

MINIMAL NATIONAL STANDARDS FOR SOLID WASTE MANAGEMENT

Decision makers face environmental, technological, economical, and political constraints in setting environmental standards. Environmental standards are set to protect the environment from the negative effects of anthropogenic activities. However, other considerations must be taken into account to ensure successful implementation. For example, technology should be available to treat the waste as per the regulations and the standards should make economic sense for the industry to follow. Current environmental legislation in different countries is guided by their own set of principles. The following table summarizes the key features of some current guiding principles for setting environmental standards. The prudence avoidance principle has been adopted in Australia, Sweden, and several US states).

Different principles of setting environmental standards

Principle	Features
“Safe” Levels	<ul style="list-style-type: none"> • Pollutant levels are set to levels deemed to be safe • Definition of “safe” not defined • Aspires to maximum safety benefit without regard to cost
Prudent Reduction	<ul style="list-style-type: none"> • A particular pollutant level is set at some “worthwhile” reduction from present levels • There is recognition that a “safe” level may not be identifiable
Precautionary Principle	<ul style="list-style-type: none"> • Broadly applied general principle • Recommendation to consider action to avoid possible harm even if it is not certain to occur (WHO) • High level of protection taking into account the diversity of situations in the various regions of the Community (under the context that the principle is formally a part of EU law) • Take action to avoid potentially damaging impacts of substances that are persistent, toxic and liable to bioaccumulate even where there is no scientific evidence to prove a causal link between emission and effects
Best Available Technology Not Entailing Excessive Cost (BATNEEC)	<ul style="list-style-type: none"> • Recognizes that if a “safe” level exists it is likely to be too costly to achieve • The cost of standard is clear and reasonable • Technology should be “best” at preventing pollution and “available” to operator of activity concerned (“The effectiveness of policy instruments for energy-efficiency improvement”)
As Low As Reasonably Achievable (ALARA)	<ul style="list-style-type: none"> • Broadly applied general principle • Any procedures for controlling pollutant levels should employ the latest and best technological aids to achieve outcomes that are ALARA • ALARA levels are implied to ensure safe or prudent levels and that more than this cannot be expected from the pollutant • Major application in radiation risk and protection

The minimal national standards for waste disposal are made so as to protect human health and the environment from the potential hazards of waste disposal, conserve energy and natural resources, reduce the amount of waste generated, and ensure that wastes are managed in an environmentally sound manner. The following parameters may be considered.

S.no	Parameters	Compliance criteria
1.	Collection of municipal solid wastes	<p>1. Littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. To prohibit littering and facilitate compliance, the following steps shall be taken by the municipal authority, namely :-</p> <p>i. Organising house-to-house collection of municipal solid wastes through any of the methods, like community bin collection</p>

		<p>(central bin), house-to-house collection, collection on regular pre-informed timings and scheduling by using bell ringing of musical vehicle (without exceeding permissible noise levels);</p> <p>ii. Devising collection of waste from slums and squatter areas or localities including hotels, restaurants, office complexes and commercial areas;</p> <p>iii. Wastes from slaughter houses, meat and fish markets, fruits and vegetable markets, which are biodegradable in nature, shall be managed to make use of such wastes;</p> <p>iv. Bio-medical wastes and industrial wastes shall not be mixed with municipal solid wastes and such wastes shall follow the rules separately specified for the purpose;</p> <p>v. Collected waste from residential and other areas shall be transferred to community bin by hand-driven containerised carts or other small vehicles;</p> <p>vi. Horticultural and construction or demolition wastes or debris shall be separately collected and disposed off following proper norms. Similarly, wastes generated at dairies shall be regulated in accordance with the State laws;</p> <p>vii. Waste (garbage, dry leaves) shall not be burnt;</p> <p>viii. Stray animals shall not be allowed to move around waste storage facilities or at any other place in the city or town and shall be managed in accordance with the State laws.</p> <p>2. The municipal authority shall notify waste collection schedule and the likely method to be adopted for public benefit in a city or town.</p> <p>3. It shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority.</p>
2.	Segregation of municipal solid wastes	<p>In order to encourage the citizens, municipal authority shall organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials.</p> <p>The municipal authority shall undertake phased programme to ensure community participation in waste segregation. For this purpose, regular meetings at quarterly intervals shall be arranged by the municipal authorities with representatives of local resident welfare associations and non-governmental organizations.</p>
3.	Storage of municipal solid wastes	<p>Municipal authorities shall establish and maintain storage facilities in such a manner as they do not create unhygienic and insanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely :-</p> <p>i. Storage facilities shall be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility shall be so placed that it is accessible to users;</p> <p>ii. Storage facilities to be set up by municipal authorities or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable</p>

		<p>and user-friendly;</p> <p>iii. Storage facilities or bins shall have easy to operate design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black;</p> <p>iv. Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers.</p>
4.	Transportation of municipal solid wastes	<p>Vehicles used for transportation of wastes shall be covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering. The following criteria shall be met, namely:-</p> <p>i. The storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing;</p> <p>ii. Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.</p>
5.	Processing of municipal solid wastes	<p>Municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize burden on landfill. Following criteria shall be adopted, namely:-</p> <p>(i) The biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified in Schedule-IV;</p> <p>ii. Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorisation.</p>
6.	Disposal of municipal solid wastes	<p>Land filling shall be restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, land-filling shall be done following proper norms. Landfill sites shall meet the specifications as given in Schedule</p>

Specifications for Landfill Sites

Site Selection

1. In areas falling under the jurisdiction of Development Authorities, it shall be the responsibility of such Development Authorities to identify the landfill sites and hand over the sites to the concerned municipal authority for development, operation and maintenance. Elsewhere, this responsibility shall lie with the concerned municipal authority.

2. Selection of landfill sites shall be based on examination of environmental issues. The Department of Urban Development of the State or the Union territory shall co-ordinate with the concerned organisations for obtaining the necessary approvals and clearances.
3. The landfill site shall be planned and designed with proper documentation of a phased construction plan as well as a closure plan.
4. The landfill sites shall be selected to make use of nearby wastes processing facility. Otherwise, wastes processing facility shall be planned as an integral part of the landfill site.
5. The existing landfill sites which continue to be used for more than five years, shall be improved in accordance of the specifications given in this Schedule.
6. Biomedical wastes shall be disposed off in accordance with the Bio-medical Wastes (Management and Handling) Rules, 1998 and hazardous wastes shall be managed in accordance with the Hazardous Wastes (Management and Handling) Rules, 1989, as amended from time to time.
7. The landfill site shall be large enough to last for 20-25 years.
8. The landfill site shall be away from habitation clusters, forest areas, water bodies monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.
9. A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Departments land-use plans.
10. Landfill site shall be away from airport including airbase. Necessary approval of airport or airbase authorities prior to the setting up of the landfill site shall be obtained in cases where the site is to be located within 20 km of an airport or airbase..

Facilities at the Site

11. Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
12. The landfill site shall be well protected to prevent entry of unauthorised persons and stray animals.
13. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.
14. The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
15. Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.
16. Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.
17. Safety provisions including health inspections of workers at landfill site shall be periodically made.

Specifications for land filling

18. Wastes subjected to land filling shall be compacted in thin layers using landfill compactors to achieve high density of the wastes. In high rainfall areas where heavy compactors cannot be used alternative measures shall be adopted.
19. Wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material till such time waste processing facilities for composting or recycling or energy recovery are set up as per Schedule I.

20. Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage berms shall be constructed to divert run-off away from the active cell of the landfill.
21. After completion of landfill, a final cover shall be designed to minimize infiltration and erosion. The final cover shall meet the following specifications, namely :--
 - a. The final cover shall have a barrier soil layer comprising of 60 cms of clay or amended soil with permeability coefficient less than 1×10^{-7} cm/sec.
 - b. On top of the barrier soil layer there shall be a drainage layer of 15 cm.
 - c. On top of the drainage layer there shall be a vegetative layer of 45 cm to support natural plant growth and to minimize erosion.

Pollution prevention

22. In order to prevent pollution problems from landfill operations, the following provisions shall be made, namely :-
 - a. Diversion of storm water drains to minimize leachate generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy conditions;
 - b. Construction of a non-permeable lining system at the base and walls of waste disposal area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous materials (such as aerosols, bleaches, polishes, batteries, waste oils, paint products and pesticides) minimum liner specifications shall be a composite barrier having 1.5 mm high density polyethylene (HDPE) geomembrane, or equivalent, overlying 90 cm of soil (clay or amended soil) having permeability coefficient not greater than 1×10^{-7} cm/sec. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer;
 - c. Provisions for management of leachates collection and treatment shall be made. The treated leachates shall meet the standards specified in Schedule- IV;
 - d. Prevention of run-off from landfill area entering any stream, river, lake or pond.

Water Quality Monitoring

23. Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept in record for future reference. The ground water quality within 50 metres of the periphery of landfill site shall be periodically monitored to ensure that the ground water is not contaminated beyond acceptable limit as decided by the Ground Water Board or the State Board or the Committee. Such monitoring shall be carried out to cover different seasons in a year that is, summer, monsoon and post-monsoon period.
24. Usage of groundwater in and around landfill sites for any purpose (including drinking and irrigation) is to be considered after ensuring its quality.

Ambient Air Quality Monitoring

25. Installation of landfill gas control system including gas collection system shall be made at landfill site to minimize odour generation, prevent off-site migration of gases and to protect vegetation planted on the rehabilitated landfill surface.
26. The concentration of methane gas generated at landfill site shall not exceed 25 per cent of the lower explosive limit (LEL).
27. The landfill gas from the collection facility at a landfill site shall be utilized for either direct thermal applications or power generation, as per viability. Otherwise, landfill gas shall be burnt (flared) and shall not be allowed to directly escape to the atmosphere or for illegal tapping. Passive venting shall be allowed if its utilization or flaring is not possible.

28. The ambient air quality monitoring shall be carried out by the concerned authority as per the following schedule, namely:-
- (a) Six times in a year for cities having population of more than fifty lakhs;
 - (b) Four times in a year for cities having population between ten and fifty lakhs;
 - (c) Two times in a year for town or cities having population between one and ten lakhs.

Plantation at Landfill Site

29. A vegetative cover shall be provided over the completed site in accordance with the and following specifications, namely :-
- (a) Selection of locally adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow;
 - (b) The plants grown be such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilised;
 - (c) Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition;
 - (d) Plantation to be made in sufficient density to minimize soil erosion.

Closure of Landfill Site and Post-care

30. The post-closure care of landfill site shall be conducted for at least fifteen years and long term monitoring or care plan shall consist of the following, namely :-
- (a) Maintaining the integrity and effectiveness of final cover, making repairs and preventing run-on and run-off from eroding or otherwise damaging the final cover;
 - (b) Monitoring leachate collection system in accordance with the requirement;
 - (c) Monitoring of ground water in accordance with requirements and maintaining ground water quality;
 - (d) Maintaining and operating the landfill gas collection system to meet the standards.
31. Use of closed landfill sites after fifteen years of post-closure monitoring can be considered for human settlement or otherwise only after ensuring that gaseous and leachate analysis comply with the specified standards.

Special provisions for hilly areas

32. Cities and towns located on hills shall have location-specific methods evolved for final disposal of solid wastes by the municipal authority with the approval of the concerned State Board or the Committee. The municipal authority shall set up processing facilities for utilization of biodegradable organic wastes. The inert and non-biodegradable waste shall be used for building roads or filling-up of appropriate areas on hills. Because of constraints in finding adequate land in hilly areas, wastes not suitable for road-laying or filling up shall be disposed of in specially designed landfills.

Standards for Composting, Treated Leachates and Incineration

- 1. The waste processing or disposal facilities shall include composting, incineration, pelletisation, energy recovery or any other facility based on state-of-the-art technology duly approved by the Central Pollution Control Board
- 2. In case of engagement of private agency by the municipal authority, a specific agreement between the municipal authority and the private agency shall be made particularly, for supply of solid waste and other relevant terms and conditions.
- 3. In order to prevent pollution problems from compost plant and other processing facilities, the following shall be complied with, namely :-

- i. The incoming wastes at site shall be maintained prior to further processing. To the extent possible, the waste storage area should be covered. If, such storage is done in an open area, it shall be provided with impermeable base with facility for collection of leachate and surface water run-off into lined drains leading to a leachate treatment and disposal facility;
- ii. Necessary precautions shall be taken to minimise nuisance of odour, flies, rodents, bird menace and fire hazard;
- iii. In case of breakdown or maintenance of plant, waste intake shall be stopped and arrangements be worked out for diversion of wastes to the landfill site;
- iv. Pre-process and post-process rejects shall be removed from the processing facility on regular basis and shall not be allowed to pile at the site. Recyclables shall be routed through appropriate vendors. The non-recyclables shall be sent for well designed landfill site(s).
- v. In case of compost plant, the area shall be provided with impermeable base. Such a base shall be made of concrete or compacted clay. The base shall be provided with 1 to 2 per cent slope and circled by lined drains for collection of leachate or surface run-off;
- vi. Ambient air quality monitoring shall be regularly carried out particularly for checking odour nuisance at down-wind direction on the boundary of processing plant.