Report of the Committee
to
Evolve Road Map on
Management of Wastes in India

Ministry of Environment and Forests
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Contents

FOREWARD

Rapid economic growth is leading to urbanization and industrialization generating waste which is adversely effecting the environment. To address the problem of waste management in the country the Ministry of Environment and forests, Government of India constituted a committee under my chairmanship to evolve a road map for the management of waste in India and to suggest a policy and strategy for achieving the same. The scope of the committee was to examine the existing administrative and regulatory mechanism in Wastge management. The committee comprised of members drawn from the Central Pollution Control Board, Ministry of Urban Development, Ministry of Health and Family Welfare, Comptroller and Auditor General of India, Centre for Environment Education, Toxic Link, and National Metallurgical Laboratory. The Committee appointed two Working Groups, which interacted with various stakeholders to evolve a consensus on the strategy for waste management. The Committee discussed and finalized the report of the Working Groups and has made number of recommendations.

Management of waste in an environmentally sustainable manner is a challenging task. It involves reusing and recycling of all types of waste ranging from domestic waste to industrial waste. Technologies have to be developed for tackling Waste Management and promoting its reuse, recycling and waste to energy operation. It is vital to involve all stakeholders in Management of Waste. These include local governmental organizations, private entrepreneurs, non-governmental organizations and civil society.

The Committee has acknowledged the range and complexity of the issues involved in Waste Management. It has attempted to learn from “The Best Practices” available. A series of recommendations have been made after careful deliberations by the Committee.

I would like to thank all the members of the Committee and the Working Groups. I would also like to place on record my appreciation to Shri Rajiv Gauba, Joint Secretary for his contribution in preparation of the report of the Committee.

(R.H. Khwaja)

Executive Summary

Sustainable Waste Management needs to be based on the waste management hierarchy of, firstly, avoiding generation of waste, followed by reducing, reusing, recycling, recovering, treating and disposing whatever waste is produced.

Sustainable Waste Management envisages an integrated approach, encompassing technological, policy, administrative and legal actions to address the challenge of waste management in the country. Strategic planning based on local needs and long-term goals should inform any policy addressing community involvement and public health issues. Hence, there is a need for action to effectively translate these approaches into a unified goal, incorporating local, regional and national priorities.

The Performance Audit Report on Management of Waste in India submitted by the office of the Comptroller and Auditor General (CAG) in September 2008, surmised that the waste management hierarchy needs to be emphasized in our policies and summarized its observations on the current waste management situation in the country into seven important requirements for improvement. These were the urgent need for (i) assessing the quantum of waste being generated and its impact on environment and health, (ii) formulating policies and strategies towards prioritizing waste reduction and minimization rather than mere disposal, (iii) promulgating legislations specifically dealing with disposal of each kind of waste incorporating penalty for violation, (iv) assigning clear responsibility and accountability to various agencies involved in the process of waste management, (v) enforcing compliance to rules regulating municipal solid wastes, biomedical wastes and plastic wastes, (vi) monitoring to check non-compliance, (vi) providing funding and manpower for the implementation of rules on waste management.

Responding to this initiative the Ministry of Environment and Forests, Government of India constituted a Committee on 3rd September, 2008 to evolve a Road map for the Management of Waste in India, under the Chairmanship of Shri R. H. Khwaja, Additional Secretary, MoEF. The Committee set itself the task of examining the existing administrative and regulatory mechanisms in the country for the management of various types of waste and for suggesting a strategy for achieving sustainable waste management.

The Committee constituted two Working Groups viz: (i) on Municipal Solid Wastes, Plastic Waste, Packaging Waste, Construction and Demolition Waste under the Chairmanship of Secretary, Department of Environment, and Government of NCT of Delhi and (ii) on Biomedical Waste, Hazardous Waste and E-waste under the Chairmanship of Member Secretary, CPCB.

The Working Groups held extensive deliberations and submitted their comprehensive reports along with detailed recommendations on each type of waste under their consideration. The Committee, in its 2nd meeting on 4th September, 2009, had a detailed discussion on the reports of the working groups and accepted the recommendations.

The Committee, while recognizing the need for establishing an environmentally sound waste management in the country, also recognized that the environmental and health impacts due to improper waste management are enormous and should be addressed urgently.

The Committee, primarily, focused on issues relating to various measures required for segregation, collection, transportation, treatment, recycling and disposal of various types of waste at the generation, treatment and disposal levels. The Committee also discussed the roles and responsibilities of various stakeholders, government, non-government and other agencies for achieving sustainable waste management.

The Committee, keeping in view the suggestions of the Working Groups, made the following recommendations for waste management as priorities in the country. These are:

i) Establishing a comprehensive database on waste, aiding policy-making and intervention in all the states in India.

ii) Formalizing a policy for popularizing internationally accepted hierarchy of waste management with a specific strategy devised for India

iii) Promulgating laws/rules for the management of major kinds of waste including construction & demolition waste, end of life vehicles, packaging waste, mining waste, agriculture waste and e-waste

iv) Creating a nodal body for researching and suggesting methods and technologies for management of all kinds of waste

v) Incentivizing public and private involvement in achieving sustainable waste management and facilitating partnerships among resident association, self-help groups and small and medium entrepreneurs

vi) Devising and implementing disincentives and penalty for violation of the rules

vii) Capacity building of Agencies/Bodies both at the central and state levels to be responsible for the implementation and monitoring of waste management rules and strategies

The Committee has also made recommendations on the legal, administrative and technological interventions required for managing each type of waste as categorized in the CAG performance audit report.

1. Introduction

1.1 **“**Wastes” are materials which are discarded after use at the end of their intended life-span. Waste management is a collective activity involving segregation, collection, transportation, re-processing, recycling and disposal of various types of wastes. Sustainable waste management involves managing waste in an environmentally sound, socially satisfactory and a techno-economically viable manner. Sustainability of waste management is the key to providing a continuous and effective service that satisfies the needs of all the stakeholders and end users. Waste management differs for different types of wastes and for wastes in different geographical locations such as urban, rural and hilly areas. While the management of non-hazardous domestic waste is the joint responsibility of the citizens and the local government, the management of commercial, industrial and hazardous waste is the responsibility of the waste generators like commercial establishments, healthcare establishments, industries and the pollution control boards. Sustainable waste management can be achieved through strategic planning, institutional capacity building, fiscal incentives, techno-economically viable technologies, public-private partnerships, community participation and such others.

Strategic planning needs to be based on the local needs with the formulation of long-term goals. These should be based on the 3R principles (Reduce, Reuse and Recycle), responsible stake-holder participation along with human, physical and financial resource management..

The comprehensive integrated policy framework on waste management should guide national and local level actions, which emphasize the value of reducing, reusing and recycling waste as the primary ways for its

management, instead of mere disposal. The policy should address environmental concerns, public health issues and alleviation of poverty through environmentally safe methods and standards. It should promote public-private partnerships and reframe economic instruments to address the needs of all the stakeholders in the waste sector. This framework could include incentives to local authorities to deliver better services and recover costs from users. Technical and financial assistance to waste collectors and recyclers too, is critical in this endeavor. Regional landfill and waste treatment approaches based on cost sharing would increase viability and affordability of waste management. There is a need to strengthen services of the implementing institutions including local self governments to enable them to be efficient, accountable and transparent.

Selection of sites for locating landfills, incinerators, composting plants could become contentious, often opposed by people living in the vicinity of the proposed site and along the expected route of waste transportation. Addressing their concerns, stakeholder consultation, methods to meet costs of ensuring public safety, pollution and odour control, besides arranging alternate land/route, adopting safer and viable technologies, have to be implemented by the service providers. Relevant stakeholders need to share the cost of collection, transfer and disposal of waste. The cost-sharing arrangements could include subsidies and matching grants from the Central and State Governments. User charges are commonly utilized to recover a portion of the costs of solid waste management. User charges can also generate substantial revenues and provide incentives to minimize waste, especially if structured on the "*polluter pays principle*", that is those who pollute more, should pay more.

As per 2008 statistics, it is estimated that in India we need to manage 0.573 MMT of municipal solid waste per day of which about 60% is organic waste amounting to 0.292 MMT/d. There are only 110 facilities in the country for treating hardly 50% of the organic waste generated.

Therefore, there is a need to enhance the capacity of these plants or increase community awareness to increase treatment of such waste at source through home, institutional and community composting programmes. With Nutrient Based Subsidy (NBS) gaining momentum in the country, there is ample scope for developing community and large scale composting units with appropriate co-composting and marketing efforts.

Sustainable Waste Management also involves laying emphasis on reuse, recycling and recovery of resources from dry and recyclable waste. Although municipalities hold the primary responsibility for solid waste management, the key obstacle is inadequate investment on developing human resources for its management. For instance, in urban areas, solid waste is not segregated and collected properly for treatment and disposal because although home and community segregation programmes exist, the municipal workers are not trained to collect this waste separately nor are they properly motivated to transport or store them separately. This leads to de-motivation among citizen groups to segregate their waste at source. If segregated and stored separately dry waste and other recyclables can itself lead to 20% of resource recovery from MSW.

Insufficient and inefficient solid waste collection systems despite consuming a significant portion of the city's revenues, is resulting merely in open dumping and burning leading to major health problems. However, till date, this is the regular practice in most cities and municipalities despite Municipal Solid Waste (Management and Handling) Rules being promulgated in 2000. In the present practice of mixed collection and transportation throughout the country, collection efficiency is only around 60% and the rest 40% lies uncollected and scattered all over our towns and cities, polluting the surrounding land and water resources. This also leads to proliferation of rodents and vectors spreading diseases and air pollution from dust and smoke when burnt in the open. Although some

parts of all waste have to be eventually land-filled despite best efforts at segregated collection and treatment, inefficient storage and transportation of source segregated waste necessasitates land disposal, which is the most expensive option for solid waste management anywhere in the world.

Furthermore, merely opting for constructed landfill facilities to protect land and water resources, instead of diverting waste from open dumping or landfilling, has only increased their costs and made them more unviable. About 24 landfill facilities, jointly having the capacity of holding 0.06 MMT/d have been constructed in the country for landfilling against a total requirement for landfilling of about 0.183 MMT/d of inert wastes.

For achieving substantial diversion of waste from landfills, there is an urgent need for efficient and practical method for collection of waste. Although collection is labor intensive but segregated collection leading to greater resource recovery can render this activity not only cost-effective but environmentally and economically sustainable. A careful analysis of cost-effective segregation and collection methods needs to be done and sustainable alternatives implemented throughout the country.

Urban areas generate a lot more waste than rural areas due to economic development and increasing consumption. Therefore, it is imperative to establish municipal solid waste management systems in new towns and urban centres to prevent littering and open dumping. Instead we must promote source segregation, collection and treatment as per the Municipal Solid Waste (Management and Handling) Rules, in 2000. There is a need for assessing the exact number of towns, cities and their corresponding municipalities/ULBs for planning integrated waste management and designing regional treatment and disposal facilities.

Thus, regional approaches to waste treatment and disposal could lead to reducing cost of disposal of wastes since smaller municipalities could work together to identify resources for cost-effective management systems. Inter-municipal agreements to implement common treatment/disposal facilities handling waste from several municipalities could enable them to develop markets and optimize recycling and resource recovery besides reducing the need for a number of such sites.

1.2 In September 2008, the Comptroller and Auditor General (CAG) of India submitted a Performance Audit Report on Management of Waste in India to the Ministry of Environment and Forests. The report analysed the data about the various kinds of waste generated, existing policy for waste management, legislation and its compliance, accountability issues, enforcement and monitoring by the implementing agencies. The Performance Audit Report summarized their observations into seven categories (see box).

1.3

In the backdrop of this report, the Ministry of Environment and Forests, Government of India constituted a Committee to Evolve a Road map for the Management of Waste in India, under the Chairmanship of Shri R. H. Khwaja, Additional Secretary, MoEF, on 3rd September, 2008. The mandate of the Committee was to examine the existing administrative and regulatory mechanisms in the country for managing Municipal Solid Waste, Plastic Waste, Packaging Waste, Construction and Demolition Waste, Biomedical Waste, E-Waste and Hazardous Waste. The Committee suggested a policy/strategy aimed at achieving an environmentally sound mechanism for segregation, collection, treatment and disposal of wastes. To achieve this, along with local governments and private entrepreneurs, the state governments were also envisaged to play an important role in providing the appropriate infrastructure and direction for sustainable waste management.

2. Objective and scope of the Committee

2.1 The main objective of the Committee was to evolve a road map for the management of waste in India. The focus of the Committee was on evolving strategies for management of Municipal Solid Waste, Plastic Waste, Packaging Waste, Construction and Demolition Waste, Biomedical Waste, E-Waste and Hazardous Waste.

2.3 The scope of the Committee was to examine the existing administrative and regulatory mechanism of waste management in Municipal Solid Waste Management, Plastic Waste Management, Packaging Waste Management, Construction and Demolition Waste Management, Biomedical Waste Management, E-Waste Management and Hazardous Waste Management. The Committee was asked to examine and suggest a policy/strategy aimed at achieving an environmentally sound mechanism for segregation, collection, transportation, treatment and disposal of wastes.

2.4 In view of the variety of wastes and their critical management requirements, the Committee, which was initially set up for a period of three months, was extended up to 30th April, 2009. Office Orders no. 12-17/2008-HSMD dated 3rd September, 2008 and 2nd February, 2009 are placed in Annexure -1.

2.5 The Committee constituted two Working Groups viz: (i) on Municipal Solid Wastes, Plastic Wastes, Packaging Wastes, Construction and Demolition Wastes under the Chairmanship of Secretary, Department of Environment, and Government of NCT of Delhi and (ii) on Biomedical Wastes, Hazardous Wastes and E-wastes under the Chairmanship of Member Secretary, CPCB (Annexure-2).

2.6 The Committee under the Chairmanship of Secretary, Department of Environment, and Government of NCT of Delhi further constituted four subgroups within this working group which worked individually on four types of wastes viz. Municipal Solid Wastes, Plastic Wastes, Packaging Wastes and Construction and Demolition Wastes. The subgroups consisted of senior officials from the CAG, CPCB, IL&FS, DPCC, MCD, CEE, Sri Ram Institute for Industrial research (SIIR), Indian Institute of Packaging, MUD, and PWD. (Annexure-3).

2.7 The Committee under the Chairmanship of Member Secretary, CPCB addressed Biomedical Wastes, Hazardous Wastes and E-wastes.

2.8 The Working Groups have submitted their comprehensive reports along with detailed recommendations on each type of waste under their consideration. The Committee, in its 2nd meeting on 4th September, 2009 had a detailed discussion on the reports of the working groups and accepted the recommendations.

2.10 The Committee, at the outset, evolved an approach for developing a strategy for a road map for waste management. The Committee, inter alia, had the following approach:

a. Discussion among the members of the Committee on issues relating to Municipal Solid Waste Management, Plastic Waste Management, Packaging Waste Management, Construction and Demolition Waste Management, Biomedical Waste Management, E-Waste and Hazardous Waste Management.
b. Discussion on guidelines, regulations on the types of wastes under the scope of the Committee.
c. Discussion on the existing policy, administrative, legislative and fiscal regimes for effective waste management.

d. Discussion on roles and responsibilities of all stakeholders in the process of waste management.
e. Discussion on existing best practices in developed as well as developing countries.

2.11 The sub-groups under the Working Groups held several meetings and submitted their recommendations to the Working Groups which in turn submitted these recommendations to the Committee. The Committee held two meetings during 2008-2009 to discuss issues and recommendations of the Working Groups on various types of wastes.

2.12 The Committee recognized that there is no proper system for ensuring generation of source separated waste, its collection, transportation, treatment and disposal in an environmentally sound manner. The Committee, during discussions, also recognized that the environmental and health impacts emanating due to improper waste management needs priority attention.

2.13 The Committee, primarily, focused on issues relating to thoughtless disposal of wastes in the country and discussed the measures required for promoting segregated waste storage and collection at the primary level i.e. at waste generator level, and secure and sustainable transportation of source separated waste within the neighbourhood and to their treatment facilities at a secondary level i.e. at the waste treatment and disposal level. Appropriate authorities/agencies responsible for it need to look into the detailing of the action plans required for operationalizing waste management at these two levels. Furthermore, the Committee also discussed the roles and responsibilities of various stakeholders (government, non-government agencies and the informal sector) towards waste management.

2.14 The Committee recognized the fact that policy initiatives based on the 3 R's (Reduce, Reuse and Recycle) need to be clearly emphasized in India so that these policies could drive waste management initiatives in the future. In the absence of a clear policy, waste management in India is inadequate and ineffective in meeting environmental and public health norms.

2.15 The Committee, keeping in view the suggestions of the Working Groups, has made the following recommendations for waste management in general and for each specific type of waste in particular.

3.0 Waste Management in India: It is suggested that an overall national or regional waste policy should govern the multiple activities in the waste sector. A clear, concise and consistent policy is a necessary requirement for the waste industry to establish and set up waste management systems and make necessary investments. Policy should be backed by legislations for all kinds of waste spelling out clear penalty for violations. This is essential for guiding the management of waste in a manner that is environmentally responsible and which minimizes danger to public health.

Thus, it is recommended that:

1. A specific policy for the management of wastes in India, incorporating the internationally accepted hierarchy for management of wastes should be framed.
2. Laws/rules for the management of all major kinds of waste like construction & demolition waste, end of life vehicles, packaging waste, mining waste, agriculture waste and e-waste should be framed. Penalty for violation should also be incorporated in the laws/rules for effective deterrence and achieving compliance.
3. Bodies which would be responsible for the implementation and monitoring of the different waste management rules should also be identified, both at the central and state level. A nodal body to guide monitor and train

personnel for managing all kinds of waste, should be set up at the Central level.

4. A comprehensive assessment of the amount of waste being generated, according to the major waste types, should be carried out periodically. All the states in India should be involved in this exercise so that a comprehensive database on waste is generated for aiding policy-making and intervention.
5. MoEF may carry out waste related pollution impact monitoring, on a regular basis, to study the effects of improper disposal of waste on the environment. MoEF along with the states may also carry out regular surveillance including epidemiological surveillance of waste related impacts on public health.

3.1 MUNICIPAL SOLID WASTE MANAGEMENT

3.1.1 Present Scenario:

The Municipal Solid Wastes (Management and Handling) Rules, 2000 was notified by the Ministry of Environment and Forests for management of Municipal Solid Wastes (MSW). Except a few large cities, by-and-large, local bodies of medium and smaller towns have not undertaken regular exercise on quantification and characterization of municipal solid wastes. The Ministry of Urban Development (MoUD) assessed MSW generation in the country to be 1,00,000 Metric Tons or 0.1 million metric tonnes per day (MMT/d) in the year 2001-02. The Central Pollution Control Board (CPCB) made a survey of 59 cities in India during the year 2004-05 to assess the existing status of MSW management which included 35 metro cities and 24 State capitals. Based on this study and on census data of 2008, the MSW generation in the country has been estimated to be 0.573 (MMT/d) in the year 2008.

The average collection efficiency of municipal solid waste ranges from 22% to 60%. The highest per capita waste generation was in the city of Kochi (0.67 kg/capita/day) and the lowest was (0.17-0.19 kg/c/day) in Kohima, Imphal and Nashik. The waste characterization showed that municipal solid wastes typically contains 51 % of organic waste, 17% recyclables, 11% hazardous and 21% inert.. However, about 40% of all MSW is not collected at all and hence lies littered in the city/town and finds its way to nearby drains and water bodies, causing choking of drains and pollution of surface water. Unsegregated waste collection and transportation leads to dumping in open, which generates leachate and gaseous emissions besides causing nuisance in the surrounding environment. Leachate contaminates the groundwater as well as surface water in the vicinity: gaseous emissions contribute to global warming.

Municipalities have been mandated to implement the Municipal Solid Waste (Management & Handling) Rules, 2000 in all towns/cities of India to cover 100% collection, segregation and transportation of waste. However, hardly a few municipalities have taken initiatives for implementation of the Municipal Solid Waste (Management & Handling) Rules, 2000 to set up waste processing and waste disposal facilities. There are 86 mechanized compost plants, 20 Vermi-compost plants, 2 refuse Derived Fuel (RDF) plants, and two with energy recovery system established so far in India. Also Sanitary Landfill Facilities (SLF) have been constructed in the country for scientific disposal of MSW, many of which are in operation.

3.1.2 Existing Regulatory System:

Ministry of Environment and Forests notified the Municipal Solid Waste (Management and Handling) Rules, in 2000 which is applicable to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes in the country. The MSWM Rules stipulate specifications source segregation, collection, transportation, waste processing, disposal and others.

3.1.3 Issues:

Interactions with urban local bodies and other relevant stakeholders have raised some issues. These include the fact that MSWM Rules are not being effectively implemented in most of the local bodies i.e. in about 4377 municipalities and municipal corporations spread throughout the country. The local self government bodies have neither any capability of implementing the MSWM Rules, nor have the resources for implementing the same.

According to the MSWM Rules, waste, segregated in to bio-degradable and non-bio-degradable categories, should be properly collected, for appropriate disposal. Local bodies also need to have in-house skilled man-power and technical expertise to operate waste processing and disposal facilities. Private-public partnerships for waste management for acquiring and upgrading infrastructure and achieving capacity in managing waste within their local bodies should be explored. Furthermore, motivating citizens groups and implementing agencies to monitor performance of waste processing and disposal facilities, also increases compliance. Promoting compliance to MSWM Rules would ensure that improper disposal of waste, which harms the environment and affects public health, is minimized. Systamatizing waste management in fragile ecological systems especially hilly and coastal towns would reduce incidences of landslides and floods that are often caused by poor management of waste.

Problems faced by Municipal Bodies:

Surface and manual disposal of wastes is the most widely practiced system of waste disposal in Indian cities. Lack of an established system for collection, transportation, treatment, disposal and complete networking of the system is the major drawback in the proper management of waste in these cities. The local bodies which are responsible for proper disposal of urban waste are over-burdened with other responsibilities of much higher priorities such as immunization, food sample testing, street cleaning etc. and waste disposal is relegated to the end of the list. Where it has been possible to establish a waste management system, these are not operated and maintained properly. The reasons for poor operation and maintenance include the following:

a. Inadequate finances;
b. Multiplicity of agencies for operation and maintenance;
c. Inadequate training of personnel;
d. Lack of performance monitoring;

e. Inadequate emphasis on preventive maintenance;
f. Lack of management; and
g. Lack of appreciation for the facilities set up by the ULB for the use and safety of the community

Operational and Transportation Issues:

The waste is transferred from the wheelbarrows into dustbins. After the waste is collected from the dustbins and streets, it is transported to the final treatment/ disposal site. The trucks used for this purpose are generally of an open body type and are kept uncovered. During transfer to trucks and its transportation, the waste spills onto the road. To avoid this and to accommodate more waste on trucks, some corporations/municipalities engage compactor type vehicles.. However, the compaction gear adds to the weight of the vehicle increasing fuel consumption and cost of maintenance.

Many cities lack transfer stations and legally notified landfill sites for dumping solid wastes thereby increasing their public health liabilities manifold. Furthermore, the organizational structure within the corporations / municipalities is such that SWM tasks are one of the many to be carried out by the Health Department resulting in insufficient human-power and resources for planning and execution in this area of work. This is compounded by the division of SWM tasks between the Health Department on one hand and the Engineering Department of the Municipality or Corporation, on the other, which results in multiple yet unclear responsibility and accountability in this sector.

3.1.4 Recommendations:

1. The Municipal Solid Waste (Management and Handling) Rules, 2000 needs to be amended to incorporate waste reducing, reusing and recycling methods and strategies for achieving sustainable waste management while setting targets and timelines for achieving reduction in generation of waste.

2. Implementation of MSWM Rules could be considered in time bound phases by prioritization/categorization of cities/towns based on population and quantum of waste generation with special emphasis on hilly, coastal and tourist towns and cities.
3. A scheme may be formulated for providing incentives and disincentives to local bodies to promote better implementation of MSWM Rules.
4. National and State level Data Banks must be created with the purpose of disseminating information on characteristics of waste generated, potential for segregation, reuse, recycling and management of MSW. These would help local bodies as well as citizens to understand different aspects of MSW management and the benefits thereof.
5. Safety of workers and rag pickers associated with waste handling should be given due attention with emphasis on education for using safety equipment and necessity for immunization.
6. State governments must facilitate the making of Detailed Project Report (DPR) for even small towns and municipalities in their states and UTs. Every local body should make budgetary provision to implement the DPR. State Urban Development (UD) departments should make State level budgetary provisions including land allotment for waste storage, sorting, recycling, processing and disposal.
7. Collection of segregated waste must be done by local agencies through NGOs/ Association of rag pickers and Self Help Groups (SHG) groups for making arrangements for collection of waste from:
    - Households
    - Slums and squatter settlements
    - Commercial areas
    - Industrial areas
    - Horticultural nurseries and parks,
    - Sites generating construction and demolition waste
    - Office complexes
    - Slaughterhouses and vegetable markets

- Healthcare establishments especially their non-infected waste

8. Segregation of wastes must be at the level of residential/institutional/ Govt Departments so as to facilitate door - to - door collection of segregated waste. The inorganic/non-biodegradable waste should be channelized through the informal sector workers like door-to-door collection workers, SHGs, waste worker associations and others to registered recyclers for recycling and only the remaining waste, which cannot be recycled should be taken to sanitary landfills by the registered recyclers or the municipality. Awareness about segregation can be achieved through mass awareness campaigns, programmes at school and educational institutions, residential areas, market/commercial areas, healthcare establishments and zones of small manufacturing and service industries. This can be achieved through distribution of pamphlets, hoardings/newspaper/ local cable networks, etc.

9. Stray cattle movement could be regulated, and burning of garbage, leaves and other waste be prohibited. Other measures such as regular street sweepings, improving the same on wider roads by mechanical means, covering dusty areas/road sides to prevent flow of dust on roads, constitution of vigilance squads to prevent littering of waste, monitoring lifting of garbage on a daily basis and maintenance of dust bins could be initiated.

10. Provision of adequate number and size of waste bins (three categories of bins as per MSWM Rules) must be made in different localities (residential, commercial, slums/ squatters), weekly markets, marriage halls and other institutions to ensure clean surroundings and proper collection and storage of waste prior to transportation for recycling or landfilling.

11. Transportation systems such as hand-carts, tricycles and other simple vehicles which are appropriate and non-polluting should be provided by each municipality in their localities and municipality sub-divisions to ensure

a hundred percent collection and maintenance of clean and unpolluted surroundings.

12. Safe and sustainable Waste management through segregation, collection and categorization of all types of recyclables and their processing/reprocessing should be made mandatory in each municipality. Central Pollution Control Board (CPCB) could help each municipality in identifying the waste segregation, collection, categorization and processing technology best suited to the needs of the municipality. Sufficient funding must be provided by MoEF/MoUD to set up waste processing infrastructure in each municipality/ taluk or district headquarters as a joint/common facility for several municipalities together to make these more viable and less polluting.

13. Identification of land for setting up common/zonal sanitary landfills should be done on a priority basis and several municipalities could jointly implement and manage such facilities, according to a time bound programme. Land filling should be restricted to non-biodegradable/inorganic waste.

14. Closure of landfill sites and post-care of the existing sites, inter alia, by capping & plantation need to be done.

15. Comprehensive assessment of the amounts of waste being generated, according to the major waste types should be carried out periodically to aid decision making. All the states in India should be involved in this exercise so that a comprehensive database on waste is generated for aiding policy-making and intervention.

3.2 PLASTIC WASTE MANAGEMENT:

3.2.1 Present Scenario:

Plastics waste has attracted widespread attention in India, particularly due to the indiscriminate littering on open land, drains, rivers, coasts, landfill-sites etc. The plastic consumption in India, as per estimate in 2008 by CPCB was 8 MT/annum, out of which about 5.7 MT of plastics are converted into waste annually i.e. 15,722 tons of plastic waste is generated per day. Therefore the per capita generation of plastic waste has been estimated as 5.7 Kg/annum. The figures available on plastic waste are estimated on the assumption that 70% of the total plastic consumed is transformed into waste. It has been reported that 60% of total plastic waste generated is recycled and 40% is littered and remains uncollected. Therefore, approximately, 6289 tons per day (TPD) i.e. 40% of plastics are neither collected,nor recycled and find their way into drains, open lands, rivers, railway tracks and coasts. These in turn, choke drains or get dredged in the soil, making the land infertile. The littered wastes are mixed with other wastes, especially with municipal wastes thereby making it difficult for segregation.

The plastics waste constitutes two major categories of plastics:

(i) Thermoplastics which are recyclable and

(ii) Thermosets which are not easily recyclable

Thermoplastics, which include Polyethylene Terephthalate (PET), Low Density Poly Ethylene (LDPE), Poly Vinyl Chloride (PVC), High Density Poly Ethylene (HDPE), Polypropylene (PP), Polystyrene (PS) etc, constitute 80% of the total plastics. Thermoset plastics comprise alkyl, epoxy, ester, melamine formaldehyde, phenol formaldehyde, silicone, urea formaldehyde, polyurethane, etc. which constitute the rest 20% of the total plastics waste generated in India. Thermoplastics are recyclable plastics. Commonly littered plastic wastes include mainly the polythene carry bags, plastic wrappings, thermocol packing, plastic plates, cups, spoons etc. as recyclable plastics and *gutkha* pouches, multilayer

packaging, laminated packing etc. as non-recyclable plastic waste. . In terms of types of plastics, almost 90% of the plastic types are recyclable and only 10% of the various types of waste are non-recyclable. Thus, recycling of plastics reduces the requirement of most of the plastic. However, unsafe recycling causes health hazards as well as hazards in the environment while leading to production of products unfit for human and animal use.

3.2.2 Existing Regulatory System:

India notified the Recycled Plastics Manufacture and Usage Rules, 1999 (as amended in 2003) prohibiting the use of recycled plastic bags for storing, carrying, dispensing or packaging foodstuff. These rules also provide that minimum thickness of bags should be 20 microns and the size should not be less than 8" x 12".

The prescribed authorities for use, collection, segregation, transportation and disposal under these Rules are District Collectors (DC) and Deputy Commissioners (DyC) for plastic carry bags and the State Pollution Control Boards and Pollution Control Committees for manufacturing and recycling of plastic waste.

If minimum thickness of plastic bags is increased to 40 microns as has been done in many states, the inflow of plastic bags into the solid waste stream would be substantially reduced and the provisions effectively enforced by the State Governments/SPCBs, as it is assumed that rag pickers would be keen to segregate them for recycling purposes. However, Thin plastic bags have little value and their segregation is difficult. Besides, most PCBs and PCCs do not have the required devices to measure such minute thicknesses either onsite or in their laboratories thereby making it impossible for them to implement these standards.

Therefore, various States have notified more stringent standards and requirement for greater thicknesses of plastic carry bags than as notified in the PWM Rules. For e.g. Goa has notified 40 microns, Himachal Pradesh 70 microns, Maharashtra 50 microns, Meghalaya 40 micron, Punjab 30 micron, Chandigarh 30 micron, West Bengal 40 micron, and Kerala 30 micron as the minimum thickness of plastic carry bags required in their states.

3.2.3 International mechanism of plastic waste management:

The per capita consumption of plastics, in developed countries, is far more than in India. The technologies adopted in the developed countries for plastic waste management can be classified into four categories depending upon the importance given to PWM. These are:

- **Environment Specific technologies which include** eco-labeling, monitoring of emissions, green technologies such as fuel from waste etc.,
- **Technology Specific technologies which include** techno-economic feasibility; sustainability and innovation which are the key criteria in adopting a given technology.
- **Safety Specific technologies include** safety related issues such as hazards, risks, degradation and impact on environment.
- **Value addition Specific technologies include** improvement and quality performance from the products derived from plastic waste.

Internationally, the plastic wastes are processed in an environmentally sound manner with the following usages:

- Fuel from the plastic waste
- Plastic waste for construction of roads
- Value added products with improved performance from plastic waste

3.2.4 Issues of concern: The broad issues of concern for plastic waste management include plastic waste becoming a nuisance for all. The management of rising quantum of waste, lack of responsible stakeholders for plastic waste management, the challenge of biodegradable plastics and the existing practices of plastic recycling are all issues of great concern. It is very disturbing to note that plastic recycling in India is carried out in small, unauthorized units reprocessing thousands of tons of thermoplastics in a completely unregulated manner leading to the manufacture of highly contaminated and hazardous plastic products. Products like children's tiffin boxes, water bottles, toys, buckets and many others which contain high doses of toxic hydrocarbons like unpolymerised, free monomers, contaminants like pesticides, POPs, heavy metals such as lead, mercury, chromium, cadmium through mixing of domestic and commercial/industrial plastic waste and products derived from heating and processing plastics at inapprorpaite temperatures. Contaminants get into plastics also through addition of poor quality dyes and plasticizers during reprocessing of post consumer plastics under very poor conditions. Most of these substances, which are carcinogenic and toxic, cause immense damage to human health and the environment. Therefore, sustainable and safe options for plastic waste management need to be addressed urgently.

At present there is no focus on assigning responsibility and accountability at the implementation levels. Agencies are working in isolation and in an arbitrary and haphazard manner, which is evident from the fact that each state has adopted different mechanisms for dealing with the plastic waste management issue. A coordinated approach is required, assigning clear-cut responsibility and accountability to deal with the regulation. Proactive approaches are required to draw active cooperation and support from the pubic. There is a need for voluntary involvement of individuals, group housing societies and Panchayats for achieving concerted action.

3.2.5 Recommendations:

16. Inventory of plastic waste viz. waste generated, processed, recycled and disposed off in the country, including the details of manufacturers, processors, recyclers etc. with type and quantities of plastics being processed must be recorded; State-wise and city-wise data on plastic waste should be inventorised; This inventory would serve as the decision-support system for formulating further polices and management rules.

17. Technical manuals for each type of plastics and end use applications for the benefit of all stakeholders should be prepared. Rules for manufacture, use, reuse and recycling of plastics and monitoring mechanisms for the regulatory and implementing agencies is to be facilitated; Understanding the safety issues involved in Plastics Waste Management (PWM) is to be promoted.

18. The responsibility of Manufacturers & Processors may include the following:

- Paying for both recyclable & non-recyclable plastics and their ultimate waste management options
- Setting up of safe and sustainable common plastic waste management units by plastics processors/re-processors in community areas or in designated common facility locations.
- Providing incentives for adopting non-burn and novel technologies for non-recyclables
- Providing incentive schemes for processors & recyclers adopting environmentally sound technologies.
- Undertaking mandatory responsibility of producers for R&D activities on plastic waste mitigation.
- Undertaking R&D for developing truly safe and biodegradable polymers like food grade linings in cardboard cartons etc. made from tapioca starch or other such food based starch so that along with biodegradability, the polymer technology will also evolve into a complete safe packaging option for the consumers.

18. The responsibility of NGOs, Social groups and Government institutions to include the following:

- Initiation of awareness campaign amongst consumers against littering, dangers of wrong use of plastics and against burning etc.
- Creating awareness for proper plastic waste segregation & collection.

19. The responsibility of the recyclers to include the following:

- Recycling plastic waste into safe value-added products using environmentally sound techniques and adhering to food and health safety standards in an honest, self-regulatory manner.
- Creating occupationally safe employment opportunities in recycling sector by providing safe and conducive environment for workers

20. The responsibility of the concerned authorities to include the following:

- Capacity building for segregation of plastic waste at collection sites and safe handling by rag pickers.
- Channelizing the waste collection through waste collectors associations who practice safe and environmentally sound options.
- Specific responsibilities to be assigned to Panchayats, Blocks, District collectors, Municipalities for proper waste management.
- Demonstration units to be set up based on the technologies of converting plastic waste into value added products such as hand woven mats, bags, making of craft items like baskets from metalised plastics, engineered fuel, for bitumen in roads, reconversion to monomers etc. to be supported both on technical and financial fronts.
- Policies that prevent illegal practices of the trade to be enforced and decision to be driven by scientific facts.

- Converting non-biodegradable plastics into degradable may create more problems than solutions. Therefore, viable & practical practices be adopted than mere rhetoric.
- Focus to be placed on R&D on non-recyclable plastics and their disposal, value addition by innovative ways of plastic waste utilization like reusing metalised plastics for crafts and manufacture of structural items like roofing & building material.
- Coordinated approach for plastic waste management by manufacturers, consumers, collectors, re-cyclers as well as civic authorities.
- Need to maintain separate waste bins designated for non-biodegradable & biodegradable plastic waste both at residential and community level. Assuring and Ensuring involvement of the informal sector in segregated collection, sorting, storage, resale and safe reprocessing.

21. Educational modules to be prepared for the use of general public for awareness about the advantages and disadvantages of plastic. This would generate public support in overall system of plastic waste management at source.

22. Reference materials to be prepared for various plastics for use of policy makers and regulators to ensure the implementation of plastic waste management practices. Creation of a network of R&D institutions for science-based approach for plastic waste management.

23. A comprehensive document to be prepared on various technologies being adopted world over for plastic waste management. This would serve as the reference for decision-making on adoption of technologies for plastic waste management.

24. Necessary infrastructure to be created for plastic waste management in various towns. Encouragement of involvement of various stakeholders especially the informal sector through self-help group formations and provision of required space and sorting facilities within the cities and towns and capability building to be initiated. Amendment to the existing plastic rules would be made by including penalty provision, definition of polluters, encouragement for waste reduction and waste recycling.

25. The plastic waste rules to clearly specify actions to be taken by the DCs/DMs for enforcement of the rules relating to use, collection, segregation, transportation and disposal of plastics.

26. While making structural material from post-consumer mixed plastics is one of the best ways to manage them, Indian Standards need to be established for structurals made from post-consumer plastics. For instance, PVC woven sacs, HDPE and other mixed plastics are used for making plastic strapping material often used in airports for strapping baggage. Low quality recycled strapping gives off hydrogen chloride and other hazardous emissions every time the strap is heated for strapping a bag after the screening. This is not only an occupational hazard for those at the baggage screening machines but contributes to the 'sick building' problems at airports and other locations using such material.

27. Indian standards to be established for structures like water tanks, seats, benches, pre-fabricated walls and roofing from post-consumer plastics. While PE, PP, PS and others can easily be made into structures, isolating toxics and passive emissions from them needs to be integrated into the standards through adoption of sandwich techniques. Adoption of simple safety standards and monitoring techniques can ensure that a large portion of mixed post-consumer plastics can be used in making structurals, which are ideal for putting up shelters in normal and disaster situations.

3.3 Packaging Waste Management:

3.3.1 Present Scenario:

Packaging, as a strategic business tool, is the key for enhancing product characteristics and safety of the product. During last decade, packaging industry has grown exponentially. While quality improvement and better technology adoption are visible, one can also see a lot of packaging waste lying all around. Packaging waste, its collection and disposal have become an environmental challenge. Packaging waste comprise a wide range of materials that are derived from multiple items used as packaging material. Selection of appropriate waste characterization and processing technologies can tell us about the composition of waste and the action necessary to address the issues. Presently, the packaging material waste is being managed along with municipal solid waste.

Packaging and especially food packaging has considerable impact on health and environment. Styrofoam or Polystyrene (PS), Polyvinyl chrolide (PVC), Polypropylene (PP), Polyethylene Terapthalate (PET) and several others are reported to be unsafe as food and beverage packaging since polystyrene breaks down to styrene at low temperatures and often PVC has unpolymerised residual vinyl monomers in them, both of which are highly carcinogenic. All chlorinated plastics emit dioxins and furans and others benzene and ethylene oxide when incinerated besides emitting monomers like styrene, hydrogen chloride, vinyl monomers & pthlates. PET and other plastics like HDPE, LDPE and Polycarbonate having Bisphenol A leach into food and beverages even at room temperatures especially when aerated and other drinks are stored in them. Thermosets like Melamine are also known to give off acids and hydrocarbons into foods. Pigments (such as red, pink, black etc) in such packaging materials containing hexavalent Chromium, Mercury, Cadmium and Lead are carcinogenic and could harm the endocrine and neurological systems. If recycled plastics(thermoplastics) are used even in small quantities in the manufacture of food and beverages packaging, they cause major harm to human health as the

contaminated recyclate can leache toxic hydrocarbons such as pesticides, fertilizers, lube oils, paints and heavy metals into the edible contents packed in them. Similarly when PVC is used for blood bags or for making dialysis units, they are known to cause toxicity in patients due to leaching of pthalates, which are plasticizers, into the blood. Similarly Poly Ethylene Glucose Saline sets are known to leache out unpolymerised hydrocarbons which could be detrimental to patients, causing allergies and lengthening their stay in hospitals.

The thermoplastics like HDPE, LDPE, PVC, PP, PS, PET or any of the thermosets are not bio-degradable. These are, sometimes, starch-filled to give the impression that they are degradable but they end up being more harmful for the environment than the non-biodegradable polymers. Plastics like Polylactic Acid (PLA) and other biopolymers made from natural starches like potato starch, oils like corn oil or palm oil are known to be completely biodegradable. PLA requires higher temperatures and specific moisture content to biodegrade. These biopolymers are expensive and are as yet not used in India on a commercial basis except in manufacture of drugs and absorbable sutures.

Fused Aluminum and plastic are used for packaging food materials. PolyAl is completely non-degradable and emits toxic fumes on burning. It could cause infertility of soil, if it gets imbedded in it, reducing permeability, porosity and fertility of the soil.

Food and Beverages packaging are high volume but may have low weights, making up only 15-20% of all packaging. They are flimsy and disposable and highly visible since they are directly disposed in the environment and are found scattered everywhere. Packaging material can be broadly classified as food and non-food packaging materials:

(1) Food packaging material comprise of:

(a) Glass, ceramic and earthenware

(b) Metals like some alloys, stainless steel and aluminum cans, foils

(c) Plastics

(d) Metalised plastics

(e) Laminated Paper

(f) Multilayer packaging

(ii) Non-food packaging material is mostly:

(a) Card board

(b) Blister plastics

(c) Thermocol

(d) Cellophene and other clear transparent and opaque plastics

(e) Paper

(f) Wood

(g) Multilayer Containers and strappings

The non-food packaging make up almost 80-90% of packaging by weight and its quantity is rising day by day. Despite organized collection, recycling etc., huge quantities are sent to the landfills and dumpsites which create major constraints in availability of land and other resources. They are also a major cause of pollution when burnt or incinerated.

3.3.2 Recommendations:

28. A study should be initiated for estimating the quantity and characteristics of each type of packaging material in the waste stream, major sources of its generation and existing disposal methods being practiced.

29. A policy on packaging waste management system with the participation of all stakeholders should be developed.

30. Studies on a framework for promoting clean recycling policy for packaging waste should be developed by using Life Cycle Analysis (LCA) methods.

31. Guidelines/Rules should be brought out to involve large scale retailers and user industries from pharmaceuticals, processed food industries etc. in devising strategies for managing these wastes. Bureau of Indian Standards (BIS) should be requested to frame standards for manufacture and use of packaging with the idea that their reuse and recycling should not be hazardous to human health and the environment.

32. Plastic packaging material should be characterized and their processing recommended after proper hazard assessment as also material from other Packaging materials viz., tetra pack, paper, pharma, glass and metals.

33. There is a need to prescribe standards for non-plastic packaging as well plastics.

34. Quantification and characterization of non-plastic packaging waste reaching landfill should be carried out and their recycling potential should be assessed and safe technologies for the same recommended.

35. A comprehensive legislation on packaging waste should be initiated.

36. Handling of any post-consumer waste is an issue which has a collective responsibility for producers, consumers, regulators, policy makers and enforcement agencies. Therefore, conducting mass awareness programmes for manufacturers, consumers, regulators, policy makers and citizens would have to be initiated.

37. Strategies for recovering energy by incineration of packaging waste should be discouraged and banned. Design safer packaging, sorting, separating, reuse, recycling and safe reprocessing should be encouraged and promoted.

3.4 Construction and Demolition (C&D) Waste Management:

3.4.1 Present Scenario:

Construction and Demolition (C&D) Waste comprises of concrete, plaster, bricks, metal, wood, plastics etc. It is estimated that the construction industry in India generates about 10-12 million tons of waste annually. There is a huge demand of aggregates in the housing and road sectors but there is significant gap in demand and supply, which can be reduced by recycling construction and demolition waste to certain specifications. While some of the items like bricks, tiles, wood, metal etc. are re-used and recycled, concrete and masonry, constituting about 50% of the C&D waste is not currently recycled in India. The fine dust like material (fines) from C&D waste is presently not being used and thus wasted.

The presence of C&D waste and other inert matters is significant (almost one third of total MSW on an average) but so far, no notable development has taken place for utilizing this in an organized manner. At present, private contractors remove this waste to privately owned low-lying land for a price or more commonly, dump it in an unauthorized manner along roads or other public land. Small quantities of construction and demolition waste usually get mixed with domestic waste due to lack of segregated storage and collection facilities.

C&D waste requires focus primarily in view of (i) its potential to save natural resources (stone, river sand, soil etc.), (ii) its bulk, which is carried for long distances without any proportionate return (iii) the space it occupies at the sanitary landfill site unless the fines are used as landfill cover, (iv) its potential for spoiling processing of biodegradable as well as other recyclable waste. On the other hand it has potential use after processing and grading. Thus, its presence in terms of quantity as well as

its importance is growing. So far in India there is very little effort to manage and utilize construction and demolition waste.

Maharashtra has taken a pioneering step and notified the 'Maharashtra Non-Biodegradable Solid Waste (Proper Scientific Collection, Sorting and Disposal in Areas of the Municipal Corporation) Rules, 2006' wherein reuse of this waste is included in the action plan. The Action Plan, inter alia, prescribes separate collection and disposal of debris and bulk waste. Each city needs to have its own mechanism for collection and disposal of waste from bulk waste producers and construction debris. Municipal Corporation of Greater Mumbai notified the 'Construction, Demolition and De-silting waste (Management and Disposal) Rules'. The Municipal Corporation of Delhi has carried out a feasibility study on use of C&D waste in road and embankment construction.

Sustainability of C&D waste management is the most crucial issue. Until the relevant standards are stipulated and market is developed for C&D waste recycled products, financial sustainability can not be achieved. Therefore it would be necessary to evolve a system in which the generator of the C&D waste – whether small or large – pays for appropriate disposal. The ULB may have to share some of the cost, particularly for the small generators from slum areas, whose affordability level may be low and is otherwise difficult to track. At a later date when the use of recycled C&D waste is mandated through regulatory measures and market for processed C&D waste developed, the pattern of cost sharing may be changed. This mechanism should have the flexibility to incorporate changes depending upon any revenue accrual from sale of recycled C&D waste in future.

Not much effort has been made in this sector and data on generation and characteristics is scarcely available. Policy mandate would be required for

(a) generating authentic data by each ULB followed by collation of data by the Nodal Agency in each state, (b) expert organizations should be involved in analysis of data, of material and various situations and options and (c) setting up pilot demonstration facility preferably in each state. Data collection by the ULBs would serve two purposes – (i) generation of data in a cost effective manner and (ii) sensitization of the ULBs, the prime actors in waste management.

3.4.2 RECOMMENDATIONS:

38 Data should be generated on C&D Waste generation and its characteristics.

39. Separation of C&D waste should be promoted at source and an institutional mechanism for waste collection should be established involving the informal sector who can be trained to separate the waste into categories and also do some amount of use, reuse and reprocessing like making tiles from crushed construction debris.

40. Charges should be levied on C&D waste generators.

41. Environmentally friendly technologies should be adopted for waste utilization of C&D.

42. Standards for C&D should be formulated for waste utilization.

43. Technical and institutional support should be made available for good data analysis and for evolving ways for use of C&D waste.

44. Policy support, guidelines and regulatory arrangement should be made.

45. Amendment should be made to the existing MSWM Rules 2000 to include and address the C&D waste with guidelines for its collection, utilization and safe disposal.

3.5 Bio-medical Waste Management

3.5.1 Present Scenario:

Bio-medical waste, if not handled and disposed indiscriminately, may cause adverse effects on human health & environment. According to the available information from the State Pollution Control Boards (2007-08) 52,001 (53.25 %), Health Care Establishments (HCEs) are in operation without obtaining authorization from their respective SPCB/PCC. Approximately 288.20 tons per day (56.87%) out of 506.74 tons per day wastes generated is being treated either through Common Bio-medical Waste Treatment Facilities (159 in number), or captive treatment facilities. There are 602 Bio-medical Waste Incinerators (which include both common and captive incinerators), 2218 autoclaves, 192 microwaves, 151 hydroclaves and 8,038 shredders in the country. About 424 (70.4%) out of 602 incinerators are provided with air pollution control devices and 178 (29.6 %) incinerators are in operation without air pollution control devices.

3.5.2 Existing Regulatory mechanism:

Ministry of Environment & Forests (MoEF) notified Bio-medical Waste (Management & Handling) Rules (BMWM Rules), in year 1998 under the Environment (Protection) Act, 1986 for safe handling, segregation, storage, transportation, treatment and disposal of bio-medical waste generated from the Health Care Establishments (HCEs)/Health Care Facilities (HCFs). These Rules were amended in 2000 and 2003 so as to fill the gaps as felt necessary at that time. These Rules are comprehensive and have stipulated duties for every bio-medical waste generator, occupier, transporter and CTF operator to maintain source separated waste, pack, store, treat and dispose these wastes as per the

laid down provisions. The State Pollution Control Board (SPCB)/ Pollution Control Committee (PCC) have been notified as the prescribed authority for implementing the provisions of these Rules in the respective States/UTs.

3.5.3 Recommendations:

46. A national inventory should be made for all bio-medical waste generators (Govt/Pvt. or others). Health Care Facilities (HCFs)/ dispensaries/ blood-banks/ laboratories/ animal husbandries/ consultants etc. in terms of number and Kg/day to be made by the SPCB/PCC (for HCFs as defined under the BMWM Rules) and HCFs falling under the purview of Director General, Armed Forces Medical Services.

47. The existing BMWM Rules should be reviewed to incorporate more stringent penalty for violation. A strategy must be evolved for safer management of Bio-medical waste in the Country.

48. Responsibilities of the Operator of a facility should be clearly defined.

49. SPCB/PCC/CPCB should undertake strict and periodic monitoring of HCFs/ CBWTFs for verification of compliance of provisions of the Rules and CPCB guidelines issued from time to time.

50. SPCB/PCC/CPCB should setup a dedicated “Bio-medical Waste Management Cell” within the organization with requisite dedicated manpower and infrastructure for monitoring and implementing the action plan and the provisions of the BMWM Rules. Requisite funds could be utilized from the authorization/consent fees. Additional financial assistance may be augmented from the MoEF.

51. Adequate funds should be allocated for bio-medical waste management as well as procurement and supply of disposal equipments such as autoclaves, microwaves/hydroclaves, shredders, needle cutters, mercury spill kits to all the Govt. HCFs within one year.

52. All the HCFs should be brought under the ambit of BMWM Rules and not be permitted to operate without authorization of the SPCB/PCCs.

53. All HCFs in operation should be registered with the State/UT Deptt. of Health/ Ministry of Health and Family Welfare.

54. CPCB should make random checks on inventory reports submitted by the SPCB/PCC and Director General, Armed Forces Medical Services

55. MoEF (as per SPCBs and PCCs and Ministry of Defence) /Ministry of Health & Family Welfare should finalise National Inventory on Bio-medical Waste Generation from HCFs, Veterinary Hospitals, Armed Forces Health Care Establishments

56. SPCB/PCC, Director General, Armed Forces Medical Services should make an assessment of existing capacity of Bio-medical Waste Treatment Facilities in every State/UT along with the respective coverage area. SPCB/PCC may identify additional treatment facilities required vis-à-vis existing facilities.

57. SPCB/PCC/Ministry of Health and Family Welfare/ MoEF/Ministry of Defence should identify and allocate land for setting up of additional CBWTF, invite private entrepreneurs for setting up CBWTF. In some cases, where no entrepreneur comes forward to set up CBWTF, submit proposals along with fund details to CPCB/MoEF/ Ministry of Defence for seeking financial assistance from MoEF. In places where the location is such that CBWTF can cater to districts in neighbouring states, interstate transportation of BMW could be allowed since this helps the HCFs and makes the CBWTF more viable.

58. SPCB/PCC/ CPCB should initiate action on HCFs and CBWTFs violating the Provisions of BMWM Rules and the Guidelines issued by CPCB from time to time.

59. Ministry of Health & Family Welfare, State/UT Department of Health should initiate action on HCFs and CBWTFs violating the conditions of registration. HCFs which store used plastic disposables and sell it to unauthorized contractors for repackaging and resale of 'tainted

disposables like syringes, gloves, catheters, IV sets etc.' should be severely punished and their registration cancelled.

60. Training workshops should be organized on Bio-medical Waste Management related activities at District level, State level, national level and international level for HCFs for all the officials dealing with the Bio-medical waste Management Related Activities. SPCB/PCC/CPCB/MoEF/Ministry of Health and Family Welfare Director General, Armed Forces Medical Services/ State/UT Dept. of Health and centres of Excellence to implement these programmes.

61. State/nationwide awareness programme should be created for general public too through mass media like TV, Radio, newspaper, hoardings etc.

62. It should be made mandatory for every 50 and above bedded HCFs to have at least one person who has undertaken three/six months distance learning programme on BMWM or similar courses accredited by CPCB.

63. HCFs need to install some equipments for treatment except captive incinerators especially for mitigating spread of infection.

64. HCFs need to install a laboratory to carry out tests such as Routine Environmental checks, Disinfectant In-Use test, Validation/Efficacy tests of autoclave/microwave/hydroclave installed etc..

65. HCFs should be encouraged to use non-mercury based instruments in place of mercury based thermometers and Sphygmomanometers

66. CPCB/MoEF should review gaseous emission standards and effluent discharge norms in consultation with various Stakeholders.

67. Registrations of those hospitals that do not set up individual treatment/disposal facility or join a common treatment facility, should be cancelled. New hospitals, should not be allowed to commence operation without making sure that it has a facility for treatment/disposal of bio-medical waste or is a member of a CBWTF .

68. Segregation of bio-medical waste at source according to its type should be ensured in each hospital and HCF. Segregation could be simplified into 5 types of waste by clubbing the10 categories of waste presently in schedule 1.

3.6 E-waste Management

3.6.1 Present Scenario:

The increase of electrical and electronic products consumption rates and higher obsolescence rate leads to higher generation of e-waste. The increasing obsolescence rate of electronic products also adds to the huge import of used electronics products. Electrical and electronic waste (E-waste) is one of the fastest growing waste streams in the world. The increasing “market penetration” in developing countries, “replacement market” in developed countries and “high obsolescence rate” make e-waste one of the fastest growing waste streams in the world. The E-waste inventory based on the obsolescence rate in India for the year 2005 has been estimated to be 1,46, 000 tonnes, which is expected to exceed 8,00,000 tonnes by 2012.

Dumping of E-waste poses a major challenge in India. Imports are one of the major sources of E-waste in the country, most of it coming illegally. This adds to the huge volume of waste being dumped and processed within the country. The accurate data on such imports is not available largely owing to the nature of the trade. However, estimates suggest that imports account for an almost equal amount to what is being generated in the country. Improper disposal of e waste causes huge hazards to health as well as the environment and hence is a matter of grave concern.

3.6.2 Existing Regulatory mechanism:

There are no specific environmental laws for E-waste In India. E-waste has been included in the Schedule IV of the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008. This inclusion makes it mandatory for any e -waste recycler to get it registered with CPCB. Recognising the fact that e-waste is seen as a major future

problem, guidelines for “Environmentally Sound Management of E-waste” has been brought out suggesting treatment options and adoption of environmentally sound e-waste treatment technologies. E-waste has been categorised in Schedule 4 of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 under the “Components of waste electrical and electronic assemblies comprising accumulators and other batteries included on list A; mercury-switches, activated glass cullets from cathode-ray tubes and other activated glass and PCB-capacitors, or any other component contaminated with Schedule 2 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they exhibit hazard characteristics indicated in part C of this Schedule”. These can now be recycled by the units registered with CPCB and having Environmentally Sound Technologies. The Extended Producer Responsibility (EPR) concept had been introduced in the guidelines. All SPCBs/PCCs have been requested to grant consent to establish and give authorizations for recycling of Waste Electrical and Electronic assemblies, so as to enable the units to register as recycler with the CPCB.

3.6.3. Recommendations: The management of E-waste may be taken up at three levels, viz. Legislative, Administrative and Technological measures.

69. There is an immediate need for strengthening the legislative frame work and making them more stringent. This could be done by introducing specific rules/law governing the reuse and recycle as well as final disposal of e-waste. Lack of stringent regulations and awareness, makes dumping a preferred destination for E-waste.

70. Producers of the electronics/electrical equipments must be made responsible for end of life management of electrical/electronic products. Producers should be rule-bound to take back their products

after the life of the product is over and to get it recycled/disposed in an environmentally safe manner without health risks..

71. Amendments to the HW (M,H &T) Rules must be made to bring SEZ areas under its ambit so as to prevent dumping of e-wastes in SEZs.

72. Import of CRT should be banned. A mechanism has to be established for regulating charity goods and its route to its intended destination. Import of equipment should be permitted only if new.

73. A comprehensive national Inventorisation of E-waste needs to be undertaken on a priority basis.

74. The key to effective E-waste management is an efficient collection mechanism of the e-waste. The producers of electronic equipment may be mandated to have a centralized facility along with a wide network for e-waste collection of their brand, as extended producer responsibility.

75. There is a need to strengthen the infrastructure for management of E-waste at CPCB and SPCB level. Development of human, financial and technological resources is the need of the hour.

76. A core group should be constituted for management of E-waste including representatives from MoEF, CPCB SPCB, Ministry of Information Technology, Manufacturers Associations and a few committed NGOs.

77. Testing/Scanning procedure for goods at high sea should be established. Port Authority/Customs capability in terms of scanning of goods at high seas has to be increased.

78. Success stories of international practices need to be analysed and adopted as per the need of the country for speedy and efficient management of E-Waste.

79. Use of Hazardous substances like Cadmium, Mercury, Lead and PCB should be reduced with raw material substitution within a given time frame. This being a continuous activity, information needs to be collected, updated and disseminated on a regular basis.

80. Establishment of a clearing house of information on e-waste assembling and manufacturing is immediately mandated

81. The concept of eco-labeling of electronic products needs to be introduced so that consumers can choose to buy electronic goods that cause less pollution and which are more environment friendly. BIS may be asked to fix these criteria/standards.

82. There is a need to have more R & D projects on recovery of precious and non ferrous metals in an environmental friendly manner.

83. Establishment of a model eco-friendly recycling unit integrating all aspects of disassembly and recovery of metals and other material is mandated either in the private or public sector to understand various nuances of recycling and pollution control and disseminate the same.

3.7 Hazardous Waste Management

3.7.1 Present Scenario:

There are about 36,000 hazardous waste generating industries in India which generate 6.2 million tonnes out of which land fillable hazardous waste is about 2.7 million tonnes (44%), incinerable hazardous waste is about 0.4 million tonnes (7 %) and recyclable hazardous waste is about 3.1 million tonnes (49 %). Indiscriminate and unscientific disposal of wastes in the past has resulted in several sites in the country to become environmentally degraded. There are 141 hazardous waste dumpsites that have been primarily identified in 14 States/UTs out of which 88 critically polluted locations are currently identified. Gujarat (about 29%), Maharashtra (about 25%) and Andhra Pradesh (about 9%) are the top three HW generating States. Thereafter, Chhattisgarh (about 5%), Rajasthan, West Bengal and Tamil Nadu (about 4 %) are found to be major generators of HW. These seven States together, are generating about 80 % of country's total HW. About 64 Common Hazardous Waste Transportation, Storage and Disposal Sites (TSDFs) have been identified in various States/UTs out of which 35 sites have been notified. 25 TSDFs are operational and 9 TSDFs are under construction. As per the National Inventory of Hazardous Waste Generating Industries, total waste handling capacities of TSDFs is about 1.5 MTA and there is a deficit of about 1.2 MTA for land fillable wastes and about 0.9 MTA for incinerable wastes.

3.7.2 Existing Regulatory System:

Ministry of Environment and Forests has notified the Hazardous Waste (Management, Handling and Transboundary movement) Rules, 2008 repealing earlier rules so as to make the Rules more practical and effective in implementation. The National Hazardous Waste Management Strategy is being finalized for effective management of hazardous wastes so as to avoid environmental pollution and adverse effects due to

improper handling and disposal. A Coordination mechanism for effective implementation of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 by the custom authorities at the ports has been established.

3.7.3 Recommendations:

84. Waste generation is a dynamic phenomenon depending upon change in products, processes, capacity of production and establishment of new industries. Hence there is a need to periodically update the national inventory on hazardous waste generation so as to facilitate decision making procedures with respect to strategies of hazardous waste management. .

85. Waste minimization, waste reduction and waste reuse needs to be attempted first to avoid waste accumulation. Dissemination of information on technological options to be a continuing exercise.

86. Clean technology norms for each industry should be defined so that less hazardous waste are generated and hence pollution caused is also reduced.

87. Possibilities must be explored with industrial associations/industries for options of reusing, recovering and recycling hazardous waste in an environmentally sound manner.

88. Payback schemes should be introduced as a part of extended corporate responsibility in case of lead-acid batteries.

89. A system should be developed for channelising wastes containing toxic metals for recovery, such as mercury from thermometers and fluorescent tube lights, cadmium from batteries etc.

90. 'Waste exchange Banks /Centers' should be established to provide information on wastes and promote reuse, recovery and recycling technologies which upscale the quality of resource recovery.

91. Technological aspects need to be promoted so as to conserve the fuel as well utilization of waste as resource.

92. Currently, only 12 states have 25 operating common hazardous waste facilities (TSDFs). In addition, 35 notified sites covering other states are at various stages of development. The gap could be filled as a top priority activity. State Governments to play a catalytic role for providing financial support matching the Central subsidy.

93. The issue of interstate movement of hazardous waste should be addressed in a rational way.

94. The TSDFs need to cater to meticulously delineated hazardous waste catchment areas taking into consideration their distances from the generators and availability of wastes. SPCBs could ensure that in a given hazardous waste catchment area, no multiple operating TSDFs exist to help maintain viability of the facilities.

95. TSDFs need to be rigorously evaluated by the SPCBs/PCCs periodically to ensure operation in an environmentally safe manner in compliance with the various provisions of regulations.

96. All TSDF operators should be asked to implement the provisions of Escrow Account as per the directive of MoEF to ensure that a separate Escrow fund is created for post closure monitoring and to deal with liability arising due to mishaps, calamities etc.

97. Surveillance of industries by CPCB/SPCB and industry associations should be stepped up to take care of illegal dumping.

98. Remediation strategy needs to focus on the 'polluter pays principle' with the polluter being asked to pay penalty as well as costs of cleaning up the pollution. Industries causing pollution repeatedly should be blacklisted. Where polluters are not traceable, a dedicated fund needs to be created by SPCB/ PCC for remediation.

99. Harmonization of EXIM regulations with the provision of the Rules, training of Custom Department personnel engaged in inspection &

sampling and also up-gradation of Customs Department laboratories should be carried out to prevent illegal imports of hazardous waste.

100. In order to deal with inter-state transportation as well as disposal of hazardous wastes in a facility the following options should be considered :

- To have these processed wherever possible by the industry which supplied them;
- To appropriately incinerate either through dedicated incinerators of individual industries or through incinerators available with common facilities (TSDFs).

101. Adequate safety systems and procedures must be adopted during dismantling of ships and handling of hazardous wastes/ materials (such as used oil, waste oil, asbestos containing panels/ tiles, damaged asbestos containing material, paint chips, and used chemicals like acids etc.).

102. SPCBs/PCCs need to develop on-line tracking system for movement of hazardous waste from generation to the disposal/ recovery/ recycling stage.

103. SPCBs/ PCCs and CPCB to be strengthened in terms of manpower, equipment, instruments and other infrastructure facilities for effective enforcement of regulations. Central and State Governments should support SPCBs/ PCCs by periodically providing adequate funding, training and sponsoring awareness programmes.

Annexures

1. Office order of the Constitution of the Committee
2. Minutes of the meetings of the Committee
3. Office order of the Working Groups