

## Management of Urban Solid Waste in Shimla



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## Shimla Profile

- “Summer Capital” of the British India located in Western Himalayas
- Capital of Himachal Pradesh & most favoured tourist destination in peak summers
- A JNNURM and ICLEI South Asian City
- 31° 04’N- 31° 10’N Lat & 77° 05’E- 77° 15’E Long & at altitude of 2130m
- Population 1,42,735 (Census, 2001), average decadal growth 35%
- Estimated Population 1,98,717 (2010) with Slum Population 6.1%
- Area 35 sq. km divided into 25 ward.
- Average annual rainfall 1500mm
- Temperature varies from 15-27°C in summers and -2-13°C in winters



## Environment Legislation

- The Constitution of India provides the bedrock for environmental legislation in the country.
- The Parliament has enacted Environment Protection Act, 1986 under Article 253 of the Constitution.
  - ❖ Hazardous Wastes (Management & Handling) Rules, 1989
  - ❖ Bio-medical Wastes (Management & Handling) Rules, 1998
  - ❖ **Municipal Solid Wastes (Management & Handling) Rules, 2000**
  - ❖ Batteries (Management and Handling) Rules, 2001
  - ❖ Plastic Waste (Management and Handling) Rules, 2011
- State/Local Legislations are-
  - ❖ Himachal Pradesh Municipal Corporation Act, 1994
  - ❖ Himachal Pradesh Non- Bio-degradable Garbage (Control) Act, 1995
  - ❖ **Door to Door Garbage Collection Bye-laws (MC Shimla)- 2006**

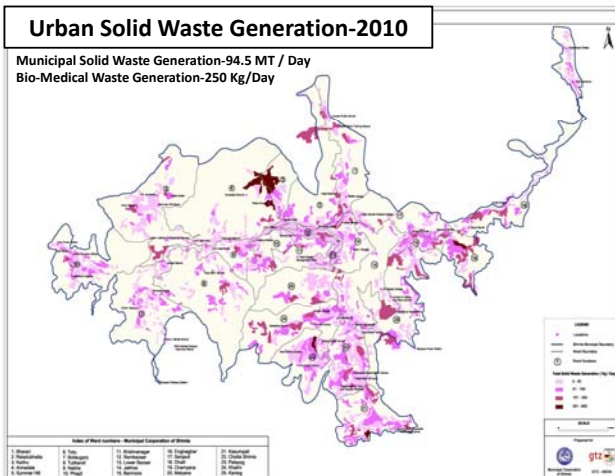
## Solid Waste Generation (Existing & Projected)



	2010	2011	2021	2031	2041
Resident Population (no.)	1,98,717	2,07,063	2,56,883	3,49,361	4,18,296
Floating Population (no.)	70,000	76,000	1,00,000	1,25,000	1,50,000
Solid Waste Generation (MT)	94.05	99.07	124.91	166.03	198.90

## Urban Solid Waste Generation-2010

Municipal Solid Waste Generation-94.5 MT / Day  
 Bio-Medical Waste Generation-250 Kg/Day



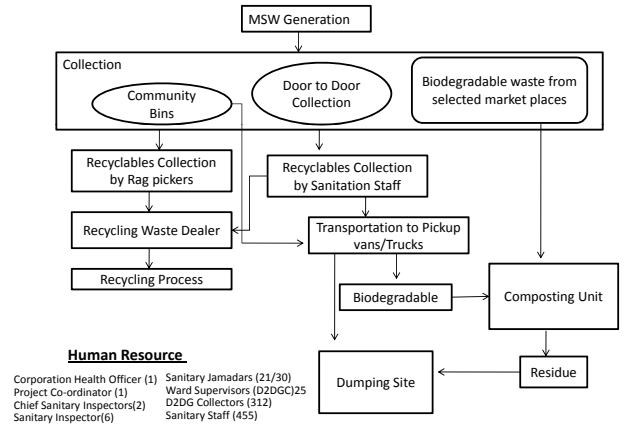
## Physical Characteristics of MSW

S. No.	Component	Residential Zone Sample Size- 1020 Kg		Commercial Zone Sample Size- 510 Kg		Mixed Zone Sample Size- 1135 kg	
		Weight (Kg)	Percentage	Weight (Kg)	Percentage	Weight (Kg)	Percentage
1	Metal	3	0.3	0.5	0.1	11	0.9
2	Glass/Ceramic	15	1.5	3.5	0.7	19	1.7
3	Food & carbon Waste	435	42.6	96	18.8	295	26.0
4	Paper & Cardboard	162	15.9	167	32.8	205	18.1
5	Textile	56	5.5	16	3.1	78	6.8
6	Plastic	84	8.2	87	17.1	164	14.5
7	Rubber/Leather	9	0.9	14	2.7	55	4.8
8	Inert	84	8.2	31	6.1	129	11.4
9	Misc. Combustible	75	7.4	22	4.3	54	4.8
10	Misc. incombustible	97	9.5	73	14.3	125	11.0

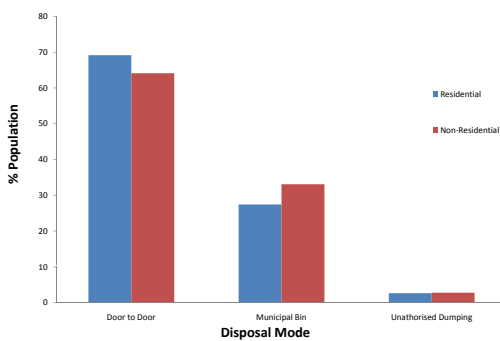
## Chemical Characteristics of MSW

S. No.	Parameter	Residential Zone	Commercial Zone	Mixed Zone
1	pH	6.48	6.84	6.23
2	Moisture (%), w/w	58.3	40.7	52.5
3	Nitrogen (%), w/w	0.87	0.68	0.71
4	Phosphorous (%), w/w	0.39	0.17	0.25
5	Potassium (%), w/w	0.32	0.28	0.63
6	Total Carbon (%), w/w	35.48	25.04	36.96
7	C/N Ratio	40.78	36.82	52.06
8	Calorific Value (kcal/Kg)	2840	2480	2950
9	Temperature, °C	13.4	10.5	12.5
10	Organic Matter (%), w/w	41.7	30.03	47.5

## Current MSW Management Practices

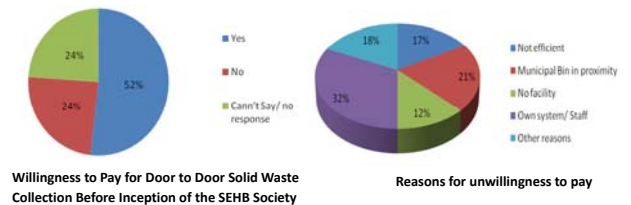


## Solid Waste Disposal Mechanism



## D2D GARBAGE COLLECTION SCHEME

- Operated through Shimla Environment Heritage Conservation and Beautification (SEHB) Society
- Two different colored bins (Green & Yellow) to each household
- All the wards are provided with hydraulically operated, fully covered pick-up vehicle
- User charge ranges from Rs 35 – 1000/-



## Public-Private Partnership Initiatives for Municipal Solid Waste Management

### Shimla Environment Heritage Conservation and Beautification (SEHB) Society

- Created by MC Shimla in 2009 for managing MSW at ward level
- Door-to-door garbage collection scheme with 312 DDGC is operational
- 80% of the population is covered
- MSW collection of 50-55 MT/day with collection efficiency of 70-80%
- MSW Processing & treatment at existing facility



### Bio-Medical Waste Management

- Six Major Hospitals & around 70 Healthcare Units generating 250 kg of Bio-medical waste per day
- Collection of Bio-medical Waste has also been outsourced to authorized operator
- 170 kg/hr incineration & ash disposal facility will be shortly outsourced

## Public-Private Partnership Initiatives for Municipal Solid Waste Management Cont...

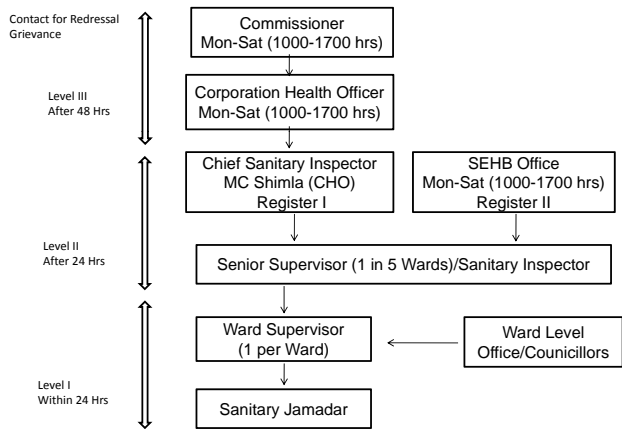
### Bio-conversion Plant

- New Bio-conversion In-vessel technology plant will be operational by May,2011
- Awarded to M/s Hanjer Biotech Energies Pvt. Ltd. Mumbai, INDIA.
- 2.27 Ha area adjoining to the landfill facility.
- PPP on BOOT basis for 20 years
- 87.47 MT/day of Bio-degradable MSW to be processed

### Engineered Landfill

- Awarded to M/s Voyants Solution Pvt. Ltd. Gurgaon, India for preparation of DPR.
- A valley of depth ~80m below the approach road with 9.98 Ha area.
- Non-Biodegradable MSW & inert rejects of Bio-conversion facility for land filling is estimated around 21.9MT/day
- Landfill facility will be operational by May,2011

### Complaint Redressal System



### GREENHOUSE GAS REDUCTION

Composting eliminates methane production  
 Use of compost leads to binding of CO2 in agricultural soil  
 Reduction in the use of artificial fertilizer also lowers CO2 emissions.

#### Carbon emission if burned

$$70 * (1 - 0.40) * (0.32) = 13.44 \text{ t/day}$$

#### Carbon emission on composting

$$\text{Dry matter in substrate} = 70 * (1 - 0.40) = 42 \text{ t}$$

$$\text{Dry matter in compost} = 42 * 0.75 = 31.50 \text{ t}$$

$$\text{Carbon weight in compost} = 31.50 * 0.3 = 9.45 \text{ t}$$

$$\text{WEIGHT OF CARBON EMISSION} = 13.44 - 9.45 = 3.99 \text{ t}$$

$$\text{Equivalent CO}_2 = 3.99 * 44 / 12 = 14.63 \text{ t/day}$$

#### Percent Carbon emission reduction due to composting =

$$[(13.44 - 3.99) / 13.44] * 100 = 54.6\%$$

Waste = 87.47t/day  
 Inert = 20%  
 Moisture content = 40%  
 Carbon content = 32%  
 Compost carbon content = 30%

### CHALLENGES

- Geographical Constraints causing inaccessibility
- Extreme Weather Conditions
- Inadequate Human Resources
- 100% Coverage of Household for D2DC.
- Segregation At Source.
- Involvement Of Community.
- Insufficient Yard Area At BCP-DKB causing unscientific waste disposal
- Mitigation of GHG

### ACTIONS

- Complete coverage of Shimla under SEHB Society
- Human Resource Generation under SEHB Society
- Training Programmes for Sanitary- staff on waste collection, segregation and occupational health & safety
- Awareness Generation Programmes for Public & School children
- Encouraging PPP for ensuring best waste management practices

### PROPOSED IMPROVEMENTS

#### Short term

- Source segregation of waste
- Compactors for long distance transport with Routing & Loading Plans
- Formation of waste transfer stations & collection points
- Construction of choutes or conveyor belt system in difficult / inaccessible areas

#### Long term

- Preparation of City Sanitation Plan
- Use Of Polythene In Road Tarring
- Setting Up Of New BCP Based On In-vessel Technology
- Engineered Landfill Site Near BCP
- Monitoring procedures for SWM functional elements

### Conclusions

- Door to door collection through SEHB society, coverage to be increased from current 80% to 95% within one year.
- Road sweeping in five out of twenty five municipal wards is being done through SEHB society.
- Bio-conservation plant at present location, within the city is being run by SEHB society.
- All these functions of SEHB society are financially sustained through recovery of user charges.

- Road sweeping in the city, lifting of containers and transportation of waste is being done through employees of municipal cooperation. These functions to be handed over to SEHB society in a phased manner. Cost recovery to be made through realization of user charges.
- New bio-conservation plant located outside municipal limits, based on in-vessel technology to be made operational within next three months. One-third cost of the project to be borne by Corporation in the shape of grant in aid to cover tipping charges for the concession period of 20 years.
- As per concession agreement, plant operator has to reduce emission of GHG, reduce carbon foot prints and earn credits for himself.
- Financial support for this project has been received from Government of India through JNNURM scheme.

**Thank You**