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Study of Muncipal Solid Waste Management Scenario of Kadapa City

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ABSTRACT
Municipal Solid Waste management constitutes a serious problem in many third world cities. Most cities do not collect the totality of wastes generated and of the wastes collected, only a fraction received proper disposal. The insufficient collection and inappropriate disposal of solid wastes represent a source of water, land and air pollution and poses risks to human health and the environment.
Over the next several decades globalization, rapid urbanization and economic growth in the developing world tend to further deteriorate this situation.
Items that we no longer need or don't have any further use are falling in the category of waste and we tend to throw them away. In early days people were not facing such big problems of disposals because of availability of space and natural materials but now a day's congestion in cities and use of non-biodegradable materials in our day life create many problems. It is directly deals with our hygiene and psychology. So, proper management of solid waste has become unavoidable.
Two decades of economic growth since 1990 has changed the composition of India wastes. The quantity of MSW generated in India is increasing rapidly due to increasing population and change in lifestyles. Land is scarce and public health and environment resources are precious. The current SWM crisis in India should be approached holistically; while planning for long term solutions, focus on the solving the present problems should maintained.
Solid waste Management, its impacts on public health and environment and prospects for the future should further researched. The findings should be disseminated into the public knowledge domain more effectively.
The present paper deals with various topics related with solid waste such as it quantity, performance of solid waste management in Kadapa Municipal Corporation, future generation trends in KMC, deficiencies in the present Municipal Solid Waste management system and also keys to reduce it etc.
Key Words: Municipal Solid Waste, Projections, Paper, Plastic, Bio-degradable, e-waste.

I. Introduction

Matters prefer to be in three states. Either solid, liquid or gaseous. Inter-relationship of these three states in the universe constitutes environment. Today, the world as whole is experiencing a remarkable technological and economical progress. The revolutionary research in science and technology has given man the great control over the nature. No doubt, it has raised the standards of living worldwide, but at the cost of principles of sustainability. In enjoying the leisure of life, humans have started sinking the globe in the pool of pollution. In doing so human beings have enormously polluted air, water and land. The pollution of drinking water sources, breathing air pollution, solid waste management crises of urban local bodies etc., are few of the emerging challenges that are knocking the doors of the research scientists all over the world. The technologies to cater the air and water pollution and most importantly the advance research in developing the suitable technologies in solid waste management, particularly in the field of municipal solid waste management is need of time.

Municipal solid waste precisely can be defined as "solid material which is generated or discarded by human beings which is of no use or wanted by it in its existing form. Solid waste is the word that is synonymous with the world refuse. Solid wasted can be classified in to two groups (1) organic substances which are easily biodegradable (2) recalcitrant's or biorefractory substances which are non-biodegradables. The biodegradable fraction consists mainly of food waste, vegetable scrape, rags, garden waste, papers and cardboards, tree clipping etc. While recalcitrant fraction is formed from the refusal of construction and demolition debris, e-waste, furniture's rubbers, glass, metals, plastics ash etc., with this composition billions of tones of solid waste is generated annually world over of which millions of tons remains untreated or disposed off unscientifically. The results are surface and ground water pollution, air pollution and most importantly

emission of green house gases, methane and carbon dioxide.[1]

The management of solid waste a worldwide concern. Its importance barely needs reiteration proper management concern contributes to public health, the protection of natural environment and the preservation of ecosystems. Improper management leads to decaying filth, litter, and infestations by vermin, insects and pathogens accumulations of toxins in the soil, air and water bodies, noxious gases and odours and unsafe food for both people and animals. Minerals, animals and vegetable debris, along with plastic tyres and metals, hydro carbons, bio-medical wastes and a wide variety of chemicals compounds left behind by industrial transformation continue to accumulate. The collection, transportations and disposal of solid waste is an over growing challenge especially in the developing and world, where galloping urbanization only exacerbates the problem.[2]

India, with a population of over 1.21 billion account 17.5% of the world population (census of India 2011). According to the provisional figures of Census of India 2011, 377 million people live in the urban areas of the country. This is 31.16% of the country's total population.

II. MUNICIPAL SOLID WASTE QUANTITY

The quantity of MSW generated depends upon a number of factors such as food habits, standard of living, degree of commercial activities and seasons. Data on quantity variation and generation are useful in planning for collection and disposal system. Indian cities now generate eight times more MSW than they did in 1947 because of increasing urbanization and changing life styles. The rate of increase of MSW generated per capita is estimated at 1 to 1.33% annually MSW generations rates in small towns are lower than those of metro cities, and the per capital generation rate of MSW in Indian ranges from 0.2 to 0.5 kg/day. It was also estimated that the total MSW generated by 217 million people in urban areas was 23.86 million t/yr in 1991 and more than 39 million ton in 2001. The Central Control Pollution Board (CPCB) had conducted a survey of solid waste management in 299 cities and has given the data of waste generation of different cities.

SOLID WASTE MANAGEMENT IN DIFFERENT CITIES OF INDIA

S.No	Name of the State	No. of Cities	Municipal Population	Municipal Solid Waste (t/day)	Per Capita generated (kg/day)
1	Andhra Pradesh	32	10,845,310	196	0.364
2	Assam	4	878,310	1479	0.223
3	Bihar	17	5,278,361	1479	0.280
4	Gujarat	21	8,443,962	3805	0.451
5	Haryana	12	2,254,353	623	0.276
6	Himachal Pradesh	1	82,054	35	0.427
7	Karnataka	21	8,283,498	3118	0.376
8	Kerala	146	3,107,358	1220	0.393
9	Madhya Pradesh	23	7,225,833	2286	0.316
10	Maharashtra	27	2,272,7186	8589	0.378
11	Manipur	1	1,985,35	40	0.201
12	Meghalaya	1	2,233,66	35	0.157
13	Mizoram	1	1,552,40	46	0.296
14	Orissa	7	1,766,021	646	0.336
15	Punjab	10	3,209,903	1001	0.312
16	Rajasthan	14	4,979,301	1768	0.355
17	Tamil Nadu	25	17,045,773	5021	0.467
18	Tripura	1	1,573,58	33	0.210
19	Utter Pradesh	41	14,480,479	5515	0.381
20	West Bengal	23	13,943,445	4475	0.321
21	Chandigarh	1	5,040,94	200	0.397
22	Delhi	1	8,419,084	4000	0.475
23	Pondicherry	1	2,030,65	60	0.295
Total		299	128,113,865	48134	0.376

Source: Status of MSW generation collection, treatment and disposal in class –I cities.

The Andhra Pradesh state generates about 11,500 tons per day (TDP) solid waste which is about 9% all solid waste generated in India. On the average, every person in Andhra Pradesh generates 570 grams per day of waste compared to Tamil Nadu (630g/day) and Jammu & Kashmir (600g/day). Andhra Pradesh

is among the southern Indian states which together generated 560 g/day per person the highest waste generated rate compared to East North and West India.[3]

III. Municipal Solid Waste In Municipal Corporation Of Kadapa

Kadapa town has been identified as Grade III Municipality in 1868 and been announced as Special Grade Municipality in 1980. The important changes in the Kadapa Municipality and as follows:

- Upgraded to Grade III Municipality in 1868
- Upgraded to Grade II Municipality in 1953
- Upgraded to Special Grade Municipality in 1980
- Upgraded to Municipal Corporation on 13th March, 2005.

Kadapa Municipality has been upgraded to Municipal Corporation (KMC) by merging the bordering village Panchayats viz. Patha Kadapa, Chinna Chowk, Chemmumiapet, Gudur and Akkayapalli.

transportation of solid waste generated in KMC area. For operational purposes the entire area of the Kadapa Municipal Corporation is divided into 4 solid waste divisions and 1 malaria division comprising 5 to 6 wards in each division. A Sanitary Inspector heads each of the solid waste division. In case of the Panchayats a Sanitary Inspector in Chinna Chowk and Maistry in other Panchayat are responsible. The primary collection in the KMC area is carried out through dustbins and open collection points and secondary collection and transportation would be through Bullock Carts and Tractors.

The primary collection system in KMC area constitutes, waste collections from open dumps, street sweeping and drain cleaning by the Sanitary Workers and placing the waste in a nearest dust bins and open collection point. In total there are 535 and 438 dust bins and open collections points located respectively in KMC Area.

PROFILE ON ONGOING SOLID WASTE MANAGEMENT IN MUNICIPAL CORPORATION OF KADAPA

1.	Name of the City	:	KADAPA
2.	Area in Sq.Km	:	164.18 Sq.K.M.
3.	Population as per 2011 census	:	3.41.823
4.	Total No. of Household	:	72.256
5.	No. of Revenue Wards	:	75
6.	No. of Election Wards	:	50
7.	Quantity of Solid Waste Generated per head	:	445 G.M./cap/day
8.	Total qty. of solid waste generated per day	:	206.21 M.Ts
9.	Of which, quantity of demostic solid waste	:	51.89 M.Ts
10.	Of which, quantity of commercial & Industrial SW (MT)	:	15.35 M.T.s
11.	Quantity of solid waste collected per day (MT)	:	196.26 M.T
12.	Total No. Community dustbins	:	----
13.	Total No. disposal sites	:	01
14.	Total No. hand trolleys available	:	300
15.	Total No. of Tippers available	:	6 Big Tippers, 24 Mini Tippers
16.	Total No. Dozer with back hove	:	01
17.	Total No. of Dumpers available (Land procuring for new dump site under Process)	:	01
18.	Total No. of Dumber bins available	:	10
19.	Total No. Tractors available	:	Own-11, Private-Nil
20.	Total No. of Tricycle available	:	29
21.	How the solid waste is treated (process)	:	Vermin Composting of Bio Degradable waste and Disposal of other waste & disposed off
22.	Frequency of waste collection	:	Daily
23.	No. of Sanitation worker	:	Regular 242+664 (Out Sourcing including Vehicle Loaders)
24.	No. of Sanitary Inspectors	:	06

Source: Municipal Corporation, Kadapa.

The primary collection and secondary collection system are not clearly structured in the KMC area. As discussed, in primary collection system waste from households, small open points and street sweeping is collected by conservancy staff and placed at dustbins and open collection points, which is transported to disposal site or low lying area.

IV. QUENTITY OF SOLID WASTE GENERATED IN KMC AREA:

A summary of quantification surveys and assessment, conclude that the total quantity of waste generated in KMC Area to be around 115 tons per day. While around 52 tons is generated by the domestic sources comprising households, over 15 tons is generated by the commercial establishments and around 26 tons from street sweepings.

TOTAL QUANTITY OF SOLID WASTE GENERATED

Sl.No	Source	Total Waste, tons/day	% to Total
1	Domestic Households	51.89	44.96
2	Commercial Establishments	15.35	13.30
3	Marriage and Function Halls	7.21	6.25
4	Hotels, Lodges and Messes	6.07	5.26
5	Markers	2.15	1.86
6	Slaughterhouse	0.80	0.69
7	Schools and Institutions	2.50	2.17
8	Street Sweepings and Drain Cleanings	25.95	22.48
9	BMW (Domestic)	1.50	1.30
10	Construction	2.00	1.73
Total Waste Generated , tons/day		115.42	100.00
Gross Per Capital Generation		445 gm/cap/day	

Source: Municipal Corporation of Kadapa.

In terms of percentage contribution, domestic waste generated from the households account for a substantial 45 per cent of the total waste generated. Street sweeping, markets and commercial waste contribute 22.48, 1.86 and 13.30 per cent respectively. The gross per capital generation (GPCG) for KMC Area thus works out to 445 gm/capita/day.

V. FUTURE GENERATION TRENDS:

The consumption of raw materials and finished product by the community is directly proportional to the Gross National Product of the country. The solid waste quantities are directly proportional to the quantity of material consumed and thus the increase in per capita solid waste quantities would be directly proportional to the per capita increase in GNP.

PROJECT GENERATION TRENDS OF SOLID WSTE IN KMC AREA

Year	Populations	Per Capita Generation	Waste Generated, tons
2001	259464	445.00	115.46
2006	294813	445.00	131.19
2011	334979	477.27	159.88
2021	432472	549.00	237.43
2026	491392	588.81	289.34
2031	558340	631.51	352.60

Source: Municipal Corporation of Kadapa.

It is projected that the per capital generation (GPCG) in Kadapa will increase from 445 gm to 631 gm by the year2031, and the total waste generated from 115 tons/day to 353 tons/day.

VI. DIFFICIENCIES IN THE PRESENT MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM:

The present MSW has come up suddenly within a short span of time and is constrained by lack of financial as well as managerial skills due to gigantic nature of the task of handling such huge quantities of waste which are heterogeneous, which are subject to rapid changes in composition due to rapid changes in

the attitude, cultures etc., of the urban population and also due to population explosion as well as technological knowledge explosion. Some of the areas in the present urban solid waste system which are of concern are

1. **SOURCES:** Very little attention is being paid to segregation and storage of waste at source because no system of segregation of recyclables organic and inorganic waste at household level and storing then separately until collection is put in place.
2. **AT PRIMARY COLLECTION:** The system of primary collection of waste is not properly designed to suit each area. In many places, door step collection facility does not exist, nor are bins kept at short intervals for collection and/or community collection and disposal of wastes. Not much attention is given to segregate hazardous industrial wastes in many areas as in many part of the city. Particularly in older parts of the town small scale industries co-exist or even found within the same house complex.
3. **STREET SWEEPINGS:** Most areas are not swept regularly, few occasionally and others not even for a long time. Even where they are swept regularly, the sweepings are not cleared on Sundays and holidays. The efficiencies of the workers vary from very poor to moderate due to poor remuneration as well as working with outmoded and unsuitable tools needed for the types of waste generated since they tax the human energies more. Further there is no yardstick or accountability in many places.
4. **COMMUNITY STORATE BINS FOR STREETS:** The community storage bins are poorly designed and also the required number of these are not provided. Many are broken and are invariably over flowing due to heavy deposition of wastes. Permanent structure for these community storage bins will not be suitable as they may have to be removed frequently due to the various developmental activities like expansion of roads, installing of underground drainage systems, underground electrical cable etc.

   Further when open dust bins, masonry bins, cement round bottomless dust bins etc., are provided at different points, the residents throw the waste from a distance resulting in spilling all over the area and contaminating the area due to decomposition. This also makes the collection difficult.[4]
5. **POLICY ISSUES:** A vigorous policy framework to give direction and thrust to environmentally sound waste management does not exist in India. Policy measures to promote waste minimization recycle and recovery is rather learned. No national targets have been set up to deal with overall issues of waste management in line with country's economic development programme. The environmental policies are "discharge and control" based instead of shifting to "source and control" based approach.
6. **TECHNOLOGY ISSUES:** Launching target efforts for development/acquisition of technologies for material and energy recovery from waste is the need of hour in India. To build confidence and test the application of such technologies in the context of developing countries pilot demonstration projects need to be established. This turn will require extensive data collection on waste characterization and quantification to facilitate assessment of recycling/recovery potential and design/development of technologies. Almost no effort seems to be taking place in this direction. Most of the work is focused on augmenting waste collecting and building disposal facilities.
7. **FINANCING ISSUES:** To support waste management one of the most pressing issues is the availability of funds. The local authorizes are mostly in a dire financial situation and are barely able to maintain the basic jobs of waste collection and somehow dispose it. Municipal level waste management continues to be heavily subsidized by government. Financing mechanisms to promote use of environmentally sound technologies. For technology development and demonstration are conspicuous by absence.[5]

SUGGESTIONS: In future to meet the future challenges the major thrust should be

- Collection of basic data on the prevailing knowledge/practices/situations prevalent in different areas/socio-economic status and its relationship to solid waste generation etc. This important aspect has been completely neglected and is responsible for many failures in the enforcement of solid waste management.
- Segregation of different types of waste at source at home/hospitals/industries/institutions etc.
- Resource recovery and recycling of wastes, so that the waste is turned into useful materials for use in daily life and also environmental and natural resource accounting.
- Appropriate technology for safe collection, transportation and disposal of solid waste.
- Waste reduction through various routes which are environmentally sound.
- On issues such as promotion of clean and low cost technologies, waste minimization.
- Development of mass based technologies and standards.

- Utilization of the available human, financial, infrastructural resource, much more efficiently and also development of institutional and human resource development to meet the needs of urban solid waste management in future.
- Maximization of reuse of quality organic wastes.
- Effecting improvements in private sector trading to meet the newer types of waste production.
- Consumer education in urban solid waste management and creating awareness of good solid waste management systems.
- Involvement of participants in urban solid waste management (participatory approach) and utilization of the various NGOs/development of NGOs participation in urban solid waste management.
- Helping the waste landless vertical growth with better quality of life and with minimum of health hazardous.
- Minimizing the health hazards to waste landless and their family etc.[6]

VII. CONSLUSION

Two decades of economic growth since 1990 has changed the composition of Indian wastes. The quantity of MSW generated in India is increasing rapidly due to increasing population and change in lifestyles. Land is scarce and public health and environmental resources are precious. The current SWM crisis in India should be approached holistically; while planning for long term solutions, focus on the solving the present problems should maintained.

The Government of India and local authorities should work with their partners to promote source separation, achieve higher percentages of recycling and produce high quality compost from organics. While this is being achieved and recycling is increased, provisions should be made to handle the non-recyclable wastes that are being generated and will continue to be generated in the future (20). State Governments should take a proactive role in leveraging their power to optimize resources.

Solid Waste Management, its impacts on public health and environment, and prospects for the future should be further researched. The findings should be disseminated into the public knowledge domain more effectively.

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