

## Chapter 10



# SOLID WASTE MANAGEMENT

The Government of India, Ministry of Environment and Forests has framed Municipal Solid Waste (Management and Handling) Rules 2000 and notified the same in September, 2000 making it mandatory for all the municipal authorities in the country and those responsible for managing the municipal solid waste in the country to implement the Rules. The Government of Sikkim (State Government) has also passed numerous gazette notifications in respect to the management of Municipal Waste in the State. They are regarding making Sikkim a plastic free state, segregation of waste and handling of waste, making MG Marg a litter and spit free zone etc. Waste generation for the City of Gangtok is

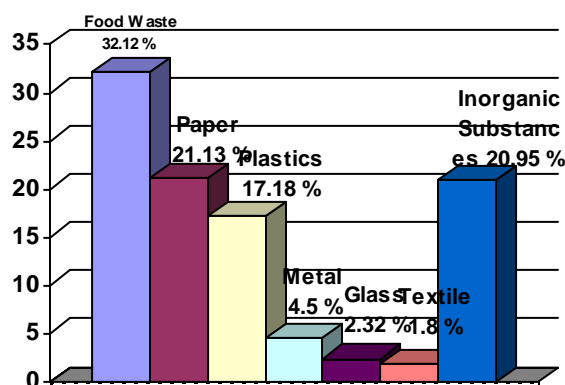
approximately 390 grams/capita/day. This includes all types of wastes such as domestic waste, commercial waste, construction and demolition waste, market waste, street sweepings etc. It is estimated that the waste generation per day in the Gangtok and adjoining area is approximately 45 Metric Tonne per day (MT/day).

A report on the assessment of pollution and formulation of action plan prepared by the State Pollution Control Board, Government of Sikkim gives detail of physical composition and chemical characteristic of waste as shown in the table below:

**Table 10.1 Physical Composition of Waste**

TYPES OF WASTE	% BY WEIGHT
Food Waste	32.12%
Paper	21.13%
Plastics	17.18%
Metal	4.50%
Glass	2.32%
Textile	1.80%
Inorganic Substances	20.95%
Total	100.00%

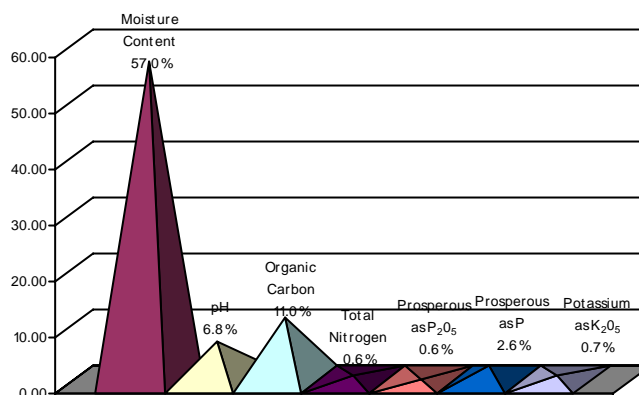
Source: SPCB, Govt. of Sikkim



**Table 10.2 Chemical Characteristics of Waste:**

CHARACTERISTICS	PERCENTAGE
Moisture Content	57.0%
pH	6.8%
Organic Carbon	11.0%
Total Nitrogen	0.6%
Prosperous as P <sub>2</sub> O <sub>5</sub>	6.0%
Prosperous as P	2.6%
Potassium as K <sub>2</sub> O <sub>5</sub>	0.7%

Source: SPCB, Govt. of Sikkim



### ■ Collection and Transportation System

- a. Door to door collections of waste from households accessible by the waste pick up vans.
- b. Collection of waste from the inaccessible areas by the back packers manually up to the road where the pick up vans will collect the waste. The pick up vans are specially designed covered waste collection vehicles that transport 500 to 600 kgs of waste.
- c. All the Pick vans deliver the waste to the transfer station located in a convenient location.
- d. Tipping trucks of about 10 MT pay load transports the waste from the transfer station to the waste management plant located 18 Kms away at Martam.

### ■ Recycling and Systems

A compost plant at Martam 18 Kms from the Gangtok city is designed to handle waste amounting 50 MT/day which covers the entire segregated organic waste generated in Gangtok and the neighboring areas. However, the landfill area that is designed to last for 15 to 20 years may not last that long. Hence, the principles of 3R and waste segregation are a mandatory for effective treatment of waste in this city.

### ■ Public and Private participation in Waste Management

Currently the Public and private partnership has been a viable concept that has been appreciated in most quarters. Our organization is moving towards treatment of waste, regulation of waste and to monitor the performance of certain programme and that of the private sectors. NGO's and local communities have been encouraged by the organization to collect the waste from the households and transfer it to the transfer station. Currently two such NGO's (1. Watson Committee 2. Golden Circe) are engaged in collection of household waste in the designated areas. This has been a successful exercise to some extent and the department is looking at up scaling such partnerships. Now the UD&HD department is poised to launch a more intense public participation and awareness programme under the JNNURM (Jawaharlal Nehru Urban Renewal Mission) that will incorporate the principles of waste segregation and 3R's. Among the many features of this Mission, waste management plays a very pivotal role in development and sustenance of Gangtok city.

### ■ Urbanization in Sikkim

Gangtok at present houses 55.5 % of the urban population of Sikkim. This may be attributed to the disparities in the regional development pattern due to the rapid increase of population in a limited area. As per the 2001 census the population of the town is only 29,354 within the notified town area but it is very apparent that the reasonable town boundaries which is applicable as per the GOS/4D and HD/6(70)2942 dated 23/11/04 is estimated to currently accommodate about 140,000 to 150,000 people. Some features of the rapid urbanization are as follows:

1. At present Sikkim do not have a municipality or an urban local body that looks into the management of the towns. The UD&HD and the PHED are the primary agencies responsible for the town development and management matters, including the physical planning, growth management and the provision and management of core civic services.
2. There is an inadequate implementation of the building regulations that has led to regional imbalances in terms of civic facilities and infrastructure development.
3. 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.
4. The Government of India has launched a JNNURM programme from December 2005 for the next seven years for the improvement and development of city management. Gangtok is one the 63 cities all over India selected for the mission programme.

### ■ BIO-MEDICAL WASTE

The Ministry of Environment & Forest, Govt. of India has notified the Bio-medical waste (Management & Handling) Rules 1998 subsequently amended in March 2000. These rules apply to all persons, who generate, collect, receive, store, transport treat, dispose, or handle Bio-medical waste in any manner. These rules also specify methods of proper treatment and disposal of the wastes and prescribe standards for doing so. The rules have also specified target dates for the setting up of the treatment facilities like incinerators/microwave systems etc.

## INVENTORIZATION OF HOSPITALS IN SIKKIM

The State Pollution Control Board, Sikkim under the project “*Implementation of Acts & Rules other than Air & Water*” till date has surveyed the following hospitals (Table) to understand the present status of handling and disposal practice and to assess the quantum of bio-medical waste generated in the state.

Government Hospitals	Primary Health Centres	Private Hospital	Private Clinics
1. STNM, Gangtok 2. Singtam District Hospital. 3. Namchi District hospital. 4. Gyalshing District hospital. 5. Mangan district hospital.	1. Pakyong, PHC 2. Rhenock, PHC. 3. Rongli, PHC 4. Rangpo, PHC. 5. Jorethang, PHC. 6. Ravangla, PHC. 7. Soreng, PHC.	1. Central Referral Hospital.	1. Ruchi Diagnostics 2. Care Diagnostics

The SPCB has undertaken a centrally sponsored project *Implementation of Acts & Rules other than Air & Water* Acts in Sikkim and accordingly inventorization and assessment of biomedical waste generated in the state of Sikkim was carried out. A total of 5 Government hospitals 7 Government PHCs, 1 private hospital and 2 private clinics were surveyed by the SPCB, Sikkim. The survey was carried out to understand the quantum of bio-medical waste generated and the status of handling and disposal practice of these waste generating bodies.

Table 10.3 Monthly Quantification of Bio-Medical waste			
Sl No.	Hospitals	No. of beds.	Total Waste Kg/Month
1.	Central Referral Hospital	300	939
2.	STNM Hospital	300	9600
3.	District Hospital Singtam	100	683
4.	District Hospital Namchi	120	2055
5.	District Hospital Gyalshing	50	708
6.	Rangpo, PHC	08	855
7.	Soreng, PHC	12	115
8.	Jorethang, PHC	10	75
9.	Pakyong, PHC	10	75
10.	Ruchi Diagonastics	NA	75
11.	Care Diagonastics	NA	75

*Source: SPCB, Govt. Of Sikkim*

It implies that the total bio-medical waste generated by the health care establishments in Sikkim is estimated to be approximate 15,255 kg/month. These establishments were found not following uniform method for the management, handling and disposal of bio-medical waste. Most of these establishments were found to be unaware of the existence of any legislation applicable to hospital waste management; they do not have copies of manual on management and hospital waste or even waste management plan. Most of the personal involved in the management of hospital solid waste are untrained. The two main hospitals the STNM and Central Referral Hospital have incineration facilities and their efficiency needs to be ascertained. The largest volume of bio-medical waste is being generated by STNM hospital 9600 kg/month followed by Namchi District Hospital 2055 kg/month. Even though the Central Referral Hospital and STNM hospital are both 300 bedded Central Referral Hospital generates only 939 kg/month bio-medical waste.

### TRANSPORTATION OF BIO-MEDICAL WASTE

The instruction of Government of India, Ministry of Environment and Forests issued under the Environment Protection Act, 1986 is to be followed and accordingly it may be ensured that the bio-medical waste stored in polythene bags in the hospitals and nursing homes is transported in closed body light motor vehicle depending on number of such establishment to be covered.

**Table 10.4 Comparative account of Districts Hospitals of Sikkim (Management and Handling of Bio-medical Waste)**

Sl. No.	Types of Hospitals/ Health care facility	No. of Beds	Total estimated qty. of waste generated Kg/day	Segregation of waste taking place (yes/no)	Containers/bags used to segregate waste.	Colour coded or labeled containers are used (yes/no)	Persons who handles the segregated waste	Containers or bags used for collection of waste
1	District Hospital Singtam	100	22.75	Yes	Metal Containers	No	Safai Karmachari	Wheel barrows
2	District Hospital Namchi	120	68.5	Yes	Plastic buckets	Yes	Safai Karmachari	Plastic buckets
3	District Hospital Gyalshing	50	20	Yes	Plastic & Metal containers	No	Sweeper	Plastics & Metal containers
4	District Hospital Mangan	50	18	Yes	Plastic buckets	Yes	Sweeper	

Source: SPCB, Govt. of Sikkim

**Table 10.5 Comparative account of Districts Hospitals of Sikkim (Management and Handling of Bio-medical Waste)**

Sl. No.	Type of Hospitals /health care facility	Waste Handlers are provided with protective apparel/gloves during waste handling. (Y/N)	Final disposal of segregated waste.	Person responsible for organization & management of waste (Administrative level)	Aware of any legislation applicable to the Hospital waste management. (Y/N)	Follows any manual or guidance on management of BMW available. (Y/N)	Any Hospital waste management plan? (Y/N)
1.	District Hospital Singtam	Yes, gloves	Open burned/collected by UD & HD vehicles	No designated Person	Yes	No	No
2.	District Hospital Namchi	Yes, gloves	Incinerated/taken to municipal landfill by UD & HD	No	No	Yes	No
3.	District Hospital Gyalshing	Yes, gloves	Buried/taken by UD&HD	CMO, DMO	Yes	Yes	No
4.	District Hospital Mangan	Yes, gloves	Buried/taken by UD & HD	CMO, DMO	Yes	No	No

Source: SPCB, Govt. of Sikkim

Table 10.6 Comparative account of Primary Health Centres of Sikkim (Management and Handling of Biomedical Waste)

Sl.no.	Types of Hospitals / Health care facility	No. of beds	Total estimated qty. of waste generated kg/day	Segregation of waste taking place(yes/no)	Containers /bags used to segregate waste.	Colour coded or labelled containers are used(ves/no)	Persons who handles the segregated waste.	Containers or bags used for collection of waste.
1.	Primary Health Centre, Pakvong	10	2-3 kg/day	Yes	Tin bins	No	Sweepers	Tin bins
2.	Primary Health Centre, Jorethang	10	2-3 kg/day	Yes	Dust bins	No	Sweeper	Dust bin
3.	Primary Health Centre, Rangpo	08	5-8 kg/day	Yes	Plastic containers	No	Sweeper	Plastic containers
4.	Primary Health Centre, Rhenock	10	4-5 kg/day	Yes	Plastic buckets	No	weeper	Plastic bucket
5.	Primary Health Centre, Rongh	10	2-3 kg/day	Yes	Metal buckets	No	Sweeper	Metal bucket
6.	Primary Health Centre, Ravangla	12	2-3 kg/day	Yes	Plastic buckets	No	Sweeper	Plastic bucket
7.	Primary Health Centre, Soreng	15	4-5 kg/day	Yes	Plastic & tin container	No	Sweeper	Plastic & tin container

Source: SPCB, Govt. of Sikkim

## DISPOSAL OF WASTE

**Incineration** : This is process for burning the waste at a very high temperature. Incineration requires high calorific value of the waste which could burn without any external fuels. Although incineration of unassailable waste is not recommended as a method of Municipal solid Waste dispose but incineration of bio-medical waste is however strongly recommended for maintenance of health of the citizens.

Table 10.7 Disposal of Waste

Sl. No.	Type of hospitals/health care facility	Waste handlers are provided with protective apparel/gloves (Y/N)	Final disposal of segregated waste	Person responsible for organization & management of waste [Administrative level]	Aware of any legislation applicable to the Hospital waste management (Y/N)	Follows Any manual Or guidance on management of BMW available (Y/N)	Any Hospital waste management plan? (Y/N)
1.	Primary Health Centre, Pakyong	No	Open burn	Medical Officer(M. O)	No	No	No
2.	Primary Health Centre, Jorethang	No	Open burn	Medical Officer	No	No	No
3.	Primary Health Centre, Rangpo	Yes, Gloves	Open burn/Incinerated	-	Yes	No	No
4.	Primary Health Centre, Rhenock	Yes, Gloves	Open burn	M.O.	Yes	No	No
5.	Primary Health Centre, Rongli	No	Open burn/buried	M.O.	Yes	No	No
6.	Primary Health Centre, Ravangla	Yes, Gloves	Open Burn	M.O.	Yes	No	No
7.	Primary Health Centre, Soreng	Yes, Gloves	Open burn/buried	M.O.	Yes	No	No

Source: SPCB, Govt. of Sikkim