

APHA Technical Report

The Public Health Implications of the Bhopal Disaster Report to the Program Development Board, American Public Health Association

BHOPAL WORKING GROUP

I. Introduction

The accidental release of methyl isocyanate (MIC) gas from a Union Carbide pesticide plant in Bhopal, India, in December 1984 now ranks as the worst industrial catastrophe in history. There is still no reliable estimate of the total number dead and injured. The well-publicized number of 2,500 dead is conceded by many to be a gross underestimate. Although the real number may never be known, most observers place it between 6,000 and 20,000 dead, and at least 15,000 injured. An estimated 100,000 to 200,000 people were exposed to a toxic plume of MIC that extended as far as 8 kilometers from the factory and covered an area of 40 square kilometers.

A. Issues

Although we may never determine the exact cause of the accident, it appears that it was precipitated by a number of factors. These include: the failure of standard operating practices and engineering controls; a pattern of disinvestment in the facility by the parent company; poor training of local operators; lack of communication and surveillance by corporate headquarters; and a variety of policies and requirements by the Indian Government.

Thus one of the principal difficulties in reviewing the implications of the Bhopal disaster is the degree to which the issues ramify. The incident poses questions concerning industrial siting, the proper kinds of safety engineering for developing countries, the export of hazardous technologies, integrated pest management (was a pesticide plant even necessary?), poverty and occupational health, to name a few. Many of these issues are being addressed by groups nationally and internationally. It is safe to assume that the typical crisis-response pattern of regulation in the United States will result in a re-evaluation of such programs as Section 112 (Hazardous Air Pollutants) of the Clean Air Act, the US Environmental Protection Agency's (EPA) regulation of underground storage tanks under the Resource Conservation and Recovery Act (RCRA), victim compensation and community right-to-know initiatives, as well as hazardous materials handling programs, among others. The Bhopal disaster has taken a place next to Love Canal, Three Mile Island, and other examples of sudden environmental crises as a symbolic lens through which these and other regulatory programs will be viewed. As a symbol, it raises not one, but a great many issues.

B. APHA's Role

The Program Development Board of the American Public Health Association (APHA) is charged with identifying those areas in which deficiencies in scientific knowledge exist in matters important to public health. In the present

instance, merely defining the problem has been a formidable task, much less identifying the knowledge required to solve it. The first question is whether there is a need for APHA to concern itself with a subject that is already drawing considerable attention.

APHA has recently issued position papers on some important issues that touch on the Bhopal tragedy (Right-to-Know laws, Victim Compensation),¹⁻³ and it would be wise to review these positions to see if they need any alteration or amendment in light of the Bhopal accident. The disaster in Bhopal has focused international public attention on occupational and environmental health, while at the same time the spectre of enormous financial liability has drawn serious attention on the part of industry to issues of health and safety. The moment may be opportune for public health professionals to shape the public debate.

With the prevention of injury and disease as our central concern, the Bhopal Working Group undertook to identify the variety of public health problems raised by the Bhopal disaster.

II. The Significance of Bhopal for Third World Development

For decades the countries of the Third World have been engaged in the strenuous tasks of economic modernization, with different nations achieving varying degrees of success. Simultaneously with economic development, and at least in part as a consequence of it, the Third World has been undergoing intense urbanization. At the same time there has been a rise in environmental and occupational problems. The dire poverty of substantial populations in these countries gives rise to its own set of public health problems and compounds the health effects of modern environmental toxins. Similarly, the effort to bring the "green revolution" to the underdeveloped countryside has introduced "high tech" hazards—chemical pesticides and fertilizers—to communities with "low tech" working and living conditions.⁴

Discussions of "technology transfer" have not usually included the transfer of health and safety technology. Nor has the debate over "appropriate technology" touched environmental health questions. In general, economic planners, public health professionals, and international health specialists have not adequately addressed these issues.

A. The Export of Hazards

In 1979, a conference on the "export of hazardous industries" was held in New York. The subsequent disaster in Bhopal vindicates the concerns expressed by scientists and policy analysts more than six years ago.⁵

Union Carbide's Bhopal plant was built in India, not to escape regulations in the United States, but to exploit better the Asian market for pesticides. However, the nature of the 1984 disaster and the utter recklessness that led to the tragedy

suggest a "double standard" of safety regulation by a multinational corporation. Jane Ives concludes her collection of studies of hazard export:

... current trends in the transfer of technology to developing countries continue to result in the ill-health of the indigenous populations. There is a serious and urgent need to study and develop a clear, consistent and rigorous policy within the World Health Organization. (5; p 186)

Dr. Ives recommends the convening of an international conference by WHO, including:

- the convening of experts to examine the health effects of technology transfer and report their findings to the World Health Organization (WHO), International Labour Office (ILO), and other national and international organizations;
- the formation of an ongoing study group to continually monitor and examine the problems of the transfer of technology and develop appropriate recommendations and policies; and
- the formation of a group of experts to conduct on-site investigations at target worksites in the developing world ... (5; pp 186-187)

International regulation or monitoring of toxic chemicals poses a substantial challenge. Whether international bodies like WHO can effectively monitor multinational corporations is debatable. However, domestic regulation of the foreign operations of US-based transnational corporations is not likely to be effective because enforcement of health and safety standards would intrude on the sovereignty of other countries. An assessment by an independent organization may be the only alternative, and then, only if compliance can be linked to industry's business interests. It is apparent that some of the costs of environmental hazards generated by industry are beginning to be felt by the insurance industry. The recent bankruptcies of some major corporations, in spite of strategies to limit their liability, have brought home the lesson that toxic exposures may not be good for profits. Investors and insurance companies may be wary of supporting the international ventures of chemical companies if they cannot be assured that excessive *liability* is not being underwritten. Legislation requiring that "Certified Environmental Audits" be filed with government agencies, such as the EPA—just as financial audits are filed with the Securities and Exchange Commission (SEC)—may actually serve the interests of industry and insurance companies, and provide some degree of protection to the public as well. Arrangements of this sort are already entered into "voluntarily" in some jurisdictions. Most banks in Massachusetts, for example, require site evaluation before giving mortgages to developers of residential buildings containing over four units and of all commercial and industrial properties. Some international lending institutions are also moving in the direction of detailed review of the environmental health and safety impact of technological projects. APHA and other professional organizations should consider what requirements "certification" might entail, joining with such groups as the American Industrial Hygiene Association, the National Environmental Health Association, and others including engineering associations to determine the appropriate requirements and to develop a consensus. All concerned professional organizations should take the initiative in urging funding institutions, such as the US Agency for International Development (AID), to increase the scrutiny and surveillance of public health consequences of the projects they sponsor, just as the World Bank now does through its environmental unit.⁶

B. Chemicals and Agricultural Development

Media coverage of the cause of the Bhopal tragedy focused only on the malfunction at the plant. Some commentators have blamed the catastrophe on poorly controlled technology or the dangers of modern science, while others blamed a lack of regulations in India and the poorly trained workers at the plant. Few have asked why this chemical plant existed in the first place.

The Union Carbide factory at Bhopal is a pesticide manufacturing plant. Pesticides have been widely used to prevent and control endemic disease, to reestablish faltering agricultural systems, and to allow less developed nations like India to develop a largely self-sufficient food system. But these were the advances of the 1950s and 1960s. We are now in the 1980s and it is time to reassess this once-miraculous technology.

Pesticides are poisons by design. Many are capable of causing cancer, genetic mutation, birth defects, neurological disorders, or spontaneous abortions in a variety of species. Malnutrition may increase the toxicity of these substances to humans. It is estimated that less than 1 per cent of the pesticide applied actually reaches and kills its target organisms while the other 99 per cent disperses in the environment where it may affect other non-target organisms, such as honey bees and birds, and has the potential to contaminate our food, water, air, and soil. Exposure of the general population to these chemicals is now so widespread that virtually all the earth's inhabitants bear a body burden of various pesticides. The health consequences of these past and continuing exposures are difficult to assess.

Not only the safety of pesticides but their efficacy must be questioned as well. Pesticide use has caused over 430 pest species to develop resistance to pesticides, making their control even more difficult (e.g., in the case of resistant malaria-carrying mosquitoes). Some secondary pests that had not posed a problem because they had been controlled by primary crop pests have flourished when the primary pest species was killed. As a result, the secondary pests have caused as much damage as the original species.

In spite of the potential health costs from these exposures and the limited effectiveness of pesticides in the long term, their use continues to grow dramatically. Less developed nations, especially, are continually urged to expand their pesticide use. Over the past 30 years, pesticide use has increased 10-fold, even as crop losses from insect damage have doubled. In the process, food chains have been disrupted, ecosystem stability reduced, and nutrient and energy pathways diverted.

One alternative to current pesticide practice is integrated pest management. In the future, agricultural development strategies should be considered within the province of international health.

III. *The Relevance of Bhopal for Industrialized Nations*

The interest of American public health professionals in the Bhopal disaster arose both because of the magnitude of the catastrophe and from the possibility that similar accidents can happen elsewhere in the Third World. In addition, chemical spills, releases, smaller scale accidents, and near disasters are seen with sufficient frequency in the United States to warrant serious attention as well. Too narrow a focus on the "double standards" of multinational corporations may blind us to imminent chemical hazards in the economically developed world.⁷

A. Spills and Releases in the United States

On October 3, 1985, the *New York Times* reported on "... the Government's first systematic effort to study the causes of ... [toxic chemical] accidents ..."⁸ This initial study, commissioned by EPA only after the Bhopal disaster, relied on an extremely limited data base from agencies in New Jersey, Texas, California, and the Midwest, the reports of certain newspapers, and inquiries to a national chemical hotline. The study reported approximately 7,000 accidents that injured nearly 1,500 people and killed more than 135. According to the investigators, extrapolation to the nation as a whole may increase the number of accidents by a factor of 2.5 to 3.

The fragmentary nature of data on hazardous material spills and releases reflects the US Government's and the public's casual acceptance of assurances from the chemical industry that it operates with necessary prudence. However, the mounting evidence, despite serious gaps in the data, suggests that broad public health concern is warranted. For example:

- The EPA receives reports of spills through its regional offices and through the US Coast Guard. A compendium of these reports available for 1977 through 1979 includes approximately 15,000 spills.
- Another source of information is the National Response Center, set up by Title 49 of Superfund (CERCLA), which receives mandatory reports of spills over certain amounts of 698 listed substances.
- The Nuclear Regulatory Commission (NRC) receives about 11,000 reports per year and estimates that an additional 30,000–40,000 spills are reported regionally to EPA each year but not compiled centrally.
- Similarly, the US Department of Transportation receives data on spills of about 14,000 substances. They are reported to the Material Transportation Bureau of the Department of Transportation.
- The Chemical Manufacturers Association has established Chemtrec as a hotline to assist spill/release containment and cleanup. The logs of their calls indicate the majority are for in-plant spills. Although Chemtrec personnel will remind the callers to notify the NRC if they have a "reportable quantity", they do not report spills independently.

EPA has proposed changes to existing laws requiring all reports to be submitted to the National Response Center. APHA and other concerned bodies, should support mandatory, centralized reporting and routine compilation of data, indexed by chemical, type of spill, and the parties involved.

In sum, while current data on "mini-Bhopals" in the United States are fragmentary and the collection of data must be improved and centralized (rationalized), existing evidence suggests that domestic problems require serious attention from the public health community.

B. Big Disasters vs Many Small Disasters.

We had been informed repeatedly by government agencies and by the company itself that Union Carbide was a leader in chemical industry safety. Yet, since the Bhopal disaster, reports about Union Carbide's domestic operations have given a different picture, showing frequent uncontrolled release of toxic gases and violations of Occupational Safety and Health Administration (OSHA) standards. On April 1, 1986, OSHA finally levied against Union Carbide their largest fine ever for safety violations, \$1.4 million. In June 1985, the whole town (approximately 1,000 people) of Thermal, Cali-

fornia, and 4,500 residents of neighboring Anaheim, Placentia, and Fullerton, were evacuated for several days because of a fire in a pesticide and fertilizer warehouse which contained over 70 different chemicals. Nine people were reported injured in this event. This serious accidental fire occurred in a desert community; had it happened in a densely settled area, the human cost might have been much more severe.⁹ In January of 1986, an accident at Kerr-McGee's Sequoyah Fuels Corporation plant in Gore, Oklahoma killed one worker and sent 100 people to the hospital. The accident occurred when a cask containing uranium hexafluoride ruptured after being heated to remove excess material. Although this procedure was "specifically prohibited" by company rules, it subsequently turned out that the same thing had been done at least 20 times in 1985 alone. There are 42 plants in the US involved in the production of nuclear fuel, and heating of tanks has occurred in at least one other plant, in Metropolis, Illinois.¹⁰

These and similar reports, together with the fragmentary evidence just cited suggesting that "small" disasters occur regularly in the United States, raise concerns that the risk of toxic chemical spills and leaks will increase with the aging chemical industry plants and with the industrial decline evident in portions of the US. Public health professionals need to be alert to these possibilities, acting now to prevent future disasters.

C. Corporate Disinvestment as a Public Health Issue

A number of factors have been the focus of discussions aimed at determining the causes of the Bhopal disaster. Design defects and modifications, mechanical failure of safety controls and monitoring equipment, inadequate training, and negligence by plant operators have all been cited as being at least partly responsible for the lethal gas leak. While poor maintenance of plant equipment and safety systems has been linked to the Bhopal tragedy in some accounts, safety precautions are often early victims of corporate cost-cutting and disinvestment decisions.

These actions were taken by Union Carbide in the broader context of its declining business in bulk commodity chemicals. In sales, Union Carbide (UC) is the third largest chemical company in the US. Recently, it has undertaken a major strategy of capital redirection away from money-losing areas, divesting itself of over \$1.4 billion in unprofitable operations.¹¹ For some time prior to the accident, the company had been attempting to sell the facility at Bhopal, which had lost over \$4.5 million over four years. This helps to explain why ten major deficiencies identified by a UC inspection of the Bhopal plant in May of 1982 were still not entirely rectified more than three years later.¹² The "action plan" adopted by the Indian subsidiary in response to the 1982 inspection most likely was not pursued with urgency because the company was losing money and the first priority was to cut these losses.

In addition to the adverse health effects that disinvestment produces in workers who are displaced from employment,¹³ corporate disinvestment increases the likelihood of disasters like the Bhopal tragedy. Where production involves hazardous materials, protection of the public health requires stringent regulations to ensure that safety standards are maintained in spite of pressures on management to cut costs. Management's failures are of such crucial importance to public health and safety that the Bhopal Working Group suggests that public health professionals study the links between disinvestment and the hazards to the public health.

IV. *Dealing with Chemical Hazards in Both Hemispheres*

In recent years, increasing talk about "industrial policy" and government interest in the "high tech" industry have raised the possibility of broad public discussion of strategies for economic development. Public health professionals must insist that the social cost of production, including occupational and environmental health hazards, be considered, and that the intellectual and capital resources of high technology be used to address the serious environmental hazards that arise. The improvement of the quality of life through the reduction of our dependence on hazardous substances should be a public health priority.

A. **Regulatory Issues**

1. *Regulatory Standards*

Neither the US nor India has adequate regulations to prevent a disaster such as Bhopal or to minimize damage in its aftermath. While the idea of evacuation planning is likely to gain currency, especially for older areas where residential and industrial uses are mixed, such plans do not address the matter of prevention. More to the point are regulations that provide for:

- specific standards on handling particular materials, to prevent explosive releases;
- performance standards to prevent explosive hazards and which would require a firm to demonstrate the adequacy of its safeguards;
- worker and community right-to-know and educational programs.

2. *Enforcement and Incentives*

Even if such regulations were put in place, government regulatory standards would be inherently limited in their ability to prescribe and enforce safeguards for every situation that arises in thousands of complex manufacturing environments. Yet, without strong outside intervention, the incentives for plant management to ensure safety, particularly with regard to low probability/severe outcome events, may be too weak. Regulatory programs are in need of bolstering or restructuring to provide stronger incentives and more thorough scrutiny of plant safety.

a. *Who Inspects*

Existing regulatory programs generally have too few inspectors to scrutinize safety protection adequately at complex manufacturing plants, or even at smaller facilities. A plant of the scale and complexity of Union Carbide's Bhopal or West Virginia facilities or Kerr-McGee's Sequoyah plant may need a dozen or more full-time health and safety experts on site. While in-house inspectors undoubtedly know far more about the workings of a plant than the occasional visiting government inspector, the right incentives for safety may be lacking. The following options for adding outside inspectors may help to increase the enforcement capability in such settings:

- *Increase federal or state inspectors.* The number of inspectors in state or federal regulatory agencies should be substantially increased.
- *Allow local inspections.* Local boards of health or Conservation Commissions and representatives of workers in the plants and of community organizations could be trained and empowered to inspect firms and penalize violators. Among the questions such local enforcement would raise are:
 - Should local enforcement be mandatory or optional?
 - Who should pay for local inspectors?
 - What training is needed?

- What public accountability mechanisms should be established to ensure honest and thorough inspection by local agencies?

- *Formalize independent health and safety auditors.* There is already a trend in industry and among insurance companies toward independent health safety and environmental audits of plants. Legal requirements could be established requiring manufacturers to pay outside consultants to review health and safety precautions at a plant frequently and thoroughly. Among the issues this raises are:

- Are there sufficient numbers of qualified auditors to conduct such audits?
- Should auditors be required to obtain a certification of qualification?
- How can such audits be made truly independent and trustworthy, if paid for by the company audited?
- What would be the time and expense involved in a thorough audit?

b. *What to Inspect For*

Given the limited reach of existing state and federal regulatory standards, a key question regarding the current inspection system relates to *what* to look for in inspections, and the degree of control that can be asserted by inspectors. (Community and worker right-to-know, an essential aspect of this discussion, will be discussed later in this paper.) Some combination of the following two ideas may be appropriate:

- *Require firms to disclose all hazards and safeguards.* Outside inspectors would seldom be as aware as company insiders of the types or risks and safeguards in a firm, unless the firm were required to indicate those elements of the operation to the inspector. In a detailed risk disclosure of the Union Carbide plant, for instance, the company might have been required to disclose:
 - the presence of methyl isocyanate (MIC);
 - the public health threat that MIC could present;
 - all mechanisms that the firm was employing to control the hazard.
- *Employ inspectors to study plant design and to recommend or require specific safeguards.* Even in the absence of specifically applicable standards, inspectors could be given some ability to control otherwise unregulated hazards. Among the things they could require might be:
 - safer alternative materials;
 - specific performance standards (e.g., double or triple back-up safeguards).

Checks on these powers might be necessary to the extent that an individual inspector could *require* any given action to be taken.

c. *Incentives for Compliance and Safety*

Should new types of penalties or incentives be employed in controlling disaster-type threats? Some possibilities might include:

- Criminal or civil penalties against corporate officers of employees;
- Increased used of administrative penalty powers;
- Increased accessibility and use of citizens' suits;
- Rewarding innovative means of eliminating toxic threats;
- Using publicity of good and bad toxics-handling habits through disclosure of safety audits to shareholders or the public;

- Penalties for poor audits by independent safety auditors;
- Mandatory insurance coverage with high premium rates for unsafe practices and materials.

Siting and Land Use Issues

The density of human settlements in close proximity to the Union Carbide Corporation plant transformed the Bhopal accident into a catastrophe. Had the same events occurred in a remote location, the movement off-site of the lethal MIC cloud to a distance of 5–10 kilometers would have resulted in far fewer, if any, deaths.

The juxtaposition of densely populated residential neighborhoods and industrial facilities is a familiar scene in Third World countries. Land use regulations to isolate potentially harmful emissions sources are poorly developed and even less effectively enforced. Indeed, until the last decade, special siting procedures governing hazardous facilities—e.g., chemical waste treatment facilities and nuclear power plants—were rarely encountered in the US chemical plants and hazardous waste treatment plants, for example, and historically fell under general zoning laws of municipalities and counties which were first enacted in the early to mid-1920s. For this reason, close proximity between heavy industrial and residential districts are commonplace in most older, built-up areas of US cities in such states as New Jersey and West Virginia.

However, two important differences exist between Bhopal and Third World settings compared with those in the US and Europe:

- First, regardless of the original patterns of land use surrounding a new industrial facility in developing countries, such activity acts as a magnet for job seekers. Strong incentives, such as reduced travel costs and early acquisition of information on new job openings, make it desirable for workers to reside near industrial employment opportunities. These necessities overwhelm many local land use controls. The resulting squatter communities or spontaneous urban settlements are common throughout Third World countries, regardless of urban land tenure systems and in spite of attempts by government to intervene in land occupancy.
- Second, job-hungry developing countries faced with potential industrial employers frequently relegate siting of plants to a subordinate role. It is difficult to conceive of the enactment, much less enforcement, of siting regulations in developing nations such as those contained in New Jersey's siting law that prohibit certain hazardous operations within a one-half mile radius of residential areas.

It is improbable that Third World governments will be willing or able to provide adequate siting safeguards to protect human populations from Bhopal-type disasters. The willingness to segregate non-worker populations from industrial risks will be undermined by pressures to accept employment opportunities. Furthermore, the reluctance of Third World governments to allocate scarce resources to establish or enforce the necessary laws on land use, especially in high density countries like India, is likely to persist. These institutional inadequacies reinforce the decisive role of corporate management and government oversight in averting future disasters.

In the United States, on the other hand, a redefinition and refinement of industrial zoning regulations is possible and

needed. The conventional "heavy industrial", "general industrial", and "light industrial" categories must be respecified to incorporate a hazard criterion. Standards for siting facilities of varying hazard levels need to be established by independent panels of technical and planning experts and disseminated to cities and towns nationwide. The movement for such action has been created by publicity surrounding chemical accidents as well as by television media coverage. Precedents for siting criteria are available for hazardous waste treatment facilities in Massachusetts, New Jersey, and elsewhere. These now need to be broadened to encompass the entire spectrum of hazardous activities covered under General Zoning regulations.

C. Right-to-Know Issues

The lack of community awareness and preparedness in Bhopal, and the trouble physicians had getting information to treat those not already dead, raise again the issues of availability of information and the "right-to-know." Such a discussion poses two related questions. First, what are the implications of the events at Bhopal for the Right-to-Know movement, and second, what specific policies should be supported to prevent future chemical catastrophes? By focusing public attention on the safety and environmental practices of the chemical industry, the Bhopal disaster has greatly stimulated state and local right-to-know movements. It has also prompted Congressional proposals for national right-to-know legislation, included to some degree in the most recent versions of the Superfund Reauthorization bill. New laws, or proposals to strengthen existing laws, will be on the legislative agendas of an estimated 15 states this year. Community and emergency response provisions have become increasingly viable politically. An interesting question is whether the right-to-know movement will extend its political goals to increasing the capacity of workers, public officials, and community residents to participate directly in the control of industrial hazards. APHA and other professional organizations should become involved in shaping this agenda.

In considering how information available through right-to-know laws can be used to recognize and change industrial practices which may endanger the lives of workers and their communities, it is important to consider:

- the ways in which public access to information can be increased by expanding and strengthening right-to-know laws and regulations;
- steps going beyond right-to-know which would enable those affected by hazards to respond to threats to their health; and
- the potential contribution of public health professionals to the development and implementation of such policies.

1. Strengthening the Right-to-Know

APHA's 1984 position paper, "Increasing Worker and Community Awareness of Toxic Hazards in the Workplace,"³ summarizes the limitations of the federal Hazard Communication Standard, steps needed to correct these deficiencies, and actions to be taken by APHA. The analysis and recommendations provided by this paper remain relevant.

However, given both the Bhopal disaster and the frequency of accidental chemical releases and spills in the US, as well as the proliferation of national, state, and local legislative proposals to deal with this threat, more explicit attention should be given to what further should be included

in community and emergency response provisions of right-to-know laws. One issue that has already been raised relates to the need for centralized, coordinated health and environmental hazard data management systems.

2. *Going Beyond the Right-to-Know: Strengthening the Capacity to Respond*

Industry opponents to right-to-know laws have argued that the mere listing of chemical identities adds little to the public's useful knowledge. However, the concept of right-to-know is already linked to increasing governmental capacities to monitor, regulate, plan, and enforce. The right-to-know has also become inextricably intertwined with the goal of increasing the ability of workers and citizens to participate in decisions affecting their lives and future.¹⁴ Most fundamentally, right-to-know is a step toward democratization of decision making regarding workplace hazards.

A comprehensive political agenda to strengthen the capacity of workers and community residents to respond effectively to information gained through right-to-know laws would affect many current laws governing the relationship between workers and employers, the community, and industry. Some of the potential measures which would make right-to-know a more meaningful tool are outlined below.

a. *Rights for Community Residents*

The overwhelming loss of human life at Bhopal along with a well-publicized and growing list of chemical disasters in the US have proven that the dangers associated with chemical production, transport, and use extend well beyond the factory gates. Communities are responding by demanding their right to know about chemicals and their health effects¹⁴ in order to participate more effectively in decisions which may affect the public health.

An agenda for expanding the rights of community residents could include the following items:

- the right to inspect facilities suspected of damaging public health or the environment;
- the right to participate in decisions which may affect the public health or environment and the authority to refuse dangerous projects;*
- the right to approve local emergency response plans.

If enacted, such initiatives would mean that decision-making authority, formerly concentrated exclusively in the hands of corporate managers, would be shared with citizen representatives where matters of community health and safety are involved. As noted by Nicholas Freudenberg in *Not in Our Backyards!*,¹⁵ these proposals raise a number of questions still to be resolved, ranging from criteria for defining a risk level acceptable to the community, to political structures for the exercise of these rights.

b. *Rights for Workers*

Events at Bhopal have thrown risks to the community surrounding an industrial facility in sharp relief and, with these risks, the need to increase the capacities of affected citizens to respond to potential health threats. It is important to remember that workers and their unions have a vital role to play in any plan to reduce industrial accidents.¹⁶ With their intimate involvement in the production process, workers

*The most significant leverage which can be exercised by a community is probably at the point of deciding whether or not to allow a plant to locate in that community, or to require use of a different process. To fully exercise a right to refuse dangerous projects, additional types of data may be necessary. For example, it may be desirable to require that Environmental Impact Statements consider "worst case scenarios" as well as analyze the impact of normal production processes.

have the greatest opportunity to detect problems that may escalate into an accident or catastrophe. As the individuals whose lives are in most instances immediately at risk, workers have a strong and direct motivation to intervene. Furthermore, the union and its health and safety representatives and committees provide mechanisms already in place at many worksites to share with management control over important health and safety decisions.

However, the employer's control of the production process, even in the face of imminent threats to worker safety and health, is widely accepted as a basic management prerogative. This value is deeply rooted in American labor law and judicial interpretations of employer rights. Workers operating outside the specific guarantees of a collective bargaining agreement place their jobs at risk when they challenge management prerogatives. Greater statutory protection is needed if workers are to be able to act in a meaningful fashion, based on their understanding of threats to their own or to the community's health. In light of Bhopal and the current weakness in inspection, APHA and other concerned professional organizations could consider supporting the following steps toward redefining the balance of power over the production process where threats to health and safety are involved:

- 1) Protection for whistleblowers,
- 2) Right to refuse dangerous work,
- 3) Right to shut down a hazardous production process.

3. *Role of Public Health Professionals*

The growing activism of workers and community groups around occupational and environmental health issues creates significant challenges and opportunities for the field of public health. Although public health has historically been at the forefront of many progressive social movements, organizations of public health professionals have not routinely played a conspicuous role in the community/environmental/labor coalitions which have fought for right-to-know laws at the state and local levels. Public health officials have frequently found themselves in an uneasy, even antagonistic, relationship with environmentalists and community activists who react critically to government's performance in investigating and controlling environmental health hazards. Although these citizen groups constitute a powerful new constituency in the public health arena, the advantages of political alliances between organizations of public health professionals and community activists have frequently been ignored.

V. *Some Implications for Public Health Policy*

Throughout this report, implications for public health policy are made, as well as indicating areas for further research and analysis. The main ones are:

- 1) Data should be collected and compiled routinely and published by name of chemical, type of spill, and involved parties, thus constituting a national registry of reportable spills.
- 2) The link between industrial decline, disinvestment, and health hazards needs to be continually monitored and analyzed by health professionals with disinvestment or decline viewed as a probable warning sign of potential increased risk;
- 3) International health specialists and funding agencies need to give close and consistent attention to occupational and environmental hazards in planning their projects and carrying out their activities;
- 4) Research and monitoring of the relationship be-

tween agricultural development and the Green Revolution should be strengthened by the greater involvement of public health professionals, and various approaches, such as integrated pest management, should be assessed and recommended as public health strategies;

- 5) More attention is needed on the analysis of possible hazards in technology transfer to diverse types of regions and local areas in various parts of the world. Public health professionals should join with other professional groups to determine criteria needed for a system of appropriate environmental audits and the certification of qualified auditors. Legislation should be considered requiring periodic filing of "Certified Environmental Audit" reports by firms seeking investment funds or insurance for international activities;
- 6) Source reduction should be a key element in protection of the public's health from environmental hazards; public health professionals should seek to influence the national discussion of industrial policy to include environmental and occupational health concerns. Regulatory agencies, such as the EPA, should direct attention to strategies for minimizing toxics usage by substituting safer products and materials for hazardous ones, changing processes to avoid waste and effluent generation, and recycling or reuse of chemicals to avoid the need for disposal;
- 7) Public health professionals should consider supporting the steps which redefine the rights of workers so that they might be better able to identify, and promote measures to redress, hazards in the production process involving health and safety, with regard to protection of whistle-blowers, rights of workers to refuse dangerous work, and the right to shut down a hazardous production process;
- 8) There is a unique and important role for public health professionals in providing communities and employees in hazardous industries with the knowledge and skills needed to institute and maintain effective controls of industrial hazards;
- 9) The suggestions for improved regulation and enforcement should include expanding regulatory standards, broadening inspection authorities, and establishing new incentives for safety.

- 10) The discussion of siting emphasizes the necessity for strict regulation of plant safety; it is illusory to consider land-use regulation as a tool for avoiding Bhopal-type disasters in developing countries. In the US, attention is advisable to the possible need for incorporation of considerations of public health hazards which should be included in zoning regulations as affecting existing, as well as future, land use.

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