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Invited article

A review on current status of municipal solid waste management in India

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ABSTRACT

Municipal solid waste management is a major environmental issue in India. Due to rapid increase in urbanization, industrialization and population, the generation rate of municipal solid waste in Indian cities and towns is also increased. Mismanagement of municipal solid waste can cause adverse environmental impacts, public health risk and other socio-economic problem. This paper presents an overview of current status of solid waste management in India which can help the competent authorities responsible for municipal solid waste management and researchers to prepare more efficient plans.

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Introduction

Human activities create waste and these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health (Saxena et al., 2010; Zhu et al., 2008). Economic development, urbanization and improved living standards in cities increase the quantity and complexity of generated solid waste (Gidde et al., 2008; Rathi, 2007). In discussing solid waste, generally and traditionally certain categories of wastes are well recognized as they are very common. For example, solid wastes include domestic, commercial, industrial, (due to construction and demolition), agricultural, institutional and miscellaneous. Many times domestic and commercial wastes cannot be differentiated and are considered together as urban wastes (Syed, 2006).

Municipal solid waste is generally a combination of household and commercial refuse which is generated from the living community (Rajkumar et al., 2010). The continuous

indiscriminate disposal of municipal solid waste is accelerating and is linked to poverty, poor governance, urbanization, population growth, poor standards of living, low level of environmental awareness (Rachel et al., 2009; Ogu, 2000) and inadequate management of environmental knowledge. Municipal solid waste generally includes degradable (paper, textiles, food waste, straw and yard waste), partially degradable (wood, disposable napkins and sludge) and non-degradable materials (leather, plastics, rubbers, metals, glass, ash from fuel burning like coal, briquettes or woods, dust and electronic waste) (Jha et al., 2011; Herat, 2009; Tchobanoglous et al., 1993). Rapid industrialization and population explosion in India has led to the migration of people from villages to cities, which generate thousands of tons of MSW daily. Poor collection and inadequate transportation are responsible for the accumulation of MSW at every nook and corner (Bundela et al., 2010; Gidde et al., 2008; Sharholly et al., 2007). The management of municipal solid waste is going through a critical phase, due to unavail-

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ability of suitable facilities to treat and dispose of the larger amounts of MSW generated daily in metropolitan cities. Adverse impact on all components of the environment and human health occurs due to scientific disposal of MSW (Gupta et al., 2007; Rathi, 2006; Ray et al., 2005; Sharholly et al., 2005; Jha et al., 2003).

Improper management of solid waste has been reported by several researchers in different cities of developing countries (Mohanty et al., 2014; Das and Bhattacharya, 2013; Noorjahan et al., 2012; Jafari et al., 2010; Chatterjee, 2010; Imam et al., 2008; Chung and Carlos, 2008; Berkun et al., 2005). Due to improper solid waste management, waste has become one of the

Table 1 – Municipal solid waste generation rates in different cities of India.

Sample no.	Name of city	Population (as per 2001 census)	Area (Km ²)	Waste quantity (TPD)	Waste generation rate (kg/cap · day)	Compostables (%)	Recyclables (%)	C/N ratio	HCV* (Kcal/kg)	Moisture (%)
1.	Kavaratti	10119	4	3	0.30	46.01	27.20	18.04	2242	25
2.	Shillong	132867	10	45	0.34	62.54	17.27	28.86	2736	63
3.	Shimla	142555	20	39	0.27	43.02	36.64	23.76	2572	60
4.	Agartala	18998	63	77	0.40	58.57	13.68	30.02	2427	60
5.	Gandhinagar	195985	57	44	0.22	34.30	13.20	36.05	698	24
6.	Dhanbad	199258	24	77	0.39	46.93	16.16	18.22	591	50
7.	Pondicherry	220865	19	130	0.59	46.96	24.29	36.86	1846	54
8.	Imphal	221492	34	43	0.19	60.00	18.51	22.34	3766	40
9.	Aizwal	228280	117	57	0.25	54.24	20.97	27.45	3766	43
10.	Jammu	369959	102	215	0.58	51.51	21.08	26.79	1782	40
11.	Dehradun	424674	67	131	0.31	51.37	19.58	25.90	2445	60
12.	Asansol	475439	127	207	0.44	50.33	14.21	14.08	1156	54
13.	Kochi	595575	98	400	0.67	57.34	19.36	18.22	591	50
14.	Raipur	605747	56	184	0.30	51.40	16.31	223.50	1273	29
15.	Bhubaneswar	648032	135	234	0.36	49.81	12.69	20.57	742	59
16.	Tiruvananthapuram	744983	142	171	0.23	72.96	14.36	35.19	2378	60
17.	Chandigarh	808515	114	326	0.40	57.18	10.91	20.52	1408	64
18.	Guwahati	809895	218	166	0.20	53.69	23.28	17.71	1519	61
19.	Ranchi	847093	224	208	0.25	51.49	9.86	20.23	1060	49
20.	Vijaywada	851282	58	374	0.44	59.43	17.40	33.90	1910	46
21.	Srinagar	898440	341	428	0.48	61.77	17.76	22.46	1264	61
22.	Madurai	928868	52	275	0.30	55.32	17.25	32.69	1813	46
23.	Coimbatore	930882	107	530	0.57	50.06	15.52	45.83	2381	54
24.	Jabalpur	932484	134	216	0.23	58.07	16.61	28.22	2051	35
25.	Amritsar	966862	77	438	0.45	65.02	13.94	30.69	1836	61
26.	Rajkot	967476	105	207	0.21	41.50	11.20	52.56	687	17
27.	Allahabad	975393	71	509	0.52	35.49	19.22	19.00	1180	18
28.	Vishakhapatnam	982904	110	584	0.59	45.96	24.20	41.70	1602	53
29.	Faridabad	1055938	216	448	0.42	42.06	23.31	18.58	1319	34
30.	Meerut	1068772	142	490	0.46	54.54	10.96	19.24	1089	32
31.	Nashik	1077236	269	200	0.19	39.52	25.11	37.20	2762	62
32.	Varanasi	1091918	80	425	0.39	45.18	17.23	19.40	804	44
33.	Jamshedpur	1104713	64	338	0.31	43.36	15.69	19.69	1009	48
34.	Agra	1275135	140	654	0.51	46.38	15.79	21.56	520	28
35.	Vadodara	1306227	240	357	0.27	47.43	14.50	40.34	1781	25
36.	Patna	1366444	107	511	0.37	51.96	12.57	18.62	819	36
37.	Ludhiyana	1398467	159	735	0.53	49.80	19.32	52.17	2559	65
38.	Mumbai	1437354	286	574	0.40	52.44	22.33	21.58	1421	43
39.	Indore	1474968	130	557	0.38	48.97	12.57	29.30	1437	31
40.	Nagpur	2052066	218	504	0.25	47.41	15.53	26.37	2632	41
41.	Lucknow	2185927	310	475	0.22	47.41	15.53	21.41	1557	60
42.	Jaipur	2322575	518	904	0.39	45.50	12.10	43.29	834	21
42.	Surat	2433835	112	1000	0.41	56.87	11.21	42.16	990	51
44.	Pune	2538473	244	1175	0.46	62.44	16.66	35.54	2531	63
45.	Kanpur	2551337	267	1100	0.43	47.52	11.93	27.64	1571	46
46.	Ahmedabad	3520085	191	1302	0.37	40.81	11.65	29.64	1180	32
47.	Hyderabad	3843585	169	2187	0.57	54.20	21.60	25.90	1969	46
48.	Bangalore	4301326	226	1669	0.39	51.84	22.43	35.12	2386	55
49.	Chennai	4343645	174	3036	0.62	41.34	16.34	29.25	2594	47
50.	Kolkata	4572876	187	2653	0.58	50.56	11.48	31.81	1201	46
51.	Delhi	10306452	1483	5922	0.57	54.42	15.52	34.87	1802	49
52.	Greater Mumbai	11978450	437	5320	0.45	62.44	16.66	39.04	1786	54

Source: CPCB, 2005.

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