

June 30, 1992

Leonard Rice, President
National Environmental Health Association
Denver, Colorado

Dear President Rice:

On behalf of members of the NEHA Committee on the Future of Environmental Health, I am pleased to submit the report of the committee, as well as the following recommendations which deal with the National Environmental Health Association.

1. That NEHA approve The Future of Environmental Health.
2. That NEHA vigorously pursue implementation of the recommendations contained in The Future of Environmental Health.
3. That The Future of Environmental Health be published in the Journal of Environmental Health, or published as a supplement to the Journal, at an early date.
4. That The Future of Environmental Health be widely distributed to appropriate agencies, officials, key political leaders, universities, environmental groups and associations, accrediting bodies, and the news media.
5. That NEHA work with other organizations such as the American Public Health Association; the International Association of Milk, Food and Environmental Sanitarians; the Conference of Local Environmental Health Administrators; and the American Industrial Hygiene Association to develop a coalition to address environmental health and protection policy issues at the national level.
6. That NEHA take the lead in promoting a national conference on the Future of Environmental Health and Protection. This will require the efforts of a consortium of public and private sector agencies and organizations. Funding might be provided by the U.S. Public Health Service, the Environmental Protection Agency, and/or private foundations.
7. That the organizational title be changed to National Environmental Health and Protection Association. This will recognize and adjust to changes which have already taken place in our nation, place the association in an improved position for leadership, and enhance membership marketing efforts beyond those who identify with environmental health only.

8. That the title of the Journal be changed accordingly.

9. That the Journal banner be changed from "Dedicated to the Advancement of the Environmental Health Professional", to "Dedicated to Protecting Human Health and Environmental Quality."

10. That NEHA establish an appropriate presence in Washington, D.C., in order to be in a position to have an effective impact on public policy relating to environmental health and protection.

Sincerely,

Larry Gordon, Chair
Committee on the Future of Environmental Health
National Environmental Health Association

**THE FUTURE
OF
ENVIRONMENTAL HEALTH**

Prepared By

*The Committee on the Future
of
Environmental Health*

National Environmental Health Association

1992

The Future of Environmental Health

INTRODUCTION

Many of the environmental health and protection issues associated with the modern environment of our nation and the world continue to become increasingly complex, and some may be intractable.

The causes of environmental degradation are manifold, but include population growth, resource consumption and disposal, and urbanization. The environmental problems impact human health as well as ecological relationships, and they are closely interwoven. The ecological maxim that "everything is connected to everything else" becomes more apparent each day.

Solutions to our environmental ills are as complex as the causes, and opinions as to solutions are as varied as opinions regarding their nature and causes.

However, solutions are increasingly dependent on certain basic considerations. These include a properly informed citizenry; a sound economy; continuing basic and applied environmental health and protection research to define problems as well as design control measures; data essential to measuring effort and understanding trends; properly designed and targeted environmental policies and requirements; the provision of adequate resources focused on risk as identified by sound epidemiology, toxicology, and risk assessment; societal mechanisms and agencies having missions of protecting the environment and humans as a part of the environment; and, basic to all the foregoing, a professional environmental health and protection workforce.

The purpose of this report is to discuss the factors that ultimately determine the level of environmental health and protection afforded the population and the environment. This report is designed to identify issues, provoke discussion, and provide recommendations to address many of these issues.

The intended audience for this document on the future of environmental health includes environmental health and protection practitioners, educators and researchers; official bodies accrediting environmental health science and protection graduate and undergraduate academic programs; various agencies and associations involved in environmental health and protection; as well as civic and political leaders.

The Future of Environmental Health

ACKNOWLEDGMENTS

This document is the product of scores of environmental health and protection practitioners and academicians representing a wide variety of agencies and institutions throughout the nation. Each draft of the document was widely circulated for review, editing, recommendations and criticism.

The document was envisioned by Leonard Rice, 1992 President of the National Environmental Health Association. Early in 1992, President Rice appointed the NEHA Committee on the Future of Environmental Health. Committee members included:

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The Future of Environmental Health

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The Future of Environmental Health

CONTENTS	Page
I. What is Environmental Health and Protection?	1
II. Current Concern	1
III. Risk and Priorities	1
IV. The Primacy of Prevention	5
V. Organizations and Program Scope	6
VI. A Lack of Data	8
VII. Relating and Networking	9
VIII. Access to Services	9
IX. Cost-Containment for Health Care	10
X. Research Essential to the Future	10
XI. Public Education a "Must"	10
XII. Professional Personnel Essential	11
XIII. Leaders or Followers?	12
XIV. Professional Education and Training	13
XV. Academia-Agency Relationships	14
XVI. Credentialing	15
XVII. Financing the Effort	16
XVIII. Concluding Thoughts	16
XIX. Policy Recommendations	18

I. WHAT IS ENVIRONMENTAL HEALTH AND PROTECTION?

Environmental health and protection refers to protection against environmental factors that may adversely impact human health or the ecological balances essential to long term human health and environmental quality, whether in the natural or man-made environment. These factors include but are not limited to air, food and water contaminants, radiation, toxic chemicals, wastes, disease vectors, safety hazards and habitat alterations.

II. CURRENT CONCERN

Concern for the quality of our environment and related public health implications has never been more intense. Political leaders and ordinary citizens, whether liberal, moderate or conservative, express concern over the quality of our environment, as well as the need for professional environmental health and protection leadership.

The nation does not have an environmental health and protection system, but has a confusing patchwork of often overlapping and competing agencies having different and sometimes conflicting missions and divergent priorities. This is also relevant in the design, assignment of authority and implementation of preventive programs, particularly at the state and local levels. While this non-system is costly, it also leads to confusion, inefficiency and ineffectiveness. Although it may be the product in a democratic society, the problem of environmental health and protection is sufficiently large and complex to warrant an evaluation of the current non-system to determine what improvements and efficiencies might be appropriate to provide a greater level of protection for the environment and human health.

Large sums are being spent by the public and private sectors to solve environmental problems, but inadequate attention is being given to preventing those problems. There is widespread disagreement and confusion regarding environmental health and protection priorities, goals and resources, as well as defining acceptable risk. In addition, it is frequently not clear which agency or level of government has responsibility for designing and implementing programs.

The absence of a comprehensive, coordinated system to provide environmental health and protection services suggests that it might be impossible to properly balance risks with resources allocated to address those risks.

III. RISK AND PRIORITIES

Environmental health and protection continues to be a matter of local, national and global discussion and debate. Globally, priority issues include species extinction, possible global warming, stratospheric ozone depletion, wastes, desertification,

deforestation, planetary toxification and (most importantly) overpopulation. Excessive population contributes to all the foregoing as well as to famine, war, disease, social disruptions, economic woes, and resource and energy shortages.

A 1990 Roper poll found that, in terms of public perception, at least 20% of the public considered hazardous waste sites to be the most significant environmental issue.

But contrary to public perception, the 1990 report of the Environmental Protection Agency's (EPA) Science Advisory Board, Reducing Risk: Setting Priorities and Strategies for Environmental Protection, lists ambient air pollutants, worker exposure to chemicals, indoor pollution and drinking water pollutants as the major risks to human health. Childhood lead poisoning and food protection are not EPA programs, but should be added to any list of priorities impacting human health.

EPA's REDUCING RISK also states that:

"...there is no doubt that over time the quality of human life declines as the quality of natural ecosystems declines....over the past 20 years and especially over the past decade, EPA has paid too little attention to natural ecosystems. The Agency has considered the protection of public health to be its primary mission, and it has been less concerned about risks posed to ecosystems....EPA's response to human health risks as compared to ecological risks is inappropriate, because, in the real world, there is little distinction between the two. Over the long term, ecological degradation either directly or indirectly degrades human health and the economy....human health and welfare ultimately rely upon the life support systems and natural resources provided by healthy ecosystems."

As risks to the natural ecology and human welfare, Reducing Risk listed habitat alteration and destruction; species extinction and overall loss of biological diversity; stratospheric ozone depletion; global climate change; herbicides/pesticides; toxics, nutrients, biochemical oxygen demand and turbidity in surface waters; acid deposition and airborne toxics. Among relatively low-risks to the natural ecology and human welfare, the list also included oil spills, groundwater pollution, radio-nuclides, acid runoff to surface waters and thermal pollution.

A December 1991 survey conducted by the Institute for Regulatory Policy of nearly 1300 health professionals in the fields of epidemiology, toxicology, medicine and other health sciences entitled The Health Scientist Survey: Identifying Consensus on Assessing Human Health Risk, indicated that:

"Over eighty-one percent (81%) of the professionals surveyed believe that public health dollars for reduction of environmental health risks in the United States are improperly targeted."

Taking all of this into consideration, it must be emphasized that the issue of how risk is identified, assessed, defined, understood, prioritized, communicated and managed, and the manner in which perception, emotion and hysteria are handled, is itself among the most critical environmental problems of today and tomorrow. Resources can be best allocated to address actual and significant risks, yet public perception often drives the response of elected officials and public agencies. Environmental health and protection professionals usually have greater expertise in the technical program issues than in the realm of assessment, hazard analysis, epidemiology, prioritization, economics, communication, management and public policy. It is important for the professionals to understand the role of science in determining public policy. Further, it is necessary to recognize the misuse or absence of science in an effort to justify a position or alarm the public.

Environmental health and protection personnel should specifically:

- Recognize that the media is frequently a conduit for an abundance of misinformation and a shortage of critical scientific inquiry behind many of the "catastrophe-of-the week" issues.
- Recognize that if all the alleged environmental catastrophes were scientifically factual, we would have many times the morbidity and mortality rates that we actually have. The interests served by numerical exaggeration include those entities whose funding or political importance varies with the hysteria surrounding a particular issue. Environmental health and protection personnel and agencies must refute scare stories which are not based on sound epidemiology, toxicology and risk assessment.
- Question reports which base a problem on finding one anecdotal example, e.g., one cancer patient near a hazardous waste site, that capitalizes on appeal to the emotions. Epidemiologists term this the "I know a person who" syndrome.
- Beware of individuals and organizations who use "science" to front and further their organizational and political objectives. Peer-reviewed science does not depend on media manipulation, Hollywood personalities, or slick public relations.
- Beware of "predicted" morbidity and mortality figures pulled out of the air by self-styled "experts".
- Be scientifically critical. Too many so called "professionals" are actually only regulators and functionaries, ever ready to accept, promote, and enforce the current party line or misinformation. Examples of environmental extremism surround the issues of radon, asbestos removal, alar, below regulatory concern (BRC) disposal of low level radioactive wastes, and the Waste Isolation Pilot Project.
- Be wary of accepting problems based only on extrapolations and correlations rather than

on good epidemiological and toxicological cause-and-effect studies. The science of epidemiology attempts to sort out from myriad chance correlations those meaningful ones which might involve cause and effect. It is important to understand, however, that epidemiological methods are inherently difficult and that it is not easy to obtain convincing evidence. There are also many sources of bias. For example, because there are so many different types of disease, by chance alone one or more of them may occur at a higher frequency in any given small population. The science of toxicology provides evidence as to whether correlation is credible.

- Recognize that there may be a difference between science-based facts and public perception.
- Learn and practice the art of risk communication on the level at which your audience is listening. Few environmental health and protection professionals understand and practice effective risk communication. Instead, risk communication is considered to be a speech, a press release or a leaflet. This is one of the precursors to the fact that public perception of risk is at variance with that of scientists.
- Always question, challenge, investigate alternative solutions, and analyze existing and proposed regulations and standards to determine the validity of their scientific base. Existing programs, standards and regulations tend to be magical and take on a life of their own. They are seldom challenged. A standard in motion tends to remain in motion in a straight line unless impeded by an equal and opposite force. Environmental health and protection professionals should provide the scientific "equal and opposite force" to challenge the prevailing understanding of risk.
- Place a high value on scientific excellence when developing public policy.
- Remember that people tend to overestimate risk from rare but dramatic events. They also tend to underestimate common events such as unintentional injuries and deaths, and the slow homicide and suicide caused by tobacco. They disdain changing preconceived notions about risks and priorities. People are quick to dismiss evidence as erroneous or biased if the information contradicts their preconceived opinions.
- Understand that many Americans, and even some environmental practitioners, seem to exhibit a love of calamity. Some extremists are applauded and profit from false predictions of environmental calamity, some of which become translated into public hysteria and public perception, thence into political action, and finally into expensive and unnecessary programs and public policy. Those promoting such hysteria accept no responsibility for their false statements and predictions.
- Understand the problem before proposing a solution, and fit the solution to the problem rather than the problem to the solution.

- Realize that the proper standard for environmental health and safety is not "zero-risk", but "net societal benefit." Zero-risk may not be economically or practically attainable, and the cost of pursuing zero-risk for one particular issue may preclude resources essential for addressing more important problems.
- Understand that an unnecessary or poorly designed or overly expensive program becomes even more difficult to stop or alter once a bureaucracy or an industry is developed to promote the program. The issues of asbestos removal and radon detection and management provide excellent examples.
- Utilize the environmental health and protection model in the decision making process for environmental health and protection issues, rather than the medical model. The former looks at the community, nation or planet as the patient and, in principle, allocates resources to maximize health and environmental quality for all. The latter, once a pathology is diagnosed, provides everything possible to cure the pathology without regard for resources, priorities or effects beyond that one particular patient.

IV. THE PRIMACY OF PREVENTION

While the field of environmental health and protection identifies with prevention, a preponderance of effort is currently devoted to cleaning up problems created as a result of earlier actions taken by the public and/or private sectors. For the most part, environmental health and protection personnel are neither adequately trained to be involved nor effectively involved during the planning and design stages of energy production and alternatives, land use, transportation methodologies, facilities construction, resource utilization, and product design and development activities.

EPA's Reducing Risk states:

"...end-of-pipe and waste disposal should be the last line of environmental defense, not the front line. Preventing pollution at its source through the redesign of production processes, the substitution of less toxic production processes, the screening of new chemicals and technologies before they are introduced into commerce, energy and water conservation, the development of less-polluting transportation systems and farming practices, etc., is usually a far cheaper, more effective way to reduce environmental risk, especially over the long term." "More widespread use of pollution prevention techniques holds enormous environmental and economic promise for a number of reasons. For one thing, some environmental problems like global warming, simply cannot be remediated in any practical way using only end-of-pipe controls.

Pollution prevention also minimizes environmental problems that are caused through a variety of exposures. For example, substituting a non-toxic for a toxic agent

reduces exposures to workers producing and using the agent at the same time as it reduces exposure through surface water, groundwater, and the air.

Pollution prevention also is preferable to end-of-pipe controls that often cause environmental problems of their own. Air pollutants captured in industrial smokestacks and deposited in landfills can contribute to groundwater pollution; stripping toxic chemicals out of groundwater, and combusting solid and hazardous wastes, can contribute to pollution. Pollution prevention techniques are especially promising because they do not move pollutants from one environmental medium to another, as is often the case with end-of-pipe controls. Rather, the pollutants are not generated in the first place."

Environmental policy must be based on prevention if there is to be any hope of preventing further resource depletion, ecological destruction and minimizing the health impacts of environmental contaminants. The Superfund Program has demonstrated that the complexity and cost of cleanup is well beyond current technology and resources. Current regulatory programs must incorporate incentives for pollution prevention as a means of complying with the intent and specific requirements of environmental laws.

V. ORGANIZATIONS AND PROGRAM SCOPE

There are many agencies which administer environmental health and protection programs at all levels of government. There is no standard model for environmental health and protection programs. Every level of government has numerous agencies with environmental health and protection responsibilities. Three prominent models are health departments, "little EPA's", and super-agencies. Often responsibilities are distributed among these agencies.

At the federal level, these agencies include the Environmental Protection Agency, the Occupational Safety and Health Administration, the U.S. Public Health Service (including the National Institute of Environmental Health Sciences, the Centers for Disease Control, the Indian Health Service, the Food and Drug Administration, and the Agency for Toxic Substances and Disease Registry), the National Institute for Environmental Health and Safety, the Coast Guard, the Geological Survey, the National Oceanographic and Atmospheric Administration, the Fish and Wildlife Service, the National Marine Fisheries Service, the Nuclear Regulatory Commission, the Corps of Engineers; and the Departments of Transportation, Agriculture, and Housing and Urban Development. Major departments administering proprietary programs include Defense, Energy, and Interior.

Environmental health and protection programs continue to be transferred to state "EPAs" as they were 20 years ago at the federal level. State level agencies include health departments, EPAs, and departments of ecology, conservation, environmental quality, natural resources, pollution control, agriculture, atomic energy, and occupational health and safety.

Local environmental health and protection programs are typically components of local health departments. However, a number of jurisdictions in the western U.S. have established separate environmental health or environmental management departments. Environmental health and protection activities are also located in such local agencies as public works, housing, planning, solid waste management, special purpose districts, regional authorities, etc.

These organizational changes occur for a variety of reasons including political perception of the importance of the environment, demands of environmental advocacy groups, political responsiveness of the agencies, and differences regarding program emphasis and priorities in existing health departments.

The trend to organizationally separate environmental health and protection agencies from health department programs will continue in response to the demands of environmental advocates, and in response to many health departments becoming substantially involved in health care issues. It is unrealistic to develop programmatic relationships between water pollution control, for example, and any one of a number of treatment and rehabilitation programs (health care). Further, the drift of federal, state and local health departments toward more and more health care (as providers of last resort) translates into less and less leadership for environmental health within such health departments. The movement of environmental health and protection programs away from health departments is a part of our evolving governmental system. However, there is a need to evaluate the balance of authority and responsibility between the federal, state and local environmental health and protection agencies. There is further need to unify environmental health and protection programs, if not in the same agency, then through improved inter-agency coordination. Health department based environmental health professionals have often exhibited a preference for the traditional programs of food protection, liquid waste disposal, solid waste management and vector control. In spite of public demand for local agency involvement in air, land and water pollution programs there often appears to be a reluctance to acquire the necessary skills and resources to participate in some of what are often referred to as the environmental protection programs.

Considering the organizational changes occurring, we must evaluate whether the public and the environment may be served as well or better by environmental health and protection agencies separate from health care organizations. The changes presage the creation of more EPAs, as environmental constituents, both citizen and political, find it impossible to identify with the health care character of many health departments.

No matter the titles or organizational arrangement, to be effective, the lead agencies for environmental health and protection should be comprehensive in programmatic scope; staffed by personnel having the requisite competencies and leadership skills (Sections XIII and XIV); have program design and priorities bases on sound epidemiology, toxicology and risk assessment data; and have adequate analytical, data, legal and fiscal resources.

Environmental personnel who identify only with traditional health departments may be

an endangered species eking out an existence in a constantly shrinking organizational environment.

As separate environmental health and protection organizations are created, every effort should be also made to insure that all environmental health and protection programs are transferred, so as not to further fragment the environmental health and protection effort itself. Many misguided jurisdictions have rationalized that such programs as food, water supply, and liquid wastes are "health," while air, water pollution and waste programs are not "health." In fact, all such programs have a health goal, are based on health standards, and would not exist except for their health implications. All such programs should be prioritized together. All require the same type of program methods, laboratory support, legal resources, epidemiology, prioritization, risk assessment, risk communication, risk management, surveillance and data.

It must be noted, however, that environmental health and protection programs are faced with a serious and damaging conflict-of-interest when they are organizationally included in agencies which also have a mission of resource utilization or exploitation and development.

Industry has learned that products and services must be continuously redesigned and repackaged in order to compete and survive. Environmental health and protection personnel must follow the example of the private sector and redesign, repackage and re-title their products (programs) when appropriate for effective marketing, public service, and protection of public health and the environment.

VI. A LACK OF DATA

The data profiling state health agencies, collected and published by the Public Health Foundation (PHF) are incomplete and thereby misleading for environmental health and protection throughout the nation. The PHF's annual questionnaire is distributed to a designated "state health official" in each state, while not addressing the need for data from other environmental health and protection agencies. These PHF data include only those environmental health and protection activities under the purview of the designated "state health official."

Inasmuch as there are more environmental health and protection activities outside than within the scope of each "state health official," there is no comprehensive national data collection effort for environmental health and protection. Accurate, comprehensive reporting would portray a many-fold increase in environmental health and protection activities beyond that reported by the PHF, thereby indicating a radically higher percentage of effort and emphasis on environmental health and protection as compared with other reported health services.

The National Association of County Health Officials (NACHO) has also surveyed local health departments to identify the nature of the environmental health workforce and programs at the local level. The U.S. Public Health Service Bureau of Health Professions has sponsored several studies to further profile the environmental health workforce. In each case there has been

significant uncertainty as to what proportion of the workforce was represented in the data collected.

There is no known comprehensive state and local listing of the various environmental health and protection agencies and their specific responsibilities. The organizations vary widely from state to state, both in titles and scope of services.

Another data shortfall is in health and environmental status information. This includes morbidity and mortality data, occurrence data of different chemical contaminants in the environment, and health effects data from the exposure to those contaminants.

A solution to data needs in environmental health and protection can be found through additional resources, new technology (i.e., for health effects research) and improved measures of health status. However, until data needs are met, there will continue to be confusion, misunderstanding and differences between perception and reality that cannot be easily resolved.

The lack of a nationwide, comprehensive data collection system is a critical problem.

VII. RELATING AND NETWORKING

Environmental health and protection programs are most effective when continuing institutionalized relationships are insured, not only with other environmental health and protection agencies and groups, but also with those involved in activities which relate to the quality of the environment.

This is particularly relevant in the coordination of such activities as land use, energy production, transportation, resource development and utilization, agriculture, conservation, engineering, design, education, public health, product design and development, and economic development.

Environmental health and protection personnel must recognize the key role that they should play in the planning and development phase of these activities to ensure that health and environmental protection issues have been adequately observed.

Environmental health and protection personnel must improve communication with and, as appropriate, join forces with all the various environmental groups and agencies.

VIII. ACCESS TO SERVICES

Every citizen of our nation requires the benefits of effective environmental health and protection services, whether at home, work, play, in institutions, or while traveling. This assures freedom from environmental factors which adversely affect human health, safety, comfort and well-being, or which damage delicate ecological relationships or the economy upon which

positive health depends. Every individual must have protection from such factors as toxic chemicals, polluted air and water, unsafe drinking water, unintentional injuries, unsafe food, excessive radiation exposure, solid wastes, hazardous wastes, vector-borne disease, inadequate shelter, and global environmental health and protection problems. Access to these services is essential to ensure an acceptable quality of life for the inhabitants of this planet.

Such access will not be effective without the full involvement of adequate numbers of properly educated and experienced professionals possessing a working knowledge of the various technical and scientific areas, as well as epidemiology, risk assessment, problem prioritization, toxicology, biostatistics, environmental economics, cost-benefit of programs, risk communication, and public policy development and implementation.

IX. COST-CONTAINMENT FOR HEALTH CARE

Environmental health and protection services are an integral and essential component of the continuum of health services which also includes disease prevention, health promotion and health care. Efforts to control the runaway costs of health care will be ineffective without adequate provision of environmental health and protection services in necessary quantity, quality and comprehensiveness.

X. RESEARCH ESSENTIAL TO THE FUTURE

The ultimate effectiveness of environmental health and protection services lies in the capacity to identify, understand and control environmental problems. As our technological society becomes more complex and population stresses increase, the need for increased environmental health and protection research is essential. Well designed, targeted research is a prerequisite to preventing and solving problems, as well as an essential tool in prioritizing and designing effective programs. Research and development funds have routinely been inadequate to address the research needs that exist. Without the development of new technology through research and development, it will be difficult to move forward in areas such as remedial action and cleanup design, improved laboratory analytical capabilities and product substitution, for example.

XI. PUBLIC EDUCATION A "MUST"

Increased environmental health and protection education is essential not only to address public concerns, but to provide students and other citizens with knowledge and skills to allow them to make informed decisions about environmental matters. Education will allow our citizens to factually understand risk and relative risk of the complex variety of potential environmental insults which they may face. Such education will also help them decide which risks are acceptable and which are not.

When risk assessment includes active public education and participation, the outcomes

are more likely to be supported by the public and the business community.

XII. PROFESSIONAL PERSONNEL ESSENTIAL

A wide variety of personnel from routine surveillance and inspection levels through management, policy, communication, education and research levels are essential to modern environmental health and protection efforts in the private, governmental and voluntary sectors. At the professional levels, this necessitates a supply of appropriately educated and trained personnel from the baccalaureate through the doctoral levels. It also dictates a need for both environmental health and protection professionals, and professionals in environmental health and protection.

- Environmental health and protection professionals are those who have been adequately educated in the various environmental health science and protection technical (programmatic) components, and in epidemiology, biostatistics, toxicology, management, public policy, risk assessment and reduction, risk communication, environmental law, social dynamics and environmental economics.
- Professionals in environmental health and protection include but are not limited to such other essential personnel as chemists, geologists, biologists, meteorologists, physicists, physicians, economists, engineers, attorneys, planners, epidemiologists, social marketing professionals, sociologists, biostatisticians, public administrators, toxicologists, and planners.

A U.S. Public Health Service Bureau of Health Professions report indicates shortages in a number of program areas, estimates that only 11 percent of the environmental health and protection work force have formal education in environmental health science and protection, and estimates a need for 120,000 more professionals to address problems in several key program areas.

The 1990 EPA Science Advisory Board publication, Reducing Risk, states that:

"The nation is facing a shortage of environmental scientists and engineers needed to cope with environmental problems today and in the future. Moreover, professionals today need continuing education and training to help them understand the complex control technologies and pollution prevention (emphasis added) strategies needed to reduce environmental risks more effectively.Most environmental officials have been trained in a subset of environmental problems, such as air pollution, water pollution, or waste disposal. But they have not been trained to assess and respond to environmental problems in an integrated and comprehensive way (emphasis added). Moreover, few have been taught to anticipate and prevent (emphasis added) pollution from occurring or to utilize risk reduction tools beyond command-and-control regulations. This narrow focus is not very effective in the face of the intermedia (emphasis added) problems that

have emerged over the past two decades and that are projected for the future."

The Department of Defense Deputy (DOD) Assistant Secretary for Environment has stated that the shortage of properly qualified and trained environmental health and protection professionals constitutes a major impediment to DOD's world-wide mission of environmental problem prevention and clean-up.

The Department of Energy (DOE) Secretary has charted a new course for DOE toward full accountability in the areas of environment, safety, and health to demonstrate that DOE is committed to complying with the nation's environmental laws and discharging its many responsibilities, which include protecting public health and safety. This has required strengthening the environmental, safety and health technical capabilities of line managers within DOE; to do this, DOE officials need sufficient numbers of appropriately skilled DOE line managers to support them. The DOE Secretary has also greatly expanded emphasis on comprehensive epidemiological data on DOE and contractor employees.

The Congressional Office of Technology Assessment (OTA) concluded that a shortage of experienced and technical experts may be a factor in the current lack of quality performance and may cause a bottleneck in an expanded Superfund program. The OTA report also suggested that current educational programs may not be able to prepare some professionals in sufficient numbers.

XIII. LEADERS OR FOLLOWERS?

Environmental health and protection personnel managing programs and agencies should objectively evaluate their activities to insure that they are providing effective leadership as scientists, managers, policy formulators and risk communicators. Additionally, schools of public health, other environmental health science and protection programs, academic accrediting bodies, and funding agencies should evaluate their efforts and the proven competencies of graduates.

The dearth of effective environmental health and protection leadership must be addressed. It may well be that leaders and potential leaders are not attracted to such governmental agencies. This may be due to lack of professional identity, inadequate financial reward, lack of challenge, lack of responsibility, lack of advancement, or lack of adequate career opportunity. Or, perhaps lack of properly designed, targeted and effective education and training are not available.

Leaders should:

- be strategic planners addressing current and emerging issues;
- lead rather than resist desirable changes in organizations, priorities, goals and programs;
- be visionary, provocative, and become the agents in charge
- demonstrate the courage and ability to direct public and political attention and action to

science based priorities, rather than emotionally perceived priorities;

- develop and effectively implement necessary public policy;
- seek and capably fill positions at levels where policy is proposed, debated, and adopted;
- practice the art of networking, constituency development and diplomacy;
- practice total quality management internally and externally to their agencies;
- be sought by civic and political leaders for their expertise;
- insure that alleged problems are adequately defined prior to proposing expensive solutions and programs; and
- understand and communicate the net environmental, health, economic and social impact of proposed programs.

Education and training organizations and institutions should be teaching personnel the knowledge and skills essential to the foregoing.

Professional organizations should also play an active role in the development of environmental health and protection leaders while practicing leadership as an organization.

Part of the leadership issue can be addressed through formal academic training and part of it through the work of individuals, agencies and associations to identify and seize opportunities to provide leadership in addressing key environmental health and protection issues.

XIV. PROFESSIONAL EDUCATION AND TRAINING

The public health community has not perceived development of the environmental health and protection work force as a priority for the past 20 years. This inattention has contributed to the widespread deficit of properly educated and trained environmental health and protection personnel. Individuals with little or no knowledge of epidemiology, biostatistics, toxicology, public policy, risk assessment, risk communication, and environmental health science and protection program issues are filling key positions where such knowledge is essential.

Necessary competencies include:

- managerial and organizational behavior skills
- analytical skills
- communication and marketing skills
- policy development and implementation skills
- cultural awareness skills
- strategic planning skills
- financial planning and management skills
- basic environmental health and protection technical and scientific knowledge
- risk assessment skills
- risk management skills
- risk communication skills
- epidemiological skills

- biostatistical skills
- knowledge of the sciences of toxicology, chemistry, physics, biology, and geology.
- communicable disease/chronic disease knowledge
- environmental economics knowledge
- environmental law knowledge
- environmental health and protection planning knowledge (land-use, energy production, resource utilization, transportation methodologies, product design and development)
- knowledge of federal, state, and local environmental organizations
- ability to understand the net impact of proposed actions
- data collection and analysis skills

Many environmental health and protection professionals are now being educated by accredited environmental health science and protection programs, rather than by schools of public health as was the case in earlier years.

Many accredited academic environmental health programs and schools of public health appear to believe that their market is the health departments, rather than the full range of agencies and industries responsible for environmental health and protection.

The vast majority of personnel are professionals in environmental health and protection who are recruited from various professional disciplines such as chemistry, biology, geology, physics, administration, etc.

Continuing education and in-service training opportunities are in extremely short supply, but there is a consistent need and demand. Environmental health and protection problems associated with the modern environment are complex and constantly changing. Personnel who do not take affirmative steps to remain current are soon out-of-date and ineffective. Continuing education should be required and available in each state, or regionally.

XV. ACADEMIA-AGENCY RELATIONSHIPS

Schools of public health, environmental health science and protection programs, and other environmental health science and protection education and training efforts, will function most effectively when there is good two-way, continuing communication and involvement with the field of practice.

Likewise, the efforts of practitioners will be enhanced through the continuing and effective involvement of environmental health science and protection faculty.

Good rapport between academia and practitioners will not only enhance the quality of professional education and services, but will aid in ensuring the development of necessary applied research involving and benefiting both academia and practitioners.

XVI. CREDENTIALING

Credentialing is the formal recognition of professional or technical competence. There are two distinct means of credentialing: (1) individual credentialing consisting of certification, registration and licensure; and (2) institutional accreditation of education and training programs, colleges, and universities.

Certification is the recognition granted by a non-governmental agency or association to environmental health and protection personnel who have met specific educational requirements. Certification is granted by such groups as the American Academy of Sanitarians, the American Industrial Hygiene Association, and the Academy of Environmental Engineering. Environmental health and protection requires such a broad and varied group of disciplines, that certification of all professionals within the field is not feasible. However, as the need for specialized personnel increases, certification may help prospective employers identify candidates with the desired qualifications.

Registration is the acknowledgement by a governmental body that a person possesses a specific set of professional qualifications. Given the fact that the field of environmental health and protection requires the talents of scores of diverse professional groups and disciplines, registration of all such personnel is not possible. Some of these groups are required to be registered in accordance with non-uniform standards in many states. Many statutes provide for voluntary, rather than mandatory, registration. Some view registration acts as measures to protect and promote a profession, while others advocate such requirements on the basis of protecting the public from unprofessional practice.

Licensure is the process by which a government agency grants permission to an individual to engage in a given occupation upon finding that the applicant has attained the minimal level of competence necessary to ensure that public health, safety and welfare will be reasonably well-protected. With the exception of environmental engineers, environmental attorneys, environmental and occupational physicians and occupational nurses, most environmental health and protection personnel are not required to be licensed. Licensing requirements for engineers, physicians, attorneys and nurses relate primarily to their primary discipline, rather than to the field of environmental health and protection.

Accreditation is the acknowledgement that an educational institution or program maintains standards of education which qualify its graduates for admission to higher or specialized institutions, or for professional practice. Accreditation of schools of public health is conducted by the Council on Education for Public Health. Industrial hygiene programs are accredited by the Relating Accrediting Commission of the Accrediting Board for Engineering and Technology. The National Environmental Health Science and Protection Accreditation Council accredits both graduate and undergraduate environmental health science and protection programs.

Properly designed and applied, credentialing has the capacity of elevating the credibility and competence of specific components of the environmental health and protection workforce through the establishment of minimum standards, continuing education requirements and demonstrated competence. At the same time, credentialing programs must be sound. Further, they must be developed for the purpose of improving the quality of the workforce and protecting the public, rather than being incidental to protecting the workforce or being a marketing or promotional effort.

XVII. FINANCING THE EFFORT

Total funding utilized by the public and private sectors in the United States ostensibly to protect health and the environment may be adequate. The real problem lies in how the money is being spent and on which issues. Uncounted millions are being spent on relative non-issues in response to public perception and concern that has been turned into political action and public policy. The issue of environmental health and protection priorities has been discussed in Section III of this report. If the funds being inappropriately utilized for such low priority issues as asbestos removal, radon detection and control, elimination of Alar, the Waste Isolation Pilot Project, infrequent low levels of atmospheric carbon monoxide and other such programs not adequately based on good epidemiology, toxicology, and risk assessment were utilized to prevent problems which offer substantial risk reduction, the public and the environment would be better served.

Where funds cannot be reallocated from lower priority activities, state and local environmental health and protection agencies are increasingly required to rely on pollution taxes and fees for service.

Fund reallocations and imposition of pollution taxes and other market-based incentives will require the very best in articulate and knowledgeable environmental health and protection leadership as outlined in Section XIII, and the availability of professionals possessing the competencies iterated in Section XIV.

XVIII. CONCLUDING THOUGHTS

The future of environmental health and protection will, to a significant degree, depend on the ability of environmental health and protection agencies and personnel to:

1. Assess, prioritize and communicate environmental problems on the basis of sound epidemiology, toxicology and risk assessment rather than hysteria and reaction to self-serving advocacy groups. Prioritization among myriad complex and competing demands may be the most important responsibility of environmental health and protection professionals.
2. Exhibit a high measure of leadership and effectiveness in designing, promoting, gaining approval for, and implementing public policy. This may be the most difficult

responsibility for most environmental health and protection practitioners as few have been trained or experienced in the public policy and constituent development process.

3. Assure the public that effective environmental health and protection services are provided.

To merely manage the environment in accordance with legislative and executive branch dictates is comparatively easy. Such legislative and executive elected officials, understandably, have their own priorities based on the demands of their constituents. Environmental health and protection may or may not be among these priorities, but the relative priorities of environmental health would be much different if they were based on sound epidemiology, toxicology and risk assessment rather than emotion and political perception. Frequently, it is not a matter of shortage of total budget, but rather how it is being spent or in some instances wasted on relative non-issues.

Leadership on the road to improved environmental quality is not an easy route. There are many potholes in the way of providing effective, priority environmental health and protection services. The journey requires vision and steadfastness of purpose, as it is beset by emotional pressures, tempting comfortable detours, political surprises, and frequently offers no short-term gratification or pay-off. There are few if any rest stops along the way.

The foregoing will require that schools of public health and other programs educating environmental health and personnel ensure that all graduates be competent in analytical skills, communication skills, policy development, program planning skills, cultural skills, basic public health sciences skills, and financial planning and management skills. It is also essential that incumbent personnel be "retreaded" with these skills through effective continuing education mechanisms.

Ensuring a quality environment will require the combined efforts of government, individual citizens and citizen groups, the private sector, professional and trade groups, and academia. Effectively addressing the challenges and recommendations contained in this document will help ensure a quality environment for this and future generations.

XIX. POLICY RECOMMENDATIONS

1. Comprehensive and effective environmental health and protection services should be available to every citizen of our nation.
2. Environmental health and protection personnel, agencies, and other groups are urged to base priorities and programs on good epidemiology, health risk assessment, ecological risk assessment and toxicology; and agencies must have adequate analytical, data, legal and fiscal resources.
3. All agencies must be encouraged to give priority to the basic concepts and practices of prevention. Pollution prevention must be established as the management tool of first choice. Public policy must reflect the need to establish pollution prevention incentives and rely less on allowing environmental degradation with the response and remedy being the enforcement of command and control regulations directed at cleanup.
4. Agencies must become effectively involved in environmental health planning to be in a position to prevent problems created by land use, transportation, energy production, resource development and utilization, and product design and development.
5. Environmental health and protection personnel and agencies must effectively coordinate their activities with those of other public and private agencies and advocacy groups.
6. Programs should provide appropriate balance to issues of human health and ecological degradation.
7. Practitioners must recognize that environmental health and protection programs are organized within a wide variety of agencies at the federal, state, and local levels, not just in traditional health departments.
8. The U.S. Public Health Service and/or the Environmental Protection Agency should fund a study to identify the agencies responsible for the various environmental health and protection programs in each state. This study should also determine expenditures, and numbers and types of personnel engaged in such programs.
9. The current confusing non-system of delivering environmental health and protection services should be evaluated and recommendations made regarding the roles of federal, state and local agencies.
10. All environmental health and protection personnel must learn and practice the art of risk communication.

11. Every agency and educational institution should fulfill their responsibility to ensure that the public understands the complex variety of environmental insults which they may encounter.
12. Agencies should emphasize recruiting and retaining professionals who have the knowledge and skills essential to effectively prevent and solve the complex environmental issues of our society.
13. Educational institutions developing environmental health and protection personnel should review their curricula and ensure that graduates possess the competencies essential for their future responsibilities.
14. Educational accrediting bodies should modernize their criteria and ensure that graduates possess the essential competencies.
15. Inasmuch as most major environmental health and protection programs are federally mandated, the U.S. Congress should enact and fund a *National Environmental Health Education and Training Act* to ensure a continuing supply of environmental health and protection professionals to meet the nation's needs.
16. Every environmental health and protection agency and every appropriate environmental educational institution should develop a continuing, coordinated system in order to enhance the quality of professional education and training efforts, develop targeted research, improve operating programs, and enhance recruitment and marketing efforts. This must include a strong component of academic-practice interaction to enhance the transition from the educational system to the workplace, and enable the academic sector to maintain a current perspective of issues of applied environmental health and protection.
17. Schools of public health and other environmental health science and protection programs should carefully define and target the various issues and design their programs to address all public and private sector needs, rather than just those of "health departments."
18. Emphasis should be placed on educating and training a balance of generalists and specialists. Specialization has moved efforts farther away from the desired integrated approach necessary to focus on human and ecological issues.
19. Efforts to collect information about environmental health and protection activities should be expanded to include complete reporting at all levels of government. The Public Health Foundation should be the lead group to implement this recommendation.
20. Adequate research funding must be available to accurately identify and manage the

complex variety of threats to health and the environment and provide the data required to address the legitimate threats to human health and the environment.

21. Environmental health and protection research institutes should be established in a leading university in each state to ensure timely research that addresses local and regional issues.

22. Providing essential funding for preventing and solving the nation's environmental ills will increasingly require the best in creativity. Those charged with such responsibilities must develop competencies in environmental economics. This competency will also aid the practitioner in understanding the impact of programs on the economy, and the impact of the economy on programs and the quality of the environment.