



Management of waste in India: SAI India

1. Significance of the topic

Waste represents a threat to the environment and human health if not handled or disposed of properly. Surface and ground water contamination takes place when waste reach water bodies. Residues from waste can change the water chemistry, which can affect all levels of an ecosystem. The health of animals and humans are affected when they drink the contaminated water. A specific environmental hazard caused by waste is leachate, which is the liquid that forms, as water trickles through contaminated areas leaching out the chemicals. Movement of leachate from landfills, effluent treating plants and waste disposal sites may result in hazardous substances entering surface water, ground water or soil. Waste contaminates soil and can harm plants when they take up contaminants from their roots. Eating plants or animals that have accumulated soil contaminants can adversely affect the health of humans and animals. Emissions from incinerators or other waste burning devices and landfills can cause air contamination. Incinerators routinely emit dioxins¹, furans² and polychlorinated by-phenyls³, which are deadly toxins, causing cancer and endocrine system damage. Landfills are a big source of release of greenhouse gases, which are generated when organic waste decomposes in landfills. E-waste contains a mix of toxic substances such as lead and cadmium in circuit boards; lead oxide and cadmium in monitor cathode ray tubes; mercury in switches and flat screen monitors; cadmium in computer batteries; polyvinyl chloride in cable insulation that release highly toxic dioxins and furans when burned to retrieve copper from the wires. Thus, improper handling of waste has consequences both on the environment as well as on the health of the people.

Improper management of waste leads to pollution of the environment and also has effects on biodiversity and public health. In light of effective waste management being a problem in most cities of India, mainly due to increased population, urbanization and development, management of waste in Indi for 3 main source—municipal solid waste, bio-medical waste and plastic waste was chosen for Performance Audit.

2. Audit Scope, objectives, criteria

Audit scope:

In India, policy and laws are made at the federal level, by the main ministry for pollution control, called Ministry of Environment and Forests (MoEF). The implementation of these policies and laws takes place at provincial and local levels. Performance Audit (PA) of “Management of Waste in India” sought to examine whether the government had identified waste as a risk to environment and health, accurately assessed the amount of different kinds of waste being generated in the country and drafted

¹ Dioxins are known to increase the likelihood of cancer and are considered a serious threat to public health. Environmental campaigners describe dioxins as among the most dangerous poisons known.

² Furan is a colorless, flammable, highly volatile liquid with a boiling point close to room temperature. It is toxic and may be carcinogenic.

³ Also called PCBs, these were used as coolants and insulating fluids for transformers and capacitors, stabilizing additives in flexible PVC coatings of electrical wiring and electronic components etc.,. PCB production was banned in the 1970s due to the high toxicity of most products containing PCBs. PCBs are classified as persistent organic pollutants which bio-accumulate in animals.



a policy on waste management which focused on waste minimisation and waste reduction, as compared to waste disposal, as the more effective ways to manage waste. In addition, the PA sought to examine whether all kinds of waste had been covered under legislation for safe disposal and whether agencies had been allocated responsibility and accountability for the management of waste. The PA also sought to check the compliance to rules relating to the implementation, monitoring and evaluation and adequacy of funding relating to municipal solid waste, bio-medical waste and plastic waste.

The scope of the PA excluded:

- the implementation, monitoring and evaluation of hazardous waste management rules due to its complexity and the multiplicity of agencies involved in its implementation and monitoring; and
- the implementation, monitoring and evaluation of radioactive waste due to the confidential nature of such wastes as well as their restricted use.

The audit took place simultaneously at the federal and provincial levels. At the federal/central level, audit scope covered policy, planning and legislation at MoEF and the implementation, monitoring and evaluation activities relating to management of waste and pollution control bodies. At the provincial/state level, audit checked the records of 24 state government departments like Department of Environment/Forests, Urban Development etc., 24 state level pollution control bodies, 56 municipalities in 20 states (for implementation/monitoring of rules relating to solid waste), 60 districts in 20 states (for implementation/monitoring of rules relating to management of plastic waste) and 180 hospitals in 15 states to verify implementation/monitoring laws related to bio-medical waste.

Audit Objectives: Performance audit was carried out to assess whether:

Performance audit of “Management of Waste in India” covering the period from 2002-2003 to 2006-2007, was taken up with the objectives of assessing whether:

- I. Quantum of waste being generated in the country had been assessed and the risks to environment and health posed by waste had been identified;
- II. Specific policy for management of waste existed and whether policies and strategies for the management of waste gave priority to waste reduction and waste minimisation as against waste disposal;
- III. Legislations specifically dealing with disposal of each kind of waste existed and whether penalty for violation had been incorporated in the legislations already enacted;
- IV. Various agencies involved in the process had been allocated clear responsibility and accountability for waste management and whether or not a mismatch/gap/overlap existed among the responsibility centers;
- V. Effective compliance to laws regulating municipal solid waste, bio-medical waste and plastic waste was taking place in the states;
- VI. Monitoring was effective in checking non-compliance; and
- VII. Funding and manpower were adequate for the implementation of rules on waste management and whether the funds/infrastructure were used economically, efficiently and effectively.



Audit criteria

The main audit criteria used in the PA were:

- Agenda 21 document of the World Commission on Sustainable Development of the United Nations Conference on Environment and Development, held in Rio in June 1992;
- United Nations Environment Programme (UNEP) guidelines;
- Adherence to rules relating to the bio-medical waste, plastic waste and municipal solid waste;
- Adherence to system of periodic monitoring in MoEF, CPCB and PCBs relating to management of waste; and
- Policies, directives, legislations and good practices for management of waste indifferent countries.

As sufficient audit criteria for benchmarking performance of waste management processes were not available in India, rules, policies, strategies and good practices for management of waste in different countries were also used to benchmark the performance of the different environment protection agencies in waste management.

Audit sampling

PA covered 24 out of 28 states (86 per cent) for Responses on policy for management of wastes, municipalities in 20 out of 28 states (71 per cent) for compliance to municipal solid waste/plastic waste rules and hospitals in 15 out of 28 states (54 per cent) for compliance to bio medical waste rules. Random sampling was used to select 24 states/PCBs from whom responses were sought on policy issues.

- Municipal solid waste: Stratified random sampling was used to select the municipalities for inclusion in the sample for audit. Three municipalities each in 20 states were selected by means of a stratified random sample where the sample was stratified according to population and municipalities were selected randomly from within the strata. 56 municipalities were sampled in total.
- Plastic waste rules: The districts in which the municipalities fell were taken as sample and 56 districts were sampled in total.
- Bio-medical waste: simple random sampling was used to select hospitals for inclusion in the audit sample. 180 hospitals were selected (12 hospitals each in 15 states) by means of random selection of four districts in each state and random selection of three hospitals from within the sampled district.

3. Methodology

The initiation of the PA was with guidelines for audit, prepared in consultation with Non-Government Organizations (NGOs) like Center for Science and Environment, Toxic Links, apart from stakeholders like MoEF and Central Pollution Control Board (is a technical/monitoring body to advise MoEF on environment and pollution control measures).



Guidelines of INTOSAI (International Organisation of Supreme Audit Institutions) on waste titled “Towards Auditing Waste Management” were also referred to while framing these guidelines. These guidelines facilitated audit effort in the sampled states. The Performance Audit of “Management of Waste in India” commenced with an entry conference with MoEF in July 2007, in which the audit methodology, scope, objectives and criteria were explained. The audit methodology mainly consisted of document analysis, responses to questionnaires, physical collection and testing of samples. Records and returns relating to the issue were examined:

- at the central level at MoEF and CPCB between July 2007 to December 2007.
- at state level (in 24 states) in PCBs, state Forest Departments, state urban development department, municipalities, districts and hospitals between June 2007 to December 2007.

A total of 100 audit personnel were involved in this audit.

4. Findings and recommendations

Issue 1 Assessment of quantum of waste being generated in the country and identification of the risks to environment and health posed by waste.

Audit findings

- Federal ministry/state governments had not completely assessed the quantity of various kinds of waste like municipal solid waste, bio-medical waste, hazardous waste, e-waste etc., being generated in the country.
- The Federal ministry was unable to make any projections about the amounts of waste that might be produced in future and only 25 per cent of the sampled states had made projections about the growth in waste.
- Adequacy of capacity to handle waste currently and in the future was assessed only by 29 per cent of the states.
- The Federal ministry/federal pollution control board had not completely assessed the risks to environment and health posed by waste and only 25 per cent of the sampled states had assessed these risks; that too, partially.

International Good practices

- *Sweden, Germany, Italy, Norway, Spain, Poland and United Kingdom have a detailed database on different kinds of waste.*
- *The Commission of the European Countries and USA has projected trends in growth in waste.*
- *Portugal has estimated its capacity to handle all wastes for the future.*

Good practices in India

- *Karnataka and Punjab had carried out detailed studies on the effect of waste on health and environment.*

Recommendations

- Federal ministry/Federal Pollution Control Board, as the nodal agency for pollution related issues should carry out, periodically, a comprehensive assessment of the amounts of waste being generated, according to the major waste types. All the states should be involved in this exercise so that a comprehensive database on waste is generated for aiding policy-making and intervention.
- Federal ministry/Federal Pollution Control Board, in conjunction with the states, may estimate the current capacity to handle all kinds of waste



all over the country and ensure that additional capacity of waste infrastructure, if required, is created for safe disposal.

- MoEF along with the states should carry out regular surveillance, including epidemiological surveillance of waste related impacts on public health.

Issue 2 Existence of policies and strategies for management of wastes and reflection of priority to waste reduction and waste minimisation as against waste disposal.

Audit findings

- Waste management efforts in India were not directed by a specific waste policy, which incorporated a clear-cut waste hierarchy, which gave priority to reduction, recycling and reuse of waste instead of only waste disposal (as depicted in the Waste hierarchy pyramid).
- The order of priority for management of wastes had not been defined in India leading to the current focus being only on disposal strategies. No effective strategies to implement the 3 R's (recycle, reduce and reuse) were being followed by MoEF and only 8 per cent of the sampled states had introduced such strategies.
- The National Environmental Policy, 2006, which promoted certain waste reduction strategies, had not been translated effectively into action.
- The Federal ministry had not adequately addressed the role of informal sector in handling waste and in the states; only 17 per cent of the sampled states had recognised the role of rag pickers.
- The Federal ministry had not taken effective action on greening government procurements to promote the use of recycled and environmentally friendly products and government procurement systems had not been altered in 46 per cent of the sampled states to include Environment Preferable Purchasing.
- The Federal ministry 's environment labeling program started in 1991 was a failure as the label was granted to only three product categories in more than 15 years of its existence.

International good practices

- *Denmark, Japan, Korea, South Africa, Ireland, Philippines and Finland have a separate waste policy which emphasises on 3R's.*
- *Ireland, USA, New Zealand, Netherlands and Korea have effective reduction, reuse and recycling strategies.*
 - *USA, Ireland, Japan and Denmark have set specific targets and timelines for waste reduction and recycling.*
 - *Canada Japan and USA have introduced green practices in government procurement.*

Good practices in India

- *West Bengal has effective waste minimisation programmes.*

Recommendations

- The Federal ministry may consider framing a specific policy for the management of wastes in India, incorporating the internationally accepted hierarchy for management of wastes in the policy.



- The Federal ministry/states may consider introducing effective strategies for the reduction and recycling of household waste like deposit refund schemes, promoting the use of jute bags rather than plastic bags, waste exchanges, etc., for reduction of waste at source.
- The Federal ministry should consider the introduction of Environmentally Preferred Purchases and lay down guidelines for the purchase of recycled products to promote the purchase of ecofriendly goods by the government and the agencies controlled by it.

Issue 3 Existence of legislations specifically dealing with disposal of each kind of waste incorporating of penalty for violation.

Audit findings

- Laws in India were not framed for all kinds of waste, leaving the safe disposal of many kinds of waste like construction and demolition waste, agriculture and forestry waste, e-waste etc., unmonitored.
- Polluters were not being effectively held responsible for unsafe disposal, thereby creating no deterrence for non-implementation of the rules. Only in 25 per cent of the sampled states, some token action had been taken by pollution control board/government against defaulters for illegal dumping of waste.

International good practices

- *Finland and Ireland have comprehensive waste legislations which covers all kinds of waste.*
- *Finland, Sweden and Denmark adopted the polluter pays principle by levy of a Carbon Dioxide tax for emissions above a particular limit.*

Recommendations

- The Federal ministry should consider framing laws/rules for the management of all major kinds of waste like construction & demolition waste, end of life vehicles, packaging waste, mining waste, agriculture and forestry waste and e waste being generated in the country to promote safe disposal of waste.
- The Federal ministry should consider incorporating punishment/penalty as well as responsibility of the polluter in the specific rules governing management of each kind of waste so that there is a strong deterrent for violation of the rules.

Issue 4 Allocation of clear responsibility and accountability to various agencies involved in the process of waste management.

Audit findings

- There was no single body taking ownership of waste issues both at the federal and state level, leading to dispersal of responsibility and weak accountability.
- Only 15 per cent of states constituted the Solid Waste Mission for implementation of municipal solid waste rules, despite directives of government in 2004-05. Similarly, advisory committees to advise the state governments on the implementation of bio-medical waste rules were set up only in 47 per cent of the sampled states.
- There was no clear identification of bodies for monitoring of waste rules at the centre as none of the four federal ministries, i.e., Ministry of



International good practices

Environment and Forests, Ministry of Urban Development, Ministry of Health and Family Welfare and Department of Petrochemicals took responsibility for monitoring of municipal solid waste, bio-medical waste rules and plastic waste rules.

- In the states, only 33 per cent each of the sampled states had allocated responsibility to bodies/agencies for monitoring of municipal solid waste rules, 46 per cent of the states had allocated responsibility for monitoring of bio-medical waste rules and only 37 per cent of the sampled states were monitoring the implementation of the plastic waste rules.

- *Finland, Austria and New Zealand have central nodal bodies for waste management.*

- *Philippines, Slovenia and Austria have bodies at the central level to implement waste management plans and policies.*

- *Finland, Philippines, Slovenia, USA and New Zealand have bodies at the central level to monitor implementation of waste management policies and programmes.*

Recommendations

- Since waste causes pollution and pollution issues are necessarily the responsibility of the federal Ministry of Environment and Forests, the Central Government should consider appointing Ministry of Environment and Forests as the nodal body for all kinds of waste.

- The Federal Ministry of Environment and Forests should clearly identify, at the central level, bodies which would be responsible for the implementation of the waste management rules relating to municipal solid waste, biomedical waste and plastic waste. The states should also clearly identify the agency responsible for implementation of the waste rules.

Issue 5 Compliance to rules regulating municipal solid waste, bio-medical waste and plastic waste.

Audit findings

5.1 Compliance to Municipal Solid Waste rules

- **Collection:** Waste was regularly collected only in 22 per cent of the sampled municipalities.
- **Segregation:** Segregation of waste took place only in 10 per cent of the sampled municipalities.
- **Storage:** Only 17 per cent municipalities were able to ensure proper storage of waste.
- **Transportation:** Covered trucks for transportation of municipal solid waste were being used only in 18 per cent of sampled municipalities.
- **Processing:** Only 11 per cent municipalities had waste processing capabilities.
- **Disposal:** Only two states out of the sampled 20 states had established a landfill, leading to dumping of waste in open dumpsites in the states. The activity outlined in the Implementation Schedule for the development of landfills was carried out only in 14 per cent of the sampled municipalities.

5.2 Compliance to bio-medical waste rules



- Authorization: Only 29 per cent of the sampled hospitals had set up waste disposal facilities only after getting authorisation from the prescribed authority.
- Segregation: Segregation as envisaged in the bio-medical waste rules was taking place in only 29 per cent of the hospitals. Bio-medical waste, like effluents, needle sharps etc., were mixed with other wastes in 34 per cent of the sampled hospitals.
- Labeling and storage: Labeling took place only in 19 per cent of sampled hospital and 17 per cent of sampled hospitals kept untreated waste beyond 48 hours.
- Treatment /disposal: Only 17 per cent of sampled hospitals were treating/disposing bio-medical waste as per the compliance criteria in the rules. More than 50 per cent of the hospitals sampled had inadequate waste processing/disposal infrastructure.

5.3 Compliance to plastic waste rules

- Actions were not being taken designated authorities for the enforcement of the rules and it was difficult to verify whether vendors were using carry bags or containers made of recycled plastics for storing, carrying, dispensing or packaging of foodstuffs.
- It was difficult to verify in audit whether recycling was being done according to specifications.
- It was difficult to verify whether all manufactures had sought authorisation from pollution control boards for the manufacture of plastic carry bags/containers.

Recommendations

- State governments could make waste segregation mandatory and the municipality be authorised to levy fines if segregated waste is not made available to the municipality for collection by households/commercial establishments.
- Waste processing should be made mandatory in each municipality. The federal pollution control board to help each municipality in identifying waste processing technology best suited to its needs.
- Dumpsites in residential areas and near water sources/water bodies should be closed down and moving the waste to a sanitary landfill.
- Registrations of those hospitals that do not set up treatment/disposal facility or join a common facility could be cancelled. New hospitals should not be allowed to commence treatment without making sure that it has a facility for treatment/disposal of bio-medical waste.
- It should be ensured that each hospital has the full waste treatment/disposal infrastructure to treat each category of bio-medical waste generated. Alternatively, each hospital could join a common facility for treatment/disposal and PCB should ensure that each common facility has the requisite and complete infrastructure to handle waste safely.



Audit findings

- Monitoring of the municipal solid waste rules, bio-medical waste rules and plastic rules, at the central level, was not effective. Systems were not in place to check non-compliance of rules by municipalities, hospitals and district authorities.
- Pollution control boards of the states were not monitoring regularly whether municipal solid waste was being disposed in an environmentally safe manner and in a manner not to pose health risks.
- Monitoring by state governments was taking place only in 11 per cent of the municipalities and as such, no effective check was being exercised to see that waste processing and disposal facilities meet the compliance criteria outlined in the municipal solid waste rules.
- Only 13 per cent of sampled hospitals were being monitored for compliance to bio-medical waste rules.
- Only in 20 per cent of the sampled states, the designated authorities were monitoring the implementation of plastic rules.
- In **Delhi**, analysis report open landfill showed that Total Dissolved Solids (TDS) and hardness content of the ground water was 800 per cent and 633 per cent respectively in excess of the desirable limits. TDS another open landfill site was also in excess of the desirable limit which showed that the ground water of both the open landfills sites has been critically contaminated with leachate generated from the landfill site. In **Punjab**, samples of ground water from hand pumps at four places from the municipal solid waste open dumpsite in Amritsar revealed that that none of the samples collected from the dumpsite met the acceptable limit for drinking water and were thus, not fit for drinking purposes. In **Tamil Nadu**, two water samples collected from the dumpsite at a swamp area revealed that dissolved solids, chlorides and cadmium was far above the prescribed desirable limits.

Recommendations

- At the central level, the federal ministry of environment and forests and at the level of the states, the pollution control boards should draw up a schedule of monitoring of municipalities and hospitals and monitor them not less than once in 6 months.

Issue 7 Adequacy of funding and manpower for the implementation of rules on waste management.

Audit findings

- The provision for management of waste in the state budgets was low and only 30 per cent and 27 per cent of the sampled states made some provisions for municipal solid waste and bio-medical waste management.
- 55 per cent of the sampled states reported shortages in manpower in the municipalities hampering municipal solid waste management while pollution control boards in 54 per cent of the sampled states had cited shortages hampering their work.

Recommendations

- States should make provisions for waste management activities, both municipal solid waste and bio-medical waste in the budget to ensure that municipalities and hospitals have adequate funds for waste management.



- State governments and pollution control boards should assess manpower requirement for implementing the waste rules and accordingly, raise a staff dedicated to the implementation and monitoring of waste management activities.

5. Impact

On the receipt of recommendations contained in the Performance audit, the Federal Ministry for Environment and Forest constituted a committee to draw up a road map for the management of waste in India. The terms of reference of the Committee is to make recommendations for evolving a policy and mechanisms for effective implementation and monitoring of waste in India keeping in view the recommendations made in the Performance audit. The Committee consists of senior officials of the Government involved in waste management, Federal Pollution Control Board, representatives from Non-Governmental Organisations, and eminent persons in the field of waste management. A representative of the C&AG was also invited to attend the meetings. Committee made more than 100 recommendations which are being put into practice now. The impacts were:

- Rules were revised: Biomedical waste rules, municipal solid waste rules revised
- New rules: E waste management rules introduced
- Bodies set up: Advisory bodies now set up for advising on better management of waste
- New methodology introduced: city plans drawn up with site for landfills as well as plans for processing of waste

6. Challenges and barriers

Some of the challenges faced were:

- Waste management systems was very dispersed, with each state adopting a different practice. To understand the accountability relationships and responsibility centers was time consuming.
- There were more than 100 audit personnel who were conducting this audit simultaneously. It was a challenge to coordinate their efforts and manage effectively the teams which were in the field level, going to municipalities and hospitals to collect records. Use of standardized audit questionnaires gave a quality assurance as well as help build standardization into the reporting mechanism and increased the control over the audit teams.
- Collating their results and writing the report was also a challenging due to the huge amount of data generated during the course of this audit.
- There were no rules for the management of waste like e waste, packaging waste etc., so fixing audit criteria was difficult.

We overcame these by holding a capacity building sessions for the whole team before audit, also through mid-term reviews and regular assessment of quality of audit work. Problems of criteria were worked out in consultation with MoEF by using international best practices/international accords which India is a signatory to.