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ENVIRONMENTAL AUDIT OF MUNICIPAL SOLID WASTE MANAGEMENT IN INDIA

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Abstract : Hazardous wastes are considered highly toxic and therefore disposal of such wastes needs proper attention so as to reduce possible environmental hazards. Industrial growth has resulted in generation of huge volume of hazardous wastes in the country. In addition to this, hazardous wastes sometimes get imported mainly from the western countries for re-processing or recycling. Inventorisation of hazardous wastes generating units in the country is not yet completed. Scientific disposal of hazardous wastes has become a major environmental issue in India. Hazardous Wastes (Management and Handling) Rules, 1989 have been framed by the Central Government and amended in 2000 and 2003 to deal with the hazardous wastes related environmental problems that may arise in the near future. This paper gives details about the hazardous wastes management in India. Health effects of the selected hazardous substances are also discussed in the paper.

Keywords:

INTRODUCTION

Environmental management of hazardous wastes has become a major concern in India as haphazard dumping of hazardous wastes results in severe environmental impairment.

The adverse effects of hazardous wastes as well as the significant potential risks posed by them to the life and its supporting systems are increasingly recognized1. Rapid growth of industries in India has resulted in generation of increasing volume of hazardous wastes. Both indigenously generated and imported from other countries for recycling or reprocessing need scientific treatment and disposal. However, only a few secured landfill sites are available in the country for disposal of hazardous wastes in an environmentally sound manner. An illegal dumping of hazardous wastes by the industries may cause severe environmental pollution. The Ministry of Environment and Forests (MoEF) has promulgated Hazardous Wastes (Management & Handling) Rules, 1989 and amended the same in 2000 and 2003 for proper management and handling of hazardous wastes in the country. These rules also deal with the ban for importing a few categories of hazardous wastes. India has also ratified the Basel Convention on transboundary movement of hazardous wastes in 1992, which is a significant tool for controlling and monitoring of import and export of hazardous wastes and its proper management. However, various issues and the regulatory framework for hazardous wastes management in the country should elaborately be understood in proper perspectives by the regulatory agencies and industries to help the Government to develop environmentally sound management system. In this paper, an attempt has been made in this direction to highlight such aspects, which will help policy planners, decision makers, researchers etc. of the country.

Characteristics of hazardous wastes

Hazardous wastes, which may be in solid, liquid or gaseous form, may cause danger to health or environment, either alone or when in contact with other wastes2. Hazardous wastes can be identified by the

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characteristics that they exhibit viz., ignitability, corrosivity, reactivity, or toxicity3. The general characteristics of hazardous wastes are given in Table 1. Various agencies have defined hazardous wastes in different ways and as such, there is no uniformly accepted international definition so far. It is presumed that about 10 to 15 percent of wastes produced by industry are hazardous and the generation of hazardous wastes is increasing at the rate of 2 to 5 percent per year4.

Process wastes

Hazardous wastes in India can be categorized broadly into two categories, viz., i) hazardous wastes generated in India from various industries, and ii) hazardous wastes imported into or exported to India. Hazardous wastes are being generated in the country by various industries. Inventorisation of hazardous wastes generating units and quantification of wastes generated in India are being done by the respective State

Sr. No	Hazardous characteristics	Potential hazards on living animals / environment
1	Flammable/ explosive	This type of waste may cause damage to the surroundings by producing harmful gases at high temperature and pressure or by causing fire hazards.
2	Oxidizing	Type of wastes that may yield oxygen and thereby cause or contribute to the combustion of other materials.
3	Poisonous (Acute)	These wastes have high potential to cause death, serious injury or to harm health if swallowed, inhaled or by skin contact
4	Infectious substances	Hazardous wastes containing micro-organisms and their toxins, and responsible for diseases in animals or humans.
5	Corrosives	These wastes are chemically active and may cause severe damage to the flora and fauna, or to the other materials by direct contact with them.
6	Eco-toxic	These wastes may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems.
7	Toxic (Delayed or chronic)	These wastes, if inhaled or ingested or if they penetrate the skin, may cause delayed or chronic effects, including carcinogenicity.
8	Organic peroxides	These are organic waste containing bivalent-O-O-structure and may undergo exothermic self-accelerating decomposition.

Pollution Control Boards (SPCBs) or Pollution Control Committees (PCCs). Depending on the physical and chemical characteristics of hazardous wastes, these may be categorized into three categories, viz., recyclable, incinerable and landfill. The hazardous wastes may be categorized as recyclable when resource recovery is possible by reprocessing the waste, as incinerable when it is possible to incinerate the wastes for destruction and

energy recovery, and as landfill waste when this is not suitable either for resource or energy recovery, but suitable for dumping with or without any treatment1. Reliable data on quantity of various categories of hazardous wastes generated is not available as yet. The processes of inventorisation of hazardous wastes generating industries and quantification of hazardous wastes in India are in progress. In many cases, it is difficult to procure reliable data on quantification of hazardous wastes and the SPCBs have to rely on the figures produced by the industries, which may not have adopted scientific methods for quantification of different categories of hazardous wastes. While observing data from various sources, the rate of generation of hazardous wastes in India could be above 6.7 MT/ year5. Apart from the above insitu hazardous wastes generation in the country, import of hazardous wastes is a matter of concern for India.Various types of hazardous wastes are being imported, mainly from the developed countries. Proper record of the same is still difficult to maintain in spite of due attention drawn by the Supreme Court Monitoring Committee (SCMC) on Hazardous Wastes. These wastes are being imported for recycling. Therefore, there is need to keep an authentic record of whether the hazardous wastes are recycled or dumped elsewhere, as such types of imported recycled wastes are highly concentrated with hazardous constituents. Recycling of hazardous wastes regenerates hazardous wastes, which are often more toxic in concentration than the material recycled. Such wastes have a detrimental impact on public health and the natural environment, including wildlife, if disposed of unscientifically.

Recycling of hazardous wastes

Hazardous wastes having the resource values are recycled or reprocessed for value recovery. Used oil, battery wastes and other non ferrous wastes like zinc, lead are commonly recycled in India. Used oil is generated in the industrial sectors and from the automobiles, transformer or capacitor oil etc. Used oil contains high levels of various heavy metals like lead, cadmium, arsenic and chromium etc. It also contains contaminants such as chlorinated solvents, polychlorinated bi-phenyls and other carcinogens. It is estimated that one gallon of used oil is sufficient to contaminate one million gallons of ground water. Import of used oil/waste oil is banned in India due to its potential pollution hazard. However used oil is a precious and non-renewable resource and can be recycled back to pure lube oil again and again. USA generates 1.4 billion gallons of used oil every year, of that only 12 percent is recycled back into high quality products and rest is either burnt (56 percent) or disposed illegally (32 percent).20 The Hazardous Wastes (Management & Handling) Amendment Rules, 2003 recommend Environmentally Sound

Technologies (EST) for recycling of used oil in our country. These technologies include : i) Vacuum distillation with clay treatment, ii) Vacuum distillation with hydro-treating and iii) Thin film evaporation process. The Ministry of Environment and Forests can approve any other suitable technology for used oil re-refining. The major concern over recycling or reprocessing of hazardous wastes is that these processes again generate toxic waste, in which the concentration of toxic substances may be more than its pre-processing stage.

Electronic wastes

Over the years, our dependence on the electronic products has grown manifold, both for domestic and for office uses, and this has resulted in generation of electronic wastes (E-waste) all over the world. E-wastes are a fast growing waste stream. On an average, E-waste makes up approximately 1 percent of municipal solid waste (MSW) stream as per the study report of EPA, USA7. Many municipalities are facing problems with huge amounts of E-waste because rapid changes in computer technology attract the people to throw the gadgets of old technology. Obsolete computers, color cathode ray tubes (CRTs) and other electronic appliances form the electronic waste or E-waste. These E-wastes contain hazardous substances, such as lead, mercury, chromium, etc. A television and CRT monitor contains about four pounds of lead on an average8. Ewaste may contribute high level of Hg contamination in muncipal solid waste. Flame retardants containing bromines are used in plastic materials of various electronic appliances.

Toxics abundant in E-waste are released into the environment through leachates in land fill sites or through incinerator ash. Toxic air pollutants are also released into the environment through incinerators. Therefore, management of E-waste has become a priority in many countries. India is now experiencing the environmental problems of E-waste9. However, presently there is not any legislation enacted for disposal of E-waste in India. Central Pollution Control Board is working for formulation

of the E-waste rule in India under the provisions of Environment (Protection) Act, 1986.

Recycling of E-waste

Recycling of E-waste is a need of the day to reduce/ avoid pollution, and to extract valuable and limited virgin resources. Recycling reduces the energy used in new product manufacturing. In developed countries, municipalities, public and private organizations accept used / waste computers and other electronics for recycling. Now electronics manufacturers like Dell and HP are offering recycling services in some countries. The retailers and dealers of electronic items may be made responsible to ensure proper end-of-life disposition of E-wastes. It is reported that 1.6 million kg of material each month are recovered in recovery centres of HP in the US and Europe, which is 98% by weight of all material received from customers and from within HP10. The waste and the constituent parts must be sent to specialists, who can deal with the components to recover reusable materials and then safely dispose of the rest. CRTs, LCDs, printed circuit boards, power supplies and batteries must all be processed individually to ensure that the respective materials are handled safely. The recycling programmes of Dell and HP have encouraged the Irish people to take advantage of E-recycling. Through Dell, Irish customers recycled over 22 tons of computer equipments in 2004. Looking at this Irish trend, continued and concerted effort on behalf of government, producers and environmental groups is needed in each state level and country as a whole to ensure proper management of increasing volume of E-waste in India.

Reusing and recycling the raw materials from obsolete E-products help in conserving natural resources and reducing the air and water pollution as well as reducing greenhouse gas emissions, which are caused during manufacture of such products. As being followed in many countries, donating electronics for reuse extends the life of the electronics as well as keeps the valuable products out of the waste management system. By donating used electronics to the schools, NGOs, and lower income families, which can not afford the new-purchase, the society can be benefited. USA provides tax incentives for computer donations.

Legislations and regulations for hazardous wastes

Hazardous Wastes (Management and Handling) Rules, 1989 Hazardous Wastes (Management and Handling) Rules, 1989, as amended to date, were notified in the country under the provisions of the Environment (Protection) Act, 1986, for management and handling, and import of hazardous wastes into the country. These rules were amended in 2000 and 2003, to bring the Rules in line with the requirements of the Basel Convention and also to improve the applicability and implementation aspects with regard to imports of hazardous waste. Apart from Ministry of Environment and Forests (MoEF), Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs) / Pollution Control Committees (PCCs) have been delegated certain powers for control and regulation of hazardous wastes.

As per Rule 11 of the Hazardous Wastes Rules, 1989, import of hazardous wastes from any country to India shall not be permitted for dumping. Import of hazardous wastes.

Health effects of hazardous wastes

may be allowed for processing or re-use as raw material, after examining each case on merit by the Ministry of Environment & Forests. Hazardous Wastes Amendment Rules, 2003, 29 categories of hazardous wastes, prohibited for import and export are tabulated. Wastes containing Hg, As, Waste Asbestos (Dust or Fibres), waste oil etc., are in the list of banned wastes for import and export. Both Basel Number and OECD Numbers as applicable are mentioned for each of these 29 categories of hazardous wastes. After import or export permission is granted by the Central Government or the SPCB/ PCC, as the case may be, the same is intimated to the concerned Port Authority to take appropriate steps regarding the safe handling of the hazardous wastes at the time of off-loading the same. Any person importing hazardous wastes shall maintain the records of the hazardous wastes imported as specified in Form 6A, and the records so maintained shall be open for inspection by the MoEF / CPCB / SPCB / PCC, or an officer designated by these regulatory bodies.

CONCLUSION

It is difficult to develop alternative technology for total elimination of hazardous wastes generation. In developing countries, the thrust on economic development is often given

priority to production costs than the best available technology and this results in more wastes generation.

The cost of treatment and disposal of such wastes becomes a liability on the society. The MoEF has elaborately identified various treatment and disposal options of different hazardous waste streams that include physical / chemical treatment, landfill, biological treatment, incineration, recycle and recovery and solidification etc. As on today, the most often used option for disposal of wastes is secured landfill. Several publications define criteria for selection of such sites keeping in mind hydrogeological factors, land use-cover, ecological and human values16. The other options should be given also equal weightage to reuse and recycle of such wastes for resource recovery before deciding for a landfill. Environmental Impact Assessment (EIA) is being practiced all over the world to decide a site of secured landfill to ensure less negative impact of such facility on human and ecological systems.

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