ORGANIZATION AND RESPONSIBILITIES IN THE PREVENTION AND EMERGENCY PLANNING INVOLVING CHEMICAL SUBSTANCES

Duncan Ellison

27

TABLE OF CONTENT

INTRODUCTION

Chemicals are a very significant part of human life and provide directly or indirectly most of the tangible benefits we enjoy. It is estimated that there are more than 6 million different chemicals, and new ones are being developed on a daily basis around the world to meet specific needs. Chemicals range from the absolutely essential and generally benign, such as "water" (hydrogen oxide) through a whole range of agricultural and industrial chemicals, drugs and medicines to the hazardous wastes and toxic by-products such as dioxins and furans. In the ultimate, every physical component of the world and its creatures is some combination of chemicals and relies on chemicals for food, for shelter, and for employment. Chemicals transform naturally and through stimulus into other chemicals.

It is essential then that society come to terms with chemicals, recognizing them for what they are - essential, mostly naturally occurring, and mostly beneficial. Society must recognize also that chemicals will be part of our daily lives in many different manners and aspects, and that we can "manage" them to our advantage. Chemicals are often hazardous if not managed well. Even "water" if not managed well can create emergencies. All living creatures need "water" to live, but they can die from it. For example, by drowning in floods, by hypothermia in cold waters, by scalding in boiling water, or by crushing in avalanches. Emergencies can be created when there is an over abundance of a chemical in one place, or if it comes into contact with another chemical with which it reacts.

Chemicals have a variety of different interactions, some of which are chemical (reactivity), some non-chemical (radiation). All chemicals therefore present a number of hazards to living creatures and to the environment. The hazards can be physical or chemical in nature. These hazards have been categorized into a number of broad groups which include: explosivity, flammability, corrosivity, toxicity and radioactivity. Their physical characteristics may also present hazards and they can be solid, liquid or gaseous either in their natural state or in an unnatural state, for example, vapourized, molten, liquefied, compressed, or frozen. Each of these chemical and physical properties or conditions will have an effect on the nature of emergency situations and the prevention, preparedness and response to them.

MORAL AND LEGISLATIVE FRAMEWORKS

The organization and responsibilities for the prevention of and planning for chemical accidents is a complex situation in most societies due the weaving and interaction of the moral and legislative frameworks which direct and form inter-relationships within the society. In simple societal situations, each individual member had or tends to have greater control over and responsibility for the immediate environment and area they inhabit. The concept of specialization of function did and does not apply, indeed need not apply because it was and remains an uncomplicated situation - accidents occurred, but the causes were often direct and immediate and the responses to them equally direct and immediate, and constrained to the local area. Chemical accidents in our complex societies often result in indirect effects as well as direct ones, and distant effects as well as those felt in the immediate area. This situation results in the imposition of a legal framework within the society setting out responsibilities and establishing requirements for individuals and organizations in the organization of chemical accident prevention and planning for accidents.

The moral framework, while applicable to complex societies and often the basis for the legislative framework, lends itself to the simple one more readily and had its origins there. Simply stated, the moral framework is a four-fold statement of requirements that:

- any person engaging in an activity should examine that activity to determine if harm to others may eventuate,

- any person engaging in an activity that may present a hazard should take all reasonable steps to manage that hazard so that others are not endangered,
- where a hazard eventuates, that person should immediately take all reasonable steps to mitigate it, and
- where damages occur, that person should provide reasonable compensation to those who suffer loss.

In a simple societal situation, for example, a farmer spraying weedicide on his property, the farmer may do so in a manner that advertently or inadvertently permits the weedicide to extend beyond his or her property and damages the crops of a neighbour. To meet the first two conditions of the moral framework, the farmer should recognize that the weedicide is destructive of vegetation and have anticipated the effect of wind on the spray pattern and either postponed the work to a day without risk of wind effects or adjusted the spray pattern in some manner (i.e., risk prevention) or had on hand equipment that would enable any effect to be immediately counteracted. Once the dispersion of weedicide had been noticed, it might have been possible to mitigate damages (the third condition) by perhaps using a water spray to dilute the weedicide on the neighbour's crops to a point where damage may not result (the second condition of the framework would have suggested having the hoses already connected and laid out for use). Should damage occur, the fourth condition of the framework requires that the applicator of the weedicide compensate the neighbour for any loss, in this case the destruction of the crop, either in kind or in cash.

In complex societal situations which are typically the ones being faced in developing and developed countries, legislative frameworks have been developed to set out the details for the organization of and the responsibilities for preventing and planning chemical accidents. These complex societal situations involve a number of factors including:

- the nature and quantities of the chemicals concerned;
- the circumstances in which they may appear in society (production, storage, sale, use, transport);
- the question of ownership of property and the chemicals;
- the development of governmental organizations at all levels (municipal, state and federal) to provide services;
- the provision of specialty commercial services to all groups (insurance, inspection, environmental clean up, training and education services); and
- the involvement of financial institutions in industrial development.

Typical components of the legislative framework found in all nations to deal with these factors exist as follows:

- legislation setting out the responsibilities of manufacturers, importers, storers, transporters, users and disposers of chemicals, either in general, or often by specific classes or groups of chemicals such as explosives, radioactive materials, flammable materials (most often hydrocarbon liquids or gases) and for certain groups of toxics - pesticides, environmentally toxic residues or by-products;

- legislation setting out the administrative structure and responsibilities of the various levels of government which establish for example, environmental agencies, emergency planning agencies, police fire services, national defence organizations (Army, Navy, Air Force and Coast Guard services), public health and occupational health agencies, agencies to govern the behaviour of financial and insurance institutions;

- legislation setting out the conditions for prosecution of criminal offences or the pursuit of civil actions in courts;

- legislation setting out national commitments to international agreements for the management of situations having an international impact and consequence.

PUBLIC SECTOR RESPONSIBILITIES - MUNICIPAL GOVERNMENTS

Responsibilities for the prevention of and planning for chemical accidents will typically exist at all levels of government, and the model described here assumes a bi-level governmental structure: municipal and federal. In tri-level countries, the areas of legislative competence of the state level and the federal levels are derived from a division of the areas of legislative competence normally reserved to the senior level, but the responsibilities assigned to the municipal level remain similar in both bi- and tri-level countries.

The municipal level typically has responsibility for three key areas of public action in respect to the subject of chemical accidents:

- land-use planning, zoning and the issuance of land-use permits,

- the construction and operation of municipal infrastructures such as roads, sewers, water and electrical services,

- the provision of public safety and security services within the municipality including emergency response which typically covers fire, police and ambulance services.

Land use planning enables the municipality to establish industrial, commercial and residential zones amongst others, to locate specific activities which may present dangers to the environment or to other occupants of the municipality. This process and activity should take into account all the hazards presented by the activity including the effects of chemical vapour releases and air emissions, the emission of effluents into water bodies, explosions (blast and shock waves), the products of combustion caused by fires, and thermal radiation. But it is only in recent years that hazards beyond noise and dust have been taken into account. Land use planning should also take into account the transportation of products into and out of the zone by all modes of transport, to ensure that the imposition of risk along the transportation corridors is an acceptable one. Typically, land use planning should be such as to ensure that the level of

risk (of all types) to the neighbouring areas is acceptable (this includes both public and environmental safety), and that any unacceptable risk is contained within the land reserve of the activity itself.

The design, provision and operation of the components of the municipality's physical infrastructure should again take into account the hazards and risks present in commercial and industrial activities permitted within the municipality. If, for example, an activity is likely to need large quantities of water for fire fighting purposes (i.e., typically at a plant in which flammables are manufactured, used or stored), then the municipality which permits such an activity to be located in a particular zone should ensure that the publicly provided water services have a capacity to meet the likely demands, and of course that the municipal taxes imposed on the activity should reflect this cost to the city. In the alternative, the municipality should demand that the industrial activity itself develop and ensure that adequate quantities of water are available. Road systems connecting the plant to the city and perhaps to the state highway system should take into account the nature of the traffic; electrical power distribution systems and networks should be designed to continue to function even in the event of a major disaster in a particular plant; and similar criteria should be applied to any physical infrastructure provided by the municipality including telephone and gas utilities.

In parallel with this, other public services of the municipality should be similarly planned and the services or operations adapted to the hazards and risks inherent in the authorized activities. Fire services should be conveniently and appropriately located - i.e., adjacent but not in the danger zone and equipped as necessary with special equipment and their crews trained in the types of emergencies likely to be faced and the use of the special equipment. Police services should think in terms of cordoning off danger zones and evacuating threatened areas; ambulance and local health response units (often provided by the next higher level of government) should also anticipate the presence of danger and the existence of risk.

None of these activities should be taken by the municipality in isolation of the other stakeholders in public safety and security, and the value of consultation and participation between and within the local government authorities and the industrial and other residents of the municipality is high. The UNEP program Awareness and Preparedness for Emergencies at the Local Level - APELL - clearly sets this out principle out and offers a model for the conduct of these consultations.

PUBLIC SECTOR RESPONSIBILITIES - STATE GOVERNMENTS

The primary function of state governments is to establish the overall legislative framework and to protect and balance the rights of its citizens. To do this it has to withdraw from its citizens some of their individual rights for the common advantage of all. Citizens will naturally establish business, conduct commerce, hire employees, engage in enterprises of all types. The moral framework should govern their behaviour but it often has to be reflected in a legislative framework with observation and inspection by government agencies to ensure compliance with the requirements and punishments may have to be imposed by the state on behalf of its citizens collectively if the conditions of the legislative framework are not met.

Municipal governments draw their authority from the state government and by and large, the state government does not replicate or duplicate the authority it has provided the municipalities. For example, it is the state government which will enact legislation permitting or prohibiting, as the case may be, the manufacture or importation of a given group or class of chemicals within the country. Once permitted, it is often left to the municipal government to state that the manufacture or importation can take place or

shall not take place in a given area of the municipality. In a few cases, for example explosives and radioactive materials, the state government may reserve to itself this additional power of determining where the product may be manufactured or located. Here then is an example of a typical combination of state and municipal authority working together - the state government permits the manufacture in the country of a chemical product, and the municipal government permits the manufacture to take place at a specific site. The state government has therefore determined that the value of the chemical to society as a whole merits the risk from the manufacture, use, transportation or storage, the municipal government determines where that risk will be located, at least with respect to its manufacture, storage or use.

Typical examples of state level legislation dealing with the risk of manufacture, importation or use of chemicals relate to specific groups or classes - explosives, flammables, toxics (pesticides, weedicides), radioactives. Often this type of legislation will date from some historic period - for example, legislation dealing with explosives often dates back to the late 1800's whereas legislation for pesticides may come from the late 1920's and for radioactive materials from the 1950's or 1960's. Some classes of chemicals - corrosives for example, may not be subject to any specific legislation controlling manufacture or import. In recent years, though, environmental protection legislation has tended to capture all classes of chemicals not already specifically legislated and establishes requirements for the manufacturing processes particularly with respect to environmental safety. Occupational safety and health has been dealt with under labour legislation going back over many decades.

In addition to this area of legislation, state legislation may also deal through a variety of legislative instruments (building codes, fire safety codes, transportation legislation, emergency planning legislation, etc.) with the general aspects of chemical accident prevention - establishing for example the conditions of building design and construction in which flammable materials may be handled and stored, or the manner in which chemicals might be transported by road or rail within the country, or the requirements that industries have emergency plans created and tested to respond in the case of an accident in the plant, on the transportation network. The range of legislative instruments available to ensure that chemical accidents are prevented where possible or anticipated where prevention is not assured, is quite broad. This legislation may require that a plan of action is in place in case the accident occurs The difficulty is that these have been created on a piece-meal basis, one by one as the issue arose, without necessarily any consistency between them or overall.

In addition to these prescriptive requirements which may govern if and how some activity shall be carried out, the state level of government may set the rules on how compensation for damages incurred may be pursued, if they may be pursued at all - in some cases, the authorized agency may be a state enterprise, against whose actions, individual citizens may have little recourse. Nevertheless, the ease with which citizens, individually or collectively may embark upon a civil suit to recover damages from an accident can be a stimulus to industry to take all reasonable measures to prevent accidents from occurring in the first place or in responding promptly to mitigate the damages or to compensate for them following the accident.

Beyond the role of government to establish the legislative framework, there is the role of government to provide services to its citizens. Such services will include hospital and health care services, the provision of national highway systems, the operation of national railway services, emergency response coordination and planning, public broadcasting services in radio and television. All such agencies have responsibilities to think and plan their roles in the event of a chemical emergency. Hospitals, for example, should be aware of industrial activities in the region they serve and anticipate the nature of injuries that

persons within their region could suffer - such anticipation should include also transportation corridors and the type of products that may be passing through the region. Agencies responsible for the construction, maintenance and enforcement of highways and highway transportation services have the responsibility to consider the passage of vehicles carrying chemicals and the implications that this may mean for the use of particularly critical transportation facilities such as bridges or tunnels, especially if there are peak traffic conditions in which the consequences of an accident involving the chemicals may be particularly significant - the use of time-of-day or day-of-week restrictions on transiting the facility might be appropriate. Similarly, news media should appreciate that they have responsibilities and a public service to provide in terms of reporting accurately and promptly information related to chemical accidents, particularly as they may be an essential feature in evacuation scenarios.

In many countries, public agencies are providing an essential service in the communication of chemical information through the operation of chemical information data bases and the provision of computer software to assist in the prediction of spill scenarios. Such agencies may operate 24 hour-a-day chemical information services, act as emergency response coordination centres, act as a repository of emergency response plans that can be triggered when the need arises. In many cases, there will be a number of such centres, and there is a need for coordination between them - for example, environmental, health, transportation and emergency planning agencies are all likely to have some sort of emergency response centre. These centres will also work with the crisis centres operated by large companies who will need to have and operate such centres when their company becomes involved in a chemical accident, and will also provide international linkages with centres in other countries when there is a need for international information flows.

PSUEDO-PUBLIC SECTOR STANDARDS

Every chemical has a life-cycle from creation to destruction or consumption. Life-cycle Analysis has been developed as a technique to manage the risks from chemicals, largely by industries seeking to protect themselves from civil or criminal liabilities. Similar techniques being expressed currently in terms of Environmental Risk Analysis, Environmental Risk Management, Environmental Management Systems and Environmental Auditing are being developed by the International Standards Organization and national Standards Organizations as psuedo-legislative frameworks to assist in the proper management of chemicals, leading generally or specifically to the prevention of accidents and the planning for accidents. ISO 9000 and ISO 14000 are international examples of such practices which reinforce other requirements or imperatives on those who are involved with chemicals to behave reasonably and appropriately.

PRIVATE SECTOR

The private sector of the economy is the commercial and industrial components of society and they are the ones who wish to manufacture, import, transport, store, use or dispose of chemicals. The chemicals can range from relatively harmless yet beneficial chemicals such as common salt through the whole range of chemical products that drive our economy, provide for agricultural products, protect our forests from insect infestations, enable us to produce and refine metals, provide us with paper to write on or read, permit the construction of highways and buildings and which fuel our transportation system. For every chemical that is produced, there is a demand for that chemical. For every chemical that is produced there is some sort of hazard, largely because we are creating a significant quantity of it in one place at one time. Oxygen, for example, exists naturally in the atmosphere at concentrations ranging between 16 and 19 %, yet a 100% oxygen atmosphere is a very dangerous one for all organic materials, causing them

to ignite spontaneously. Chlorine occurs naturally in the atmosphere in very low concentrations (parts per million), particularly above oceans, yet in greater concentrations, it can cause severe corrosion to moist organic tissues (lungs and respiratory tracts) and in higher concentrations can even cause metals to burn (oxidize).

The moral code requires that those who create by their actions, a hazard, shall anticipate the causation of damages to others and do all that is reasonably possible to prevent any damage from occurring. In some cases, the government has taken that moral requirement and has specifically established the rules under which that activity will take place (permission to manufacture a chemical, establishment of the conditions under which it may be manufactured or used or transported or disposed of after use, prescription of who may do so and under what circumstances, and even where this may take place). In neither case is the industrial sector relieved of any responsibility for their actions, although demonstrated conformity with some legislated requirement or better yet, demonstration that even stricter standards than those required have been followed, can lessen the liability when damages have occurred.

Evidence of the willingness of industry to organize itself to undertake accident prevention and accident planning measures can be found in an increasing number of countries and include the provision of appropriate information to users of their products on the hazards present and the means to combat them, in the provision of emergency response assistance in the event of an accident, certainly via electronic means and often on the site of the accident. Specific contracts may be established between companies in the private sector to provide mutual assistance in the case of an accident involving chemicals that are distant from the company's own source of expertise, or in some cases, companies may contract the provision of these services with specialized companies offering these services. Transportation companies may be offered or may demand this type of assistance from the company that has shipped the chemicals with them.

The basis for these actions is that the company that has actually produced the chemical knows or should know fully what the hazards associated with the chemical are, and should have developed the means to safely contain the chemical, knows also how to handle the chemical should it escape from its industrial environment and containment, and has the appropriately trained and equipped personnel to do so.

Other components of the public sector beside the manufacturers or users of the products develop products or services which will influence the achievement of sound organization and planning for accidents. Companies exist which provide speciality services in the transportation, storage and disposal of chemical wastes, others provide emergency response assistance when needed, and yet others will provide consultation services in risk analysis and risk management. In addition there is a broad range of educational and training institutes specializing in providing training for industrial workers in the proper handling of chemicals in all circumstances as well as for emergency response planning and preparedness. Such companies make it easier for those engaged in the life-cycle of chemicals to meet their moral and legislative framework requirements.

Other influences exist on the companies directly concerned and those are the financial and insurance sector. Most companies require some sort of financial resourcing and require insurance coverage for the unexpected and major losses. Banks and insurance companies have traditionally filled these needs. However, in many countries, the emerging or recent legislation dealing with environmental protection and rights has led to the insurance companies facing extreme risks or banking institutions being held jointly

liable with the companies in the case of bankruptcy - i.e., they financed the risk for a potential profit, therefore they should be liable for any social or environmental effects that may have result. This so called fiduciary responsibility is causing the banking and insurance industries to take a close look at the risks they may be incurring when they become associated with chemical industries. In addition to these sectors undertaking inspections of their clients to ensure their clients are meeting legislated standards, they are often establishing their own minimum standards that may fill in legislative frameworks or exceed them. This is a perfectly legitimate exercise of a commercial contract or agreement between companies wishing to do business together.

SPECIFIC EXAMPLES OF RESPONSIBILITY

The range of specific examples of organizations structuring themselves and their services to prevent chemical accidents and to prepare themselves for such events is enormous and extremely varied between countries. Nevertheless a few examples of what is being done in some countries may be of value:

- municipalities should undertake risk assessments of the location of chemical producing or using plants within their community to identify high risk areas and to develop risk reduction programs which might involve changes to land use zoning, encouragement to the companies concerned to change their production processes or facilities, or the installation of special emergency warning systems and response capabilities;

- industrial plants using chemicals should examine all activities and processes to identify potential hazards and risks and to adjust their operations to minimize those risks, such activities could include reducing the quantity and type of chemicals within the plant, substituting less hazardous ones for the more hazardous ones, ensuring that all chemical processes are properly monitored and that appropriate emergency response systems and backup systems are in place; companies shipping chemicals should have an emergency response assistance plan that extends to all locations outside the plant where the products may be transported en route to their destination and should work closely with the transportation carriers concerned to ensure that their equipment is appropriate to the commodities being transported and that the transportation company employees are properly trained and equipped to handle the chemicals in both normal and abnormal circumstances;

- municipalities should coordinate their emergency and non-emergency services with those of the industries in their municipality and with other local services such as hospitals and schools; adult education facilities should be developed and readily accessible to workers in chemical and related industries to ensure that the work force is aware of chemical hazards and trained and educated in these hazards and the methods to handle them;

- state transportation agencies should take into account the nature of chemicals being transported along and through transportation corridors and ensure that accident prone portions of the transportation system are examined to remove risks, that inspection and enforcement staff are properly aware of the hazards that may be present in the system, and are capable of contributing to the response;

- occupational health and safety agencies should ensure that appropriate data bases of information on the hazards and proper responses to chemical spills are documented, widely distributed and readily available;

- procedures for citizens to pursue civil remedies in the courts in the case of harm or injury should be simplified and accessible to ensure that compensation is readily and fairly paid; media companies of all types (radio, television, newspapers) should be cognizant of their public service roles in reporting accurately and factually hazards that may exist when they occur and be part of the solution rather than part of the problem in emergency response during the emergency response; and

- international agencies have a special role to ensure that information developed in countries having good experience in chemical accident prevention and preparedness for chemical accidents should undertake the transfer of this experience to countries with less experience and resources.

CONCLUSIONS

Since chemicals are such a pervasive component of modern day societies, even of those that are less developed and industrialized, the responsibility for being aware of chemicals and the hazards that may be presented along with the benefits we derive from them, falls in almost all respects on all components of our society, whether public sector or private sector, whether producers or users of chemicals or those who may think they are not implicated at all - bankers funding industrial development, hospital administrators and newscasters providing information services. A close examination of the situation indicates that many groups are either indirectly implicated or implicated in the task of organizing for and accepting responsibility for the prevention of chemical accidents and in establishing a preparedness to respond, by the nature of their services to society.

Experience has shown that legislative frameworks may be needed to specify in particular detail the elements of the moral code that should govern our personal and corporate behaviour at all times:

- examine your actions to determine if harm could come to others from those actions, take all reasonable precautions to eliminate that risk of harm, where harm occurs, immediately take all reasonable steps to mitigate it, and if harm occurs, compensate those who are harmed;

- and to provide the mechanisms to enforce these requirements.

Where chemical accidents occur, we should be able to learn from them and exchange this information with others so that others may have their risk of harm reduced.