

Management of Chemicals in Pakistan: Concerns and challenges

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Abstract

Key Words:

Introduction

The Chemical Industry has gradually attained central role in modern and transitioning economies of the world. Globally, the trade in chemicals is generating business in trillions of dollars. For instance, the chemical industry in the U.S. is amongst the top exporters; and based on its significance out of seventy-seven industrial sectors the chemical industry ranks ninth. (Murmman, 2002) The chemical products are extremely important for national economy, and the strong dependence between chemical industry and other industries is mutually reinforcing. Therefore, few targeted attacks against chemical infrastructure can have consequences far greater than the immediate deaths and destructions. (Dixon, 2002) Handling chemicals at any stage is cumbersome and risky. Therefore, the safety and security of chemicals and related facilities has immense importance for avoiding the chemical accidents, preventing inadvertent and deliberate misuse of chemicals.

Hypothetically speaking, a chemical industrial accident can devastate the whole city. The chemical plant accident at Bhopal, India (1984) demonstrated the enormous destructive potentials of a chemical accident. The terrorist groups use of chemicals for their nefarious designs have intensified the significance of the safety and security of the chemical industry. That is why; the dangers from the chemical plants received serious attention from the 9/11 Commission. Senator Barrack Obama (currently President of the United States) declared chemical plants "Stationary Weapons of Mass Destruction" spread throughout the country. (Obama, 2006) According to an estimate of the U.S. Army a worst case successful terrorist attack against a chemical industry and the consequent release of toxic chemicals may kill or injure up to 2.4 million people. (Kosal, 2008) Notably, beside loss of lives and property, the chemical accidents have severe environmental consequences.

The preceding discussion underscores the significance of the proper management of chemicals and related facilities. The rapid urbanization, growth in population, and poor land use planning by housing schemes shrink the distance between the chemical industries and major population centres in Pakistan. Therefore, an accident in an industry could cause immense destructions and possibly domino effects. Internationally, serious concern persists about the probability that terrorists may cause the release of toxic chemicals when the dual-use toxic chemicals are transported or by attacking chemical industry. The Second Review Conference of the Chemical Weapons Convention reaffirmed this concern. (ÜZÜMCÜ, 2010) More precisely, the chemical plants are both attractive and vulnerable

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targets for terrorism due to their designs. It seems that these plants cannot withstand well executed terrorist attacks. Thus, the safety and security of the chemical plants is imperative to prevent the chemical disaster in the country.

The following discussion is divided into five sections. The first section contains brief overview of a few major chemical accidents. It is followed by a discussion on the chemical industry of Pakistan. The third section highlights the challenges to the chemical industry in the country. The fourth section spells out the national legalistic apparatus of the Pakistani chemical industry. The fifth section highlights Pakistan's membership with various international agreements and treaties to improve the safety and security of its chemical industry.

Major Chemical Accidents

The accidents due to the human errors or technical drawbacks at the chemical facilities are very disastrous and have lasting repercussions. Therefore, it is imperative that one ought to review the chemical accidents intelligently to avoid their repetition in one's own chemical industry. Indeed, the chemical accidents can be caused by many factors; therefore, it is imperative to study chemical accidents for preventing them in future by formulating and implementing appropriate policies at various levels. In the past many chemical accidents have occurred such as at Bhopal in India in 1984, Toulouse in France in 2001, BP Texas City of USA in 2005, Buncefield disaster in the U.K. in 2005, etc. In the succeeding paragraphs, the disaster at Bhopal (1984) and the Buncefield Fire (2005) are discussed with an aim to draw some lessons.

Bhopal Disaster, India (1984)

This is the worst chemical accident in the chemical industry's history. In a Union Carbide Pesticide Plant in Bhopal, a runaway reaction took place on 4 December 1984, which caused the release of toxic chemicals. The complete protection system designed to minimize any leakage did not function, the flare system for burning leaked vapours was out of order, the refrigeration system did not work, and the scrubbing system for absorbing leaked gases was not installed. Consequently, approximately 27 tons of Methyl isocyanate (MIC) released and it spread and half a million people were exposed to this deadly gas. Dr. Mannan attributes the above-mentioned safety failures to insufficient budgeting. (Mannan, 2012) The consequences of this accident were terrifying, "about 3,000- 7,000 people were killed immediately; 20,000 cumulative deaths; 200,000- 500,000 injured; posttraumatic stress; and continued medical consequences." (Lees, 1996)

Although, the management of the industry was responsible for the proper maintenance and operations of the plant, yet the UCIL's parent multinational could not be absolved because the Union Carbide Corporation (UCC) initially suggested large MIC storage tanks in the process design, but this recommendation was not supported by the UCIL engineers. Moreover, the corporate inspection report of 1982 revealed that the UCC was aware that the chemical plant at Bhopal had significant safety issues, but the corrective actions were not taken by the industry. Moreover, Frank Lees is of the view that had Indian provincial and

national authorities effectively implemented worker safety and environmental laws and regulations, this disaster could have been prevented.

Buncefield Disaster, the UK (2005)

The series of explosions and subsequent fire destroyed the Buncefield Oil Storage depot on 11 December 2005. (News, 2006) In the U.K. this fuel depot was the fifth largest depot. This accident caused immense environmental damage and the loss of approximately 2 Billion Euros. (Genserik, 2010) In fact, the switch for stopping the fuel supply when the tank was filled failed to function; consequently, 300 tons of petrol went out of the storage tank. (The Final Report of the Major Incident Investigation Board, The Buncefield Incident, Vol. 1, 11 December 2005) This switch was unreliable and was serviced in August 2005. However, this unreliable safety device was not properly addressed. The second safety feature of the petrol storage tank was a bund retaining wall. This bund could not retain the escaped fuel due to improper design and siting. These were the technical causes that caused the explosion and subsequent fire. However, according to the U.K. Environment Agency, there were significant underlying causes, which could be attributed to the management failures, such as:

“Management systems were deficient and instructions were not properly followed, despite the fact that the systems were independently audited. Two, pressure on staff had been increasing before the incident. The site was fed by three pipelines, and the control room staff had little control on two pipelines in terms of flow rates and timing of receipt. This meant that staff did not have sufficient information easily available to them to manage precisely the storage of incoming fuel. Three, throughput had increased at the site. This put more pressure on site management staff and further degraded the ability to monitor the receipt and storage of fuel. The pressure on staff was made worse by lack of engineering support from the Head Office.” (Sohail, 2012)

The above-mentioned pressures created a culture where safety was not given due importance and the management and the staff remained focused on keeping the process operating. This accident highlights the significance of creating safety culture and taking very serious the signals of failures of safety critical equipment.

Pakistan’s Chemical Industry

The chemical industry in Pakistan was non-existent at the time of partition in 1947. Nevertheless, it has gradually developed since early 1950s. The first chemical industrial estate was established in district Mianwali, Punjab, which comprised Pak-American Fertilizers, Pak Dyes and Chemicals, Maple Leaf Cement, etc. This industrial estate served as a nucleus for the development of chemical industry in Pakistan. (Sohail, 2012) Presently, Pakistan’s chemical industry comprises industries of all sizes, which are mostly located in major cities such as Lahore, Karachi, Faisalabad, Peshawar, Hattar, Kala Shah Kako, Mianwali, Haripur, Gujrat, Gujranwala, Multan, Sialkot, etc. The larger enterprises include

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Engro Chemicals, Fauji Fertilizers, Fatima Group, Pak-Arab Fertilizers, Dawood Hercules, Clariant Pakistan, etc.

Today, Pakistan's Chemical Industry is vibrant and is also growing. For instance, Dyes and Pigments, approximately 200 medium and large size processing mills exist along with small dye houses, which are in thousands. Six units are producing dyestuff in the organized sector. They are Clariant Karachi, Gadoon Dyes Chemicals Gadoon Amazai, Chemi Dyestuff Industries Karachi, BASF Karachi, and M.B. Dyes Gadoon Amazai. The textile industry is based on the export and manufacture of threads and spinning yarn. (National Profile for Chemical Management) Regarding fertilizers and pesticides, Pakistan has no manufacturing facility for pesticides. The local requirements are met by 30 companies, which just formulate pesticides. The requirements of fertilizers are met mostly by indigenous production of Engro Chemicals Dharki, Fauji Fertilizers Mirpur Mathelo, Fauji Fertilizer Goth Machi, Pak- Arab Fertilizers Multan, Fatima Group, etc.

The Crystal Chemicals Lahore was Pakistan's first Oleo plant that was established in 1987. This facility continued its operations till 1997. Nimir Industrial Chemicals Limited Lahore, and Gamalux Oleochemicals Karachi also produce oleo chemicals. The chemical industries producing Sulphuric Acid¹ are Rawal Chemicals Sheikhpura, Lyallpur Chemicals & Fertilizers Jaranwala, Pakistan Ordnance Factories (POF) Wah, Ambar chemicals Hattar, Pakistan Atomic Energy Commission (PAEC) D.G. Khan, Rawal Chemicals Hattar, Prime Chemicals Sheikhpura, Hazara Phosphate Haripur, Riaz Aslam Chemicals Chunian, Attock Chemicals Hattar, Ittehad Chemicals Lahore, Karsaz Chemicals Lahore, Crescent Chemicals Sukkur, Excide Pakistan Ltd Karachi, Pak Chemicals Karachi, Acid Ind Pvt Ltd Karachi.² Regarding soaps detergents and cosmetics, Colgate-Palmolive is the top detergent powders manufacturer. Kohinoor Soap & Detergents and Wazir Ali Industries, Colgate-Palmolive, and Unilever Pakistan are major producers in this sector. Small manufacturing units of cosmetics are functioning in Mingora, Swat.

There are large numbers of manufacturers and outlets throughout the country regarding paints and varnishes. The three major producers of paint are Buxly Paints, Imperial Chemical Industries (ICI) Pakistan, and Berger Paints. Together they meet 45 percent local requirements. Decorative paints are manufactured by Master Paints, ICI Pakistan, Berger Paints, Buxly Paints, Brighto and Gobbis manufacture decorative paints. Moreover, more than 400 units are producing paints and varnishes in the unorganized sector. The textile industry uses variety of chemicals for processing both natural and synthetic fibers. Many small units are producing textile chemicals but large quantities are imported. The eight major producers of textile and tannery chemicals are Clariant Jamshoro, M.B. Dyes Gadoon Amazai, BASF Chemicals & Polymers Karachi, Universal Karachi, ICI Karachi, Nimir Chemicals Lahore, Sandalbar Faisalabad, and Delta Chemicals Lahore. Most of the chemicals used for the treatment of municipal and industrial water are imported. Some simple chemicals like sulphuric acid, caustic soda, activated carbon, chromates, alums and chlorine are locally manufactured.

Many units are manufacturing variety of food chemicals in both unorganized and organized and sector. In the organized sector, the two major units are Leiner Pak Gelatin Ltd, Kala Shah Kaku, Lahore and Habib Arkady Ltd Karachi. Pakistan's petrochemical

industry is limited to production of synthetic fibers of polyvinyl chloride, such as Purified Terephthalic Acid (PTA), aromatics polyester, polyamide, and carbon black. Formaldehydes are manufactured by Izhar Enterprises Ltd Lahore, Wah Nobel, Dynea Pakistan Ltd Karachi, Pakistan Resins Ltd Azad Kashmir, HTG Petrochemicals Hub and Super Chemicals Ltd Karachi. Moreover, Sitara Chemicals and Ittehad Chemicals produce Hydrochloric acid. Pak Arab Fertilizers, Multan and POF Wah produce Nitric acid. Thirteen units are manufacturing alkyd resins. Acetic Acid is produced by three units namely, Ravi Rayon Pvt Ltd Lahore, Wah Nobel Acetates Ltd Wah, Midas Chemicals, Lahore.

National Concerns and Challenges

The chemical industry of Pakistan is vulnerable to various challenges. That is why; there is a serious concern about its safety and security. Indeed, Pakistan has adopted various legalistic frameworks to address chemical industry related problems. The following discussion assists us in framing the various unavoidable challenges to the industry and also manifests the cause of these problems.

Hazardous Waste disposal

The chemical industries regardless of their size generate huge quantities of hazardous waste. But proper chemical waste disposal facilities do not exist even in the larger enterprises. Consequently, chemical wastes scatter all over the country with immense implications on human health and the environment. Moreover, no central database exists about the chemical waste sites.⁵ Most often chemical industries hand over their hazardous waste to contractors. The contractors release them in broken ground close to roads and residential areas, cultivable lands or water bodies thus it harms humans, the environment and the pollution and contamination enters the food chain.

In cities, flammable and toxic chemicals are sold just like grocery items. The tanneries discharge huge amount of untreated chemical waste into the environment. For example, the toxic industrial waste discharged by tanneries in Sialkot is causing serious diseases such as cancer. (Qaiser, 2010) If we take the example of Hattar Industrial Estate, it has 184 functional industries of all sizes. But these plants have no waste treatment facilities. Consequently, the hazardous waste is discharged in broken grounds or in Jhar, Noro and Dojal Nullahs. In Hattar and adjacent areas approximately 20 percent local people are suffering from kidney, lungs, stomach, bones and skin diseases. (Rahman, 2012)

Safety and Health Issues

Textile dyeing uses variety of chemicals such as bleaching agents, toxic and flammable solvents, acids and alkalis. Mostly Azo dyes are used in Pakistan textile industry. Some chemicals are harmful for skin and some have carcinogenic and mutagenic properties.⁶ Mostly chemicals are manually mixed and workers are not provided safety equipment and clothing. Moreover, the workers are neither educated nor informed regarding the hazards associated with the chemicals they work with.⁷ The industries discharge untreated chemical

waste in municipal drains; and when the chemical waste gets spilled in the locality due to blockage, it damages the limbs of children when they come in contact with the hazardous waste. For example the Sindh Industrial Estate generates approximately 180 tonnes of both hazardous and non-hazardous waste on daily basis. A chemical industry of said estate discharged its hazardous waste in an open plot in 2006, which seriously injured many children e.g. one child died and another lost his both legs. (Mukhtar, 2010)

The larger enterprises pay special attention to safety and security and strive for “zero incident goal”. Such industries have developed comprehensive safety polices that includes measures for accident prevention, preparedness and response. They regularly conduct process hazard analysis and chemical hazard evaluations for examining external factors, internal processes, human factors and reliability of safety critical instruments and equipment. The declared industry and larger enterprises have comprehensive disaster management plans but such plans are rarely tested in field exercises. The larger enterprises maintain record of safety and security incidents and conduct expert analysis for addressing the technical and underlying causes.⁸

The management of larger industries provides safety and security training to the employees at the time of induction and subsequently throughout their service they are provided refresher training.⁹ However, the transportation of hazardous chemicals outside the facility remains vulnerable to security threats. Moreover, the communication of the industry with the local community regarding risks posed by the industry to the community and related response measures is inadequate. It is also the responsibility of the governmental authorities to ensure that the industry keep the local community informed regarding the hazards. In fact, the local community must be involved in the safety and security planning and response measures. Moreover, the land use planning is not effectively implemented by the governmental authorities. Consequently, most of the industries are located inside population centers, which generate safety risks to the local community.

Most of the small and medium size chemical industries are not very particular with regard to safety and security measures. Such industries neither maintain record of various accidents, injuries, fatalities, etc; nor do they report such incidents to governmental authorities due to the fear of reprisal. The small and medium industries do not take adequate measures for site security and the transportation of hazardous substances. The small and medium sized industries have hardly any mechanism for process hazard analysis and have no cooperative arrangements with the larger industries and governmental authorities for the safety and security purpose. Management of the small and medium size industries do not provide personal protective equipment to workers.⁹ Moreover, the workers are not even informed regarding the hazards associated with the chemicals they are working with. The small and medium sized industries are located without any land use planning and they do not keep the local community informed regarding the hazards associated with the chemicals used in the industry.

Lack of National Database

Accurate and reliable data is essentially required for the systematic planning and safe and sound management of chemicals. Relevant ministries and organizations maintain their respective data; however, no central data exists for broader study and strategic planning.¹⁰ In fact, Pakistan lacks the expert capacity for data collection, analysis and dissemination to various stakeholders. Many industries neither maintain records of accidents, injuries, fatalities; not do they report to public authorities. The chemical industries do not maintain safety and security related data in a transparent manner. No data exists regarding areas heavily polluted by chemical waste and sites of obsolete chemicals. Moreover, national information system regarding chemicals and related safety and security aspects do not exist.¹²

Misuse of Fertilizers in Improvised Explosive Devices

Fertilizers are being misused by terrorists for developing Improvised Explosive Devices (IEDs). For instance, Lieutenant General Michael D. Barbero, Director Pentagon's Joint Improvised Explosive Devices Defeat Organization told the Senate hearing that virtually all of Ammonium Nitrate found in Afghanistan has come from Pakistan.¹³ General Barbero stated:

“IED events increased 80 percent, from 9,300 in 2009 to 16,800 in 2011. IEDs remain the leading cause of civilian, military and law enforcement casualties in both Afghanistan and Pakistan. More than 60 percent of U.S. combat casualties in Afghanistan, both killed and wounded in action, are a result of IEDs. During 2012, 1874 U.S. casualties were caused by IEDs...Pakistan has a significant and growing IED challenge that threaten its own soldiers and populace. As of November 2012, there have been more than 926 IED attacks inside Pakistan, resulting in excess of 3,700 casualties. Fertilizer based explosives still remain our greatest challenge in Afghanistan. Today, more than 85 percent of IEDs employed against coalition forces are Home Made Explosives (HME) and of these, about 70 percent are made with Ammonium Nitrate derived from Calcium Ammonium Nitrate (CAN).” (Barbero, 2010)

“IEDs had killed 2,395 people inside Pakistan during 2011. Therefore, requisite restrictions on the sale of Ammonium Nitrate (AN) and effective national monitoring mechanism for the sale, use and distribution of fertilizers is essentially required. To prevent smuggling of AN to neighbouring countries, the capacity building of custom officials and border guards is essentially required because mostly smugglers dye AN as detergents.

Lack of Involvement of Academic Institutions

The academic institutions can make immense contribution to the safe and sound management of chemicals. In Pakistan students are seldom encouraged to undertake research in chemical accident prevention, preparedness and response measures. Dr. Riffat N Malik pointed out that: “The academic institutions are producing nothing regarding the

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safety and security of chemical industry and the environmental implications for the undergraduate and graduate students and teachers, journalists, and first responders.”¹⁴ Moreover, the universities can to the benefit of society include chemical life cycle management issues in their curricula.¹⁵

In a meeting with Dr. Amin Badshah, Chairman Chemistry Department mentioned “the lack of requisite resources for chemical safety and security is the main cause of inadequate safety and security measures at institutional level.”¹⁶ He cited attending an international workshop on safety and security and appreciated that opportunity of learning and subsequently implementing safety and security measures at his department, and transferring that knowledge to his students and faculty. The Ministry of Education ought to provide such learning opportunities to the heads and faculty of chemistry, international law, chemical engineering, political science, defence and strategic studies, etc. Moreover, not even a single medical college teaches ‘disaster management’ to the students.¹⁷ Consequently, the doctors and medical staff are not trained in medical toxicology.¹⁸

Lack of Involvement of Community and Public Interest Groups

According to the United Nations Development Programme more than 8000 NGOs and CBOs are working in Pakistan.¹⁹ They are involved in variety of fields such as advocacy, emergency response, rehabilitation, relief activities, implementation of developmental projects, etc. In Pakistan large numbers of NGOs are working exclusively on environmental issues but not even a single NGO is working on the safe and secure management of chemicals.²⁰ Presently, the contributions of NGOs to sound management of chemicals is of indirect or ancillary nature, whereas safe and secure management of chemicals is a specialized subject that warrants that public interest groups may be properly structured, developed and trained for working on the safe and secure management of chemicals. The voluntary Self Monitoring and Reporting Mechanism for industries under Pakistan Environmental Protection Act (PEPA), 1997 place industrial declarations regarding pollution levels in the public domain, which enables NGOs and CBOs to monitor such declarations. (Khan, 1998) Moreover, the NGOs and CBOs can perform useful roles in monitoring the safety and security measures and standards of industry.

A few drawbacks of the role that the public interest groups can perform are that most of the NGOs are working in isolation, which prevent the development of requisite synergy. Hence, the requisite coordination may be developed amongst NGOs and CBOs at national and provincial levels for achieving desired results. Furthermore, Pakistan’s chemical industry has significant base of trade unions. They are striving to improve the working conditions in industry. However, their analytical capacities for understanding wider environmental issues, safety and security concerns, and collaboration with international partners are limited. This deficiency needs to be addressed. The consumer associations are also active in management of chemicals. But the national legislations do not provide adequate consumer protection. This issue is further complicated by the low literacy rate, thus people do not understand the adverse effects of fertilizers, pesticides and other preservatives on human health. Such consumer associations must strive that manufacturers ensure their products meets the highest health and ecological standards.

Chemical Disaster Management

Pakistan has faced variety of disasters but the predominant way of responding had always been reactive. In October 2005, a devastating earthquake exposed the weaknesses of Pakistan's disaster management mechanism. Consequently, Pakistan National Disaster Management Ordinance (NDMO) was promulgated in 2006. This Ordinance established National Disaster Management Commission (NDMC) headed by the Prime Minister, National Disaster Management Authority (NDMA) and provincial and district disaster management authorities (PDMAs and DDMA). This new system provides comprehensive perspective on disaster management including prevention, preparedness, response and mitigation measures in line with best international practices. NDMO provides a broad based mechanism including dealing with all eventualities regarding chemical and industrial accidents or incidents.

Although Pakistan has comprehensive disaster management plans yet it has serious drawbacks also. For example, it has no mechanism for investigating chemical accident. Moreover, the plans for disaster management at chemical facilities and hazardous chemical during transportation are never tested during field exercises. Emergency responders such as fire fighters, police, and other emergency services are not properly trained and equipped for effective and coordinated response to a chemical disaster. Only few major hospitals maintain decontamination facilities, antidotes, and expertise for handling victims of toxic and flammable chemicals.²¹ In fact, the emergency responders from various departments need to be developed into a pool of experts that could be confidently employed anywhere in the country or abroad on short notice.

Legal Framework for Management of Chemicals

A comprehensive and dedicated legislative framework is essential for the sound management of chemicals. There are 53 Acts and regulations, which are considered relevant for the management of chemicals in Pakistan. However, in reality, most of these acts have just some sort of relevance with chemicals. A few legislations that contribute constructively in the management of chemicals are discussed in the succeeding paragraphs:

Hazardous Substances Rules- 2007

This Act obligates licensee to undertake following measures:²²

- a. Employ qualified technical experts for the handling, storing and use of hazardous substances. Provide safety training to the employees; and ensure packing and labeling that the hazardous substances can be used, stored and transported without deterioration.
- b. Ensure proper safety conditions inside the facility, and provide protective clothing and equipment to the employees handling hazardous substances.
- c. Ensure that no worker above 60 years and below 18 years is employed for physical handling of hazardous substances.

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- d. Empowers and obligates relevant national authorities to inspect such facilities once in a year that is storing, handling and disposing hazardous substances. Moreover, the licensee has to submit annual declaration covering the quantity and characteristics of hazardous substances generated previous year.
- e. An applicant of the hazardous facility has to submit detailed safety plan that must include hazard analysis, in case of an accident the estimated effects on environment, and the response and mitigation measures in case of an accident.
- f. The management of the facility has to inform all those who would be affected in case of an accident.

The Agricultural Pesticides Ordinance, 1971 & Rules, 1973

Under this Ordinance, the advertisement of pesticide, offer for sale, sale, holding stocks, formulation, manufacture, import, are prohibited unless duly registered. The noncompliance or contravention of this Act is punishable with fine up to 1000 rupees, and the repeat of such contravention is punishable with fine not less than 2000 rupees.

Chemical Weapons Convention Implementation Ordinance- 2000

Pakistan is a State Party to the Chemical Weapons Convention (CWC). Under this Convention, Pakistan is obliged to enact national implementation legislation. Thus, the CWC Implementation Ordinance gives effect to the CWC in Pakistan. In the light of the said national Ordinance, Pakistan has enacted penal and administrative legislation called *Pakistan CWC Implementation Rules- 2010*. The CWC and associated national legislation, rules and regulations are designed to prevent the reemergence of Chemical Weapons i.e. guarding against proliferation concerns, the misuse of dual-use chemicals and the complete elimination of Chemical Weapons by the possessor states.

The Railways Act, 1890

Under this Act, the carriage of any offensive or dangerous goods is not allowed by railways. If a person violates this Act and transport dangerous goods on railways, the violator is “punishable with fine which may extend to 500 rupees.”

The Baluchistan Local Government Ordinance, 2001

It prohibits discharging hazardous or dangerous substances in any public water course, drain or public land. “The contravention of this Act is punishable with imprisonment which may extend to three years or with fine which may extend to fifteen thousand rupees, or with both.”

Sindh Local Government Ordinance, 2001

Under this Ordinance, controlling pollution and environmental protection is the responsibility of the district governments. In city districts, “the *Zila* (town) Council approves plans for environment control and ecological balances and oversees the implementation of rules and by-laws on environment.” According to the Sind Local Government Ordinance:

“Discharging industrial, commercial or other waste, dangerous chemicals, and hazardous or offensive materials into drains and water bodies or onto public land is an offence punishable with a maximum penalty of three years’ imprisonment and/or a fine of 15,000 rupees, in addition to a fine of 1,000 rupees for each day that the offence continues to be committed.”

Similar penalties apply for the unauthorized manufacture and sale of dangerous hazardous chemical and explosive materials.

The Punjab and NWFP Local Government Ordinances, 2001

These Acts obligates local governments to formulate plans for the sewerage and drainage of commercial and industrial effluents and waste.

Import and Export Policy Order, 2013

Pakistan promulgated Export Policy Order- 2013 and Import Policy Order- 2013 in the light of Imports and Exports (Control) Act- 1950. Pakistan is quite successful in the effective implementation of Export Control Act- 2004.²³ Export Policy Order control export of all scheduled chemicals as per the CWC and Pakistan CWC Implementation Ordinance-2000.²⁴

Labour Policy, 2006

The Labour protection covers the impact of industrial operations on the environment, safety at work, and occupational health. For addressing the said three aspects, the management of an industry is responsible. The management is an industry is under obligation to provide protective equipment and clothing to workers, and make consistent efforts to reduce and eventually eliminate hazards. This policy encourages industries in all sectors and of all sizes to formulate and implement health and safety policies. Moreover, the management of industry bears the responsibility for ensuring that the functioning of the industry and the disposal of waste does not harm the human health and the wider environment.

Explosives Act, 1884

This federal law covers the production, use, possession, transport and sale of explosives. Under this law, without valid license the import, possession or production of any explosive substance is prohibited. The maximum fine for illegal possessing, importing, or

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manufacturing explosives is Rs.5,000/-. Moreover, keeping in view the explosive properties and the processes involved in manufacture, the governmental authorities may declare any substance dangerous to life or property. Such materials may include explosive chemical substances.

Pakistan Membership of Multilateral Agreements

Pakistan is State Party to the Chemical Weapons Convention (CWC), Strategic Approach to International Chemicals Management (SAICM), Basel Convention on the control of trans-boundary movement of hazardous waste and their disposal Commission on Sustainable Development (CSD), Rotterdam Convention on Prior Informed Consent (PIC) for certain hazardous chemicals and pesticides, Stockholm Convention on Persistent Organic Pollutants (POPs), and Montreal Protocol on Ozone Depleting Substances. (Khurshid, 2006)

The effective implementation of SAICM would improve the safety of all stakeholders in both public and private sector. For the effective implementation of SAICM in Pakistan, the Ministry of Climate Change is responsible. This ministry regularly consults with the United Nations Institute for Training and Research (UNITAR) and civil society. However, regarding the adverse effects of chemicals on humans and the environment the general awareness of the public is insufficient. Especially, the workers in industries and agriculture know very little regarding the adverse effects of chemicals on their health; and what are their rights with regard to safety and health issues. This awareness raising of masses is essentially required, (Mehmood) because, SAICM cannot be effectively implemented without the participation of masses.

The International Labour Organization (ILO) Convention addresses health and safety issues at all levels. This Convention provides the legal basis for related national implementation legislations and regulations. In the light of the ILO Convention, the governmental authorities must demand formal health and safety policies and their implementation from all industries, especially industries handling hazardous substances. Moreover, Global Harmonized System (GHS) of nomenclature assign code to chemicals. The GHS is specified in the Rotterdam Convention and was adopted by the World Customs Organization in 2004. This system aims to ensure that information on toxicity and physical hazards from chemicals is made available to users.²⁵ This will substantially contribute to human health and the environment. However, in Pakistan, little is known regarding GHS. Therefore, necessary capacity building of all stakeholders and awareness raising must be undertaken for the implementation of GHS.

Ministries and Agencies Managing Chemicals

The management of chemicals in Pakistan is done through a structured governmental mechanism. This mechanism specifically defines the responsibilities and mandates of various ministries through national laws. For the management of chemicals, the responsibilities of various ministries and organizations are given in succeeding paragraphs.

Ministry of Climate Change

This Ministry implements Pakistan Environmental Protection Act (PEPA)-1997 and four multilateral agreements, namely, Implementation of World Summit on Sustainable Development (WSSD), Rotterdam Convention on procedures for certain hazardous wastes, Economic & Social Commission (ECOSOC), United Nations Commission on Sustainable Development (UNCSD), and Convention on Persistent Organic Pollutants (POPs).

Pakistan Environmental Protection Agency, Provincial EPAs

They promote research and development in Science & Technology, which can contribute to the prevention of pollution, protection of the environment, and sustainable development. These agencies also specify safeguards for the prevention of accidents and disasters; and encourage the involvement of NGOs and CBOs for preventing and controlling pollution and promoting sustainable development.

Ministry of Food and Agriculture

This ministry is responsible for following:

- b. The storage, handling, transportation, distribution, and use of imported fertilizers.
- a. Import, production, marketing, transport, storage, distribution, use and handling of pesticides.
- c. To monitor the use of fertilizers both locally produced and imported.

Ministry of Industry and Production

This ministry implements the Agricultural Pesticides Ordinance, 1971 & Rules 1973, Petroleum Act & Rules, Development of Industries (federal control) (Repeal) Ordinance, and Boilers Act. This Ministry is responsible for:

- b. Provide safety guidelines to industry and ensure its implementation.
- a. Domestic production, transportation, storage, distribution and handling of the locally produced fertilizer and all other chemicals.
- c. Awareness raising regarding safety in industry.
- e. Developing physical capacity for industrial disaster management.
- d. Prepare inventory of hazardous chemicals and raw materials used in various industries and study the hazards posed by various industries.

Ministry of Labour and Manpower

This Ministry implements the Labour laws, Mines Act & Rules, Factories Act and Regulations & Rules, Hazardous Occupation rules, and Fatal Accident Act. In this regard, it develops human resource and develop respect for human rights.

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Ministry of Commerce

The Ministry of Commerce implements Import Policy Order and Export Policy Order through the trade policy and regulates the import and export of raw materials and chemicals used for chemical production.

National Fertilizer Development Centre (NFDC)

NFDC provides advice to fertilizer industry, government, and all stakeholders on matters related to fertilizers. It undertakes research on soil fertility, fertilizers and plant nutrition management. The NFDC monitor impact of fertilizers on crop productivity and problems faced by farmers. NFDC is working closely with international fertilizer community.

Ministry of Communication

Ministry of Communication is the administrative authority on transport and communication sector of the country. It handles the transportation of chemicals and related equipment.

Ministry of Foreign Affairs (MFA)

National Authority on Chemical Weapons Convention (CWC) is located at the MFA. The National Authority is responsible for national implementation of CWC and in this regard undertakes necessary coordination with the Organization for the Prohibitions of Chemical Weapons (OPCW) and States Parties of the CWC. Moreover, MFA plays an important role in multilateral negotiations, signing and ratification of international agreements.

Federation of Pakistan Chambers of Commerce and Industry (FPCCI)

FPCCI is the apex body representing country's industry, trade and services. It advocates collective concerns and aspirations of the private sector. In this context, FPCCI offers advice and assistance to the Government, thus serves as a bridge between the private sector and the government.²⁶

Conclusion

In Pakistan a well structured mechanism exists for the management of chemicals. However, their monitoring and implementation capacities require improvement. The lack of human and financial resources and insufficient coordination amongst various ministries and organizations are the main impediments for the sound management of chemicals. The lack of coordination can also be attributed to the lack of national database and the ability to collect and analyze reliable information.²⁷ Moreover, it is felt that the quality of input, analysis and the policies would substantially improve with the involvement of scholars and experts on the subject of management of chemicals.

Importantly, Pakistan has no national law dealing with safe and secure storage, transportation and disposal of chemicals. Though, Explosives Act exists, yet it does not

cover all types of chemicals. Pakistan's existing legislation does not provide adequate consumer protection. These areas warrant priority considerations and related comprehensive legislations. Perhaps, Pakistan has many legal instruments but the capacity of concerned ministries requires improvement. Basically, the regulatory framework is not effectively enforced, which is the main drawback of the whole system. Moreover, some of these Acts also require review, keeping in view the prevailing security environment and for comprehensively addressing the safe and sound management of chemicals. Moreover, the penalties for various offences should be reformatory in nature and must induce deterrence, restraint, and also rectify the caused damage to the environment. For example, under the *Sindh Local Government Ordinance-2001* imposing Rupees.15000/- fine for discharging industrial waste in the water body may not yield desired effect. Similarly, under the *Explosives Act-1984* imposing Rs.5000/- fine for illegally manufacturing, importing, possessing explosives has no deterrence value.

Pakistan has no central database for broader analysis. In fact the national capacity for collection and analysis of data is inadequate. This requires definite improvement otherwise grey areas will exist. Public access to available data in various organizations is a difficult task. Therefore, a national chemical information system may be developed, which would help public interest groups and academic institutions in obtaining requisite data and drawing analysis and lessons from such information. Such academic researches and organizational analysis would also contribute to national policy formulations. Similarly, the governmental authorities must ensure that industries also maintain data regarding safety and security aspects in a transparent manner. The industry ought to cooperate with academic institutions and public interest groups for mutual and national benefits.

The NGOs and CBOs may be encouraged to develop capacities especially for the safe and sound management of chemicals. The governmental authorities must assist public interest groups in developing said capacities and performing a proactive role in the safe and sound management of chemicals and related facilities. The NGOs work closely with local population; thus they can work as useful partners of national and international organizations in raising awareness of masses and also conveying the concerns of local community to the management of industry and the governmental authorities. The NGOs may be given role in policy formulations and also in monitoring the chemical facilities and related activities such as transportation of chemicals, hazardous waste disposal etc. Thus, public interest groups would perform the monitoring role, which augment the limited capacities of the governmental authorities. In Pakistan more than 8000 NGOs and CBOs are working but one of their major handicap is lack of coordination. This weakness needs to be addressed for synergetic efforts.

Pakistan is member of large number of multilateral agreements, which are designed to contribute to both national and international efforts for sound management of chemicals. The effective implementation of the international instruments requires dynamic national implementation bodies with requisite technical and administrative capacities. Nonetheless, the national implementing bodies alone cannot achieve the desired results, because it requires enthusiastic involvement of the civil society. This also requires awareness raising of the masses and the workers regarding safety, health and security issues. For example, Pakistan is member of the *ILO Convention* and has established *Labour Inspection Policy-*

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2006, but the working conditions in small and medium sized industries are characterized hazardous. So much so that the workers are not provided protective clothing and equipment and they are not even informed regarding the hazards associated with the chemicals they work with. Therefore, the governmental authorities, management of industries, public interest groups, civil society and representatives of the local community must ensure that national policies, rules and regulations are effectively disseminated and implemented, and the awareness level of workers and the general public are improved. This would significantly contribute to the safety, health and security aspects, the wider environment and national economy.

Notes

1. The demand of Sulphuric Acid is like a barometer of industry in any country. It is of great commercial importance for use in manufacture of fertilizers, textiles, plastics, explosives, paints, dyes and pigments, acids, heavy chemicals, leather tanning, oil refining, water treatment, treatment of cotton seeds, etc.
2. "National Profile for Chemical Management," op.cit, pp.91-92.
3. The chemicals used in the textile industry include softeners, emulsifiers, acids, bleaching powder, soda ash, hydrogen peroxide, caustic soda, sodium carbonate, dyes & pigments, waterproofing agents, etc.
4. Alkyd resins are used for manufacturing enamel paints because they provide effective protective coatings. "National Profile for Chemical Management," op.cit, p.103
5. Author's meeting with Dr Abda Farooqi, Department of Environmental Sciences, Quaid-i-Azam University, Islamabad, 26 March 2014.
6. Author's meeting with the management of A.J. Textile Mills, Gadoon Amazai, 16 August 2013
7. National Capacity Assessment of Pakistan for Implementation of Strategic Approach to International Chemical Management (SAICM), op.cit, p.19.
8. Authors visit to Engro Chemicals Pakistan Ltd, Daharki, 6 November 2009; Fauji Fertilizer Mirpur Mathelo, 6 November 2009; Pak-Arab Fertilizer Multan, 24- 28 February 2010; Fauji Fertilizer Ghoth Machi, 5 November 2009.
9. Authors visit to Fauji Fertilizer, Ghoth Machi, 5 November 2009; Clariant Pakistan Limited Jamshoro, 7 November 2009; Daud Hercules Ltd Lahore, 3 November 2009; Super Chemicals Karachi, 8 November 2009.
10. Author's visits to Amber Chemicals Private Limited, Hattar, 27 March 2014; Polykim Factory, Hattar, 27 March 2014; MB Dyes Chemical and Silk Industries (Pvt) Limited, Gadoon Amazai, 16 August 2013; Ink Chemicals Gadoon Amazai, 16 August 2013; Razar Chemical Industries, Gadoon Amazai, 17 August 2013.
11. Author's meeting with Dr Amin Badsha, Chairman Department of Chemistry, Quaid-i-Azam University, Islamabad, Pakistan, 28 April 2014.
12. National Capacity Assessment of Pakistan for Implementation of Strategic Approach to International Chemical Management (SAICM), op.cit, p.9.
13. When Calcium Ammonium Nitrate is processed and mixed with fuel oil, this fertilizer becomes a deadly explosive. The Department of Defence (DoD) officials estimated that a 110 pounds bag of Calcium Ammonium Nitrate (CAN) yields about 82 pounds of explosive material, and this small amount can destroy an armoured vehicle. Refer: "IEDs and Pakistani Fertilizers," Think Defence, 16 July 2012, p.1.
14. Author's meeting with Dr Riffat N. Malik, Chairperson Department of Environmental Sciences, Quaid-i-Azam University, Islamabad, 26 March 2014.
15. Author's meeting with PhD and MPhil scholars of Chemistry Department, Quaid-i-Azam University, Islamabad, 6 November 2013.
16. Author's meeting with Dr. Amin Badshah, Chairman Department of Chemistry, Quaid-i-Azam University, Islamabad, 28 April 2014.
17. Kiran Ejaz, "Disaster Management Never Part of the Medical Curriculum in Pakistan," Journal of Pakistan Medical Association, May 2011.
18. Author's visit to Social Security Hospital, Gadoon Amazai, 17 August 2013.
19. "A Study of NGOs in Asia: Pakistan," Transparency Watch Organization, 1999, p.3. Available at www.transparencywatchorganization.com.
20. Author's meeting with Dr. Riffat N. Malik, Chairperson Department of Environmental Sciences, Quaid-i-Azam University, Islamabad, Pakistan, 26 March 2014.

21. National Capacity Assessment of Pakistan for Implementation of Strategic Approach to International Chemical Management (SAICM), op.cit, pp.21-22.
22. Hazardous Substances Rules- 2007, Ministry of Environment, Government of Pakistan, Section.8-19. 7 April 2009.
23. Author's meeting with Director General Ministry of Commerce (MoC) and Assistant Director Policy, MoC on 9 October 2013.
24. Schedule I and Schedule II chemicals cannot be exported to States not party to CWC, and Schedule-III chemicals can be exported to states not party to CWC. However, the importing State must ensure that the chemical in question is not misused. In this regard, the importing state has to provide End User Certificate to the exporting state.
25. National Capacity Assessment of Pakistan for Implementation of Strategic Approach to International Chemical Management (SAICM), Ministry of Environment, Government of Pakistan, November 2009, p.15.
26. The Federation of Pakistan Chambers of Commerce and Industry, "Role and Function of FPCCI in the Growth of Trade, Industry, Services, SMEs, Commerce & Economic Development of Pakistan." Available at www.fpcci.com.pk.
27. Author's meeting with Dr. Abda Farooqi, Associate Professor, Department of Environmental Sciences, Quaid-i-Azam University, Islamabad, Pakistan, 24 March 2014.

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