



# Newsletter

NATIONAL SOLID WASTE ASSOCIATION OF INDIA

ENVIS ENVIRONMENTAL INFORMATION SYSTEM NODE (CENTER)



## Urban Municipal Solid Waste Management

Sponsored by: The Ministry of Environment & Forests, New Delhi, under a programme on Environment Management Capacity Building Technical Assistance Project of the World Bank

NSWAI ENVIS

• THIRD ISSUE •

OCTOBER, 2004

### Editorial

*A voluminous data on Municipal Solid Waste Management of 1999 is edited and reproduced here: This is derived from Annexure III of the report published by Central Public Health And Environmental Engineering Organization (CPHEEO) in the year 2002. This database forms the background material for comparison with the latest data collected by NSWAI-ENVIS. Possible relation between urbanisation and waste generation rate, between garbage pressure and cost of solid waste management is being looked into.*

*NSWAI-ENVIS intends to highlight achievements in the SWM field and two such cases are reported in this issue.*

*Municipal bodies may send their comments and project their shortcomings to identify solutions*

- Editor

### Urban Municipal Solid Waste Management 1999 Collection, Transport, Treatment, Disposal and Financial Aspects

The data of 1999 in the second issue of NSWAI-ENVIS Newsletter published in February 2004 deals with Waste Generation and Generation Rates of Municipal Solid Waste for 117 cities. In the present issue the data on collection, transport, treatment, disposal and financial aspects for 78 of these cities is reproduced. For the sake of convenience the Table 7 in this issue is made self sufficient in terms of data of Table 6 of February 2004 issue and the present added information. (The collection efficiency, the number of people served by a single community bin, the solid waste management (SWM) cost per capita per year and the cost per Metric Tonne (MT) of the waste has been calculated.)

#### Collection:

Table 7 (columns 10 to 13) gives data on collection of waste in  $MTd^{-1}$ , efficiency of collection, the number of community bins and the number of people served by a community bin. Collection efficiencies vary from 10% to 100% (Tables 7,8). Out of the 72 cities where collection efficiency is reported, 22 cities collect all the waste generated i.e., 100% efficiency; 32 cities have collection efficiencies ranging

between 71% - 99%; 7 cities have efficiencies ranging from 51% - 70% and 11 cities have a low efficiency of 10% to 49%. That is 75% cities have collection efficiencies of above 71%.

The number of community bins varies from city to city as expected. But the number of people served by a single community bin varies a lot among the 70 cities for which the data is available (Table 9). Majority of cities (57) serve 201 to 5000 people per community bin. Sirca (Haryana), Palakkad (Kerala), Bhind (Madhya Pradesh), Tiruppur (TamilNadu) and Hathras (Uttar Pradesh) are reported to have no community bins. This is surprising. If there is house-to-house collection then that is a good achievement. Data of community bins is not (available according to the report) for Nashik and Pimpri-Chinchwad of Maharashtra. Although significant data on frequency of collection per week is given in the report, the data is quite confusing and hence this is not reproduced here.

#### Physical and Chemical Characteristics:

No data on physical and chemical characteristics is given in the report. But this is desirable and needed.

**Transportation:**

The data gives the number of handcarts, trolleys, trucks, dumpers, tractors and compactors in various cities. The frequency of transportation and the distance covered is also mentioned (columns 14 – 20). This is very useful.

**Treatment:**

Composting practice is reported for 10 cities viz., Nellore (Andhra Pradesh); Bellary (Karnataka); Kolam (Kerala); Bhopal (Madhya Pradesh); Solapur, Latur (Maharashtra); Rajapalayam, Nagercoil, Thochukudi and Kancheepuram (TamiNadu). For many cities this practice has been undertaken subsequently.

**Disposal:**

At least 52 out of 78 cities are reported to be dumping the waste in the open land (Column 21 – 26). The situation should improve. More and more cities have started looking for good disposal sites. Majority of the cities have identified disposal sites; however the waste is not dumped in such sites scientifically.

**Financial:**

Financial data is given in columns 27 – 29. Total annual cost on SWM for the cities is given. Cost of SWM per capita per year ranges from Rs. 0.5 to Rs. 345. Cost per MT varies from Rs. 2.6 to Rs. 6088. The variation for both is by 3 orders of magnitude. The cost on SWM depends on several factors. These factors have to be identified and their effects should be studied.

**Staff:**

Number of staff in each city and their number per 1000 population is given in columns 30-32. Table 10 gives the breakup of the staff per 1000 population. Three and less than three staff of SWM per 1000 members of population appears to be predominant. More than 95% of the cities have such a situation. Only 4.29% of the cities have staff more than 3 per 1000 persons. Adequacy of the staff of SWM has to be assessed with more experience and after seeing the effect on SWM.

**Good Practices of Solid Waste Management in India****Integrated Solid Waste Management – Akola Municipal Corporation (AMC)**

After the positive intervention of Supreme Court, the Government of India has adopted “**Municipal Solid Waste Management Rules 2000**” and it becomes imperative for all municipal corporations and “A” class Municipalities to adopt and implement the same. Innovative approaches are needed to achieve this goal especially through house-to-house collection processing, and disposal activities.

Akola has a population of 4 lakhs as per 2001 census and generates around 110 MT of municipal solid waste per day. The approaches adopted and activities of Akola Municipal Corporation (AMC) for integrated solid waste management include road sweeping, collection of municipal waste, house to house collection (introduction of tricycle with ring bell through public participation and collection of recyclable through rag pickers), collection of waste from hotels and commercial establishments, secondary collection and transportation, processing (compost plants) and disposal.

The corporation lifts nearly 100% of solid waste per day through fully loaded trucks (each truck carrying around 2.5 MT waste) making 50 to 55 trips. The highlight of the operation is the indigenous model of tricycle with ringing bell developed by the Corporation. There are 40 tricycles in 5 municipal wards covering approximately 10,000 households i.e. 20% area of the city. This tricycle costs Rs. 8000/-, which is given to various wards and colonies on demand to Mahila mandals, area committees, and youth organizations (on loan basis) who undertake the responsibility of collecting household waste by appointing unemployed youth. All beneficiary households have to pay Rs. 10/- per month as service charge. Thus by this method AMC aims to collect 75% of household biodegradable solid waste through community participation.

*Source: Presentation by Shri Laxmikant Deshmukh, Commissioner, Akola Municipal Corporation, Maharashtra at Good Governance India 3<sup>rd</sup> International Conference & Exhibition on Public Works, Municipal Services and Urban Development 23-26 January 2004, Mumbai.*

**Efforts to Achieve Zero Based Solid Waste Management  
- in Suryapet Municipal Urban Town**

The presentation highlighted the initiatives taken by Suryapet municipality in order to achieve a zero garbage town. Suryapet, a prominent town in Nalgonda district of Andhra Pradesh, is emerged as a municipal town in 1952 with population of mere 10,000. Now it's enjoying the status of Grade-1 Municipal town having a population of one lakh three thousand. It has 28 municipal wards.

With an aim to achieve a healthy community and hygienic surroundings, an innovative sanitation programme is being implemented in Suryapet town. This programme in a unique way tries to build clean hygienic and a dustbin free town.

In this sanitation process the sanitary department personnel go directly and collects garbage from the houses. The town is divided into 7 zones having tractor and few sanitary personnel. The personnel with the tractor go to the zone at a particular time and the households hand the garbage over to the sanitary personnel with the tractor; they don't throw it on the streets. This has transformed the whole town into clean and garbage free town.

The waste collected has also led to income generation for the Municipality. The wet and dry garbage is collected separately. The wet garbage is sold to farmers as it can be used for making

vermi compost manure while the dry is sold to paper industry

Particulars	2002	2003
Garbage generated	42 tonnes	43 tonnes
Garbage lifted	30 tonnes	43 tonnes
Income from Garbage	Nil	Rs. 26,000
Public satisfaction	25%	100%

The results achieved due to these efforts :

- 100% door-to-garbage collection without any additional staff & machinery.
- 25 % source segregation through two bin system.
- 100% clean streets and drains.
- Revenue generation through the sales of recyclables from 4000 families is Rs. 13,000/- per month (started from November 2003)
- Removal of 360 dustbins
- Achieved 100% cooperation of the municipal council & staff.

*Source: Presentation by Shri S.A Khader Saheb Municipal Commissioner, Suryapet at Good Governance India 3<sup>rd</sup> International Conference & Exhibition on Public Works, Municipal Services and Urban Development 23-26 January 2004 Bandra Kurla Complex, Mumbai*

**International Events**

Sr. No.	Date	Event	Venue	Contact			
				Tel :	Fax :	e-mail :	web :
1.	12-14 Jan., 2005	4th International Electronic Recycling Congress Basel, Switzerland	ICM AG, International Congress & Marketing Luzernerstrasse 91, 5630 Muri, Switzerland	+41 56 664 72 50	+41 56 664 72 52	info @ icm.ch	www. icm.ch
2.	9-11 March, 2005	IARC 2005 5th International Automobile Recycling Congress	Jeanette Duttlinger, ICM AG Luzernerstrasse 91, 5630 Muri, Switzerland	+41 56 664 72 50	+41 56 664 72 52	info @ icm.ch	www. icm.ch
3.	3-6 April, 2005	20th International Conference on Solid Waste Technology and Management	Dr. Rolnald L. Mersky, Department of Civil Engg., Widner University, 1 University Place, Chester, PA 19013 - 5792, USA	+1610 499 4042	+1610 499 4059	solidwaste @ widener.edu	www. widener. edu/ solid. waste

Table 7 : MSW generation, collection, transport, treatment, disposal and financial aspects, 1999.

1	2	Area & Population			General				Collection				14
		3	4	5	6	7	8	9	10	11	12	13	
State	City	Area km <sup>2</sup>	Population 1991	Population 1998	Total MTd <sup>-1</sup>	SW Generation Rate gms/capita/day	Domestic (MTd <sup>-1</sup> )	Commercial / Industrial MTd <sup>-1</sup>	Collection (MTd <sup>-1</sup> )	Collection Efficiency %	Community Bins (No)	Number of people served per bin	Handcarts/trolleys (No)
ANDHRA PRADESH	Outbullapur	46.67	105380	250000	70	280	60	10	70	100	511	489	60
	Eluru	11.88	212000	252000	142	500	35	40	142	100	520	485	50
	Ramagundam	93.67	214384	350000	280	800	168	112	70	25	511	685	60
	Mahabubnagar	13.00	115000	180000	30	30	Nil	Nil	22	73.33	375	480	150
	Tirupati	24.00	174.36	210000	125	0.5	70	40	125	100	850	247	70
	Nellore	48.39	316.445	404081	202	500	122	80	202	100	580	697	Nil
ASSAM	Jorhat	9.20	112	170000	20	180	11	9	14	70	25	6800	5
BIHAR	Bhagalpur	64.00	254995	290700	72	250	58	14	24	33.33	168	1730	45
DELHI	Delhi	1484.50	93,00,00	1200000	6000	450	2000	Nil	6000	100	3264	368	12500
GUJARAT	Jamnagar	26.00	326,241	500000	300	500	50	15	300	100	950	526	500
	Surat	112.00	149000	220000	870	517	390	480	850	97.7	700	314	3500
	Navsari	9.00	126089	138836	40.26	290	30.26	10	29	72.03	84	1653	75
	Bharuch	20.00	133102	175000	100	250	30	Nil	75	75	80	2188	Nil
	Bhavnagar	54.00	402338	491950	165	300	95	60	115	69.7	200	2460	400
	Vadodara	108.00	1039346	1400000	560	400	560	0	500	89.29	480	2917	2500
	Gandhidham	31.00	104585	250000	110	400	100	10	70	63.64	200	1250	150
	KARNAL	Karnal	22.00	176131	220000	88	400	50	15	66	75	65	3385
KARNATAKA	Sirca	27.00	112542	138293	35	250	20	15	30	85.71	Nil	Nil	105
	Gadag-Betigeri	20.00	133914	150336	75	500	20	50	50	66.67	541	278	Nil
	Mangalore	115.00	272000	450000	202.5	450	29	23	200	98.77	1200	375	100
	Hassan	13.00	111486	130000	68	1.63	45.33	22.67	22.67	33.34	2800	46	Nil
KERALA	Bellary	82.00	287601	343818	86	250	78	8	60	69.77	543	633	100
	Palakkad	26.60	123289	NA	20162	(91)	3	17	20	100	Nil	NA	36
	Kolam	18.00	139852	141778	62	350	20	25	58	93.55	190	746	50
MADHYA PRADESH	Vadakara	21.00	72434	70325	25.3	300	12.4	12	10.76	42.53	36	1953	12
	Bhind	17.18	109731	175000	28	160	28	Nil	24	85.71	Nil	NA	57
	Rajnandangaon	51.13	120394	160000	39	243	35	2	39	100	25	6400	229
	Korba	215.02	241273	350000	100	285	45	55	100	100	35	10000	30
	Bhopal	235.00	1062771	1390480	600	260	450	250	450	75	910	1528	400
MAHARASHTRA	Shivpuri	72.00	108274	140000	30	250	24	6	28	93.33	41	3415	103
	Bhusawal	13.58	145143	200000	30	150	30	Nil	30	100	94	2128	60
	Nashik	259.13	656925	838753	300	300	251	22	280	93.33	NA	NA	26
	Solapur	278.00	620000	929000	400	500	60	25	400	100	1451	640	100
	Mumbai	437.11	9809547	11000000	6000	545	3000	1200	6000	100	6300	1746	2000
	Pimpri-Chinchwad	206.00	517073	900000	350	400	NA	NA	350	100	NA	NA	763
	Latur	20.00	191407	270675	150	1	100	100	22	14.67	375	722	150
	Nanded	46.00	274626	410000	149	250	39	39	90	60.4	585	701	65
	Navi Mumbai	163.00	318447	501225	400	400	200	200	400	100	1500	334	162
	Kolhapur	67.00	405118	500000	155	350	0	0	115	74.19	1247	401	Nil
	Wardha	9.00	102974	120000	40	333	30	30	40	100	399	301	76
Nagpur	218.00	1624757	2300000	600	0.3	200	200	450	75	2000	1150	387	
Jalna	0.00	174975	225000	9	400	3	3	9	100	93	2419	61	

15	Transport				20	Treatment & Disposal						Financial			Staff		
	16	17	18	19		21	22	23	24	25	26	27	28	29	30	31	32
Lorries(L)/trucks(T) (No)	Dumpers (No)	Tractors (No)	Compactors (No)	Frequency of transport (No/day)	Distance covered (km)	Disposal site (No)	Area (acres)	Area in km <sup>2</sup>	Distance from city (km)	Treatment	Mode of Disposal	Economics (Total Cost in Rs on SWM in Lakhs/Annum)	Rupees/capita/Year	Rupees/MT	Staff :Supervisory	Staff : Subordinate	Staff : No/1000 population1998
4	Nil	1	Nil	4	40	1	10	0.04	8	Nil	Dumping on open land	58.71	23.5	229.7	1	50	0.2
Nil	Nil	13	Nil	5	50	2	NA	NA	Nil	Nil	Dumping on open land	1.25	0.5	24.1	29	383	1.6
4	Nil	1	Nil	4	40	1	10	0.04	6	Nil	Dumping on open land	58.71	23.5	229.7	-	-	-
Nil	Nil	3	Nil	6	10	6	1000	4.047	Nil	Nil	Nil	3	1.7	27	13	180	1
1	Nil	13	Nil	4	12	4	30	0.121	8	Nil	Nil	200.5	95	439.5	42	322	2
1	Nil	32	Nil	4	6	1	NA	NA	Nil	comp	comp yard	4.25	105	576	50	585	1.571
2	Nil	3	Nil	3	16	1	NA	NA	2	Nil	Nil	19.9	11.7	272	6	48	0.32
Nil	Nil	6	1	9	5	NA	NA	NA	Nil	Nil	Nil	99	34	377	11	384	1.359
570	Nil	Nil	Nil	2	Nil	3	150	0.607	35	Nil	Dumping on open land	21555.7	180	984	1647	38,111	3
Nil	Nil	25	Nil	8	5	1	4	0.016	8	Nil	Dumping on open land	700	140	639	44	1316	3
65	85	46	Nil	5	10	2	200	0.809	7	Nil	Dumping on open land	156	70	49	20	470	2.227
1	2	3	Nil	3	45	2	0.5	0.002	10	Nil	Nil	120	86	816	14	220	1.685
25	3	Nil	Nil	4	200	2	10	0.04	10	Nil	Dumping on open land	255	145	698	22	310	1.9
20	Nil	15	4	Nil	Nil	1	5	0.02	3	Nil	Dumping on open land	34.762	7	58	4	316	0.65
32	20	2	Nil	8	Nil	8	20	0.081	7	Nil	Dumping on open land	1200	86	587	172	3403	2.553
2	Nil	5	Nil	5	25	1	Nil	NA	NA	Nil	Dumping on open land	143	57	336	8	211	1
Nil	Nil	6	Nil	4	10	Nil	Nil	NA	NA	Nil	Dumping on open land	13.92	6	43	18	476	2.245
Nil	Nil	4	Nil	5	3	2	1	0.004	5	Nil	Dumping on open land	180	130	1409	9	380	2.813
Nil	Nil	6	Nil	4	8	2	Nil	NA	NA	Nil	Dumping on open land	141.26	94	516	-	-	-
19	3	Nil	Nil	2	60	1	40	0.162	15	Nil	Dumping on open land	317	70	434	62	422	1.076
Nil	36	6	Nil	4	5	4	6	0.024	5	Nil	Dumping on open land	10	7.6	40	6	89	-
6	0	1	0	5	12	1	0	0	0	compost	compost yard	341	100	1086	30	320	1.018
4	1	1	Nil	2	30	1		8.54	5	Nil	Dumping on open land	171.28	138	2346	0	0	2.636
4	25	9	Nil	2	Nil	1	NA	NA	NA	compost	compost yard	150	106	663	22	147	1.192
2	Nil	Nil	Nil	2	Nil	1	NA	NA	Nil	Nil	Dumping on open land	37.76	54	409	10	40	0.711
12	3	8	Nil	3	NA	NA	NA	NA	in city	Nil	roadside dump	17.93	10	175	11	142	0.874
2	1	3	Nil	1	5	6	0.75	0.003	5	Nil	Dumping on open land	50	31	351	10	325	2.094
2	3	6	Nil	3	10	4	20	0.081	10	Nil	Nil	105	30	287	13	189	0.577
23	3	11	9	2	20.5	1	76	0.308	20	comp	comp	1517	109	692	140	2160	1.654
3	1	3	Nil	2	16	Nil	NA	NA	NA	Nil	Dumping on open land	98	70	895	6	154	1.143
Nil	Nil	5	Nil	5	16	Nil	Nil	NA	6	Nil	Dumping on open land	127.65	64	1165	6	317	1.615
6	NIL	2	1	2	8	1	NA	NA	NA	Nil	Dumping on open land	24.5	2.9	22	80	1884	2.342
25	Nil	2	Nil	4	9	2	NA	NA	Nil	comp	comp	160.103	17	110	20	144	0.177
15	82	18	156	2	20	2	174	0.704	25	Nil	Dumping on open land	38000	345	1735	Nil	Nil	2.348
25	12	NIL	12	2	20	1	NA	NA	20	NIL	Dumping on open land	269.71	30	211	169	1888	2.285
Nil	Nil	3	Nil	6	10	6	1000	4.047	Nil	manual comp	Dumping on open land	3	1.7	27	9	488	1.8
7	1	5	0	3	15	Nil	1	0.004	3	Nil	Dumping on open land	292	71	537	7	631	1.556
26	Nil	Nil	18	4	20	1	30	0.121	10	Nil	Dumping on open land	10	2	7	NA	NA	NA
16	Nil	Nil	2	2	Nil	7	NA	NA	NA	Nil	Dumping on open land	483.01	96	854	69	1144	2.426
4	Nil	2	Nil	3	4	1	35	0.142	Nil	Nil	in trench ground	91	76	623	2	335	2.808
35	7	2	Nil	2	15	1	10	0.04	15	Nil	Dumping on open land	2666	116	1217	211	3590	1.652
10	1	6	Nil	8	5.7	1	10	0.04	507	Nil	in trench ground	200	89	6088	24	314	2



1	2	Area & Population			General				Collection					
		3	4	5	6	7	8	9	10	11	12	13	14	
State	City	Area km <sup>2</sup>	Population 1991	Population 1998	Total MTd <sup>-1</sup>	SW Generation Rate gms/capita/day	Domestic (MTd <sup>-1</sup> )	Commercial / Industrial MTd <sup>-1</sup>	Collection (MTd <sup>-1</sup> )	Collection Efficiency %	Community Bins (No)	Number of people served per bin	Handcarts/trolleys (No)	
MEGHALAYA	Shillong	10.00	131719	216732	78	504	12	12	78	100	70	3096	Nil	
ORISSA	Berhampur	34.00	210418	260918	270	1035	226	44	196	72.59	300	870	300	
PUNJAB	Amritsar	133.00	709000	1000000	600	750	375	225	500	83.33	225	4444	500	
	Ambala Cantt	5.50	90872	99009	-	-	10	3	20	NA	85	1165	150	
TAMILNADU	Chennai	174.00	4000000	5000000	2550	500	1530	1020	2550	100	100	50000	2500	
	Madurai	53.00	946000	1045000	380	40	200	180	-	-	400	2613	166	
	Triuneveli	109.00	374058	414700	160	400	70	30	100	62.5	60	6912	110	
	Rajapalayam	11.36	114202	123408	44.25	390	9.25	35	44.25	100	50	2468	80	
	Nagercoil	24.00	200000	-	30150	(91)	30	5	30	100	444545	(91)	156	
	Salem	91.00	585350	636500	250	392	160	90	250	100	1915	332	Nil	
	Karur	5.96	73418	73818	30	450	0	0	8	26.67	245	301	25	
	Neyveli	480	117409	133304	42	285	32	10	38	90.48	612	218	Nil	
	Pallavapuram	18.00	111865	142500	84	500	71	6	62.6	74.52	450	317	30	
	Kumbakonam	12.87	139483	144700	15	500	5	10	15	100	144	1005	8	
	Thoochukudi	13.50	199854	205800	25	125	10	5	22	88	35	5880	Nil	
UTTARANCHAL	Kancheepuram	11.72	144055	156700	60	350	48	12	50	83.33	96	1632	3	
	Tiruppur	27.00	235681	318800	350	109	150	200	300	85.71	Nil	Nil	Nil	
	Dehradun	52.00	271000	510000	255	500	216	39	50	19.61	104	4904	306	
	UTTAR PRADESH	Hathras	3	113658	185352	3	200	2.5	0.5	3	100	Nil	Nil	50
		Jhansi	30.00	301304	506600	180	360	100	60	135	75	107	4735	250
		Mathura	26.00	226157	300000	170	300	Nil	Nil	170	100	38	7895	110
		Bareilly	104.00	650000	925000	500	540	190	115	375	75	499	1854	521
		Itawa	15.00	125000	195000	41	200	38.5	2	35.5	86.59	29	6724	113
	WEST BENGAL	Titagarh	3.00	113831	121351	65	500	39	26	50	76.92	130	933	50
		Kolkata	187.00	4388242	9000000	25000	450	1375	1125	2500	10	526	17110	3600
		Raniganj	25.00	97458	120000	142	1000	108	21	108	76.06	158	759	50
Rishra		67.83	106649	126553	67	400	77	51	8	11.94	164	772	45	
Chandernagar		20.00	140000	170000	42	300	30	12	35	83.33	20	8500	52	
Uttarpara		13.00	131645	142177	64	350	49.75	14.22	49	76.56	13	10937	Nil	
Howrah		5174	946732	1065304	746	700	Nil	Nil	700	93.83	502	2122	Nil	
Asansol		127.00	478395	545370	180	250	120	60	138	76.67	1135	481	250	
Barasat		35.00	177097	260000	108	350	91	17	24	22.22	108	2407	35	
Kanchrapara		9.00	111000	137000	70	365	50	20	30	42.86	2	68500	10	
Bally	12.00	184077	270000	150	500	60	40	140	93.33	587	460	50		
Panihati	19.00	275359	360000	329	913	296.1	32.9	164.5	50	700	514	125		

Source: Report of the Technology Advisory Group on Solid Waste Management. CPHEEO, Ministry of Urban Development and Poverty Aviation, Government of India, New Delhi - 2002

Table 8: SW Collection Efficiency

Efficiency	No. of Citites
100%	22
71% - 99%	32
50% - 70%	7
10% - 49%	11
<b>Total</b>	<b>72</b>

Table 9: Number of people served by a community bin

No. of people served	No. of Cities
<100	1
101-200	0
201-400	11
401-600	8
601-800	9
801-1000	2
1001-5000	27
5001-10000	8
>10000	4
<b>Total</b>	<b>70</b>

Transport						Treatment & Disposal						Financial			Staff		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lorries(L)/trucks(T)(No)	Dumpers (No)	Tractors (No)	Compactors (No)	Frequency of transport (No/day)	Distance covered (km)	Disposal site (No)	Area (acres)	Area in km <sup>2</sup>	Distance from city (km)	Treatment	Mode of Disposal	Economics (Total Cost in Rs on SWM in Lakhs/Annum)	Rupees/capita/Year	Rupees/MT	Staff : Supervisory	Staff : Subordinate	Staff : No/1000 population/1998
10	Nil	1	Nil	1	14	1	NA	NA	10	Nil	Dumping on open land	86.32	40	303	20	366	1.781
NIL	NIL	18	NIL	4	40	1		0.02	in city	Nil	NIL	50	19	51	45	762	3.09
56	17	1	56	4	10	3	27	0.109	5	Nil	Dumping on open land	130	13	59	27	1771	1.798
1	NIL	5	2	3	20	2	35	0.142	2	Nil	Dumping on open land	15.55	16	-	25	300	3.282
284	Nil	40	1	2	Nil	2	150	0.607	15	Nil	Dumping on open land	7000	140	752	306	10165	2.094
31	14	11	Nil	3	4	1	150	0.607	15	Nil	Dumping on open land	75	7	54	650	2700	3.205
22	1	2	Nil	3	5	3	12	0.049	5	Nil	Dumping on open land	429.26	103	735	10	900	2.194
5	Nil	4	Nil	3	15	Nil	Nil	nil	nil	comp in trench	comp in trench	133	108	832	296	Nil	2.398
6	1	Nil	Nil	3	0	15	NA	NA	2	comp	comp	17.64	9	161	1	8	0.045
80	Nil	1	Nil	3	29	3	38	0.154	1	Nil	Dumping on open land	616.57	97	675	100	1500	2.513
10	Nil	Nil	Nil	2	15	2	NA	NA	NA	Nil	Nil	10.7	14	98	3	10	0.121
5	1	Nil	Nil	4	20	4	NA	NA	Nil	Nil	burning	17.8	13	116	11	253	1.98
7	0	2	Nil	2	Nil	3	15	0.061	5	Nil	Dumping on open land	207.196	145	676	33	334	2.575
13	Nil	Nil	Nil	2	Nil	Nil	NA	NA	Nil	Nil	Dumping on open land	2.37	1.6	43	0	7	0.048
5	Nil	4	Nil	5	8	1	10	0.04	12	comp	comp yard	240	117	2630	2	432	2.108
12	Nil	Nil	Nil	3	15	2	7.5	0.03	5	comp	comp & landfill	1.54	98	703	23	241	1.684
18	Nil	4	Nil	3	Nil	3	2	0.008	NA	NA	Nil	280.13	88	220	Nil	30	0.094
3	2	7	1	Nil	Nil	1	2.36	0.01	10	Nil	Dumping on open land	407	80	437	39	915	1.87
1	Nil	3	Nil	2	NA	1	8	0.032	3	Nil	landfill	1.39	0.75	127	10	246	1.381
Nil	1	13	3	5	4	5	Nil	NA	NIL	Nil	Dumping on open land	240	47	365	34	700	1.448
Nil	6	6	Nil	5	3	3	5	0.02	5	Nil	Dumping on open land	124.22	41	200	27	325	1.173
30	3	21	3	4	120	2	NA	NA	Nil	Nil	Dumping on open land	56	6	31	85	1600	
Nil	Nil	5	Nil	6	1	6	5*	NA	1	Nil	Dumping on open land	100	51	676	14	203	1.112
2	Nil	8	Nil	3	2	2	NA	NA	Nil	Nil	Dumping on open land	111.67	92	470	14	213	1.87
65	52	10	Nil	3	50	5	8.4	0.034	20	Nil	Nil	11400	127	1249	1560	13500	1.673
Nil	Nil	6	Nil	36	5	80	NA	NA	NA	NA	Dumping on open land	3.90893	3.25	7.5	Nil	8	0.067
Nil	Nil	3	Nil	3	10	NIL	NA	NA	Nil	Nil	Dumping on open land	75	59	160	9	185	1.532
Nil	Nil	7	Nil	3	20	1	5	0.02	NA	NA	Nil	12	8.6	78	15	300	1.852
Nil	Nil	8	Nil	4	25	Nil	NA	NA	25	Nil	Nil	51.93811	36.5	222	7	162	1.188
Nil	Nil	Nil	Nil	Nil	Nil	Nil	50 bighas	NA	NA	Nil	Nil	855.5	80	335	0	0	0
23	Nil	2	Nil	3	NA	NA	NA	NA	NA	NA	Dumping on open land	137.2637	25	209	23	487	0.935
1	Nil	6	Nil	2	NA	1	2.47	0.01	3	Nil	Dumping on open land	20.81368	8	53	5	115	0.461
0	0	4	0	3	1.5	12	0	0	1.5	0	Dumping on open land	15.37	11	60	5	131	0.993
2	Nil	16	Nil	8	10	NA	NA	NA	NA	Nil	Nil	1.42483	0.5	2.6	9	433	1.637
3	2	12	10	2	15	3	7.77	0.031	3	Nil	Dumping in trench ground	99.93	28	83	3	12	0.042

Erratum

Issue: Second Issue of February 2004

Table 10: Staff for SWM

Staff No. per 1000 population	No. of Citites	Percentage (%)
< 1	16	22.86
1 - 2	34	48.57
2 - 3	17	24.29
> 3	3	4.29

Data for 7 Cities not available

Pageline / S.No.	Read as
3 33	y = 3x + 381.9
3 40	ranges from 381.9 to 470 gc-1d-1
6 S. No. 101	Badauni
6 S. No. 102	Bareilly



## Waste Minimization Through Segregation At Source



### Seminar Report

Seminar on 'Waste Minimization Through Segregation At Source'. was held on 01<sup>st</sup> October, 2004 organized by National Solid Waste Association of India (NSWAI) in association with Maharashtra Pollution Control Board (MPCB), Municipal Corporation of Greater Mumbai (MCGM) and P.G. Department of Family Resource Management, SNDT Women's University at Juhu Campus.

The response to this seminar was over whelming. A large group of participants included eminent speakers from functionary bodies, experts from different NGO's, ALM groups, academicians and students who made the seminar interesting and action oriented.

The seminar was inaugurated by lighting of lamp and a welcome address by Dr. M. C. Badarinarayana, President-NSWAI. The introductory speech was given by Mr. R. K. Garg Emeritus President-NSWAI who covered characteristics of waste and the worldwide factors influencing source segregation. It was followed by the keynote address of Dr. (Mrs.) Indrani Chandrasekharan, Director (EI) Ministry of Environment & Forest, New Delhi, which was read by Dr. A. K. Sahu, Vice-President NSWAI. Then Mr. A. K. Jain, IAS & Sr. Advisor SWM, AILSG spoke on Sustainable Municipal Solid Waste Management and Policy Issues. He stressed upon aspects like traditional SWM, MSWM rules 2000, cost implications, community involvement and capacity building among municipal functionaries, citizens and other stakeholders.

Dr. Shyam Asolekar, Prof. CESE IIT Mumbai, chaired the Technical Session I. During the session Mr. P.P.Nandusekar, Principal Scientific officer Maharashtra Pollution Control Board (MPCB) presented on behalf of Dr. D.B. Boralkar Member Secretary MPCB. He spoke on the impact of solid waste and the initiatives needed to be taken. Mr. R.R.

Markandeya Chief Engineer Solid Waste Management Cell MCGM who was the next speaker explained the benefits of segregation, present trend of segregation, necessity of enhancing segregation agencies for segregation and economics of segregation. He was followed by Dr. Rakesh Kumar Sr. Asst. Director & Head National Environmental Engineering Research Institute Mumbai Zonal Centre. Dr. Rakesh presented innovative techniques in segregation one of which was the designing of household dustbin-cum-compost bin. Then Dr. Sujata Phadke, Reader & head of Family Resource Management emphasised on waste prevention aspect by proposing 5 R's of waste minimisation such as Reject, Reuse, Recycle, Reduce & Replace.

The Technical Session II was chaired by Mrs. Jyoti Pandya, Chief development officer, Below Poverty Line, MCGM. During the session there were presentations of good practices and case studies from various NGOs, like Mr. Ashok Datar from Makarand Society an ALM from Mahim, Dr. Rajan Gupte from Parisar Mandal, Mahim, Mrs. Jyoti Mhapsekar from Stree Mukti Sanghatana and also Mrs. Jyoti Pandya. These NGOs shared their experiences, problems and achievements. This technical session was followed by panel discussion wherein the participants' gave valuable suggestions and remarks on the theme of the seminar. The out come of the seminar was focussed on aspects like need for waste reduction & importance of segregation at source and it was highlighted on the involvement of community and every individual for waste minimisation for better quality of life and healthy environment. It was also suggested to have well designed community bins for segregation of waste to dry and wet and further dry waste to different categories depending upon the inventory of waste in the locality.

The seminar concluded by vote of thanks by Mr. R. Bhattacharya, General Secretary, NSWAI.

#### Editor:

Dr. M. V. M. Desai

#### ENVIS Core Group:

Dr. Amiya Kumar Sahu, Convener

Dr. M. V. M. Desai

Dr. Rakesh Kumar

Mr. Ramdas Bhattacharya

Mr. P. U. Punjawani

#### Address for correspondence:

National Solid Waste Association of India (ENVIS)  
25/Unique Industrial Estate, Veer Savarkar  
Marg, Prabhadevi, Mumbai-400 025, INDIA.

Phone: 91 22 24375363

Fax: 91 22 56603487

Website: [www.nswai.com](http://www.nswai.com)

E-mail: [info@nswai.com](mailto:info@nswai.com) / [nswai@envis.nic.in](mailto:nswai@envis.nic.in)

This Bulletin of NSWAI-ENVIS is published by the National Solid Waste Association of India in Mumbai

Visit us at: [www.nswai.com](http://www.nswai.com)