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COMPARATIVE ANALYSIS FOR THE MAJOR CITIES OF NATIONAL AND INTERNATIONAL SCENERIO OF SOLID WASTE MANAGEMENT

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ABSTRACT

Municipal Solid Waste Management (MSWM) is one of the major environmental problems of Indian and International scenario of the world. Solid waste generated by the daily activities of the people needs to be properly managed in such a way that it minimizes the risk to the environment and human health. Site suitability analysis for resource collection and disposal requires an integrated approach and can be addressed most economically an efficiently using geospatial technology. In the present study, an attempt has been made to provide a comprehensive review of the characteristics, generation, collection and transportation, disposal and treatment technologies of Municipal Solid Waste practiced in India. The study carried out to evaluate the current status and identify the major problems. The study is concluded with fruitful suggestions, which may be beneficial to encourage the competent authorities to work towards further improvement of the present system.

Keywords: Solid waste, Comprehensive & Comparison etc

I. INTRODUCTION

Solid waste generated by the daily activities of the people needs to be properly managed in such a way that it minimizes the risk to the environment. The risk problems facing society today have many characteristics that complicate the application of formal analysis (Merkhofer 1987). The Solid Waste Management process includes collection, transportation and disposal. The observed trend of waste material is a continually growing issue of concern not only at local or regional levels but also at the larger global level. Each city produces tonnes tonnes of solid wastes daily from households, hospitals, industry offices, market centres etc. Some of these are biodegradable some are non-biodegradable and hazardous waste. The increased consumption of electronic items and IT hardware increased obsolescence rate of these products, which will results in the higher generation of electronic waste (e-waste). This waste is ultimately thrown into municipal waste collection centres from where it is collected to be further thrown into the landfills and dumps. With the increase in population, urbanization and economic development, there has been a significant increase in municipal solid waste generation in Hyderabad making its management and disposal a problem. Municipal Solid Waste Management (MSWM) is one of the major environmental problems of Indian cities. The management of municipal solid waste (MSW) is a high priority issue for many communities throughout the world including India.

II. ANALYSIS OF SOLID WASTE MANAGEMENT OF MAJOR INDIAN CITIES

2.1 The Mumbai City: The Financial and commercial capital of India, an spread over an area of around 437.71 sq. km and houses more than 12 million people. Concerned institutions and industrial houses in Mumbai provide considerable employment opportunities. The results of the consequent large sale migration has resulted in very high densities of population and corresponding demand on its infrastructures.
Mumbai generates 6,000 tons per day (TPD) approximately of MSW at a per capital rate of 0.475 kilograms. Final disposal of the MSW in Mumbai since last many years is by open dumping method without the proper waste treatment.

2.2 The Delhi City: The Municipal Corporation of Delhi (MCD) is one among the largest municipal bodies in the world providing civic services, an spread over the capital city of India covering an estimated area of around 1,400 Sq km and houses an estimated population of 13.7 million people.Delhi generates an estimated Municipal Waste of 6,500 tons per day (TPD) approximately of MSW, and the waste generation is poised to touch 18,000 TPD by 2021. Final disposal of the MSW is dumped at land fill site.

2.3 The Bangalore City: The Bangalore Mahanagara Palike, The total geographical area of Bangalore is 800 sq km and total Population (2008) has been 78 lakhs.,Householdsare 25 lakhs,Commercial Properties are 3.5 lakhs .The No of Zones are 8, No of Wards are 198 for BBM. An Estimated MSW generation Projection for each year from all sources for BBMP zones is 3000 tpd and per capita waste is 350 grams per day (gmpd) (domestic waste). Households contribute to 54% percent of the total waste; Markets &function halls contribute to 20% and, Commercial establishment &institutions contribute to 17% and, others 9%, Segregation of waste at source 10%.

2.4 The Kolkata City : In the city area, street cleaning waste and other wastes are dumped at one of the 664 collection points (primary collection). MSW is then loaded into transportation vehicles (trucks) (secondary collection), which transport the waste (transfer) to disposal sites. The solid waste collection method used in Kolkata is primary collection and secondary collection method. Kolkata's municipal solid waste generally consists of waste generated from residential, commercial and institutional areas, parks and streets, and is not sorted at the source, but stored in the same waste containers. The dimensions and numbers of containers vary according to the width of the street and the quantity of the waste generated. The total number of waste bins in Kolkata is 664. Solid wastes stored in waste bins are collected and transported to the open dump area by vehicles belonging to the municipality of Kolkata. Field surveys were carried out by KEIP in 2005 and by KMC in 2010 to assess the status of MSW generation in the KMC area. Kolkata city generates approximately 5114.76 ton/d i.e., 1.10 kg/cap-d of MSW daily.

2.5 The Chennai City: Chennai Municipal Corporation area is divided into 10 zones and each zone is further sub-divided into about 15 Divisions totaling to 155 Divisions. Conservancy responsibility has been delegated to Zonal officials in City Corporation. According to Census 2001, the population of the City was 43.43 lakhs and the average per capita solid waste generated within the City is estimated to be about 585 grams. It has been

estimated that 3000 tonnes of solid waste is generated in these 10 zones in the City area daily and in addition Chennai Corporation also handles about 500 tonnes of debris.

2.2 The Hyderabad City: Greater Hyderabad Municipal Corporation is one of the largest civic bodies in India and capital city of Telangana State. GHMC covers an area of 638 Sq. Km, generating about 3800 TDP of solid waste.

The total population of the district according to 2001 Census is 38,29,753 which is purely urbanized. The decennial growth rate (1991-2001) is 21.74% against the growth rate of 14.59% for the state. The density of population in the district is 19,1949 persons per sq.km. The sex ration in the district is 933 females per 1000 males among the total population. Total workers consist of 29.24% of population. A large percentage of population eke livelihood from non-agriculture occupations covering mostly urban trades, construction and industrial fields. The solid waste generation pattern in Hyderabad is as shown in a tabular form.

III. STUDY AREA

The latitude and longitude of Hyderabad can be projected as 17° 22' 31" N and 78° 28' 27" E. The city is nestled on the Deccan Plateau and is positioned at a height of around 500 meters from the sea level. Major parts of the city feature rocky terrain and in some parts hills can also be noticed

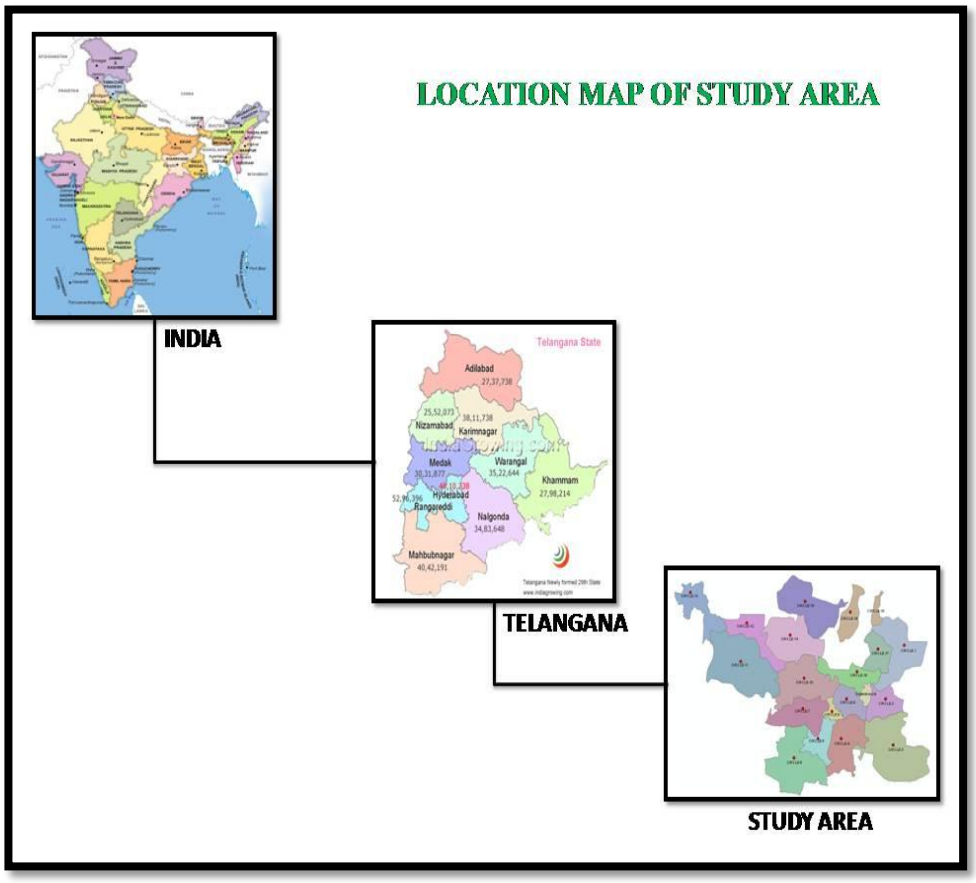


Table 1.1 Showing the Solid Wast Generation Pattern of Hyderabad

Zone	Area	Circle	Waste Generated in M.T	Number of workers		Total
				GHMC	Private	
East	L.B. Nagar	3	185	144	1535	1679
	Kapra	1	124	52	515	567
	Uppal	2	78	98	318	416
	Gaddiannaram		27			0
West	Kukatpally	14	335	177	2063	2240
	Serilingampally	11, 12	128	26	1054	1080
	RC Puram and Patancheruvu	13	22	8	198	206
North	Alwal	16	59	81	396	477
	Qutbullapur	15	118	36	747	783
	Malkajgiri	17	152	42	432	474
	Secunderabad	18	900	564	1200	1764
South	Rajendra Nagar	6	74	46	306	352
	Hyderabad	4, 5		1120	2347	3467
Central	Hyderabad	7, 8, 9, 10	1600	1724	4873	6597

(A Journal of Geology & Geosciences, 2014)

Table 1.2: Solid Waste Generated and Disposed to the Nearest Transfer Station: Comparision for the Year During 1994 & 2001.

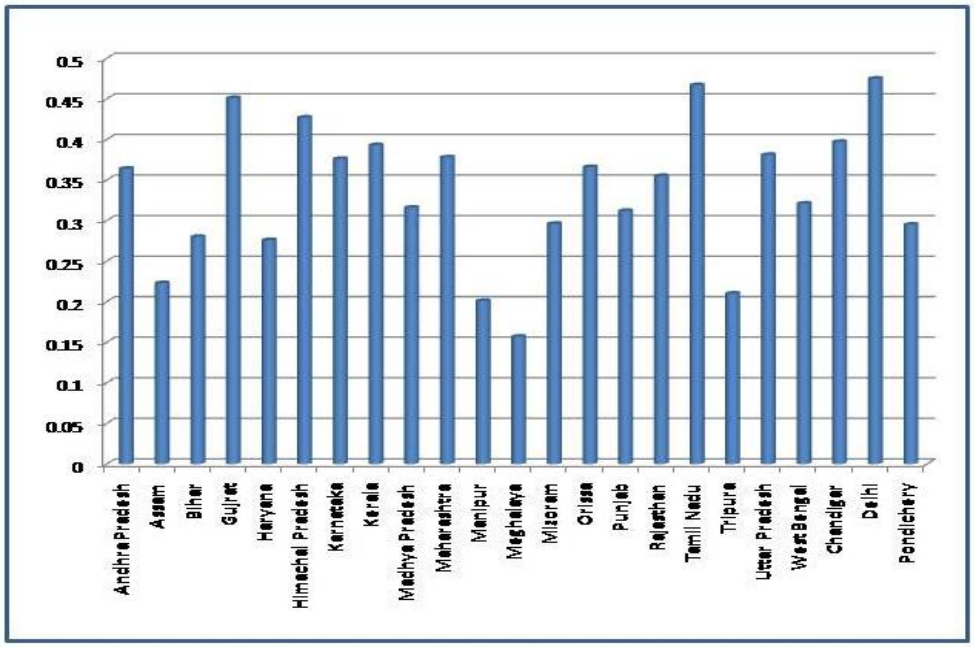
Sl.No	Area in Sq.mt	Total Waste generated per day in metric tones (MT/Day)		Nearest Transfer station
		1994	2001	
1	31.02	181	370	IBT
2	14.91	117	372	IBT
3	17.98	238	234	TBT
4	28.12	144	206	YZT
5	45.36	131	402	YZT
6	4.93	150	46	IBT
7	20.26	210	590	TBT
		1171	2220	

(Source: Padmaja Vuppala ET AL, Centre for Environment, IST, JNTUH 2006)

Table 1.3: Municipal Solid Waste Generated Rates In Different States In India

Sl.No	Name of the State	No. of cities	Municipal Population	Municipal Solid Waste (t/day)	Per capita generated (kg/day)
1	Andhra Pradesh	32	10845907	3943	0.364
2	Assam	4	878310	196	0.223
3	Bihar	17	5278361	1479	0.280
4	Gujrat	21	8443962	3805	0.451
5	Haryana	12	2254353	623	0.276
6	Himachal Pradesh	1	82054	35	0.427
7	Karnataka	21	8283498	3118	0.376
8	Kerala	146	3107358	1220	0.393
9	Madhya Pradesh	23	7225833	2286	0.316
10	Maharashtra	27	22727186	8589	0.378
11	Manipur	1	198535	40	0.201
12	Meghalaya	1	223366	35	0.157
13	Mizoram	1	155240	46	0.296
14	Orissa	7	1766021	646	0.366
15	Punjab	10	3209903	1001	0.312
16	Rajasthan	14	4979301	1768	0.355
17	Tamil Nadu	25	10745773	5021	0.467
18	Tripura	1	157358	33	0.210
19	Uttar Pradesh	41	14480479	5515	0.381
20	West Bengal	23	13943445	4475	0.321
21	Chandigar	1	504094	200	0.397
22	Delhi	1	8419084	4000	0.475
23	Pondichery	1	203065	60	0.295
		431	128112486	48134	7.717

(Source: MCH Handout)



PIE CHART SHOWING THE GENERATED RATES IN DIFFERENT STATES IN INDIA

IV. OVER VIEW OF THE MACROECONOMIC AGGREGATES OF INDIAN ECONOMY

The Indian economy has registered a robust growth pursuant to the liberalization policies unveiled in 1991. The growth of Gross Domestic Product for every decades since 1950 is given in Table.

Table.1.4: Decades Wise Statistics Of Growth Of Gdc In India Since 1950

Sl.No	Year	GDP in Rs. Crores
1	1950 -51	9719
2	1960 -61	16512
3	1970 -71	42981
4	1980 -81	132520
5	1990 -91	515032
6	2000 -01	1925017
7	2007 -08	4303654

(Source: Hand Book of statistics on the Indian economy by RBI 2007-08)

V. ANALYSIS OF SOLID WASTE MANAGEMENT OF MAJOR INTERNATIONAL CITIES

5.1 The China City: The total quantity of municipal solid waste (MSW), industrial solid waste(ISW), and Hazardous waste (HW) in 2002 were 136.5 millions tons, 945 million tons, and 10 million tons, respectively. In 2002 the quantity of MSW disposed of was 74.04 million tons, 89.30% of which was landfilled, 3.72% was incinerated, and 6.98% was composted. There are currently 651 disposal facilities for MSW in China.

5.2 The Thailand City: Thailand is one of the developing countries in southeast Asia with a current population of 65 million, and showed an increasing trend parallel to the development of economic condition, urbanization, and rapid growth of population. The total MSW generation in Thailand increased from 11.2 million tons in 1993 to 14.3 million tons in 2002. The average per capita generation rate increased from 0.53 kg/capita/day in 1993 to 0.62 kg/capita/day in 2002.

5.3 The Japan City: Japan as got well planned and organized Solid Waste management system, has achieved the goal of sustainability. In line with global trends, the innovating and integrated systems are used to resolve sustainability issues; mainly through legislative measures and the incorporation of 3R (Reduce, Reuse and recycle) policy. It mainly focuses on recycling practices in both countries and suggests that while formal recycling is common and successful in Japan. Japan has played a leading role in promoting the 3R in Asia. The population of Japan has remained almost constant in the past few years with 126.9 millio in 200 to 128 million in 2010. According to Statistics Bureau of Japan, the quantity of average MSW production declined from 1.18 Kg in 2000 to 0.97 Kg per capita per day in 2010. It generated around 52 million tonnes of MSW in 2000, 77.4 percent of which was incinerated, 5.9 percent landfilled and 16.7 percent recycled. In 2010 the MSW quantity reduced to 43 million tonnes out of which 79 percent incinerated, 1.5 percent landfilled and 19.4 percent recycled. According to the Ministry of Environment, Government of Japan, the daily per capital waste was 1.18 kg in 2000 which decreased to 1.08 kg in 2007, reduced by 8.1 percent from 2000.

5.4 The London City: The London city, in 2006 they reached a significant milestone on the waste diversion road - 40% waste diversion was achieved in London. We've come a long way since 1989 when only 4% of residential waste was diverted from landfill. What made the difference? Certainly the introduction of the Blue Box Program in 1990 allowed us to make significant inroads, but moreover it has been the commitment of Londoners to continuously increase the amount of waste that is recycled through the expansion of this program or composted through newer City initiatives. Today's waste management initiatives divert 40% of residential waste from the landfill. Londoners have enthusiastically embraced the various waste diversion programs offered by the City or private businesses.The numbers prove this. Since 1987 Londoners have reduced the amount of garbage produced per person from 420 kilograms in 1987 to 247 kilograms in 2007.

5.5 The Singapore City: Singapore is a highly urbanized and industrialized small island nation with a land area of 697 km2 and a population of 4.2 million. It has four waste-to-energy refuse incineration plants and an offshore sanitary landfill for the disposal of non-combustible waste.Given that the rate of waste disposed by its citizens had risen six-fold between 1970 and 2000, it is no surprise that the nation has set an ambitious target to achieve zero landfill. Indeed, if this growth in waste were not curtailed, Singapore would need to build a new 3000-tonne/day incineration plant every five to seven years and a new 350-hectare landfill every 25 years to cope with the waste

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