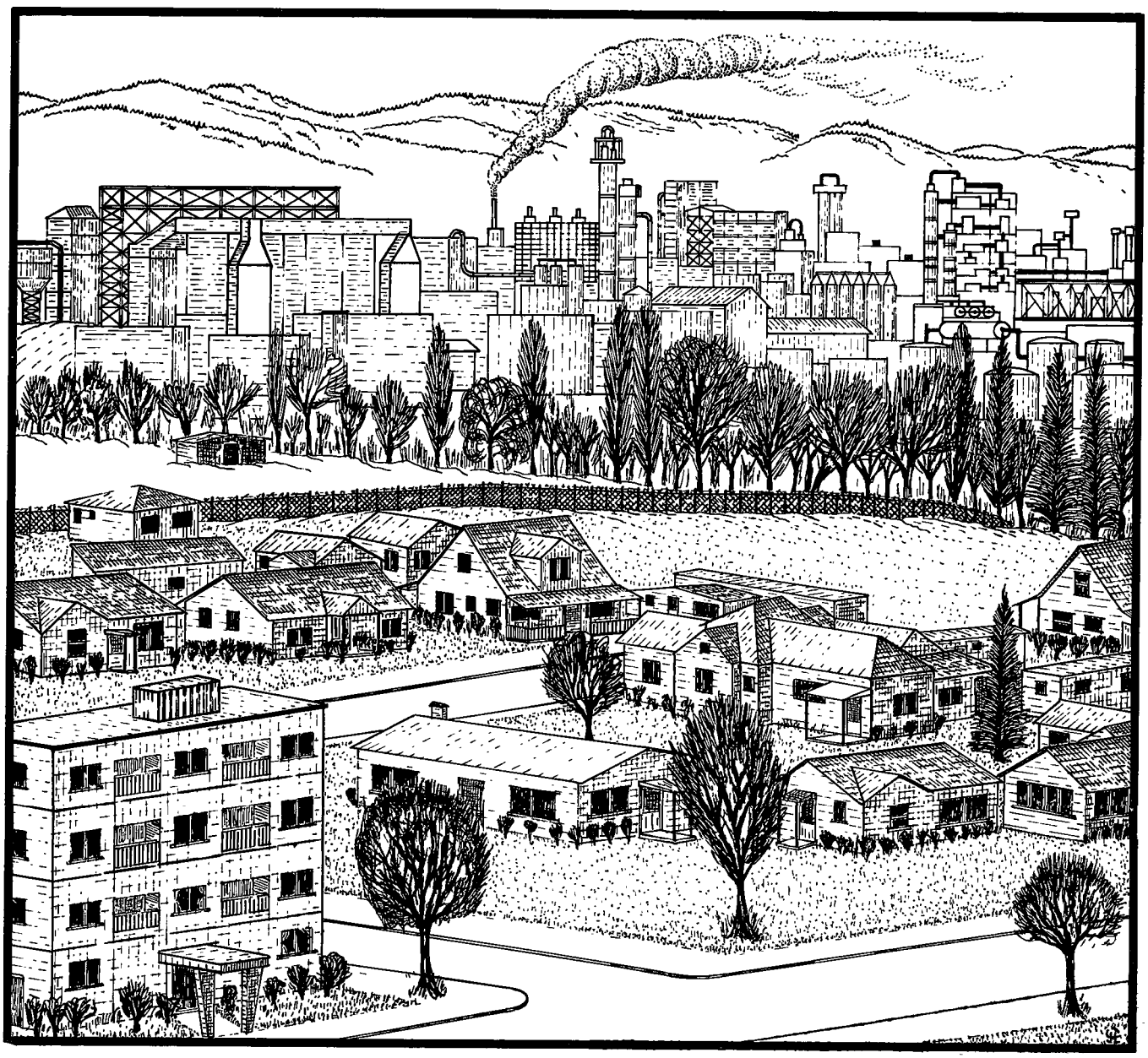
Bhopal Aftermath Review : An Assessment of the Canadian Situation

Summary Report

February 1986



Environment Canada
Environnement Canada

Environmental Protection Service
Service de la protection de l'environnement

Canada

Environment Canada | Environnement Canada

2043995H M

CANADA. COMITE DIRECTEUR DES REPERCUSSIONS DE BHOPAL.

BHOPAL AFTERMATH REVIEW: ASSESSMENT OF THE CANADIAN SITUATION

SUMMARY REPORT

prepared by a Steering Committee representing:

Agriculture Canada
Alberta Energy Resources Conservation Board
Canadian Association of Administrators of Labour Legislation
Canadian Chemical Producers' Association
Canadian Petroleum Association
Canadian Transport Commission
Emergency Planning Canada
Environment Canada
Health and Welfare Canada
Petroleum Association for the Conservation of the Canadian Environment
Regional Industrial Expansion
Transport Canada

February 1986

ERRATUM

Bhopal Aftermath Review: An Assessment of the Canadian Situation

Summary Report

February 1986

Pages 16 and 18 - In the last sentence on both pages:

Chemical Valley Emergency Coordinating Organization

should be

Chemical Valley Emergency Control Organization

Etude des Répercussions de Bhopal: Évaluation de la situation Canadienne

Rapport Sommaire

Février 1986

Page 19 - 3ième paragraphe, dernière phrase:
Page 21 - Dernière phrase:

Chemical Valley Emergency Coordinating Organization

devrait être

Chemical Valley Emergency Control Organization

MEMBERS OF THE BHOPAL AFTERMATH REVIEW STEERING COMMITTEE

D. WAYNE BISSETT, CHAIRMAN
Chief, Chemical Industries Division
Environmental Protection Service
Environment Canada

EDWARD R. BRUSHETT
Manager
Environmental Protection Division
Energy Resources Conservation Board
Alberta

ADRIAN CARTER
Evaluation Officer
Pesticides Division
Agriculture Canada

ALLAN C. CORMACK
Manager, Planning
Safety, Health and Environmental Services
Petro Canada

Representing the Petroleum Association for the Conservation of the Canadian Environment

DAVID GOFFIN
Manager
The Canadian Chemical Producers' Association

J. ROY HICKMAN
Director, Bureau of Chemical Hazards
Environmental Health Directorate
Health and Welfare Canada

W.F. KARASKEWICH
Dangerous Goods Division
Operations Branch
Railway Transport Committee
Canadian Transport Commission

BRIAN MANSFIELD
Chairman, Working Group No. 3
Environmental Emergency Program Division
Environment Canada

PETER MAZEROLLE
Chairman, Working Group No. 1
Environmental Emergency Program Division
Environment Canada

JOHN McADAM
Chemicals Directorate
Resource Processing Industries Branch
Regional Industrial Expansion

JOHN R. MONTIETH
Director, Regulatory Requirements
Transport Dangerous Goods
Transport Canada

F. CHRISTOPHER SMITH
Senior Specialist-Safety
Gulf Canada Resources Inc.
Representing the Canadian Petroleum Association

LLOYD SWICK
Plans Co-ordination and Development
Emergency Planning Canada

RALPH TIMMERMAN
Emergency Services Division
Medical Services Branch
Health and Welfare Canada

RAYMOND E. VALIN
Technical Secretariat
Occupational Safety and Health Committee
Canadian Association of Administrators of Labour Legislation (CAALL-OSH)

CONTENTS

FOREWORD

On December 3, 1984, the world's most tragic chemical accident occurred at Bhopal, India. Over 2000 people were killed and tens of thousands were injured. In the few days that followed the Bhopal release, Canada's Minister of the Environment announced that departmental officials would be contacting their federal and provincial colleagues and representatives of industry to assess the adequacy of existing accident prevention and emergency preparedness measures.

Five years before Bhopal, in November 1979, the City of Mississauga faced a major chemical transportation accident of potentially catastrophic proportion. Over 200 000 residents were evacuated without incident. That experience brought many changes in the way dangerous commodities are shipped by rail in this country and spurred on safety efforts in other methods of transport, leading to the Transportation of Dangerous Goods Act in 1980 and subsequent regulations in 1985.

The sour gas well blowout at Lodgepole, Alberta, in October 1982, had a similar effect. The oil and gas production sector strengthened its measures to prevent accidents, especially during drilling, and took steps to drastically reduce the impact should an accident occur.

The Bhopal accident triggered the chemical industry to increase its efforts in the areas of plant safety, community awareness and emergency response.

An industry/government steering committee met in March, 1985, to establish terms of reference for the Bhopal Aftermath Review Project. Working groups were formed to:

- examine the **potential** for Bhopal-type incidents in Canada;
- review measures taken by industry and governments to **prevent** accidents;
- assess the collective ability of industry/government to **respond.**

In July 1985, a discussion paper outlining the issue and the Steering Committee's need for more information on industry and agency programs, legislative aspects and public concerns was distributed to over 300 recipients. Several organizations and associations, including representatives of environmentalist groups, labour agencies, and municipalities, indicated their desire to participate in the project. Over 700 copies of the working group draft reports were distributed and in early December, a series of six meetings were held across the country where interested parties could consult with and provide comment to Steering Committee members. The results of this extensive

consultation have greatly benefitted the committee's work and have resulted in the final report.

In the early part of its work, the Steering Committee had to determine the scope of its work. It was decided that an intensive investigation of the Bhopal incident would not significantly advance the cause of accident prevention in Canada. What was needed was an overall picture of where we stand in Canada today, on major accident prevention and emergency preparedness. As we have not had an accident with such a tragic result, we defined a Bhopal-type incident as a major industrial or transportation incident resulting in an acute exposure to a chemical that has the potential to cause death or adverse health effects in the community. Accidents such as the Mississauga train derailment, the Lodgepole blowout and many others, illustrate the type of incident on which we wanted to focus. Throughout the text we have used Bhopal-type incident and other terms, such as major industrial accident, interchangeably.

Future action will involve industry, governments at all levels and citizens who, while becoming more cognizant of the dangers around them, must become more responsive and participative. The recommendations will have to be evaluated by:

- government agencies (at all levels) that have a legislated mandate to act in a particular area, such as zoning, plan approval, worker safety, transport, public and environmental protection;
- industry, which has the ultimate managerial responsibility for loss prevention; and
- interested parties, such as labour and the public, which have the right to work in and live in a safe environment.

The Steering Committee recognized that this review can only point the way to reducing the risk to society of major industrial accidents such as Bhopal. We also recognize that Canadians enjoy a lifestyle that relies on potentially dangerous chemicals. Ensuring that chemicals are managed better and that Canadians are adequately protected depends on the personal commitment of politicians, industrialists, workers, public officials and the general public. If we, collectively are not prepared to make this commitment then we may face the consequences of a Canadian Bhopal.

OVERVIEW: WHAT CAN WE LEARN FROM BHOPAL?

One of the obvious lessons that Canadians have learned from Bhopal is that large scale human suffering and death can result from major chemical accidents. We have again been reminded that a population that benefits from the advances made by technology also bears a risk for adverse effects which can never be entirely eliminated. We see once more the message that such accidents, as well as smaller incidents and near-misses must be studied in depth for the many lessons they can provide to prevent and mitigate future disasters. Identifying the lessons in hindsight and documenting them is the easier, but less important task. People within an organization must be committed to the frequent review and application of such lessons for their own situations. As a loss prevention expert once said, "Organizations have no memories". Foresight and preventive action before the next event is the more important and difficult task.

In the Canadian context, we have experienced a number of serious chemical accidents in recent years, although fortunately with little loss of life. Many people recall names like Mississauga and Lodgepole in this context, but there have been a number of other accidents and near-misses. As a nation, we have learned some lessons and made some improvements, but Bhopal has shocked the whole system, and made all parties more receptive to review and change for improved industrial safety and loss prevention. The greatest challenge is to sustain this awareness and continuing concern in the months and years ahead.

As a first step in meeting this challenge we must address a number of specific lessons or issues which the Bhopal disaster has raised:

(i) Potential for Chemical Accidents

The Bhopal disaster provided direction for the committee to shape the criteria for identifying chemicals that have a potential for a major chemical incident. By reviewing all possible mechanisms by which the public could be exposed to catastrophic events caused by chemical accidents, it was possible to define the characteristic by which chemicals with such potential could be identified.

Although the chemicals involved in the Bhopal incident are not manufactured in Canada, other chemical agents equally dangerous are made and used in this country. The committee concluded that, while the safeguards in place go a long way to minimize the occurrence of such a major incident, Canadians should not become complacent as the possibility for such an incident is always present.

(ii) **Siting and Land-Use Control**

In Bhopal, residences were built virtually up to the factory gate and so any major release would affect the community. To a certain extent in Canada, residential development has been allowed in close proximity to industrial plants even though most municipalities have zoning by-laws. We must find ways to ensure that this does not occur for new facilities and look at ways to maintain buffer zones at existing plants. Politicians and officials who make zoning or planning decisions of this type must be fully aware of the potential hazards which may be involved in plant siting.

(iii) **Safety Management Systems**

When we reflect on the Bhopal lessons for Canada, a number of conclusions can be drawn regarding safety management. As an example, many improvements have been made in the field of hazard analysis and risk management in recent years and these developments will continue. Certainly, the plant at Bhopal would have been designed using some of these techniques. But even though the plant was relatively new, evidence suggests that changes were made in processes, equipment, maintenance and operations which were not taken into account through proper hazard analysis. While this kind of incident could occur in a large plant, it is more likely to happen in a smaller facility that does not have rigorous design analysis procedures and management safety systems.

The lesson here is that we need to ensure that all plants apply hazard analysis and risk management techniques in the assessment of their processes and operations. This assessment should be comprehensive and should re-examine even basic process design questions regarding toxic chemicals. Examples would include re-evaluation of the required inventory volumes and/or concentrations, and the possibilities of substitution of less toxic chemicals involved in the process.

Another lesson involves the need to consider <u>total</u> incident costs when examining risks, economics and the merits of process changes or operational improvements for safety and loss prevention. Management must provide adequate resources and corporate commitment to the loss prevention function. In addition to the human suffering involved, the magnitude of potential economic impact of a major chemical accident on even the largest of industrial companies was brought forcefully to the attention of every corporate executive by the aftermath of the Bhopal accident. Increasingly, industries should be recognizing the benefits of auditing the safety of

their hazardous material operations by competent independent experts. The Bhopal experience suggests that such reviews should be carried out periodically throughout the life of the plant or other hazardous operation. Companies should keep abreast of, and use as soon as feasible, the best of available and new safety technologies.

Another lesson involves the reminder that hazardous chemical plants cannot be allowed to operate unless all safety systems are adequate and are functioning properly. This increased awareness and commitment must somehow be sustained in future when recent accidents begin to fade from people's memories. In addition, all industrial workers, supervisors and managers involved in making, handling, storing, transporting or using hazardous chemicals must be sure they understand the nature of the hazards in their control, and the possible magnitude and implications of a major accident.

Every employee must be alert to such hazards, and be able to evaluate and communicate his concerns. Management must be listening and responding as needed to these concerns.

(iv) **Community Awareness**

It is difficult to say whether public knowledge of the chemicals involved in Bhopal would have assured any different outcome. Certainly, the government officials who approved the siting of the plant were aware of the chemicals. Many of the people who were killed lived in poverty and may have had little other choice except to live where they did, even if they understood the potential danger.

While we are fortunate in Canada not to have the problems that faced the people of Bhopal, we must never assume that the people living next to industrial plants are not concerned with what goes on behind the factory fence. The public may not be concerned with the technical details of a process (i.e., temperature, pressure or type of catalyst), but they do want, and have a right, to know whether chemicals are present that could harm them and what safeguards are in place.

Bhopal has triggered a reaction by industry that recognizes this right and industry is initiating programs to communicate more openly with the community. The Steering Committee believes that this is a two-way street and that if industry is willing to work with the community, community officials must respond in kind. This may take more resources in terms of staff to work jointly with industry to develop the appropriate contingency plans.

(v) **Emergency Preparedness and Response**

Any major disaster can strain or overwhelm the collective capability for response. Emergency planning, establishment of adequate warning and response systems and care of the affected population are three important facets of this capability. Most reports from Bhopal indicate an inadequate warning system was further hampered by a delay of several hours in sounding the alarm; and by a lack of training or knowledge on how to respond on the part of both employees and nearby residents. Clearly, a warning must be immediate, and the response based on a set of comprehensive and integrated contingency plans for both the facility and the nearby community. These plans must be publicized and tested on a regular basis. They should be sufficiently detailed to include such options as deliberate destruction of property (e.g., igniting the gas cloud at Bhopal) if safety concerns for a populated area become paramount.

(vi) **Emergency Medical Treatment**

There is general agreement that the medical staff in Bhopal did everything that they possibly could to treat the victims. However, there is also evidence that the necessary antidote information was not made available to the doctors until some 24 hours after the release. Some debate still exists about the nature of the exact poison mechanisms involved in this tragedy.

In Canada, we can and must take steps to ensure that the medical staff in our hospitals are knowledgeable in the methods required to treat victims of the most probable chemical releases in a specific area and that information is available at a moment's notice for other situations. However, along with the knowledge of medical protocols, the medical supplies for treatment must also be available on short notice. Identification or provision of inventories of such specialized material and equipment should be undertaken in higher risk areas for those chemicals of local concern.

CONCLUSIONS AND RECOMMENDATIONS

In assessing the adequacy of existing measures in Canada to prevent and respond to major industrial accidents such as occurred at Bhopal, the Bhopal Aftermath Review Working Groups and Steering Committee came to a number of conclusions that identify where further action is recommended to improve information transfer, strengthen operation of industries and government agencies, and provide more efficient and effective safety management and emergency preparedness systems. These recommendations will require commitments of resources, both human and financial, for their implementation.

Throughout the consultations across the country, the Steering Committee was reminded of the need for leadership and coordination in ensuring that recommended actions are taken. The Steering Committee suggests that a task force of senior level officials from appropriate departments (federal and provincial), representatives of industry and possibly other parties representing the community interest be established to evaluate the implications of the recommendations on the resources of various government agencies and industry. This task force could also coordinate or at least monitor specific activities that are undertaken and could report at a future date on the progress that has been achieved. The Steering Committee believes that existing federal/provincial committee structures with their expertise in specific areas could offer appropriate assistance to the task force in reviewing and implementing the recommendations.

Each recommendation is followed by a listing of those organizations or groups which the Steering Committee feels could be involved in follow-up action. The organizations and groups are designated as follows:

E	Environment	T	Transport
H	Health and Welfare	P	Emergency Planning
L	Labour (includes all aspects of occupational safety and health)		

Risk Assessment

Conclusion 1. In Canada we manufacture, use and transport many chemicals that fit the hazard criteria for chemicals that could give rise to a major industrial accident. The analysis of use patterns and spill trends of chemicals used in Canada indicates that there is a definite correlation between the chemicals most commonly used in industry and those spilled in greatest volume and frequency.

It is possible to apply criteria based on toxicity, flammability and dispersive and explosive characteristics as has been done in the Transport of Dangerous Goods Regulations to determine which chemicals have the greatest potential to affect a large population in the event of a major spill or release.

Recognizing that it is not feasible to anticipate all possible accidents, criteria were developed to identify chemicals having a potential for large scale incidents in Canada. In addition to these criteria, qualitative risk analyses can be carried out taking into account such factors as volume of material present, storage conditions, and other parameters, on a case-by-case basis.

Recommendation 1

(a) Using the hazard criteria as a basis for identifying the chemicals of importance, a site-specific risk assessment should be carried out for each industrial plant to determine the potential for a major industrial accident. (Industry)

(b) Industry should involve community officials in risk assessments. (Municipalities; Industry)

(c) Information contained in Material Safety Data Sheets should be provided by companies to emergency response teams through public officials as input to the risk analysis. (Industry; Municipalities)

(d) A central "clearing house" for the preparation of uniform Material Safety Data Sheets should be established. (Federal/Provincial)

Chemical Spill Response Information

Conclusion 2. Data bases providing profiles for all chemicals manufactured, used or transported in Canada already exist in various agencies such as Transport Canada, Environment Canada, the Canadian Centre for Occupational Health and Safety, chemical companies and others. Information can be obtained quickly by telephone through the Canadian Transportation Emergency Centre (CANUTEC), Environment Canada, or from the manufacturer.

Emergency responders also require readily-available reference materials in the form of handbooks or manuals which can be used at the accident scene. Government publications presently do not contain all necessary information on chemicals that meet the hazard criteria for Bhopal-type incidents.

An important consideration in many emergency situations is the mixture of chemicals. In these cases, the first responder must seek the advice of experts as the combination of chemicals that could occur cannot possibly be covered in an easy-to-use manual.

Recommendation 2

(a) Transport Canada's initial response book "Emergency Response Guide for Dangerous Goods" should be reviewed and Environment Canada's second level response manual "Manual for Spills of Hazardous Materials" should be updated and expanded to include on a priority basis Bhopal-type chemicals listed in Schedule XII, Part II of the Transport of Dangerous Goods Regulations. (Federal: E, T)

(b) Government agencies, industry, and representatives of first responders should determine how this information might best be disseminated to users. The policy of cost-recovery for such materials should be examined. (Federal: E, L, T; Provincial: E, L, T)

Safety Audits and Assessments

Conclusion 3. After the sour gas well accident at Lodgepole, Alberta, the oil and gas production sector re-examined its safety programs and implemented stronger measures in many areas. The petroleum refining industry, due mainly to the size of its operations and corporate structure, has had safety and loss prevention programs in place for some time. The majority of chemical companies also have safety audit programs, but immediately after Bhopal, the Canadian Chemical Producers' Association (CCPA) assessed the extent of audit practices within its membership. The CCPA then developed a standardized safety assessment procedure for use by its members in their plants.

Other safety audit programs, such as the Five Star Program administered by the Industrial Accident Prevention Association in Ontario, are also used in Canada at many plant sites.

Recommendation 3

(a) Industry through its associations and governments should determine the actual status of safety and accident prevention programs as well as auditing activities in medium and small operations. (Federal: E, L; Provincial: E, L; Industry)

(b) Major industrial associations should provide assistance to medium and small companies and share information relevant to establishing safety and accident prevention programs. (Industry)

(c) The standard safety assessment procedure developed by the Canadian Chemical Producers' Association or the Five Star Program should be implemented widely by all chemical user industries to establish and maintain adequate safety management systems. (Industry)

First Steps to Hazard Reduction

Conclusion 4. Although many companies have adopted extensive measures to reduce the risk associated with hazardous materials, certain immediate actions were identifed as a minimum first step.

Recommendation 4

Companies using or manufacturing hazardous chemicals should:

(a) minimize inventories of hazardous materials (Industry);
(b) exchange information on accidents and "near-misses" (Industry); and
(c) ensure that personnel are fully trained and knowledgeable about the hazardous chemicals they are required to handle (Industry).

Safety Statistics

Conclusion 5. The accident record of the Canadian chemical and petroleum industries is, in general, better than the average for other industry sectors. However, the information base that documents this record needs to be improved. Worker loss-time and illness statistics can be interpreted as an indication of the attitude and approach taken by an industry sector towards safety but not necessarily as a reflection of the programs in place to prevent a Bhopal-type incident.

Recommendation 5

Governments and industry should make safety statistics available to one central clearing house such as Statistics Canada or the Canadian Centre for Occupational Health and Safety. These statistics should specifically include data related to hazardous chemical accidents. (Federal: E, T, L, H; Provincial: E, T, L, H; Industry)

Contingency Planning

Conclusion 6. In the petroleum, industrial chemical and major railway industries, the development of chemical spill contingency plans has been underway for many years. These industries are continually reassessing and improving their capabilities for dealing with serious chemical accidents. Companies that transport or use Bhopal-type chemicals in their operations can learn from the experiences of the major producers or suppliers and transporters.

Recommendation 6

(a) Contingency plans and planning guidelines such as those developed by Canadian Petroleum Association and Alberta Public Safety Services for possible sour gas releases, as well as the emergency preparedness assessment program of Canadian Chemical Producers' Association, should be used as exemplary models by all companies involved with Bhopal-type chemicals to develop contingency plans.

(b) Companies that use chemicals of concern and their industry associations (e.g., the Canadian Pulp and Paper Association, the Mining Association of Canada, and the Canadian Manufacturers Association) should, in consultation with the appropriate agencies, review their emergency

preparedness programs to ensure a firm commitment to spill prevention, an initial response capability, and a rapid access to response teams. (Federal: E, P, L; Provincial: E, L; Industry; Municipalities)

(c) The Canadian Trucking Association, in cooperation with provincial emergency measures agencies and others that administer the on-highway transportation of dangerous goods, and in consultation with Transport Canada and the Canadian Chemical Producers' Association, should review existing training programs for truckers and handlers of Bhopal-type chemicals to ensure that adequate knowledge of initial-response actions for such chemicals is being provided. A followup to the review may involve specific projects for individual companies or for the association. (Industry; Provincial: T)

(d) The many small railways in Canada should consult with CN and CP, and with other government agencies to ensure an adequate capability for dealing with incidents involving Bhopal-type chemicals. The adequacy of their response capabilities, including countermeasures equipment available from mutual-aid sources, should be examined and additional capability should be acquired if necessary. (Federal: T (CTC))

(e) The Canadian Coast Guard (Ship Safety and Emergencies groups), in consultation with the industrial associations and appropriate government agencies, should review the spill prevention and response capability of the shipping industry. (Federal: E, T; Provincial: E, T; Industry)

Spill Reporting and Analysis

Conclusion 7. Reporting of spills as required by the Transportation of Dangerous Goods Regulations is providing an extensive data base on transportation related accidents. The National Analysis of Trends in Emergencies System (NATES) was designed to compile and analyze information on spills from all sources. However, the reporting of plant-site releases, is not consistent amongst provinces; the information is also vountarily supplied to NATES by the provinces. As transportation sector reporting is mandatory and the other sectors are not, there are consequent gaps and inconsistencies of information in the data base.

Recommendation 7

As the data base for plant-site releases should parallel the activity for transportation incidents:

(a) Legislation requiring the reporting of spills/releases from non-transport accidents to a particular government agency on a mandatory basis should be examined. (Federal: E, T; Provincial: E, T)

(b) Government agencies should re-examine the NATES program and the level of resources necessary to maintain and improve the system. (Federal: E, T; Provincial: E, T)

Using Contaminant Levels for Planning Evacuations

Conclusion 8. In developing emergency response plans, the concentration levels of chemicals in the ambient air at which public evacuation or public protection measures should be initiated needs to be established. The oil and gas production sector has been able to arrive at ambient air concentration levels of hydrogen sulphide above which evacuation must take place. No similar levels have been identified for other hazardous chemicals.

Recommendation 8

(a) A government/industry/public sector study group should be formed to determine the concentrations of hazardous chemicals in the ambient air at which public protection procedures should be initiated. (Federal: H, E; Provincial: H, E; Municipalities; Industry)

(b) In the case of transportation accidents involving a spill, information should be available on-scene as to the hazards associated with the substance and the public protection measures that should be initiated. (Federal: T; Provincial: T; Industry)

"Lessons from Accidents"

Conclusion 9. There is a need for a greater and more accessible exchange of information on lessons learned for prevention and response purposes from previous accidents and near-misses. A Canadian forum for inter-company, inter-industry and inter-government sharing of such information is desirable. Greater Canadian participation in, and subscription to, existing information exchange schemes in the U.K. and/or the U.S.A. would also be beneficial.

Recommendation 9

Through their industry associations, the Canadian chemical and petroleum industries should jointly evaluate existing accident information exchange systems and, in consultation with federal and provincial government agencies, develop a co-operative Canadian program or increase the level of participation in existing international systems, to ensure a greater exchange and application of accident lessons learned in Canada. Other industries and all levels of government should be encouraged to participate whenever appropriate. (Federal: E, L, T; Provincial: E, L, T; Industry)

Chemical Training for First Responders

Conclusion 10. In the event of a chemical accident, first response is usually provided by the local company, police or fire department. While company officials may be knowledgeable about the chemicals at a particular site, firefighters and police in many situations do not have the benefit of this training. Further, many firefighters are volunteers who may never have had the experience of handling a chemical accident.

While there are teaching facilities for on-scene commanders and firefighters, it is impractical to train every officer or even a few on each force to be knowledgeable about all of the hazardous chemicals in Canadian commerce. What is most crucial is to train the first responder how to access chemical expertise, such as may be available locally, or as provided by CANUTEC, the Transportation Emergency Assistance Plan (TEAP), major railways (CN and CP) and the 24-hour emergency spill reporting networks available in each province.

Recommendation 10

(a) For their own protection, and for the protection of the communities they serve, first responders should be trained to access chemical expertise before attempting to control unfamiliar chemicals or mixtures. (Municipalities)

(b) Agencies responsible for providing this chemical expertise should ensure that their programs are widely known by all first responders. (Federal: E, P, T; Provincial: E, P, T)

(c) In those municipalities where hazardous chemicals are manufactured, used or transported, the training of first responders should be continually upgraded and carried out with industry wherever possible. (Municipalities; Industry)

Buffer Zones

Conclusion 11. Municipal land use planning is a means available for providing distance between industrial chemical operations and residential areas. Such buffer zones can help to diminish adverse impacts on the community from major industrial accidents. In many Canadian municipalities, residential areas have spread to the fencelines of industrial or storage sites leaving little or no buffer space. This is largely because there are many pressures on local officials to allow land designated as a buffer zone to be developed, or because residential development occurred before land-use planning came into effect.

On the other hand, some senior governments have assisted municipalities by providing guidance and resources to ensure that plants that manufacture or use hazardous materials are located away from residential areas.

Recommendation 11

(a) Municipalities should introduce zoning regulations to create buffer zones between residential areas and new or existing (when possible) industrial sites. (Municipalities)

(b) Senior governments should increase their efforts to assist municipalities in siting new installations that handle chemicals away from residential areas. (Provinces)

(c) Where existing industrial plants dealing with hazardous chemicals, are already located in close proximity to residences, such plants should examine the feasibility of producing less hazardous chemicals at that site, make a concerted effort to conduct more frequent safety audits, and develop contingency plans on a priority basis in conjunction with local authorities. (Municipalities; Industry)

Dangerous Goods Routes

Conclusion 12. A few municipalities have established designated routes for dangerous goods, particularly highways to prevent such traffic from going through heavily populated areas, as a preventive measure. Other communities are studying this possibility.

Recommendation 12

Governments at all levels should examine the need for legislation or guidelines to establish traffic routes for dangerous goods to minimize the risk of public exposure. (Federal: T; Provincial: T; Municipalities; Industry)

Community Awareness/ Emergency Response

Conclusion 13. One of the important lessons to come out of the Bhopal experience is the importance of ongoing good relations and the ability to communicate quickly between local industry and neighbouring communities regarding safety and response programs. While some industries have initiated this dialogue on their own or as a group, further work is needed by companies in the petroleum and chemical industries and in other industries using or moving hazardous chemicals to improve the level of community awareness and readiness and to ensure contingency plans are compatible with those of the nearby municipalities.

Programs such as that described in the Chemical Manufacturers Association's "Community Awareness and Emergency Response Handbook (CAER)" could be used as the basis for developing Canadian versions. Through the Lambton Industrial Society and local officials, such a program is now being implemented in Sarnia and will eventually be integrated into the Chemical Valley Emergency Coordinating Organization's plan.

Governments have an obligation to encourage their officials to seek hazard information, and to participate with industries in preparing mutually-supportive contingency plans and warning systems for public response in case of major chemical accidents at nearby plants and in transportation corridors.

Recommendation 13

(a) The Canadian Chemical Producers' Association and other appropriate industrial associations should develop programs for their companies based on the principles of the Community Awareness and Emergency Response Program developed by the U.S. chemical industry. CCPA members should pass on the principles of this program to their major customers and other industry associations. (Industry)

(b) Municipal governments should become aware of the potential chemical hazards that exist in their communities and, working with other levels of government, ensure that resources are provided to establish adequate public protection measures. (Federal: P, E; Provincial: P, E; Municipalities; Industry)

(c) Working together, industry and local governments, aided by representative associations such as the Canadian Chemical Producers' Association and the Federation of Canadian Municipalities, should establish closer liaison and develop formal programs for community awareness and emergency response. (Industry; Municipalities)

(d) Municipalities/provinces through existing emergency response associations, should establish the need for a public warning in case of a localized, rapidly developing events such as a Bhopal-type

incident. (Federal: P; Provincial: P; Municipalities; Industry)

Emergency Planning Support

Conclusion 14. In some provinces, emergency response planning is left to the discretion of the municipalities without the active support or guidance of provincial or federal agencies. As a result, many municipalities, because of resource limitations, are not in a position to deal effectively with major chemical incidents.

Recommendation 14

Where such arrangements do not currently exist, provincial agencies, with the assistance of federal departments as necessary, should:

(a) provide guidance to the municipalities on how to prepare emergency response plans (Provincial: E, P);

(b) provide financial support to those small municipalities which cannot develop or implement emergency response plans with their own resources (Provincial: E, P);

(c) maintain inventories of emergency response equipment and be able to assist in the coordination and allocation of equipment and manpower in the event of major incidents (Provincial: E, P).

Chemical Incident Simulation Exercises

Conclusion 15. While many municipalities across Canada have emergency plans to respond to major incidents, very few emergency organizations hold simulation exercises to test the adequacy of their plans. The Chemical Valley Emergency Coordinating Organization in Sarnia and FORT MAP (the mutual aid response organization in Fort Saskatchewan) both hold annual simulations; their programs could be used as models for other emergency organizations.

Recommendation 15

To ensure the adequacy of emergency response plans, all emergency organizations should periodically carry out exercises to simulate an incident, evaluate the effectiveness of the response and make improvements where necessary. (Federal: E, P, T; Provincial: E, P; Municipalities; Industry)

Coordination of Legislation Pertaining to Hazardous Chemicals

Conclusion 16. Legislation dealing with safety and prevention of accidents, both in the work place and in transport, is well established in Canada. Regulations dealing with hazardous commodities, specifically in the areas of occupational health and transport, are continually under review and updated in light of new information. Occupational health and safety legislation is for the most part the responsibility of the provinces, with some programs such as the Workplace Hazardous Materials Information System Program (WHMIS) being coordinated nationally by the Federal Department of Labour. Provinces will also become responsible for implementation of the Transportation of Dangerous Goods Regulations.

While there appears to be adequate safety legislation in place, some confusion may arise as to who has responsibility for various activities in various jurisdictions. For example, the procedures for obtaining appropriate permits vary considerably from province to province. Certain provinces have established interdepartmental committees to ensure that legislation and program activities are co-ordinated.

Recommendation 16

Federal and provincial governments should examine the coordination of legislation and programs particularly in relation to the prevention of major industrial accidents

within their jurisdictions to ensure that gaps do not exist. (Federal: E, L, H, T; Provincial: E, L, H, T)

Technology Development

Conclusion 17. Countermeasures technology for Bhopal-type incidents is very limited. Although some measures and equipment are available to prevent medium-sized events from escalating into major incidents, increased efforts are needed to expand the frontiers of this technology and to assess and widen the application of existing technology. Greater consultation and broader participation by industries and governments would make this research program more effective.

Recommendation 17

(a) Environment Canada should continue its work as the federal focal point for research and development related to chemical spill countermeasures. It must also continue to monitor and participate in relevant spill technology projects undertaken elsewhere in the world relating to existing high priority toxic chemicals and other chemicals identified as having potential to create Bhopal-type incidents. However, increased input on needs and priorities identification should be sought from federal, provincial, municipal and industrial users of the technology. (Federal: E)

(b) The petroleum and chemical industries should continue to participate with Environment Canada in relevant research projects both for Bhopal-type chemicals and other spill problems. Industry associations should further encourage the marketing or sharing of useful information where the research and development is being done by individual companies. (Federal: E; Industry)

(c) Groups of chemical companies producing or using products having similar properties or behaviour

should pool their resources and undertake jointly, or in cooperation with Environment Canada specific new countermeasures projects for Bhopal-type chemicals and other priority chemicals having medium-to-major spill potential. (Federal: E; Industry)

Emergency Medical Treatment

Conclusion 18. Hospital and medical staff are well-prepared to handle accidents involving household chemicals or poisons. However, readily-available information required for emergency medical treatment of mass casualties from a chemical release, chemical fumes and combustion products appears to be lacking in many areas of the country.

Recommendation 18

(a) The Department of Health and Welfare should lead a federal/provincial study group, including professionals in emergency medicine, to clarify and consolidate information for emergency medical treatment and first aid for victims of chemical accidents, and those exposed to combustion products of chemical fires. A secondary task of this group would be to review training and planning aspects of mass casualty care particularly as they relate to a major chemical incident. This group should also identify shortfalls in the information base and seek sponsors/funding for projects to fill in the missing information. This information should be distributed to hospitals, poison control centres and emergency clinics, as well as medical teaching institutions and first aid training organizations such as St. John's Ambulance. (Federal: H; Provincial: H)

(b) The establishment of a national emergency medical aid response centre or regional centres should be considered by this group. (Federal: H, E; Provincial: H, E)

Advanced Emergency Preparedness Activities

Conclusion 19. Canada's immediate priority in emergency preparedness is the development of adequate contingency plans and emergency response systems. Beyond this, further advances could be made in the areas of:

(a) airborne chemical dispersion modelling and improvements in public warning systems;
(b) methods for objectively assessing emergency response capability; and
(c) programs for career development of professional emergency planners.

Recommendation 19

(a) Public protection decisions require knowledge by local authorities of expected movement of airborne chemical clouds, and an ability to warn residents quickly. To assist local authorities in public protection, realistic trajectory modelling should be available, together with alarm systems for all areas where major incidents may occur. (Federal: E; Provincial: E; Municipalities; Industry)
(b) A study, with provincial, municipal, federal and industrial participation, should be initiated by agencies concerned with emergency preparedness to determine the feasibility of an objective measurement system for emergency response capability. If feasible, the system should be developed and applied at all levels of government. (Federal: E, P; Provincial: E, P; Municipalities; Industry)

(c) A continuing program for the further education and professional career development of emergency managers and planners should be developed in Canada, as a joint federal/provincial project, in consultation with industrial and municipal emergency planners. (Federal: P, E; Provincial: P, E; Municipalities; Industry)

Professional Safety Training

Conclusion 20. Safety practices and loss prevention programs are a part of an evolving science and new technology. It is important to keep abreast of all the innovations and international experience.

Recommendation 20

Scientific and engineering professionals should receive training in accident and loss prevention. Industrial management courses should address safety as an integral part of the manager's range of responsibilities. (Industry; Universities)

"Right-to-Know" Legislation

Conclusion 21. The Steering Committee received comments from several interested parties suggesting that this "Bhopal Review" should more specifically address the issue of "right-to-know". The comments ranged from the immediate need for legislation at the provincial and/or federal level in this area to the reliance on voluntary sharing of information with those public officials who need and can use the data, to the attitude that "the public would not know what to do with the information anyway".

The Steering Committee was not able to identify any existing legislation under which the federal government could act. We are aware of some of the initiatives in the United States, as well as the City of Vancouver Dangerous Goods By-Law and legislation proposed by several municipalities such as the City of

Toronto. While we respect the concern that development of differing legislative requirements at the municipal level could possibly be burdensome to industry and that therefore senior governments should take the initiative, the Steering Committee concludes that, due to legal and constitutional concerns, the issue needs further study.

Recommendation 21

The issue of "right-to-know" with all its various facets should be examined in a separate study involving governments (at all levels), industry and representatives of environmental and public interest groups.