

Municipal Solid Waste Management Plan for Sikkim



**Urban Development and Housing Department
Government of Sikkim
Gangtok**

1. Background of Existing Solid Waste Management and its Status

Although Sikkim has urban local bodies in the capital city Gangtok, and six other major towns of the state, these bodies were constituted barely five years ago. Therefore, management of municipal solid waste by the ULBs in their respective areas is still in a nascent stage. The Gangtok Municipal Corporation (GMC) has formulated a Solid Waste Action Plan for Gangtok and its peripheries which is being implemented under the SIPMIU Project, being aided by the ADB. The other ULBs, on the other hand are managing municipal solid waste in their respective areas through periodic collection and transportation to the dumpsites. As such these ULBs do not have the full fledged capacity or infrastructure to manage the waste in their respective areas.

Presently Sikkim in its entirety, due to rapid urbanization and changing lifestyles is generating about 63,700 tonnes of solid waste every year. Further, due to intermittent driving forces such as tourism, about 210 tonnes per year of solid waste is added to the existing waste generation quantum in the tourist destinations.

Although the ULBs in Sikkim spend a sizeable portion of the municipal budget on cleanliness of towns, they are unable to provide effective services in the MSW management sector. The MSW generation estimates are normally based on the capacity of bins or the garbage collection utility vehicles.

The Urban Development & Housing Department UDHD is the primary agency responsible for the town development and management matters, including the physical planning, growth management and the provision and management of core civic services. There is an inadequate implementation of the building regulations that has led to regional imbalances in terms of civic facilities and infrastructure development. Growth trends are estimated to continue concentrating on the major towns which will lead to the aggravation of the imbalance in the already hard pressed civic facilities.

Unplanned urban expansion has strained the State resources. In Gangtok, the capital city, an estimated 50 MT of solid waste is generated daily in the Gangtok Municipal Area. In certain areas the curb-side collection is prevalent. Though GMC is primarily responsible for collection, transportation and disposal of the solid waste, collection and transportation of waste is being handled privately in certain small, organized areas. Burning the waste and dumping into the jhoras in peripheral areas is not uncommon.

1.1 Number of Urban Bodies Constituted in the State of Sikkim

A total of seven ULBs have been constituted in Sikkim in the towns of Gangtok, Rangpo, Singtam, Mangan, Gyalshing, Jorethang and Namchi.

1.2 Current status of Municipal Solid Waste Management

Currently, among the ULBs, two wards in East District have begun with source segregation of MSW after rigorous training and IEC activities, cluster-wise in a phased manner. Separate bins are provided to residents for source segregation being executed by Community motivators. The waste thus segregated is being taken to the landfill site where degradable discards are being composted while non-degradable items are being recycled

through scrap dealers. The management of MSW in 8 wards has already been outsourced to NGOs with GMC exercising stringent monitoring on a regular basis. The MSW of these wards is being collected and transported to the dumpsite at Martam which is being converted into a sanitary landfill under the afore-mentioned SIPMIU project.

In North District, under Mangan Nagar Panchayat, all the vegetable waste of the marketing centre is being turned into compost through the Organic Waste Converter that has been installed by the ULB.

MSW from South and West Districts is being collected and sent to MSWTF under construction at Sipchu, West Sikkim, being constructed with funds received from the CPCB.

1.3 Quantity of Municipal Solid Waste generated daily from each town

The quantification of waste generation for Gangtok city has been worked out as per the sampling methodology in accordance with the SWM, CPHEEO Manual (*DPR on SWM for Gangtok under NERCCDIP, MoUD*). Furthermore, the quantum of per capita waste generation for **Class I, IV, V & VI** towns as per Census 2011 has been taken as an average count of wastes generated from residential households, commercial establishments, markets, construction etc.

Estimation of per capita waste generation (household and other sources) of towns in Sikkim based on the 2011 Census data can be seen in the table below:

Sl.No	Town	HH	Population	Average/ capita generation (gms/day)	Total (Tonnes /day)
01	Mangan NP	1054	4644	400	1.85
02	Gyalshing NP	881	4013	400	1.60
03	Nayabazaar NTA	252	1235	400	0.50
04	Namchi MC	2733	12190	450	5.50
05	Jorethang NP	2107	9009	450	4.00
06	Gangtok MC	23773	100286	500	50.10
07	Singtam NP	1144	5868	450	2.64
08	Rangpo NP	2505	10450	450	4.70
09	Rhenock CT	1269	5883	450	2.65

CLUSTER PLAN OF MSW MANAGEMENT FOR URBAN CENTRES

In every urban centre, MSW will be managed by dividing wards into clusters. Each cluster will comprise not more than 50-60 households, the demarcation of clusters will be so made as to suit the landscape specifications that would facilitate collection & transportation of waste. **The prevalent cluster model in two wards of East District where source segregation at household level has been introduced will be emulated in other towns as well.** ULBs will take care of MSW collection, transportation, storage right up to the disposal at landfill level. Community Collection Centres (for segregated dry waste as well as compost made at the household level) will be set up in every ward. Community composting / biogas units will also be taken up at these Collection Centres wherever

deemed feasible. **However, prior to introducing the hardware and infrastructure, the software must precede it in terms of rigorous IEC & Awareness Campaigns.** This cluster approach will be adopted in all ULBs.

Disposal of waste at cluster level

- ULBs shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize the burden on landfills.
- The biodegradable wastes shall be processed by composting, vermin composting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes, at source to the extent possible and thereafter at the community level.
- Landfilling shall be restricted to non-recyclable, residual and inert wastes that are unsuitable for either recycling or for biological processing.

Furthermore, the MSW bio-degradable & non-degradable, emerging out of all marketing centres (primarily sabzi mandis) will also get linked to these Community Collection Centres. Alternatively, Biogas units of varying capacities based on waste quantum will be installed at these marketing centres for managing vegetable waste as to treat it at source and avoid burdening the community collection centres. These units will be maintained and manned by the shopkeepers & immediate stakeholders.

2. Initiatives in municipal SWM under Government of Sikkim

The Government of Sikkim is amongst the first state of the country to successfully enforce a total ban on the use of polythene bags. The State has also (i) passed the **Non – biodegradable Garbage (Control) Rules in 1997** to minimize the generation of such waste as also its indiscriminate dumping on roads, streets and in jhoras and (ii) installed a **Compost plant at Martam** to dispose the biodegradable waste which has been recently revived following a period of inoperation, thereby reducing the waste generation for disposal. (iii) Further, processes have been initiated to **impose bans on use of disposable items** like styrofoam and plastic plates, cups, spoons etc. along with other non-recyclable waste such as flex banners/hoardings/signposts in order to reduce waste at source. Burning of agricultural waste, leaves, litter, paper waste and garbage has been prohibited vide **Notification No. 196/FEWMD, dated 5/1/15.**

3. Management Principles

3.1 Effective segregation, collection and transportation

The most important components of the MSW operations namely segregation, collection, transportation and storage of waste, require active involvement of the government bodies, private operators, community, NGOs, CBOs etc., besides introduction of equipment and vehicles for efficient management of waste. **However, the key component would be awareness creation and changing the mindset of the people in their current attitude/perception of waste which is important for developing and creating a healthy environment. The mechanism to be adopted will be as per zero waste concepts.**

For effective segregation, collection and transportation, the municipal waste management will be based on the following important principles:

- Effective & efficient source segregation, collection, transportation
- Maximum resources recovery
- Effective treatment
- Safe disposal
- To avoid manual handling of waste and also minimize multiple handling by adopting state of the art modern SWM vehicles and equipments suitable to hilly terrain.
- Developing of skills and mechanisms in waste collection of the “waste collection crew” which are humane and dignified.

3.2 Collection and segregation at each town

- ULBs will provide daily waste collection service to all households, shops and establishments for the collection of segregated bio-degradable waste due to its putrescible nature. This service must be reliable and regular. The practice of segregation of waste at source will be ensured through different category bins such as degradable, non-degradable, hazardous so as to prevent the discards from reaching the waste stream and facilitate material recovery by means of composting and recycling. Door-to-door collection with community participation on cost recovery basis will be organized by ULBs. In case of difficult household locations where households do not have vehicle accessibility, composting of segregated kitchen waste will be taken up at the household level itself which will not necessitate daily collection while dry waste can be stored category-wise and handed over to the Community Collection Centres on a periodic basis. ULBs will however ensure thorough sensitization of the community and follow it up with constant monitoring.
- Recyclable material can be collected at longer regular intervals as may be convenient to the waste producer and the waste collector, as this waste does not normally decay and hence need not be collected daily.
- Domestic hazardous waste is produced occasionally. Such waste can be collected periodically, however the waste producers need to be advised / directed to store them separately.
- Collection of waste can be done by:
 - Municipal workers themselves
 - Contracting the collection of wastes to a competent organization
 - Privatizing through ragpickers and scrap dealers or any suitable agencies.

It is also important to keep all the roads, lanes and surroundings clean. In order to cater to the needs of tourist/ floating population in and around major centers and market areas, taxi stands, bus stand, parking lots, shopping areas, adequate number of bins with lids (separate compartments for different waste type) will be made available by ULBs. These bins will be emptied by municipal workers attending to primary collection in the respective areas and linked to the community collection centers set up in respective wards.

Waste collectors will be organised with the assistance of NGOs for achieving segregation of waste. Kabadiwallas and recycling industries will be encouraged to maximize reuse & recycling of dry waste.

Publicity campaign for creating Community Awareness and Public Participation (CAPP) for segregation of waste will be carried out and continued to achieve segregated biodegradable waste for composting and minimizing the waste for final disposal.

3.3 *Procedure of collection:*

- All clusters will be manned with adequate number of sanitary workers with requisite facilities. Vehicles (large and small) as per town size will be provided for collection bearing separate compartments / bins to carry the segregated waste. Every collection time will be announced by an audible bell.
- Wherever the vehicle is not accessible, composting at the household level will be followed for degradable waste while the recyclables could be deposited periodically (since it does not necessitate daily collection) in Community Collection Centres provided by the ULBs. These community centres are also to be manned by sanitation workers. Since recyclable waste has a value, the proceeds from such sales will be rolled back into the ULB revenue for further financial strengthening and sustainability.

3.4 *Other responsibilities and transportation*

- The local bodies will identify the Resident Committees ward-wise, in each Ward and shell out the responsibility of managing the Collection Vehicle for Door to Door collection.
- The Resident Committee will engage the Collection crew and the Driver for Door to Door collection of waste in their respective wards.
- The collection vehicle will collect the waste by covering the entire ward in a day.
- The collection vehicle after it has reached its full capacity will transport the waste to the Community Collection Centres.
- The local bodies will depute Sanitation Supervisors at every cluster to supervise the collection efficiently. Also they will coordinate and communicate among each other and the drivers of the collection vehicle and the Community Collection Centres in-charge to know the movement of these vehicles so as to effectively and economically lift and transport the garbage.
- Waste compactors will be installed district-wise in the main towns at the collection centres from where the waste can be recycled / disposed to landfill.

Vehicles with hydraulic system will be introduced to achieve hygienic garbage handling in larger towns.

3.5 Regulatory measures

Solid waste management practices can never reach the desired level of efficiency until the public participates and discharges its obligation religiously. In order to improve solid waste management practices in urban areas, it is planned to incorporate suitable provisions in the state law to ensure public participation and providing for minimum level of solid waste management.

The following will be regulated by ULBs by stringent law and vigilance monitoring for all the waste generators including households, restaurants, hotels, shops, offices, institutions:

- i. To make segregation at source compulsory to all Households, commercial spaces (hotels, shops, markets), Institutional premises (school, colleges, offices)
- ii. Residents will be asked to deposit segregated waste to Door to Door Collection Vehicle on time. They shall not throw any solid waste in their neighbourhood, on the street, jhoras, open spaces and into vacant plots or into drains. Punishment will be meted out to those who litter and dispose waste on streets etc.
- iii. They shall keep the kitchen discards (food waste) as and when generated, in any type of domestic waste container and (a) hand over to the waste collector daily or (b) compost it at the household itself using suitable technology provided by the ULBs. They shall keep Dry/recyclable waste preferably in bags or sacks in a segregated manner to be transported to Community Collection Centres periodically.
- iv. They shall not dispose off wet waste in plastic or any other carry bags.
- v. They will keep domestic hazardous waste separately, for disposal at designated place arranged by ULBs. Domestic hazardous/ toxic waste material will be deposited in special bins (provided by the local body at specific designated places in the towns) at the Community Collection Centres. These hazardous waste will be taken eventually to the landfill. This would facilitate maintaining hygienic condition and easy handling of the waste for further processing and proper disposal.
- vi. Authorized bodies will be appointed by ULBs to provide uniforms, identity cards and protective equipment for sanitation workers and waste collectors.
- vii. Societies/Associations/Management of commercial complexes will be responsible for keeping their premises clean.

3.6 Maximum Resource Recovery

The 'Hierarchy of Waste Management' gives a priority listing of the waste management options and indicates important general guidelines on the relative desirability of the different management options. The hierarchy will be adopted and will aim at:

- waste minimization/reduction at source
- recycling
- waste processing – with recovery of resources i.e. material (products) and energy

THE FIRST STEP TO WASTE MANAGEMENT IS WASTE REDUCTION

Reduction at source is the first in the hierarchy because it is the most effective way to reduce the quantity of waste, the cost associated with its handling, and its environmental impacts.

3.7 *Effective treatment and Safe Disposal*

Wastes are either burnt or dumped in open spaces and these practices will be abolished as they are deleterious to health and the environment. Landfilling occupies the lowest rung in the integrated waste management, though it is a better option than dumping the waste in open spaces. It relies on containment rather than treatment (for control) of wastes. The purpose of landfilling is to bury or alter the chemical composition of the wastes so that they do not pose any threat to the environment or public health. Landfills are not homogenous and are usually made up of cells in which a discrete volume of waste is kept isolated from adjacent waste cells by a suitable barrier. Commonly used barrier is a layer of natural soil (clay), which restricts downward or lateral escape of the waste constituents or leachate. Sanitary landfilling normally has a double liner to prevent leaching into the groundwater. Appropriate run-off controls, leachate collection and treatment, liners for protection of the groundwater (from contaminated leachate), biogas recovery mechanism (landfill gas contains high percentage of methane due to anaerobic decomposition of organic wastes), monitoring wells, and appropriate final cover design constitute integral components of an environmentally sound sanitary landfill. Proper and regular monitoring will be done at landfill sites. All these steps will be ensured in the landfills. **Landfills shall be constructed in accordance with the provision contained in the Municipal Solid Waste (Management & Handling) Rules, 2000.**

In the context of Sikkim, where the ecosystem is fragile and the geographical terrain is highly challenging, the setting up of landfills will be in consonance with these hilly and mountainous terrain conditions as to avoid leaching into the river, streams and water bodies as to not contaminate them.

4. Vegetable and Fruit Markets waste collection centres (Rural Marketing Centres)

These markets produce large volumes of solid waste and local bodies will direct the association of the market to provide large size containers which match with the transportation system of the local body or depending on the size of the market, local body itself may provide large size containers with lids for storage of segregated market waste in separate bins at suitable locations within the marketing centres, floor-wise on full cost / partial cost recovery from the market association. This will also be applicable

during **haat** days when the production volume of waste would be much higher. The following alternatives will be adopted for managing such wastes in order to manage the waste at source.

- On-site bio-digesters/composters for vegetable and fruit market waste will be encouraged.
- The waste from fruit and vegetable processing industries can be used for production of biogas. Biogas is produced by anaerobic digestion of fruit and vegetable wastes. The conversion of fruit and Vegetable Wastes to biogas using anaerobic digestion process is a viable and commercial option.

5. Marriage Halls/ Community Halls

- A lot of waste is generated when marriage or social functions are performed at these places and unhygienic conditions are created. ULBs will assigned the task of managing such waste to the committees/ associations/ societies who run these halls. During every function the waste will be collected in a segregated manner in various bins that will contain waste of all categories separately. The waste thus collected will be transported to the Community Collection Centres set up by the ULBs.
- Special arrangement will be made for collection of waste from marriage halls, community halls, puja halls etc. whenever these halls are used, on a full-cost recovery basis. The cost of such collection could be built into the charges for utilizing such halls. This service may be provided preferably through a contractor or departmentally as the local bodies deem fit. On-site, processing of food wastes by bio- methanation and composting may be encouraged.
- Further, since many wedding receptions are held in hotels and private homes, direct collection of waste from homes, hotels, restaurants, party halls etc., will be managed by local bodies. Separate vehicles (existing) with adequate crew will be provided for the purpose and the collection will be carried out on a fixed daily schedule; waste will be directly transported to disposal site. Existing waste transport vehicles available will be utilized to the maximum extent.

6. Hospitals/ Pathological Labs/Health Care Centres (PHCs, PHSCs)

These establishments produce bio-medical as well as ordinary waste. They will be directed that:

- They shall refrain from throwing any bio-medical waste on the streets or open spaces, as well as into municipal dustbins or domestic waste collection sites.
- They shall also refrain from throwing any ordinary solid waste on footpaths, streets or open spaces.

- They are required to store waste in colour-coded bins or bags as per the directions of the Govt. of India, **Ministry of Environment Bio-Medical Waste Management & Handling Rules, 1998** and follow the directions of CPCB and SPCB from time to time for handling, transportation, treatment and disposal of bio-medical waste.

7. Construction and Demolition waste

Directions will be given that:

- No person shall dispose of construction waste or debris on the streets, public spaces, footpaths or pavements.
- Till finally removed construction waste shall be stored only within the premises of buildings, or in containers where such facility of renting out containers is available. In exceptional cases where storage of construction waste within the premises is not possible, such waste producers shall take prior permission of the local authority or the State Government as may be applicable for temporary storage of such waste and having obtained and paid for such permission, may store such waste in a way that it does not hamper the traffic, the waste does not get spread on the road and does not block surface drains or storm water drains/jhoras.
- To facilitate the collection of small quantities of construction and demolition waste generated in urban centres, suitable sites may be identified in various parts of the city and people notified to deposit small quantities of construction and demolition waste. Containers could be provided at such locations and small collection charge levied for receiving such waste at such sites and for its onward transportation. Rates may be prescribed for such collection by local bodies. Contracts could also be given for managing such sites.
- Local bodies will prescribe the rate per tonne for the collection, transportation, and disposal of construction waste and debris and notify the same to the people.
- Every person who is likely to produce construction waste may be required to deposit with the concerned local body an approximate amount in advance at the rates as may be prescribed by the local body from time to time, for the removal and disposal of construction waste from his premises by the local body. Such amount may be deposited at the time when the building permission is being sought and in cases where such permission is not required, at any time before such waste is produced.
- The charges for removal of construction waste to be doubled for those who fail to deposit the amount in advance.
- Large local bodies may provide skips (large containers) to the waste producers on rent for the storage of construction waste so that double

handling of the waste can be avoided or use front end loader & trucks to pick up such waste. In small towns this may be done manually using trucks, tractors and manpower.

8. Garden waste

- Private gardens will as far as possible compost and re-use all plant wastes on-site. Where it is not possible to dispose of garden waste within the premises and the waste is required to be disposed outside the premises, it will be stored in large bags or bins on-site and transferred into a municipal system on a weekly basis. The generation of such waste will as far as practicable be regulated in such a way that it is generated only a day prior to the date of collection of such waste. It will be stored in the premises and kept ready for handing over to the municipal authorities or the agency that may be assigned the work of collection of such waste.
- Garden waste and fallen leaves from avenue trees within large public parks and gardens will be composted to the extent possible. However, if such waste has to be disposed of, large skips may be kept, which match with the municipal transportation system for transportation of such waste. Such skips may be provided by local bodies or State Governments owning such parks and gardens. In case of private parks and gardens they will make their own storage arrangement which matches with the municipal primary collection and transportation system.
- The waste stored in public and private parks, gardens, lawn plots etc. will be collected on a weekly basis by arranging a rotation for collecting such waste from different areas, on different days to be notified to the people to enable them to trim the trees and lawns accordingly and keep the waste ready. This waste may be got collected through a contractor or departmentally as deemed appropriate by the urban local authorities. Cost recovery may be insisted upon, based on the volume of waste collected.

9. Slaughter house waste

In slaughter house operations, the waste generated is of liquid and solid nature. The liquid waste will be washed away by safe potable and constant supply of fresh water at adequate pressure throughout the premises of slaughtering. The waste water from slaughter house is heavy in pollution and, therefore, it will not be allowed to mix with the municipal drain system without pre-treatment meeting sewage standards as per the Water (Prevention & Control of Pollution) Act, 1974.

- At each slaughter house adequate tools will be provided for de-hiding of the animals, hides and skins will be immediately transported out of the slaughtering area in a closed wheel-barrow or similar other devices. In no case the hides and skins will be spread on the floor of the slaughtering area for inspection. Legs,

bones, hooves etc. will also be removed immediately from the slaughtering area through a spring load floor chute or closed wheel-barrow.

- At slaughter houses adequate compartments for immediate separation and disposal of condemned material must be provided
- Slaughtering of animals generates wastes consisting of non edible offal (like lungs, large intestines, various glands, animal tissues, organs, various body parts, etc.) stomach/intestinal contents, dung, sludge from waste water treatment, bones, etc. All these types of wastes are required to be disposed by adopting methods like rendering/controlled incineration/burial/composting/anaerobic digestion like biogas etc.
- The slaughter houses are normally controlled by local bodies, which will follow the standards prescribed, but due to non-existence of modernized slaughter houses, environmental pollution arising out of the slaughtering activities cannot be controlled. The local bodies must, therefore, take up modernization of slaughter houses and achieve the pollution control norms.

10. Waste from Melas (fairs)/exhibitions/carnivals/religious festivals/tourist festivals

The prevalent system of observing various kinds of festivals and melas in Sikkim which generate huge volumes of waste that are currently not being managed properly also warrants attention. ULBs will manage the waste emerging out of these festivals by fixing the responsibility on committees/associations/societies and organizers of such events. Regulations will be passed for controlling the usage of disposable items such as Styrofoam/plastic/paper/ plates, cups, spoons which account for a large chunk of the waste. Eco-friendly alternatives like leaf and bamboo based products locally available and compostable will be encouraged. The cost of handling, storage, transportation & treatment of waste during such events will be borne by the organizers.

Furthermore, the current practice of making offerings at religious places of worship in the form food items packaged in multi-layered plastic & aluminium foil which neither has a resale value nor can be recycled and accounts for a major chunk of INERT waste at the landfill will be discouraged. To control this, eco-friendly alternatives such as locally grown food items that can be offered package-free or atleast in packaging that can be recycled.

11. Disposal of waste

Suitable technology or combination of such technologies will be adopted to make use of wastes so as to minimize the burden on landfills.

- The biodegradable wastes will be processed by composting, vermin-composting, aerobic/anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It must be ensured that compost or any other end product will comply with standards. Mixed waste containing recoverable resources will follow the route of recycling or other appropriate technologies.

- Land filling will be restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. Land filling will 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 will also be avoided unless the same is found unsuitable for waste processing.

12. Municipal Solid Waste process and treatment techniques

Current treatment strategies are directed towards reducing the amount of MSW that needs to be land filled, as well as utilizing and recovering the material discards as resources to the largest possible extent. The following methods shall be adopted for managing waste.

12.1 Composting of Biodegradable discards:

Upon source segregation, all degradable discards must be composted at the individual household level / community level. The resource thus recovered shall be used in farming at either the individual or cluster level. Wherever suitable, biogas plants must be installed for recovery of waste through productive usage of methane for cooking and heating purposes.

12.2 Material recovery of recyclable discards:

The recyclable segregated discards shall be recycled through scrap dealers, rag pickers and other unorganized sector. Collection points must be set up at the cluster level to further converge at the central level, ULB-wise. Thereon, the non-recyclables must be sent to state level landfills.

12.3 Management of electronic waste :

All electronic waste collected from offices/homes/commercial spaces etc. must converge at a common collection point district-wise. This collection centre will be provided by the ULBs and the waste so collected will get recycled in collaboration with the e-waste Recycling initiative jointly set up by the State IT Department and GMC, which is already in operation.

13. Ultimate Disposal of MSW-Land Filling

After making several attempts to identify landfill sites, UDHD concluded that it is difficult to get the required landfill area in hilly terrain. However, steps will be taken in setting up appropriate land-fills, such as:

- Landfills comparatively nearer to the towns, which would significantly reduce transportation and O & M cost would be less.
- Ensure they are easy to manage the whole Treatment & Disposal facility in one Complex. Single Leachate Treatment Plant may be utilized for both Landfill & Compost Plant.
- The design requirements for sanitary landfill development are primarily guided by the characteristics of the proposed site and the guidelines framed by the Ministry of Environment and Forests, Government of India. Part II, Section 3, Sub-Section (ii), Rule 6 (1), 6 (3) and 7 (2) of these guidelines indicate that the sanitary landfill will comply.
- Wastes will 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.
- Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil will be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage will be ensured to divert run-offs away from the active cell of the landfill.

Closure of Landfill site and Post - Care

The post-closure care of landfill site will be conducted after fifteen years and long term monitoring to assess;

- Maintaining integrity and effectiveness of final cover and repair required,
- Efficiency of leachate collection system,
- Ground water quality and action required to improve
- Maintenance and operation of gas collection system to meet the standards. The closed landfill may be used for human settlement after 15 years of post-closure care by ensuring gaseous emission and leachate compliance.

14. Financial requisites

Solid waste Management receives a comparatively inadequate share out of the total municipal budget as the municipal agencies assign a low priority to this work resulting in poor services. Today there is an urgent need to overhaul the system by making substantive changes in management & technology, which would inevitably require capital investment for beyond the current budgetary capacity of the municipal agencies Any solid waste management system will require provision of financial resources for its smooth running. The present structure of revenue does not contain any instrument specifically resources for its smooth running. The present structure of revenue does not contain any instrument specifically dedicated to the needs of SWM. It is also obvious that in future the municipal agency will find it increasingly difficult to draw the required amounts from the existing revenue resource. As per the Manual on Solid Waste Management by the Ministry of Urban Development, 2000, the annual requirement of funds for efficient SWM reveals that when the principal of Full Cost Pricing is applied the Total Annual requirements are often

2-3 times the amount being allocated at present. Thus, it is important that the beneficiaries also share the responsibility of waste management following the “Polluters pay principal”. The concerned ULBs will work out the SWM Tax/Cess to be charged from the beneficiaries depending upon their economic status. A provision of cross-subsidy will be included in such exercise. It will be based on the frequency of service, volume/ weight of the waste or combination of both or on family basis. It can be multiplied by a factor based on assessment of location, building value and income of occupant. Separate structure of tariff will have to be specified for community collection system and for house to house collection system. It will also lay down the method of charging and recovery of charges for transportation of acceptable industrial solid waste and demolition waste. There will be a provision for revision of the rates at specific intervals. For specific identified accusations, contracting out of work will be considered. However, such contracts will be performance based and appropriately framed with in-built monitoring and penalty mechanisms.

15. Mobile Sanitation Courts.

It is the tendency of the public to take their civic responsibilities lightly. It is therefore necessary that while on one hand people are motivated to participate effectively in keeping the cities clean, there will be a fear of punishment if they fail to discharge their civic obligations. Provision of Mobile Sanitation Courts is therefore very useful to ensure littering of road and disobedience of other legal provision or orders to improve the sanitary conditions. The mobile sanitation court would be able to recover its full cost from the fines that may be imposed by the court. There is, therefore, no likelihood of any financial burden on the local body.

16. Grievance Redressal

The local body will draw up a citizen’s charter clearly stating what level of service it proposes to provide to the citizens and how soon citizens can expect their grievances to be attended. Sanitation being very vital for health and environment, efficient machinery will be organized by the local body to receive public complaints and attend to them expeditiously. Formats may be prescribed for receiving such complaints, replying to the applicants as soon as the complaints have been redressed and for monitoring the pending complaints.

17 Institutional Mechanism

The fact of ownership has to be settled. With ownership must come the assumption of full responsibility for the long term sustainable performance of the Solid Waste Management System.

The ULBs will be mandated to replace inadequately qualified and inefficient staff with staff necessary to maintain the solid waste management, system. For outsourcing the job, a stringent pre-qualification criterion will be developed for the contractors which inter-alia will include sufficient number of sufficiently qualified persons and the contract agreement will be performance based for which necessary performance indicators will be evolved.

17.1 Management Plan for institutional strengthening

Rules for operation and maintenance of the solid waste management system must be established to keep honest record of specified parameters that refer to the performance of the system including the quality of work performed by each individual. Apart from the enhancement of capacities of ULBs, there will also be additional checks by a local committee of qualified civil society representatives, health officer and officers from other departments who will be empowered to visit and issue a note of caution when any component of SWM system is not working or working inadequately.

17.2 Standardised Procedures

- A Manual of standardized procedures will be established for the activities of the entire MSWM system.
- These procedures will be mandatory and penalties established for each default. The same penalties will apply whether the system is operated directly by a ULB or by an external contractor.
- A surveillance mechanism will be created to **investigate every instance of non-compliance** reported to the ULBs using fast and modern communication means such as SMS by mobile to the authorities as well as cctv installation in areas prone to littering.
- The staff responsible for solid waste management will be professionally qualified and trained.
- The operation manual will be available to each staff.
- Each staff member will be given responsibility in terms of specific activity along with date and time in writing.
- The duty assignment records will be maintained in a Master File which will be checked by officers of Nodal office and State Pollution Control Board on regular basis.
- Training of the MSWM staff will be planned and implemented properly.
- Strict action is required to be taken against the staff in case of default.
- Each staff member will submit a monthly report indicating duty performed by him and how it is matching with the assignment given to him.
- In case of deviation, sufficient reason will be recorded.
- Every ward will be monitored for its cleanliness and satisfaction of the citizen.
- The monitoring results will be completed on monthly basis and submitted to the Nodal office in the form of a monthly report.

- The report will be reviewed by the Nodal Office. In case of any problem in SWM system, the Nodal Officer will discuss it with in-charge of the SWM System and suggest remedial measures.
 - There will be a quarterly meeting of all the in-charges of the all the wards of a town including lower staff to discuss the problems and remedial measures.
- The outcome of the meeting will be recorded in the form of minutes and communicated to State Pollution Control Board within 7 days of the meeting.
- There will be a separate cell in the State Pollution Control Board for monitoring management of MSWM System in the State.
- This cell will constantly interact with the Nodal Officer on performances of MSWM System and other related issue.
- The cell will also conduct vigilance monitoring of the MSW System at least once in a month.
- The monitoring will include checking of ward wise records of the MSW System and their functioning to evaluate their performance and compliance of MSW Rules.
- In case of unsatisfactory observations, the cell will issue notice to the Nodal Officer under EPA, 1986.
- An annual report on the performance of town-wise MSW System record will be prepared and submitted to the State Boards highlighting all the important points including deficiencies and annual expenditure.
- It may be useful to involve local communities in monitoring the functioning of the entire MSWM System.
- It is necessary to have a cadre of professional staff in municipalities headed by technically qualified chief executives for planning and implementation of MSWM System.

Financial Cost estimate for management of MSW for Sikkim:

The cost estimate has been arrived at as per the estimate worked out for the approved DPR for SWM for Gangtok under NERCCDIP, MoUD funded by ADB. The estimate for Gangtok Municipal Corporation under various heads and the landfill for the North-East cluster has been deducted as it has been covered under SWM for Gangtok under NERCCDIP, MoUD funded by ADB.

Sl.No	Particulars for financial requisites	Estimate for North-East Districts in ` lakh	Estimate for South-West Districts in ` lakh
01	Procurement of Primary Collection Vehicles, Household Bins, Push Carts and Litter Bins of Various sizes for Solid Waste Management	450.00	389.52
02	Construction of Land fill, Leachate Treatment Plant, and associated Infrastructure	-NA-	174.39
03	Procurement of Secondary Collection Vehicles, 1100 ltrs capacity Bins, Landfill Vehicles & Equipments Personal Protection Equipments for Solid Waste Management	453.96	420.50
04	O & M cost for SWM activity/year		
	(i) Primary Collection of Waste from Household	20.32	19.74
	(ii) Secondary Collection & Transportation	19.71	19.15
	(iii) SWM facilities Compost Plant and	18.87	18.33
	(iv) Landfill	-NA-	3.94
	(v) Environmental Monitoring	-NA-	1.16
	TOTAL	962.86 (A)	1046.73 (B)
	GRAND TOTAL FOR THE STATE	2010.00 say (rupees two thousand ten lakhs only)	
	(A+B)		