



सत्यमेव जयते

# National Hazardous Waste Management Strategy



जहाँ है हरियाली ।  
वहाँ है खुशहाली ॥

Government of India  
Ministry of Environment and Forests



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## FOREWORD

Rapidly increasing waste generation without proper collection, processing and disposal systems is posing a threat to our environment and impacting public health. Recognizing the need for environmentally sound management of hazardous wastes, the Ministry of Environment and Forests promulgated the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.

I am happy to note that the National Hazardous Waste Management Strategy has now been formulated to complement and strengthen the regulatory regime. This is based on the understanding and experience of diverse issues connected with management of hazardous waste.

The Strategy incorporates the basic tenets of the National Environment Policy 2006, and is in harmony with the Basel Convention. It emphasizes waste avoidance and waste minimization, followed by re-use and recycle to the extent techno- economically feasible, safe disposal in captive or Common Treatment, Storage and Disposal Facilities (TSDFs); strengthening the infrastructure of regulatory bodies, and remediation of contaminated sites. It also deals with issues such as interstate transport of hazardous waste; handling and management of hazardous waste during ship-breaking, disposal of date expired drugs and pesticides; co-processing of incinerable waste for energy recovery and preventing illegal dumping of hazardous waste. The Strategy recognizes the need for import of recyclable waste to supplement natural resources, thereby reducing the environmental impact.

It is proposed that the Strategy be reviewed every five years to keep it in consonance with technological developments and the experience of implementation at the ground level.

5. I hope this document will act as a road map for action by all the stakeholders for environmentally sound management of Hazardous Waste.

6. I compliment the officers who have contributed to the preparation of this document.

(Jayanthi Natarajan)



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# 1

## EXECUTIVE SUMMARY

### OBJECTIVES:

- (i) Effective management of hazardous waste, so as to avoid environmental pollution and adverse health effects.
- (ii) To provide guidance to regulatory bodies, generators of hazardous waste, recyclers and operators of treatment, storage and disposal facilities to minimize, recycle, treat and dispose of left over hazardous waste in an environmentally sound manner.
- (iii) To facilitate implementation of the action plan in the “National Environment Policy 2006” in respect of management of hazardous waste.
- (iv) To fulfill obligations under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
- (v) To promote use of cleaner technologies.



## ACTIONS:

### 1. Inventory of hazardous waste generation:

Currently there are approximately 40,722 industries generating hazardous waste of the order of 7.6 million Metric Tonnes per annum in the country. Since industries change their products, processes and production capacities and new industries get established, periodic, updation of inventories is required. Industries are required to report changes/additions in hazardous waste generation and steps taken to reduce generation of waste per unit of production. The State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) are responsible for compliance of this provision.

Central Pollution Control Board (CPCB) will develop guidelines on identification of end of life consumer products which have the potential to generate hazardous wastes. SPCBs /PCCs will undertake inventorization of such wastes and regular updation of such inventories.

As per the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008, industries can store hazardous waste up to 90 days unless permission is obtained from the concerned State Pollution Control Board/Pollution Control Committee for extension of the stipulated period. They are required to maintain a record of sale, transfer, storage, recycling and reprocessing of such wastes. The waste could be reused/ recycled or disposed of in captive or common Treatment, Storage and Disposed Facilities (TSDFs).

The Ministry of Environment and Forests has developed a GIS based National Hazardous Waste Inventorisation System (NHWIS), which needs to be updated on a regular basis by SPCBs/PCCs.

### 2. Waste avoidance and waste minimization at source:

In the hierarchy of waste management, waste avoidance and waste minimization in the production process have to be attempted first by the industries. This would include plant recovery of resources such as solvents, other reagents and by-products. The CPCB will play the lead role in developing, promoting and dissemination of information on technological options. This shall be a continuing exercise.

### 3. Reuse, recovery and recycling of hazardous waste:

- a) Industrial associations/industries to explore development of options for reuse recovery and recycling of hazardous waste in an environmentally sound manner.
- b) 'Waste exchange Banks/ Centers' to be set up by individual or cooperative associations of industries to provide information on wastes and promote reuse, recovery and recycling technologies.





- c) The Ministry to promote setting up of treatment, storage and disposal facilities of hazardous wastes and e-wastes recycling facilities under public-private partnership mode. State Governments to encourage setting up of such facilities by providing land free of cost and matching contributions.
- d) E-Waste is one of the fastest growing waste streams across the Globe. To address the issue, the Ministry has notified E-Waste (Management and Handling), Rules, 2011. To improve E-waste management, the concept of Extended Producer Responsibility has been incorporated in regulatory framework. Producers are required to set up collection centers, take back systems for collection of their end of life electrical and electronic equipment and develop mechanisms for channelizing wastes to the authorized recyclers.
- e) Use of hazardous wastes as supplementary fuels /raw material in cement industry, thermal power plants, iron and steel plants needs to be encouraged. In the past, some experimental trial runs for co-processing of effluent treatment plant sludge, refinery sludge, paint sludge, tyre chips, plastic waste in cement kilns have been carried out in the country. The emission monitoring was also undertaken and it was found that there is no significant impact on the environment. Based on the experimental runs CPCB evolved a waste specific policy on use of high calorific value of hazardous wastes as fuel supplements in the cement kilns. Further, CPCB to undertake trials for utilization of other wastes for co-processing. Other options for reuse of hazardous waste, such as use of reconditioned paint sludge as primer/ coating to be explored.

#### 4. Safe disposal of hazardous waste:

- (a) For wastes which cannot be recycled/ reused, safe and environmentally sound disposal shall be adopted depending upon waste category. Design and operation norms of disposal facilities should be strictly adhered to as per the guidelines framed by CPCB. Supervision of such facilities during construction, operation and post-closure monitoring shall be ensured by concerned SPCB/PCC.
- (b) Setting up of common Treatment, Storage and Disposal Facilities: Disposal of hazardous wastes is being undertaken in twenty nine, common hazardous waste Treatment, Storage and Disposal Facilities (TSDFs) operating in 16 States and six such facilities are under construction. In addition, 35 sites have been notified by the State Governments for the development of TSDFs. State Governments will take action/further steps to set up TSDFs at these notified sites. In view of the difficulties faced by the State in the past for identifying suitable sites for setting-up of TSDFs, such facilities should preferably be located within





industrial estates. The State Governments shall promote such facilities and provide financial support matching the Central subsidy. A separate Escrow fund shall be created by the facility operators for post closure monitoring and to deal with liability arising due to mishaps, calamities etc. The TSDFs shall cater to meticulously delineated areas taking into consideration their distance from the generators and availability of wastes. This would be ensured by the SPCB/PCC to avoid multiple TSDFs in the delineated areas.

#### **5. Interstate transportation of hazardous waste:**

As per the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 interstate movement of hazardous wastes for disposal is permitted on mutual agreement basis.

However, there shall be no restriction on the interstate movement of recyclable hazardous wastes.

The SPCBs/PCCs shall develop on-line tracking system for movement of hazardous waste from generation to the disposal/recovery/recycle stage.



#### **6. Illegal dump sites and remediation:**

To take care of illegal dumping, surveillance by SPCBs/PCCs and industries needs to be stepped up.

A World Bank assisted project “Capacity Building for Industrial Pollution Management” is being implemented by Ministry of Environment and Forests. The project aims to develop a policy, institutional and methodological framework for the establishment of a National Programme for Rehabilitation of Polluted Sites (NPRPS). It includes inventorization of polluted sites, establishing 'best practice' solutions and engaging multiple stakeholders in the implementation, including cost recovery mechanisms.

The project would help to build the technical capacity of select SPCBs for undertaking environmentally sound remediation of polluted sites. Ten highly polluted sites, two in Andhra Pradesh (Noor Mohammed Kunta in Hyderabad and municipal dumpsite in Kadapa) and eight in West Bengal (Dhapa municipal dump site in Kolkata and seven hazardous waste sites in Hooghly district), have been identified for remediation on a pilot basis. A National Plan for rehabilitation of Polluted Sites would be developed for legacy hazardous waste dump sites.

The approach for site remediation of the existing dump sites would vary from site to site depending on nature of pollutants, future damage potential and remedial cost. The remediation strategy would focus on the 'Polluter Pays Principle' which will be strictly enforced. In such a case, the polluter has to reinstate or restore the damaged or destroyed elements of the environment at his cost. To take care of cases of remediation, wherein polluters are not



traceable, a dedicated fund will be created by MoEF/ CPCB.

## **7. Strengthening the infrastructure of regulatory bodies:**

- (a) For effective enforcement of regulations, SPCBs/ PCCs to be strengthened in terms of manpower, equipment, instruments and other infrastructure facilities.

The Central and State Governments to support SPCBs / PCCs by adequate funding, training and awareness programmes, periodically.



- (b) In order to control illegal imports of hazardous wastes. Action to be taken on priority for:
- (i) Harmonization of EXIM regulations with the provision of HW (M, H & T. M.) Rules,
  - (ii) Training of Custom Department personnel engaged in inspection & sampling and
  - (iii) Up-gradation of Customs Department Laboratories.

## **8. Handling and management of hazardous waste during ship dismantling:**

Disposal of hazardous wastes generated during Ship breaking to be done in an environmentally sound manner by utilizing technologies that meet the criteria of an effective destruction with no generation of persistent organic pollutants and complete containment of all gaseous, liquid and solid residues.





Health and safety of the workers at the ship breaking yards to be addressed.

Adequate safety systems and procedures to be adopted during dismantling of ships and handling of hazardous wastes/ materials.

The recommendations of the Supreme Court for ship breaking activities to be strictly enforced by the SPCBs/State Maritime Boards.







# 2

## National Hazardous Waste Management Strategy

### 1. Introduction

The Hazardous Waste Management Strategy incorporates the essence of the 'National Environmental Policy 2006', relevant multilateral environmental agreements like Basel Convention and the National Regulations.

The "National Environment Policy 2006" has brought out management aspects of hazardous wastes in the form of an action plan. These include:

- Develop and implement viable models of public-private partnerships for setting up and operating secure landfills and incinerators and appropriate techniques for treatment and disposal of toxic and hazardous waste, both industrial and bio-medical, on payment by users, taking the concerns of local communities into account.
- Develop and implement strategies for cleanup of toxic and hazardous waste dump sites (legacy sites), in particular in industrial areas and abandoned mines, and reclamation of such lands for future sustainable use.
- Survey and develop a national inventory of toxic and hazardous waste dumps and an online monitoring system for movement of hazardous wastes. Strengthen capacities of institutions responsible for monitoring and enforcement in respect of toxic and hazardous wastes.



- Strengthen the legal arrangements and response measures for addressing emergencies arising out of transportation, handling and disposal of hazardous wastes, as part of the chemical accidents regime.
- Give legal recognition to, and strengthen the informal sector systems of collection and recycling of various materials. In particular enhance their access to institutional finance and relevant technologies.
- Develop and enforce regulations and guidelines for management of e-waste, as part of hazardous waste regime.

The Ministry of Environment & Forests (MoEF) has notified the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 for effective management of hazardous wastes in the country. As per these Rules, hazardous wastes' is defined as any waste, which by reason of any of its physical, chemical reactive, toxic, flammable, explosive or corrosive characteristic causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances, and shall include:

- (i) wastes specified under column (3) of Schedule I.
- (ii) wastes having constituents specified in Schedule II if their concentration is equal to or more than the limit indicated in the said Schedule, and
- (iii) wastes specified in Part A or Part B of the Schedule III in respect of import or export of such wastes in accordance with rules 12, 13 and 14 or the wastes other than those specified in Part A or Part B if they possess any of the hazardous characteristics specified in Part C of that Schedule.

Hazardous Waste can cause serious adverse environmental and health effects, if not handled and managed properly. Effective management of hazardous waste is must with emphasis on minimization of generation and maximization of recycling/ reuse, taking into account economic aspects. It is, therefore, necessary to have an appropriate "strategy" hazardous waste management with clearly defined responsibilities for the regulatory bodies, generators of waste, recyclers and operators of facilities to minimize, recycle, treat and dispose of hazardous waste in an environmentally sound manner.

A number of initiative have been taken for improving environmentally sound management of hazardous wastes in the country. These include:-

- establishing a regulatory and institutional framework;
- preparation of technical guidelines on various aspects of hazardous waste management;
- developing of individual & common facilities for recycle/recovery/reuse, treatment and disposal of hazardous wastes on Public Private Partnership mode;
- inventorisation of hazardous wastes generation;

- identification & assessment of dump sites for the purpose of preparing remediation plans, and creating awareness amongst various stakeholders.

These activities will be expanded, reinforced and strengthened by MoEF, Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs).

MoEF would take steps to promote adopting a holistic approach encompassing reduction at source, reuse, recycle and recovery- in that order- through infusion of cost-effective and innovative technologies, processes, and practices, to reach the goal of "Zero Disposal of Hazardous Waste", .

Further, the management of 'end of life' consumer products, having hazardous constituents, such as used lead acid batteries and waste electrical & electronic equipment, would be given primacy to reuse, recycling and recovery.

SPCBs/PCCs would ensure that hazardous waste, which is not amenable to reuse, recycling and recovery, is sent to authorized facility for physico-chemical/ biological treatment, incineration or disposal in secured landfills by generators.

The Ministry would coordinate with Customs authority on the issue of import of recyclable, recoverable or reusable hazardous waste not only to meet the growing needs of certain materials like non-ferrous metals but also to reduce negative environmental footprints. Import of hazardous waste from any country to India for disposal will not be permitted.

## **2. Basel Convention**

India, being a Party to the Basel Convention on trans-boundary movement of hazardous wastes, is required to fulfill its objectives regarding control and reduce trans-boundary movements of hazardous wastes. Other objectives of the Convention include prevention and minimization of generation of such wastes, their environmentally sound management and active promotion of the transfer and use of cleaner technologies.

## **3. Regulatory Frame Work**

To regulate management of Hazardous Waste generated within the country and export/import of such waste, the Hazardous Wastes (Management and Handling) Rules, 1989 were notified under the Environment (Protection) Act, 1986. Any waste, which by virtue of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances has been defined as hazardous. These rules were revisited in 2008 to bring greater clarity to classification of hazardous wastes by linking generation of waste streams to specific industrial processes. Simultaneously, threshold levels for concentration of specified hazardous constituents in wastes were laid down to distinguish between hazardous and other wastes. For regulating imports and exports, wastes have been classified as either 'banned' or 'restricted'. The procedure for registration of recyclers/re-processors with environmentally



sound management facilities for processing waste categories, such as used lead acid batteries, non-ferrous metals waste and used/waste oil, has also been laid down.

The new Rules titled 'Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008' have been notified superseding the earlier regulation. Recycling of e-waste has also been addressed under these Rules.

The management and handling of Bio-medical wastes and used lead acid batteries are regulated under separate Rules made for the purpose namely; Biomedical Waste (Management and Handling) Rules, 1996 and the Batteries (Management and Handling) Rules, 2001.

#### 4. Categories of Hazardous Waste

This strategy encompasses the following categories of hazardous waste:

- a) Industrial wastes (hazardous) generated during production such as rejects/process residues, spent chemicals/solvents, spent catalysts, hazardous dust collected from air pollution control devices, sludge arising from waste water treatment plants etc having hazardous constituents.
- b) Date-expired products such as obsolete pesticides and medicines.
- c) End of life consumer products such as fluorescent bulbs and tubes containing mercury, used lead acid batteries, e-waste, etc.,
- d) Hazardous waste from demolition including ship breaking activities,
- e) Used oil/waste oil, and
- f) Used Lead Acid Batteries.

Other types of hazardous waste, not included in this strategy, are radio-active waste and bio-medical/infectious waste which are covered under separate relevant regulations.

The high volume low effect wastes such as fly ash, phosphogypsum, red mud, slags from pyrometallurgical operations, mine tailings and ore beneficiation rejects are excluded from the category of hazardous waste. Management of these wastes shall be as per the guidelines issued by CPCB from time to time. CPCB will prepare guidelines to emphasize utilization of these wastes to the maximum extent.



#### 5. Hazardous Waste Generation

The industrial growth leads to increase in generation of hazardous waste. Given the fact that India has been on a rapid growth trajectory for nearly a decade, it can be reasonably projected that the hazardous waste generation in the country would increase.



The inventory of hazardous waste generating industries and hazardous waste generated has been prepared by the State Pollution Control Boards (SPCBs) in the States and Pollution Control Committee (PCCs) in the respective Union Territories (UTs). Currently, there are approximately 40,722 industries generating hazardous waste of the order of 7.6 Million Tonnes per annum.

The inventory has also brought out detailed information on quantum of waste in terms of recyclable, reusable, landfillable and incinerable components. Since the industries do change their products, processes, or capacities and as new industries get established, there is a need to periodically update inventories by the SPCBs/PCCs. It is made mandatory on the part of industries to report changes/additions in hazardous waste generation and steps be taken to reduce generation of waste per unit of production. This would be strictly enforced by SPCBs/PCCs.

In order to have better planning for setting up of common facilities for treatment and disposal, periodic updating of the generation of hazardous waste by the SPCBs/PCCs has to be an on-going activity. In addition, a uniform on-line tracking system for movement of hazardous waste from generation to TSDF/recycling/re-users will be developed by CPCB and implemented by all SPCBs/PCCs.



As per the Hazardous Waste Rules, industries have to store hazardous waste properly, and in accordance with authorization issued by SPCBs/PCCs. The waste recycled has to be either reused or disposed of in captive or common Treatment, Storage and Disposal Facility (TSDF), or incinerated in a captive incinerator of its own, or in a common TSDF having incineration facility, based on type of waste.

So far as the 'end of life' consumer products are concerned, no detailed inventory has been prepared. These wastes are bound to increase in volume as the economy grows. Their inventorisation would be undertaken by SPCBs/PCCs.

## **6. Components of Hazardous Waste Management Strategy:**

### **a). Waste Avoidance and Waste Minimization at Source:**

In the hierarchy of waste management, waste avoidance and waste minimization have to be attempted first. This requires a close look at the processes generating hazardous waste so as to incorporate feasible modifications in processes, technologies and plant practices.

Dissemination of information on technological options for waste avoidance and minimization will, therefore, be a continuing exercise by CPCB. Whenever switch-over to cleaner processes involves substantial investments and import of machinery/ technology, suitable financial incentives in the form of rebate in customs duty, etc need to be considered, the Ministry will coordinate with Ministry of Finance.

In the chemical industry, in particular, assessment of cleaner technologies needs to be taken up in major segments such as pesticides, dyes and bulk drugs, and their intermediates. In all such industries, wherever laboratory scale trials have been completed, setting-up of pilot/demonstration plants to be encouraged through suitable incentives by MoEF through CPCB. This would enable speedier adoption of cleaner technologies by the industry.

In cases, where techno-economic feasibility of cleaner production process has been well-established and these have been already adopted by some industrial units, such as cyanide free electroplating, a dialogue should be initiated by MoEF and CPCB with the industry associations for switch over to cleaner production options within a specified time period.



In the petrochemicals, bulk drug, pesticides and dye & dye intermediates sectors, product-wise opportunities available for recovery of resources, such as solvents, other reagents and by-products as well as re-generation of spent catalysts, have been well documented and need to be implemented within a specified time frame by CPCB. The time frame may be fixed by the regulatory authorities in consultation with the industry associations concerned.

In order to assess the current technological status in different industrial categories and preparing action plans for phasing in cleaner production processes/technologies, MoEF through CPCB may constitute dedicated Task Forces comprising of experts in the concerned fields.

#### **b). Reuse, Recovery and Recycling of Hazardous Waste:**

Second in the hierarchy of waste management is reuse, recycle and recovery of useful resources from wastes, in that order. MoEF will, therefore, constitute dedicated waste specific Task Forces so as to explore options/opportunities of reusing, recovery and recycling of the hazardous



wastes in an environmentally sound manner. These Task Forces will also identify areas requiring R&D and the agencies for carrying out such R&D activities.

Further, to promote reuse, recovery and recycling of hazardous wastes, establishment of 'waste exchange banks/centres' will be encouraged jointly and severally by MoEF and State Governments by providing financial assistance. These banks/centres should not only provide information on wastes but also promote reuse, recovery and recycling technologies which up-cycle the quality of resource recovery rather than down-cycle it.



For example, recycling of non-ferrous metal scrap (zinc dross, brass dross, used lead acid batteries, copper oxide mill scale etc) offers attractive options for resource recovery. Current gap between demand and supply of lead, zinc and copper as well as the projected widening of the gap due to rapid increase in demand arising from growth in the various sectors, serves as an incentive for recycling of such wastes. The recycling of used lubricating oil is another example of resource conservation. As compared to primary production of metals, environment friendly recycling is energy efficient and hence, needs to be promoted.

As per the HW Rules, 2008, any person who is engaged in generation, processing, treatment, collection is required to obtain authorization and registration for specific wastes (listed in Schedule IV) from the concerned State Pollution Control Board. These units must have environmentally sound facilities for recovery of metals, plastics, etc. These provisions will be strictly enforced by SPCBs/PCCs.

At present, there are about 800 recyclers of non-ferrous metal wastes/used oil/ waste oil registered under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008. The capacity registered for re-refining/ recycling of used oil and waste oil is about 1.2 Million KLA; that for non-ferrous metal wastes other than lead is 1.3 Million Tonnes per annum and for lead based waste is about 0.75 Million Tonnes per annum. Registrations have been granted to units based on their processing facilities for environmentally sound re-

processing technologies. Barring a few large facilities, recycling takes place essentially in the small-scale sector. As such, there are limitations on technology up-gradation necessary to ensure re-processing in an efficient manner.

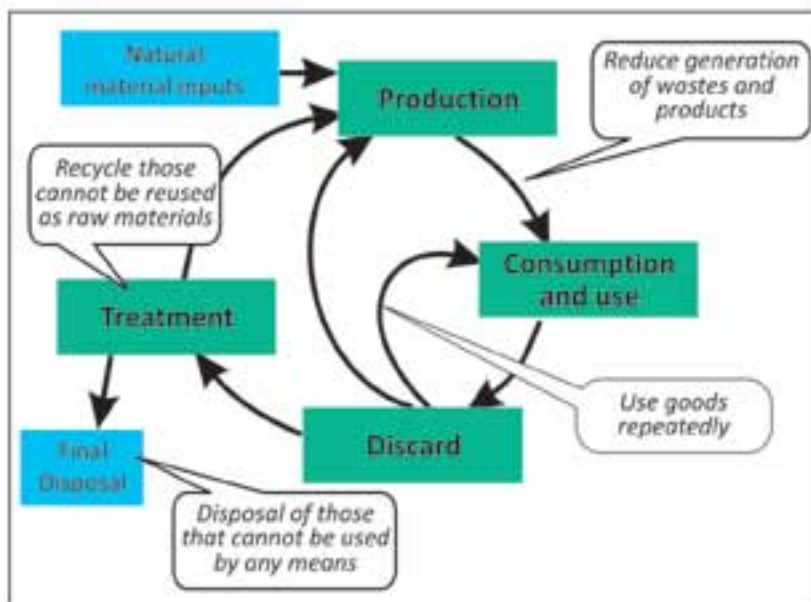
In order to promote technology up-gradation, re-processors with state-of-the-art facilities will be incentivized. One such incentive could be the preferential access to imports of hazardous and other waste to only those recyclers employing state of the art facilities. To examine the cases of preferential access to import wastes for recycling requiring MoEF's permission, MoEF may assign the task to a 'Technical Committee' comprising of experts.

Despite the registration scheme for recyclers in operation, recycling in the unorganized sector, with all its attendant environmental and health hazards, is reported to continue. This underscores the importance of channelization of wastes generated to registered recyclers. While the Battery (Management and Handling) Rules 2001, mandate return of used lead acid batteries, compliance remains unsatisfactory. It is, therefore, proposed to extend the corporate responsibility concept to the producers, for instance, in the form of a takeback scheme.

Considering the potential for serious health impacts posed by co-disposal of house hold hazardous wastes such as fluorescent tube-lights, batteries, etc. with municipal solid wastes, development of mechanisms for collection and channelization of such wastes to facilities for their re- processing would be accorded high priority. At present, there are no environmentally sound re- processing facilities in the country to recover toxic metals such as mercury from thermometers, fluorescent tube-lights etc, and cadmium from batteries for which MoEF through CPCB would initiate studies/ pilot scale demonstration projects.

The recycling of e-waste such as components of waste electrical and electronic assemblies comprising accumulators and other batteries, mercury- switches, activated glass cullets from cathode- ray tubes and other activated glass and PCB capacitors, etc. is regulated. The guidelines in this regard have been published by CPCB so as to ensure environmentally sound recycling of e-waste.

The Ministry has notified the E-Waste (Management and Handling) Rules, 2011. As per these Rules, Producers are required to set up collection centers and take back system for their end of life products and channelize them to authorized dismantlers/ recyclers. Person engaged in collection of end of life electrical and electronic equipment are required to obtain authorization from SPCB/PCC concerned and file annual





returns. E-Waste Dismantlers/ Recyclers are required to obtain authorization and registration from SPCB/PCC concerned and file annual returns. This is to ensure environmentally sound management of e-waste in the country. These provisions will be implemented by SPCBs/ PCCs.

### c). **Safe disposal of hazardous waste**

Waste which cannot be reused or recycled has to be disposed of in an environmentally sound manner. Depending on the waste category, physico-chemical/bio-logical treatment, secured land disposal, incineration or any other mode of safe and environmentally sound disposal should be adopted. Design and operational norms of such facilities, either captive or common should strictly adhere to the guidelines framed by the Central Pollution Control Board. Supervision of such facilities during construction stage would be necessary to ensure quality of the construction of the disposal facilities as per guidelines of Central Pollution Control Board. Post-closure monitoring of the disposal facilities would also be necessary and would be monitored by SPCBs/PCCs. A separate escrow fund needs to be created for this purpose. Common facilities should invariably be equipped with laboratory facilities to verify waste characteristics so as to decide upon treatment and disposal options including secured land filling or incineration.

### d.) **Public Awareness**

Dissemination of information regarding regulatory provisions, policies for hazardous waste management, etc. among stakeholders including public has been recognized as one of the key factors in effective implementation of the Rules. The Ministry provides financial assistance for creation of awareness on hazardous waste management.

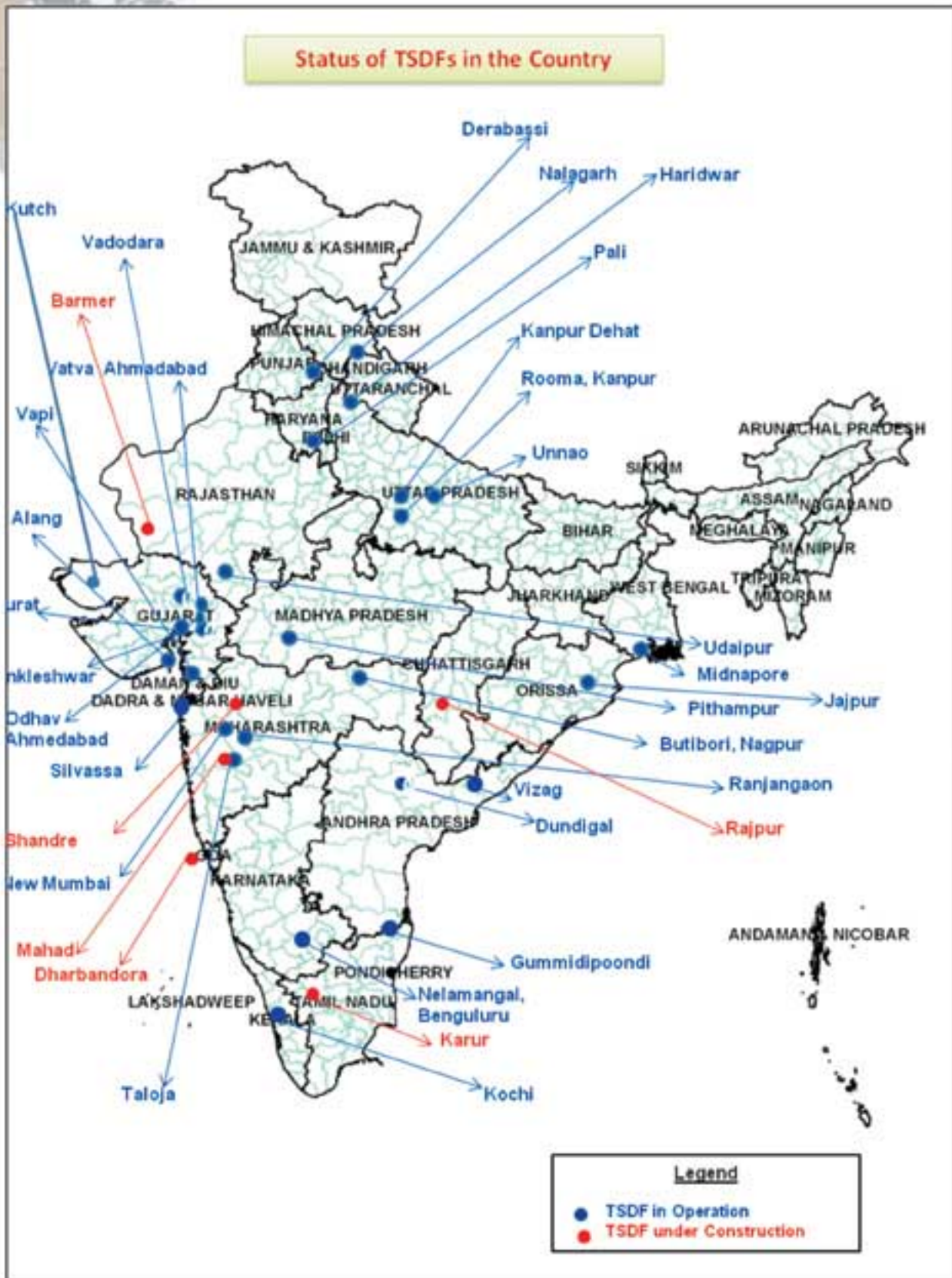
## **7. Setting-up of the Common Treatment, Storage and Disposal Facilities:**

Currently there are 29 Common Hazardous Waste Treatment, Storage and Disposal Facilities in operation in 16 States. A Map depicting locations of TSDFs, both exiting and under construction is at Figure-1. In addition to this, 64 sites have been identified and 35 sites have been notified for

setting-up of the disposal facilities. The notified sites are at different stages of development. The annual capacities of the TSDFs range from 10,000 MT/annum to 1.2 lakhs MT/annum with an operating life span of 15-30 years.

Common facilities including integrated facilities have to be planned following the polluter-pays principle although, at the initial stages, a certain level of assistance from the State Governments could significantly accelerate the process of setting up of these facilities and also ensure their viability in the initial years which is





**Figure-1: Location of TSDFs**



vital. Several State Governments have made available land at concessional rates for setting up of these facilities, which form part of the State's industrial infra-structure. The State Governments may also consider providing financial support matching the Central subsidy. For economic viability of such common facilities, the quantum of waste to be disposed of is undoubtedly the single most important factor. Considering the urgency to set up common facilities and also the imperative to make them viable; scientific planning, backed by sound economic rationale is called for.

Transportation could account for a significant portion of disposal cost in the case of landfillable wastes. Location of TSDFs should therefore be close to the sources of generation. In view of the difficulties encountered in identifying suitable sites, setting up of TSDFs should be considered within industrial estates.

The capacity of an integrated waste management facility will be decided based on availability of hazardous waste in the State/in nearby area. Such a facility should comprise a secured landfill, arrangements for treatment, incinerator, a laboratory capable of comprehensive analysis, and arrangement for transportation and handling of wastes including supporting infrastructure.



Such a facility could also have arrangement for recovery/recycle/reprocessing. During operation and for a stipulated period of post closure, liability for any damage caused shall rest with the TSDF operator. A separate Escrow fund would be created by the facility operator for post-closure monitoring and a liability insurance be taken to deal with liability arising due to mishaps, calamities etc.

The TSDFs should cater to meticulously delineated hazardous waste catchment areas taking into consideration their distance from the generators and availability of wastes based on the principle of hazardous waste disposal as close to the hazardous waste generation. The State Pollution Control Boards/Pollution Control Committees should ensure that in a given hazardous waste catchment area, there are no multiple operating TSDFs.

## **8. Interstate transportation of hazardous waste**

Interstate movement of hazardous wastes will be required when (a) landfillable waste generated by a State is less than 10,000 tonnes per annum (TPA), (b) a company with units located in several States proposes to incinerate wastes at one facility, and (c) incinerable waste generation in a State is less than 5000 tonnes per annum at which level an incineration facility becomes



financially viable. Based on mutual consultations and agreement between the State Governments, interstate movement of hazardous wastes should be permitted, in particular, to take care of the difficulties faced by some States for development of TSDFs. Subject to the above, facilities for landfilling/ incineration should be set-up within two years. In any case, there should be no restriction on interstate transportation of recyclable/reusable of hazardous waste.

In case of some States/UTs, particularly the north-eastern States, combined facilities with neighboring States involving interstate movement appears to be a preferable option due to factors such as land availability and the amount of waste generated in each State for landfilling/incineration.

For proper tracking of HW disposal in an environmentally sound manner by the State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs) the Manifest System of movement of hazardous waste shall be followed as per the hazardous waste regulations.

Adoption of On-line tracking system for movement of hazardous waste from generation to the disposal/recovery/recycle stage will facilitate the tracking of interstate movement.

### **9. Co-processing/ Co-incineration of Hazardous Waste**

Co-processing/Co-incineration is coming up as promising method of recovery of energy or resources through thermal destruction. Subject to implementation of suitable safeguards, incineration of high calorific value hazardous wastes in cement kilns is one of the safe alternatives to conventional incineration. The spread of cement industry in the country across the States makes this option particularly attractive.

Sludge from petrochemical industry, oil refinery and paint industry as well as spent solvents/solvent recovery residues from pesticide and Bulk drug industries are particularly suitable for this purpose in view of their high calorific value. In the cement kilns, the high flame temperature of around 2,000°C, high material temperature of around 1,400°C and large residence time of around 4-5 seconds ensure complete combustion of all organic compounds.

Acid gases formed during combustion are neutralized by the alkaline raw material. The non-combustible residue including heavy metals gets trapped / embedded into the clinker in an irreversible manner. However, it may become necessary to carry out some blending and processing of the wastes before they are suitable for use in the cement kiln.





The Central Pollution Control Board has conducted field trials for different waste categories and also arranged to carry out monitoring of all hazardous air pollutants. As the field trials have indicated, compliance of notified emission norms for hazardous waste incinerators, use of hazardous wastes (such as ETP Sludge from dyes & dye intermediates, Tyre Chips, paint sludge, TDI Tar Residue and Refinery Sludge ) as supplementary fuels in Cement Kilns need to be promoted. In view of this, the respective State Boards may issue authorizations and necessary approvals. Use of incinerable waste for energy recovery in other industries may also be explored by CPCB.

In case of paint sludge, successful use after reconditioning as a primer / coating has been in practice in some of the automobile manufacturing industries. Such reuse of hazardous waste is a preferable option over co-incineration and should be encouraged.

## **10. Illegal dump sites and remediation**

In the absence of common facilities, illegal and clandestine dumping of hazardous waste is reported in several States. Even after waste disposal facilities have become operational in some States, the problem persists. Surveillance, both by enforcement agencies and the industry associations, would be stepped up to avoid illegal dumping.

Remediation / rehabilitation of dumpsites should be based on scientific assessment of contamination of soil and groundwater, and based on modeling the projected future damage. The approach for site remediation, would vary from site to site depending on the nature of pollutants, future damage potential, remediation cost etc. The remediation strategy would include excavation of waste at site and shifting it to the nearest TSDF or establishing a dedicated secured landfill. Site remediation measures may be taken up to prevent further spread of contamination through containment measures. In any case, the 'polluter pays principle' has to be strictly enforced which means that the polluter has to reinstate or restore the damaged or destroyed elements of the environment at his cost. To take care of cases of remediation where the polluters are not traceable, a dedicated fund should be created by the SPCB/PCC. Technical assistance for preparing the plan of remediation could be provided by CPCB.

MoEF is implementing World Bank assisted Project on "Capacity Building for Industrial Pollution Management". The objective of the project is to build tangible human and technical capacity in selected Pollution Control Boards for undertaking environmentally sound remediation of polluted sites and to develop of National programme for rehabilitation of polluted sites. Four highly polluted sites, two each in Andhra Pradesh and West Bengal, have been identified for remediation on a pilot basis.

The estimated cost of the project, to be implemented for a period for five years, is USD 75.39 million. It is anticipated that the project will results in environment benefits i.e. improvement in water and air quantity, improved hygienic conditions, health benefits such as reduction in water borne, vector borne diseases and economic benefits i.e. employment generation during rehabilitation and remediation of contaminated sites. It would also sustain the process beyond the projects period through the development of the National Programme for Rehabilitation of polluted sites, which will be taken up for implementation on high priority.



## **11. Strengthening of Infrastructure of Regulatory Bodies**

The mantle of hazardous waste management regulation is primarily on the State Pollution Control Boards at the field level. For effective discharge of their responsibilities, the Boards have to be strengthened in terms of manpower, equipment, and instruments and other infrastructure facilities. The Central and State Governments may support the Boards by adequate funding for effective implementation of the Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2008. Further, training and awareness programmes for the Boards staff need to be organized periodically.

The Customs Department plays an important role in regulating import of hazardous wastes into the country. Cases of illegal imports of hazardous wastes indicate the need to plug existing loopholes. Priority areas for action include harmonization of EXIM Regulations with the provisions of Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 training of Customs Department Personnel engaged in inspection and sampling and also up-gradation of Customs Department laboratories.

Appraisers carrying out inspection of hazardous waste received, need to be trained to pick up representative samples. In addition to sampling techniques, appraisers should be made aware of current hazardous wastes regulations, documentation requirements, etc. Equally important is the need to upgrade laboratory facilities at all major ports of entry. Difficulties faced by Customs authorities in distinguishing between used oil and waste oil serves as a case in point to identify the gaps. Lack of laboratory facilities for analysis of trace organics, such as PCBs, could either result in holding up of supplies for long periods of time merely on grounds of suspicion or lead to illegal imports of waste oil under the garb of furnace oil/fuel oil. Trained man-power and equipment for analysis of all important heavy metals and trace organics should be taken up and a time-bound plan prepared for their up gradation. Till such time all the ports are upgraded both in terms of equipment and training of laboratory personnel, outsourcing of laboratory related work to laboratories recognized under the Environment (Protection) Act will be considered.

The EXIM Regulation on waste characterization/ classification will be synchronized with the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008. Harmonization of Customs codes with the international system as amended from time to time will also be accorded high priority.

## **12. Disposal of date-expired drugs and pesticides**

There are significant quantities of date expired drugs and pesticides lying in various States, which need to be disposed of. They have to be appropriately incinerated either in dedicated incinerators of individual industries or in incinerators available with common facilities (TSDF). In order to deal with such hazardous wastes, interstate transportation as well as its disposal in a facility should be permitted by the concerned State Governments.

India is signatory to the Stockholm Convention on the Persistence Organic Pollutants (POPs). The Convention has come into force on 12th April, 2006. So far, 21 POPs, which includes some pesticides have been banned or restricted for their production/use under the Convention. As per



the Article 7 of the Convention, Parties are required to develop National Implementation Plans (NIPs) to demonstrate how their obligations to the Convention will be addressed. The Ministry has initiated India's National Implementation Plan (NIP) project with the United Nations Industrial Development Organization (UNIDO). Under the project, the Ministry, inter-alia, is required to develop measures in relation to stockpiles of or stockpiles containing intentionally produced products such as DDT, identify sites contaminated by POPs and implement strategies for identifying and managing waste containing of or contaminated by POPs.

### 13. E-waste and its emerging dimensions

The IT industry in India has witnessed unprecedented growth in recent years, leading to a significant increase in e-waste generation. Based on a survey carried out by CPCB, the e-waste inventory in India for the year 2005 has been estimated to be 146180 tonnes. This is expected to exceed 8,00,000 tonnes by 2012. Ten states generate 70% of the total e-waste generated in India. Maharashtra ranks first followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab in the list of e-waste generating states in India. Sixty five cities in India generate more than 60% of the total e-waste generated in India. Among top ten cities generating e-waste, Mumbai ranks first followed by Delhi, Bangalore, Chennai, Kolkata, Ahmadabad, Hyderabad, Pune, Surat and Nagpur.



Inappropriate disposal and/or open burning of e-waste pose environmental hazards. The appropriate handling of e-waste can both prevent serious environmental damage and also

recover valuable materials, especially precious metals. The recovery of metals is a profitable business, which results in local, and global trade.

E-waste management is regulated under the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2008. These rules regulate the Transboundary Movements of hazardous wastes including e-waste. As per these Rules, units handling e-waste are required to register with SPCB. At present, there are 47 e-waste recycling facilities in the country with a total capacity of about 2.18 lakh MT per annum.





The Ministry has notified separate rules under the Environment (Protection) Act, 1986, for e-waste management. These rules will be applicable to the e-waste generated from IT and telecommunication equipment and Consumer electrical and electronics i.e. Television sets (including LCD & LED), Refrigerator, Washing Machine, Air-conditioners. The concept of Extended Producer Responsibility (EPR) has been enshrined in these rules to make EPR a mandatory activity associated with the production of electronic and electrical equipments. In addition, Producers are required to finance, and organize a system to meet the costs involved in the environmentally sound management of e-waste generated from the 'end of life' of their own products and the historical waste available on the date from which these rules come in to force. Producers, as necessary, can designate agencies to set up an effective take back system for all electrical and electronic equipment at the end of their life.

The threshold limits prescribed in EU RoHS Directive, which is globally accepted standard for the hazardous substance used in manufacture of electrical and electronics components have been adopted. Producers are expected to achieve reduction in use of the hazardous substance to the prescribed limit within a period of two years from the date of commencement of these rules.

SPCBs/PCCs will be responsible for implementation of provisions laid down in the E-waste Rules, 2011. CPCB will coordinate with SPCBs/PCCs, enforce provisions regarding reduction in use of hazardous substances (RoHS) in manufacture of electrical and electronic equipment. Urban Local Bodies (ULBs) will ensure segregations, collection and channelization of e-waste, which is found to be mixed with Municipal Solid Waste, to authorized collection centre or dismantlers or recyclers. ULBs will also ensure collection of e-waste pertaining to orphan products.

The Ministry has introduced a new Scheme for promoting setting up of integrated e-waste recycling facilities under the Public Private Partnership mode. SPCBs/PCCs will encourage setting up of such facility.



#### **14. Handling and management of hazardous waste during ship dismantling**

Disposal of hazardous wastes generated during Ship breaking to be done in an environmentally sound manner by utilizing technologies that meet the criteria of an effective destruction with no generation of persistent organic pollutants and complete containment of all gaseous, liquid and solid residues.

Health and safety of the workers at the ship breaking yards to be addressed.

Adequate safety systems and procedures to be adopted during dismantling of ships and handling of hazardous wastes/ materials.



The recommendations of the Supreme Court for ship breaking activities to be strictly enforced by the SPCBs/State Maritime Boards.

### **15. Review of the Strategy**

Keeping in view the developments in manufacturing technologies as well as in management practices including recycling/reuse and the experience gained, the strategy will be revisited from time to time, preferably every five years.

