating of the water courses where the snail hosts are found will serve to break the chain of transmission. Another measure is to prevent people from wading in the snail-infested waters.

3. Economical and Acceptable Treatment of Water and Waste

The incidence of enteric diseases in a community is generally inversely proportionate to the economic level. This points up the need for devising ways for reducing the costs of supplying adequate quantities of safe water and sanitary disposal of human wastes in the poorer areas of cities as well as in small towns and hamlets. Of considerable importance in this connection is the need to develop designs for low-cost water treatment and distribution facilities that will provide efficient service in these areas.

The need for low-cost designs of suitable excreta disposal facilities for economically depressed areas must also be considered. Of particular importance is the problem of securing the utilization of sanitary sewerage systems in slum areas where sub-standard dwellings hardly justify the cost of connections to accessible sewers and where occupants are not able or otherwise fail to purchase water needed to operate the water carriage systems. In unsewered areas other types of excreta disposal facilities are generally employed. In such areas where pit privies have been installed in

organized programs for improving excreta disposal facilities another type of problem frequently develops. Due to lack of appreciation for the value of the facilities or ignorance, or perhaps other reasons the house occupants either refuse to use the facilities or allow them to be misused thus negating the whole purpose of the facility. An observation in this regard made by Dr. Abel Wolman, internationally recognized sanitary engineer and educator, in speaking of rural (LDC) problems and related human behavior, is as follows (52):

"In some areas of effort-excreta removal in rural populations is a striking example - there has been very little real success. The time seems long overdue to undertake deep inquiry into the human motivations that have prevented greater success."

4. Health Education

To solve the above mentioned problem, the need for health education is obvious. People must know why such facilities are provided and they must be used and maintained, if the facilities are to serve the purpose for which they are intended.

As highlighted previously herein, the Task Force on Cholera in its Interim Report (53) stressed the importance of health education as an essential element of any program aimed at controlling cholera. That report further states: "Health education programs in addition to motivating individuals and communities toward improved hygiene and their acceptance and use of sanitary measures are of paramount importance in obtaining---legislative and financial support of the

political administration echelon of government in improvements of environmental sanitation in both urban and rural areas, as well as in all other efforts directed toward the control and prevention of cholera."

Health education is equally as important an element in a program directed toward control of enteric diseases in general and for the same reasons. Hence health education procedures should be utilized in conjunction with all efforts to improve environmental sanitation conditions and personal hygiene practices. Some recognized health authorities have claimed that an essential element for controlling enteric diseases in the home is an ample supply of water readily available for thorough handwashing and for maintaining general cleanliness in the home with respect to food, clothing, dishes and especially all items used in caring for infants. Of course, health education measures are needed to assure that the prescribed procedures are followed after the water supply requirements have been met. A readily available water supply basically is one that is piped into the home - usually from a community system.

5. Appraisal of Capital Development and Technical Assistance for Environmental Health Implications

Reference has previously been made to recent initiatives by A.I.D., World Bank and other development organizations to provide for the review of capital development projects for environmental impact. From a review of a representative sampling of individual cases the impression is gained that these reviews have neither given adequate

attention to environmental health implications nor involved specialists qualified in that field. By way of contrast it is noted that the UN Development Program requires review of projects funded by UNDP by the World Health Organization, with its multi-disciplinary staff of well-qualified health specialists.

It is suggested that consideration be given to a contractual or PASA arrangement with an institution or agency for the review of both selected capital development and technical assistance projects with special emphasis on environmental health and disease implications. These reviews should include analyses of opportunities to incorporate positive environmental health measures rather than limiting their scope to the need for safeguard against adverse impact.

This action appears to be consistent with suggestions by the U.S. Government for the 1972 UN Conference on Human Environment (54).

6. Support of Regional Environmental Health Institutes

There are numerous successful precedents for the establishment of regional specialized institutes for research, training, data collection, information exchange, technical assistance and related functions. The Pan American Health Organization (PAHO) has made some progress in organizing a regional center of engineering and environmental science in Lima with the nucleus of a multidisciplinary staff. This center is engaged in research, field studies, pilot programs, technical assistance, etc. relating to a variety of environmental health problems in the Americas.

It is suggested that additional financial support, perhaps in the form of contracts or research grants, would enable the center to acquire additional staff and other resources to undertake specific projects of mutual interest to PAHO and A.I.D.

Possibly a more effective form of support, with consequent better potential for return to A.I.D., would be a U.S. university contract for reinforcing and backstopping the center's resources.

Another possibility for a regional center might be the SEATO Graduate School of Engineering in Bangkok, although it may now be lacking in health orientation and multi-disciplinary staff. Still another is the Sanitary Engineering Center in Rabat, Morocco, where an international sanitary engineering course at a graduate level has been initiated.

7. In-Depth Study of Environmental Health Problems, Resources and Needs for Assistance

Sufficient information of a general nature is available concerning this subject to suggest basic programs in environmental health that are pertinent to the basic problems of the LDC's. There is a recognized need, however, that many countries require assistance in developing a comprehensive program addressed to problems on a broad front, both rural and urban, including facilities and services, management and operation, education and training, institution building, planning, financing, etc.

In consideration of the complexity and nature of the basic problems, comprehensive environmental health sector analyses are

needed for the development of sound programs. These sector analyses should be made on the basis of guidelines to be formulated under the leadership of the Office of Health, Multilateral agencies, such as the World Health Organization and the Pan American Health Organization, should be invited to collaborate in the preparation of the guidelines. Such involvement by the multilateral agencies should serve to produce data and information useful to A.I.D. as well as to other donors and to the host countries. In view of the intersectoral relationships within the Agency, formulation and application of the guidelines should be carried out in close coordination with the other TAB offices concerned. Also the guidelines can be drawn on by the various offices of A.I.D. in identifying environmental health elements pertinent to their respective analyses. This will serve to stimulate linkage of programs having mutual interest in environmental health.

It is thought advisable to recommend one or two field trials of the guidelines and proposed methodology. Quite obviously further research will be needed to improve techniques for measurement of problems, refinement of control programs, and quantifying costs and corresponding benefits.

It is suggested that one or more countries be identified where such assistance is needed and desired, and that a pilot project be developed for an in-depth study of problems, resources and needs. Such a study should include other development program sectors, and

should preferably be integrated with an overall country development study.

8. Exportation of Training Programs

During the past four decades, U.S. universities have received large numbers of foreign students from LDC's throughout the world, many of whom have been recipients of training grants financed by the U.S. agencies participating in foreign aid programs aimed at assisting less developed, friendly countries to achieve a higher degree of economic and social development. As the program was expanded and made more responsive to specific needs of the LDC's, special training courses were developed to provide specialized training in selected technical fields, some of which fall in the environmental sanitation category. Examples of these are short courses for engineers and other professional personnel in Ground Water Development at the University of Minnesota, Management of Water Supply and Waste Disposal Facilities at the University of Akron and Engineering Design of Sanitary Engineering Works, known as IPSED, at the University of North Carolina.

Subsequently the Ground Water Development Course was staged at several foreign locations to make the training opportunity available to LDC personnel not qualified, mainly because of language deficiency, to attend the course in the U.S.A. Under a special contract arrangement, faculty members of the University of North Carolina assisted in establishing a graduate level Regional Course in Sanitary Engineering which is offered in Spanish at the University of San Carlos in

Guatemala. This activity has now had several years of successful operation in training sanitary engineers who would be unable to study in the U.S.A. because of insufficient knowledge of English.

It is proposed that consideration be given to exporting segments of or perhaps the entire curriculum of the IPSED course in sanitary engineering design, thus making this course or selected parts of it available to professional LIC personnel who could not qualify for course attendance in the U.S.A. Also, and more importantly, the course could be established as a permanent part of the curricula at selected foreign universities and permit those institutions to undertake research programs which could assist in the development of urgently needed design standards for low-cost water treatment and distribution systems and low-cost excreta disposal facilities that might satisfactorily serve the needs of small towns and rural communities in the LDC's.

9. Monitoring and Surveillance

Modern technology, industrial development, international travel and other factors influencing life on the planet Earth have produced a wide variety of pollution problems, not only in the more highly developed countries but also in the developing countries, many of which are producing raw material for industrial processing and eventual worldwide consumption. The more advanced industrial nations have the technology and equipment to monitor pollution

levels and environmental hazards to health through organized surveillance programs, a service that is not available in the LDC's. It is recommended that a program be developed to study the problem and assist the LDC governments to establish facilities and train personnel for monitoring and surveillance of environmental health hazards.

10. Sectoral Relationships

As pointed out heretofore in this paper, the importance of coordination and development of sound working relationships with other sectoral program specialists within A.I.D. can not be overestimated. Environmental health activities should be coordinated with and lend support to other health programs and to programs in other sectors such as Agriculture, Education, Family Planning, Nutrition and Science and Technology.

The practice of periodic evaluation of projects could be utilized to determine in what manner and to what extent projects have contributed to the advancement or impairment of environmental health conditions, facilities or programs. The findings of such review would indicate modifications of project plan that should be made to maximize its contribution to environmental health.

Final Statement

The suggested program actions outlined here are not intended as all inclusive, but may be considered as representative of program approaches. Additional possibilities can and should be developed as needed.

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