

Management of Hazardous and Toxic Chemicals in India

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The views expressed in this paper are those of the author and not necessarily those of the Government.

Abstract

Chemicals have become an integral part of human life today and contribute to many basic needs. In recent years there has been an increase in the number, variety, and complexity of chemicals being used in industry and in our daily lives. Many of these chemicals are toxic, explosive, and/or reactive, thus posing a potential hazard to humans, other life forms, and the environment. Extensive use of such chemicals, while essential for a better quality of life, can result in certain adverse effects that may be immediate or may be visible over a period of time. The problem needs to be addressed with a view to providing a better environment for future generations. We need to adopt a preventive approach—"prevention is better than cure"—especially in the management of hazardous and toxic chemicals.

Preamble

The progress of a nation is invariably associated with industrial development and the ability to produce goods to meet the demand for better living standards. In this process, chemicals contribute to basic needs and their use increases yearly. Though there are naturally occurring chemicals and minerals that have been used by humans throughout history (just like any other natural resource), today there are many synthesized chemicals in use as well. Together with benefits to society, a number of chemicals are known to cause potential harm to humans and the environment, either directly or indirectly. Such chemicals require identification, reduction in use, and replacement by less hazardous alternatives with a "cradle to grave" approach.

In the past few decades, the world has witnessed a number of industrial accidents that have occurred due to improper han-

dling of hazardous and toxic chemicals. These accidents reveal that we are inadequately prepared to deal with such disasters, are unable to predict the nature of the chemical disaster likely to occur, and are not able to take adequate steps for the prevention of adverse consequences. The Bhopal gas disaster of 1984, the worst recorded accident in the history of the chemical industry, was an eye-opener to the world on the possible magnitude of a chemical disaster. It triggered action towards establishing systems for the prevention and effective management of chemical disasters. In India, an awakening to set up a system for the prevention and control of chemical accidents can be attributed to the Bhopal accident.

International Scenario

According to a 1992 report of the United Nations Environment Programme—International Register for Potentially Toxic Chemicals, there are more than 8 million known chemicals, with about 77,000 in common use. Each year about 1000–2000 new chemicals are released on to the market. By the turn of the century we may be using as many as 100,000 chemicals. Due to the ever-increasing amount of chemicals entering the environment, Agenda 21 of the United Nations Conference on Environment and Development includes chapters on environmentally sound management of toxic chemicals and hazardous wastes, including prevention of illegal international traffic in toxic and dangerous goods and hazardous wastes. Programmes have been worked out and activities have been initiated with the help of international funding agencies.

Recent estimates indicate that, of the total worldwide generation of 300–400 million tons of chemicals, the Asia-Pacific region produces approximately 50 million tons. The capacity to regulate chemicals is limited in this region, but the countries in the region have started to develop a system for chemicals management.

Prior Informed Consent Procedure

In 1960s and 1970s concerns were raised about the risks involved in the handling of hazardous chemicals. In 1987, the London

Guidelines for the Exchange of Information on Chemicals in International Trade was published, and a procedure for Prior Informed Consent was finalized in 1989, essentially to control the import of unwanted and banned chemicals. Prior Informed Consent provided for learning more about the chemicals imported and decision making for future import. The responsibility to protect human health and the environment from harmful effects was given to both exporting and importing countries. This has been developed into an international legally binding instrument. The Final Act on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in international trade was adopted in 1998, and India has signed it.

Persistent Organic Pollutants (POPs)

Persistent Organic Pollutants (POPs) are chemical substances that are likely to persist in the environment, bioaccumulate in the food web, and adversely affect human health and the environment. POPs are transported to distant places, even to regions where they have not been produced or used, consequently posing a threat to the whole world. The international community has called for urgent global action to reduce and eliminate release of such chemicals.

The assessment report of the Intergovernmental Forum on Chemical Safety lists priority POPs, including: DDT, aldrin, dieldrin, chlordane, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, polychlorinated biphenyls (PCBs), dioxins and furans. PCBs, dioxins and furans are being treated as a priority; a legally binding international treaty is being negotiated to reduce the release of these chemicals. Preparation of specific guidelines and helping developing countries strengthen chemical management systems are two of the tasks identified. The report of the Regional Workshop on POPs held in Hanoi in March 1999 is developed into a Global Environmental Facility project to assist developing nations.

Classification and Labeling

The United Nations Expert Committee on Transportation of Dangerous Goods has

finalized the Globally Harmonized Legislation on Classification, Labeling, and Packaging of Hazardous Substances. This will be enforced starting in 2001.

Indian Scenario

In the last few decades there has been phenomenal growth in the chemical industry in India. Large-scale production of chemicals including inorganics, organics, agrochemicals, pharmaceuticals, and plastics is causing concern. As a result, toxic compounds hitherto unknown are being increasingly detected in the environment. Hence there is a need to provide an efficient system for their management.

Legal Framework

A number of pieces of legislation and regulations in India have direct or indirect bearing on the protection of the environment and on chemical safety. Some of these are listed below:

- The Poison Act, 1919
- The Factories Act, 1948
- The Industries Development Act, 1951
- The Atomic Energy Act, 1962
- The Insecticides Act, 1968
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981

In 1980, gaps in existing legislation were observed for the first time with respect to environmental issues. Of particular concern were impacts of pollution on natural resources, and diffusion of chemicals and microorganisms in the environment and the likely hazards due to their handling. Thus, the need to establish a system for the management of chemicals and microorganisms was envisaged. Soon after the Bhopal gas disaster, efforts were directed toward industrial safety issues, and toward the development of mechanisms to deal with chemical emergencies.

India's Ministry of Environment and Forests undertook an exercise to identify inadequacies in existing legislation related to hazardous substances and industrial safety. On examining these laws it was determined that linkages in handling industrial and environmental safety were missing, and that

the provisions under any of these laws were inadequate. A control mechanism was thus required to guard against chemical hazards, and to combat emergency situations arising due to handling of such chemicals. The threat to public health, safety, and the environment merited special attention. The Environment (Protection) Act of 1986 was enacted to provide a single focus for all environmental issues and to plug the loopholes in earlier enactments. In this Act, the terms "handling" and "hazardous substances" were defined. India's Central Government has been given the responsibility to lay down procedures and safeguards for handling hazardous substances.

Consequent to the Bhopal gas tragedy and the absence of a provision to provide immediate relief to the victims of industrial disasters involving hazardous and toxic chemicals, the Public Liability Insurance Act was ratified in 1991 and amended in 1992. This Act applies to owners and administrators responsible for handling hazardous substances. The Public Liability Insurance Act provides immediate relief payments in the case of death, injury, or property damage resulting from an accident. This is to be provided only as interim relief. Apart from assuring immediate financial assistance to victims, it also makes it obligatory for the owner of a company to prevent accidents and prepare for emergencies. It provides impetus to enhance safety.

Regulatory Mechanisms

The Manufacture, Storage and Import of Hazardous Chemicals Rules of 1989, mandated under the Environment (Protection) Act of 1986, provide for control of the handling of hazardous chemicals. The main objective of these rules is the prevention of major industrial accidents. They provide for harmonizing the various control measures, and identify the agencies required to prevent or limit the effects of major accidents. The industrial activities covered under these regulations include the processing, storage, and import of specified chemicals listed in the schedule. Of particular importance are the specific process operations listed in the schedule, and the requirement of isolated storage of chemicals.

The rules provide for three levels of control—low, medium and high—depending on the nature of the chemical. The requirements under each of these controls include activities such as on-site and off-site emergency plans and safety reports, safety audits, and crisis management plans. These rules were amended in 1999.

Emergency Management

Emergency planning is an essential requirement in the management of hazardous and toxic chemicals. A chemical disaster can be broadly categorized as an explosion, fire, or major emission leading to adverse effects on health and the environment inside (on-site) and outside (off-site) the workplace. Emergency preparedness requires that preventive and predictive systems to be set up both within industrial sites and in the adjacent areas likely to be effected by accidents at the site. A three-tiered Crisis Management System has been set up since 1990. A directory of emergency experts and officers of the Crisis Group Alert System has been published and is regularly updated. The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules of 1996 provide legal support for the establishment of a Crisis Management System.

Hazardous Wastes Management

As a result of the use of toxic and hazardous chemicals, a substantial amount of hazardous wastes is generated. The handling, treatment, and disposal of such wastes are once again major problems faced the world over. The situation is worse in developing countries, where the problem not only pertains to the wastes generated within these countries, but the huge amount of waste being dumped in these countries by the developed nations in the garb of recycling and reuse. The Hazardous Wastes (Management and Handling) Rules of 1989 provide a control on the generation, collection, treatment, transport, import, storage, and disposal of hazardous wastes. The Guidelines for the Management and Handling of hazardous wastes provide details on the steps required to be taken for handling the wastes from its generation to final disposal.

The Chemicals Problem

A major problem is the addition of new chemicals every day and their use in daily life. An exhaustive inventory of chemicals, including data on quantity produced, quantity used, and location of the chemicals, is needed. All chemicals produced, stored, used, transported, or destroyed should be registered. The nature of the chemicals and the risks involved due to handling are very important in the case of hazardous and toxic chemicals. Such information should be made available and updated as required.

A harmonized system of classification is being used as per the international classification. In India, a uniform and accurate label must be provided for a multilingual citizenship. Though a system of classification and labeling exists, it needs improvement in order to ensure quality, uniform labeling. The labels should contain details pertaining to the nature of the chemicals and the risks involved. Invariably, the labels, when present, are often not visible and not readable. Therefore, the purpose of providing a label is lost. The labels should thus be provided in weatherproof material and should be periodically replaced.

While adequate legislation and regulations have been provided, monitoring and enforcement have been inadequate and thus require immediate attention. Effective implementation of these laws and rules can provide solutions to most of the problems faced with respect to hazardous and toxic chemicals management. The major handicap faced in the process of effective enforcement is the absence of infrastructure to deal with the problems. A will to enforce and a localized system to enforce should be evolved to deal with hazardous and toxic chemicals.

Health effects due to exposure and handling of hazardous and toxic substances is another important issue to be addressed. The effects of chemicals on health can be either immediate or may be a slow poisoning over a long period, and most chemicals have the potential to cause health hazards in some manner or other. Even those chemicals that are required for the functioning of biological systems can become

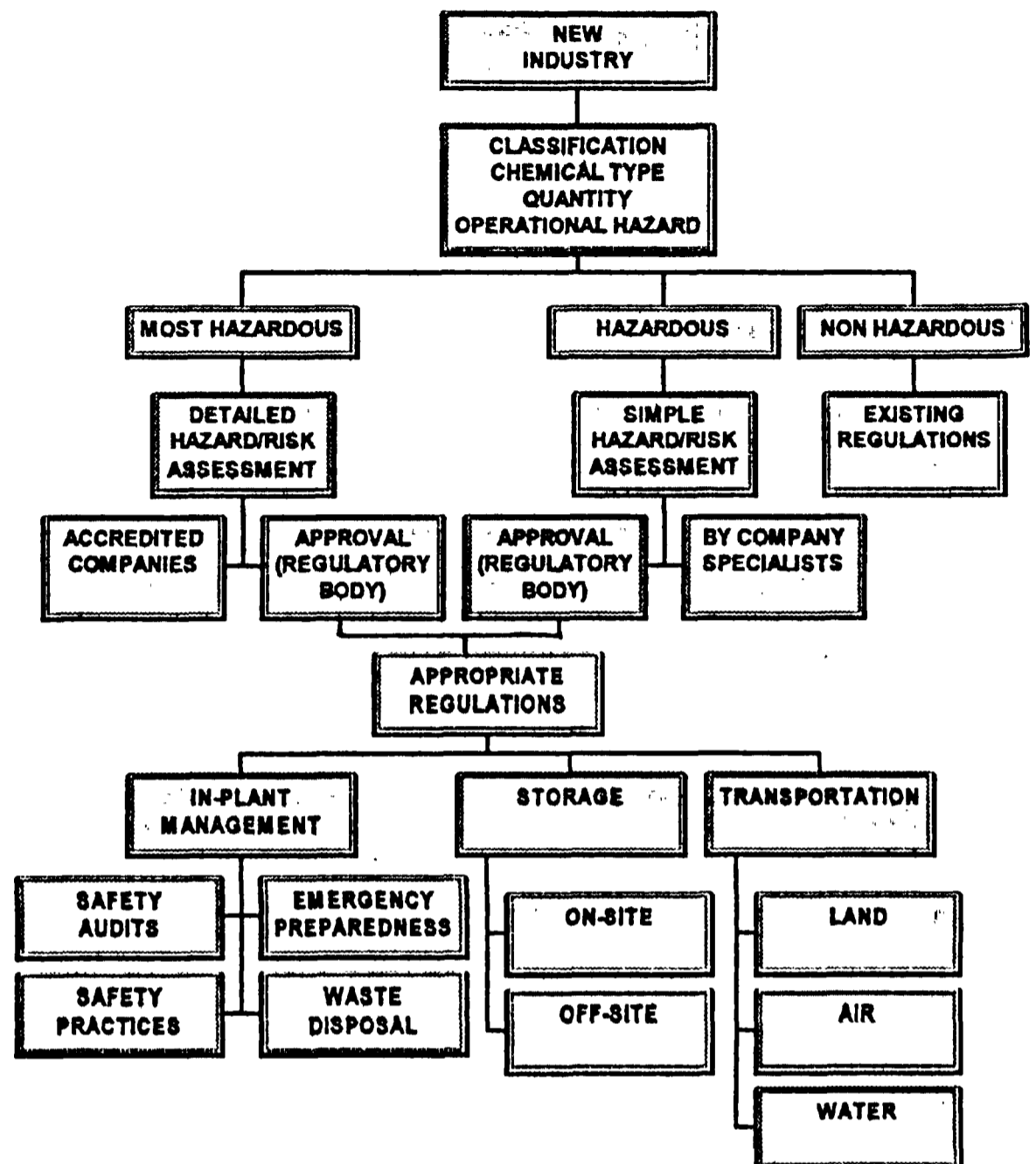


Figure 1. Model for Hazardous/Toxic Chemical Management

toxic beyond the required quantity. This is true especially in the case of micronutrients and trace elements. While an immediate effect is often handled effectively, slow poisoning often goes unattended and, by the time it is noticed, it is too late to manage the problem. The bioaccumulative nature of a large number of chemicals in use today contributes to this problem, since the consequences of indirect consumption of such chemicals take a long time to become apparent.

Proposed Chemicals Management Model

In order to combat problems arising due to the increasing use and handling of hazardous and toxic chemicals, there is a need for proper planning to deal with the chemi-

cals and to make people aware of the consequences.

To begin with, the planning process requires complete information on the chemicals and the risks associated with their use (in terms of their likely effects on life systems and the environment). Also, chemicals management needs to become decentralized—adequate facilities need to be provided at the local level for dealing with hazardous and toxic substances. While the requisite information about hazardous materials should be locally available, access to national and regional resources is needed in the event of an emergency. In this case, there needs to be clear communication and information flow between local, regional, and national authorities. For example, in-

structions could be solicited from the national authority, but the initiative will need to be implemented by the local authority.

The management of hazardous and toxic chemicals needs to include programmes for the prevention, control, and management of emergency situations that are likely to arise due to the handling of these chemicals, especially in industry. Management should also address the long-term effects of the substances in question. A preventive action is the need of the hour. Based on these observations, an Awareness and Preparedness Plan is proposed through the system shown in Figure 1. The system requires only (1) a basic infrastructure, and (2) an ability to mobilize people and resources for effective enforcement, to be a feasible system for developing nations and those with economies in transition.

Conclusions

Today the use of chemicals in daily life is inevitable, and chemical use is likely to grow in the future. Therefore, there is a definite probability of occurrence of chemical disasters in many parts of the world. Problems faced by the developed nations, developing nations, and those with econo-

mies in transition need to be addressed differently. The integration of development and environment, with an eye towards fulfillment of basic needs, improved living standards, and protection and management of natural resources for a safe and prosperous future is being envisioned. Sustainable Development, with a definite plan to optimally use the available resources, replenish the same, and use only environmentally safe technologies and products, is the only answer for the survival of humankind.

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