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Municipal Solid Waste Management (Msw) Scenario in Kurnool City, Andhra Pradesh, India

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Abstract

Municipal Solid Waste (MSW) is defined to include refuse from households, waste from commercial establishments, and refuse from institutions, market waste, yard waste and street sweeping (World Bank 1994). Waste is an unavoidable by-product of human activities, economic development, urbanization and improving living standards in cities. The increase in quantity and complexity of waste generated in municipalities and notified areas have become serious concern for Government departments, pollution control agencies, regulatory bodies and also the public in India. Inefficient management, utilisation and disposal of this solid waste is an obvious cause for the degradation of environment in India. Improper disposal of this waste generated leads to spread of communicable diseases, causes obnoxious conditions, pollutes all vital components of living environment (air, water soil) and spoils the bio sphere as a whole. Cleanliness is a major factor that influences development of any nation, which otherwise hampers due to improper disposal of solid waste. Urban society rejects and generates solid materials regularly due to rapid increase in production and consumption. The objectives of Municipal Solid Waste Management (MSWM) are to control collect, process, utilise and dispose of solid waste in the most economical way consistent with the protection of public health and the natural environment. Kurnool is one of the largest developing cities in Andhra Pradesh (India) and is undergoing rapid expansion and modernization. This paper presents a case study of present situation of MSW in Kurnool and the process being implemented presently. An environmental audit of MSWM in Kurnool city was under taken to understand the shortcomings including some possible proposals.

Index terms— Municipal Solid Waste (MSW), Municipal Solid Waste Management (MSWM), composting, vermin composting, landfill site, Kurnool Municipal Corporation (KMC

1 Introduction

he solid waste generation is an index of socioeconomic development and economic prosperity of the region. Increasing industrialisation and raising income lead to greater use of resources and waste composition is influenced by the factors such as extent of urbanisation, standard of living and climate. Thus waste quantities as well as composition are inextricably linked to the vibrancy of economic activity and resource consumption. MSWM in India is regulated by MSW(Management & Handling) Rule 2000 **??**1). In Kurnool a decade ago per capita generation of waste was 0.4 kg/day now it is 0.7 kg/day. Kurnool is one of the fastest developing cities in Andhra Pradesh with a population of 4 lack 60 thousand in 2011 in urban agglomeration, registering a growth of 20% over the past decade. The city has around 1 lack 60 thousand houses which generate 330 metric tons of solid waste per day. Kurnool is the head quarters of the district of the same name and is situated between a latitude of 15-48" and 78 east longitude of the Secunderabad -Dhronachalam section of South central railway

at a distance of 210 km south of Secunderabad. It is developed as a transit place on the southern banks of the river Tungabhadra and was commonly known as ' Kandenavolu'. It was a greasing place for the carts which were used to transport stone for the construction of a temple at Alumpur from which the name 'Kandenavolu' was derived. After independence the national government took over the administration. After separation of the 11 districts of Andhra Pradesh from the composite Madras state in 1953. Kurnool became the state Head quarters on **??**ctober 1, 1953

2 Population Growth

In The projection estimates indicates that the quantity of MSW generated will be doubled in the next five years. Source Number ii. Door-to door collection KMC introduced voluntary garbage collection by providing tricycle. A tricycle puller collects garbage from 150 houses by collecting Rs20/ from each house. After collection the tricycle puller dumps the collected garbage in to the nearby community dust bin. This practice is being implemented by KMC in 7 wards for the last six months on trial basis. iii. Road Sweeping According to the Supreme Court guidelines 2000, an efficient sweeping can support a better SWM, because one of the main problems is garbage on the roads. KMC has tried to achieve a better SWM via an efficient sweeping. The 762 strong conservancy workers consisting of the corporation staff and the private contractors sweep the city based on the formations called units (day & night) innovated by the KMC. There are some units that sweep in the day and the others that sweep in the night. Night sweeping is done to prevent people from exposure to the dust. Of the total sweeping staff, 391 are the corporation employees, and the rest are the employees of the private contractors who work under the control of KMC, KMC is engaging private workers for sweeping the roads. The waste collected is dumped in the nearby dust bins. Many times the garbage is being burnt or dumped in the road side drains. The drains get choked resulting in the overflow during rains. The placing of dustbins on the roads and streets is based on the people's choice. Wherever they have been throwing the waste, that place is given a dustbin and it becomes a collection point. The collection system is spread across the city. Disposal in open pits became routine and first municipal cleaning program was initiated in Philadelphia in 1757. Since then we have developed types of waste that cannot simply be dumped into a hole. Transportation means conveyance of MSW from place to place hygienically through specially designed transport system so as to prevent foul odour, littering, unsightly conditions and accessibility to vectors. The following Table-4 presents the details of transporting MSW. The garbage is being transported to the dumping site Gargeyapuram which has 61.7 acres of dumping area located 18 km from the city. Table -5 presents the human resource engaged in collection, transportation, processing on MSW(2). The house hold garbage collected by the tricycle puller from 100 houses (consisting of slum, middle income group & high income group) is segregated and quantity of segregated waste is noted, this procedure is repeated for four days in a weak on different days. The average value is noted. The samples are collected from commercial areas, hotels, parks and street sweepings (from selected localities). Samples are also collected from the duping sites. The samples were segregated and weighed. The results are presented in the Table-7. The average composition of MSW is shown in the last column. The survey revealed that the average generation of waste ranges from 0.5 kg/capita/day to 0.7 kg/capita/day.

3 Sources of Msw

4 VI.

5 Results and Discussions

The techniques and the shortcomings of the techniques adopted for handling of MSW have been identified. Door-to-door collection is adopted in 7 wards on trial basis, which has resulted in efficient collection of waste and reduction of littering, foul odour and anaesthetic appearance of bins. However, in commercial areas, due to the absence of community bins, waste generated is disposed in the street. A few waste heaps can be found on the roadsides in commercial areas. All the trucks that are used for transportation of waste have no polythene covers/meshes and this results in littering, scattering of waste and foul odour during transport. The entire MSW is disposed off in the Gargeyapuram dump yard, causing foul odour, scattering, leachate formation, and air pollution from burning and methane emission from decomposing organic matter.

6 a) Storage

The household waste is stored in the dust bins and from there it is being transferred into the community bins. Many a time the household is not transferred into the bins it is scattered around the bin or it is littered in the vacant space. The public must be educated to collect all the wet waste & dry waste separately. The same must be handover to the tricycle collection boy.

7 b) Collection i. Source Collection

Adopting the door-to-door collection method in some wards has proved to have many advantages. The complaints from residents due to anaesthetic bins near ear 2012 Y their houses have stopped, the number of stray dogs and stray cattle has reduced and the no bin system has also improved the waste handling by people or residents. This

method is also better suited for collection of segregated waste. Suryapet (Nalgonda district A.P) secured the ISO 14001-2004 certificate dust bin free town **??**4). Door-to-door collection must be introduced in all the areas. The tricycle must be provided with two compartments, one for wet waste & for dry waste. After collecting the waste the tricycle puller must transfer the same separately this is very convenient for processing of MSW. During door-to-door collection the pourakarmika (tricycle puller) manually segregates the waste. It is very important that this is carried out with proper protection. The staff should be provided with gloves, footwear, apron, masks and goggles for safety, as they are constantly exposed to waste every day. The waste collected in community dust bins must be transported to the dumping yard. The available community bins are not adequate; some are to the dilapidated condition. Because of this the garbage is being dumped on the roads. The metal dust bins must be painted to prevent rusting and prolong its life. Small litter bins should be provided for the pedestrians in commercial areas. There is a lack of community bins in a few of the commercial areas. Due to the high generation of waste in commercial areas, the waste is not always stored on site, but is disposed on the roadsides, causing anaesthetic appearances. Welldesigned community bins have to be placed in commercial areas, depending on the quantity of waste generated. The maintenance of the present bins is poor and has resulted in rusted bins having sharp edges. This can prove to be dangerous to the collection staff and also to the users. The staff must be provided with well fitting gloves for safety. Community bins should be provided with a partition for separate collection of waste and proper colouring and labelling on the bins. To improve the separation of waste at source and throughout the MSWM process, adequate staffing, supervision, procedures, training, posters, verbal reminders, reporting, meetings and equipments are required.

8 ii. Sweeping

The MSW collected from sweeping of the roads is transferred into the nearby bin. During the survey it is noticed waste is being pushed into the drains which results in blocking of drains. The sweepers must be educated on the effects of blocked drains; regular inspection of drains must be made.

9 iii. Rag Pickers

The rag pickers collect recyclable waste on the roads. The recyclable waste is collected by the rag pickers sell to the recyclable waste traders, from where it is transported to the recycling factories. The decrease in the percentage of plastic at the dumping site (from table -7) is because of rag pickers. At present from the Kurnool city 20 tons of plastic and 7.8 tons of waste iron is being transported daily.

10 Transportation

At present KMC is transporting the garbage collected by means of dumper trucks, dumper tractors, dumper placers. However, there is no proper enclosure provided to prevent the wet waste from leaking on to the road. It is very essential that all trucks have mesh and polythene covering (3) with a proper enclosure to prevent scattering of waste, foul odour and leakage while travelling on crowded roads. The waste is not segregated at an intermediate level and is directly transported to the disposal site. Long distance from ward to dump site, hence less number of trip a day is made by each truck. Transfer stations to be provided where waste can be further segregated and higher efficiency for transportation can be achieved by increasing the number of trips made by each truck.

11 VIII.

12 Processing

Any municipal solid waste generated in a city or a town, shall be managed and handled in accordance with the compliance criteria and the procedure laid down in Schedule-II (2). In the current MSWM system presently adopted in KMC can cause irreversible damage to the surrounding areas and is extremely hazardous to the environment. The MSW is being dumped in the dumping yard. This will cause foul odour, flies and bird menace. The waste is burnt which emits toxic gases and causes air pollution. It is suggested to provide composting and vermin composting units which not only produce biogas but also produce fertiliser. Waste to energy plants like production of refuse derived fuels and incineration plants can be set up to use waste from commercial areas once the source segregation process is set in place which not only reduce the volume of waste for land filling but also produce heat which can be used to generate steam for producing electrical ear 2012 Y power.. Suryapet (Nalgonda district A.P) won excellent award and won the Supreme Court's appreciation for proper solid waste management (5).

Some important factors that need to be considered for the overall improvement of the waste management system are:

? Monitoring. By monitoring the efficiency of collection, transportation, process, disposal, the number trucks and trips made by trucks to the specified disposal site. This should become an integral part of the waste management system. The municipal authority not only has to monitor their own staff's activities but also the activities carried out by the private organisations. The State pollution control board has to carry out regular inspections of the dump yards

? Training and education. Environmental education is a way of increasing. Understanding of problems, cooperation among stakeholders, environmental Entrepreneurship and environmental performance.

The training should be a regular feature of MSWM, with hands on training on sorting and collection.

After training there should be follow up of the practices.

? Health and safety programmes. It has been a common observation that in Kurnool maintenance staffs do not use the protection. Regular health and safety programmes are required to educate the staff on the ill effects of manual handling of waste, walking bare foot in dump yards and continuous exposure to waste. Regular health checkups should be carried out to monitor the health of the workers.

? Involvement of the community. Community involvement in waste management monitoring programmes like that of Suchi Mitra should be encouraged and more people should be involved in such activities. This increases the environmental awareness of the participants and other people. This is one of the fastest and most effective ways to make the public understand the importance of activities like sorting.

? Integration of waste pickers. NGOs should organise waste pickers, and, instead of the waste pickers retrieving waste at the dump yard which is extremely hazardous to their health, safer methods of retrieving waste from the source by the waste pickers should be developed. In this regard Gamana a voluntary organisation with the support of KMC is conducting awareness programs to the public and educating the cycle pullers regarding segregation of waste into wet & dry waste. Additionally, the waste pickers should be paid to retrieve waste from process plants and dump yards, instead of them paying to access the waste. Ways of improving the working conditions of the waste pickers and providing safety gear for them should be developed.

? Planning. The waste management that is carried out currently comprises more low cost measures in order to comply with regulation and avoid public agitation and complaints. There is no environmental management planning that is taken into consideration. A more systematic and proactive approach to management is required when the complexity of the programme increases. This would help to ensure that requirements are handled in a consistent and professional way and problems are addressed promptly and effectively. This would also ensure that the staff has clear objectives and goals while carrying out their activities.

? Public participation. Currently the main hindrance to the implementation of the MSWM is due to lack of public participation. It is very essential to educate the public regarding segregation of wet & dry waste separately before any project is implemented, a public participation meeting be held to make the public aware of impacts of mixed waste dumping and the problems associated with..

Reasons for non-compliences in waste collection are .

Figure 1:

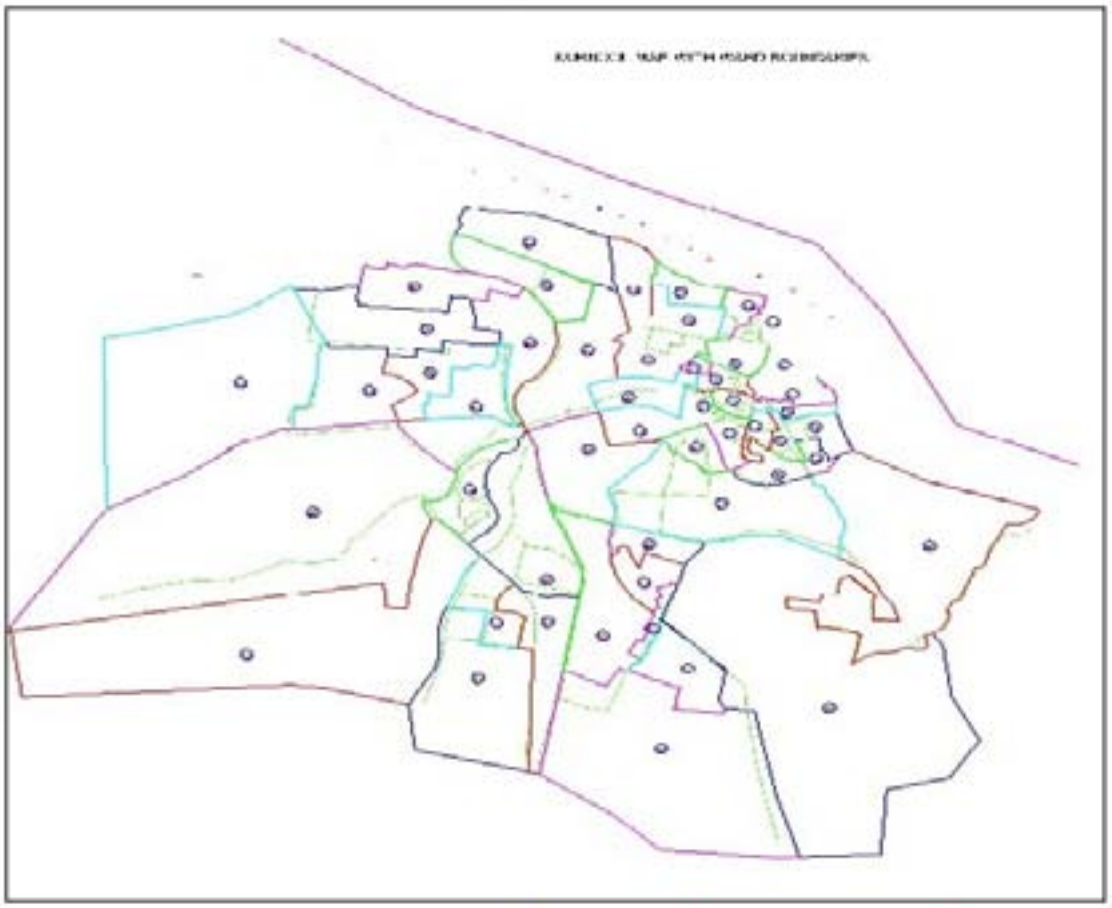

Figure 1. Kurnool City Ward wise Map

2

Figure 2: Figure 2 :

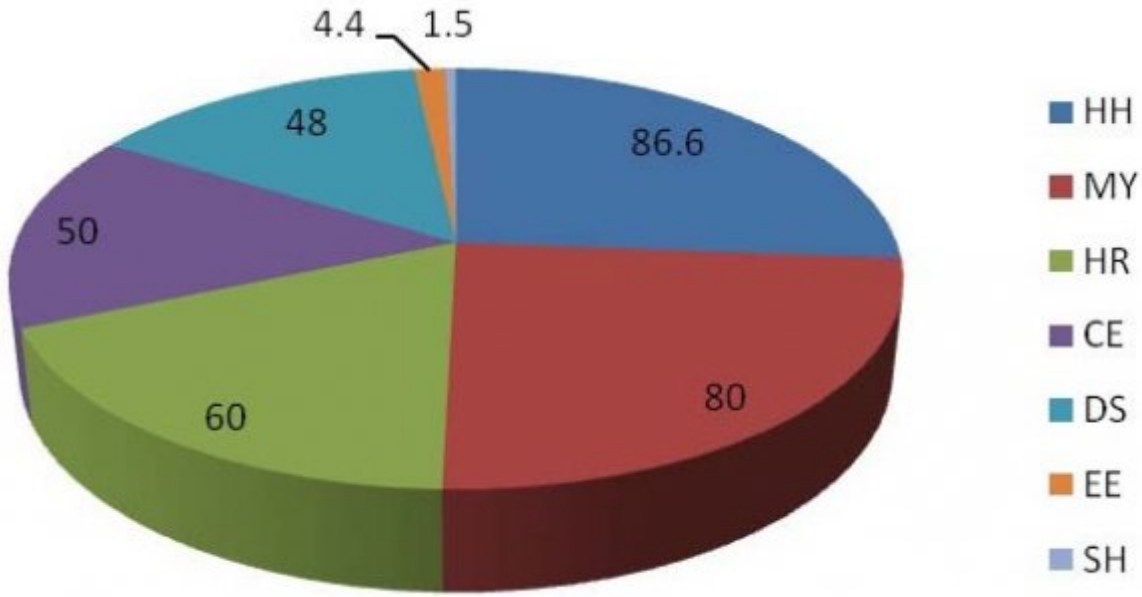

Figure 3 Proportion of MSW Generated

Figure 3:

4 

Figure 4: Figure 4 :

5 

Figure 5: Figure 5 :

6

Figure 6: MunicipalFigure 6 :

7

Figure 7: Figure 7 :

Figure 8:

8 

Figure 9: Figure 8 :

Figure 10: Municipal

9

Figure 11: Figure 9 :

Figure 12: Municipal

Figure 13:

1

III.

Figure 14: Table 1 :

-

IV. Break up of Msw
Proportion of MSW generated is presented in
the Table-2

Figure 15: Table - 1

2

Figure 16: Table 2 :

-

Figure 17: Table - 3

3

S No.	Year	Quantity Generated per anum in MT
1	2010	97200
2	2011	119004
3	2012	126000
4	2013	136800
5	2014	151200
6	2015	172800

Figure 18: Table 3 :

4

S.No.	Type of vehicles	Number of vehicles	Capacity MT	Trips per day	Total amount of MSW MT
1	Tippers	5	4	2	8
2	Tipper trucks	5	2	8	16
3	Dumper placer	5	3	24	72
4	Tractors	17	2	6	174
5	3-wheller auto tippers	6	0.5	18	9

Figure 19: Table 4 :

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S.No.	Post	
1	Health officer	2
Environmental engineer		3
Senior Entomologist		4
Sanitary		
9	P.H.Maistries	16
10	Public Health Workers*	792
11	Malaria Mazdoors	23
12	Public Health Cleaners	2

*[Note: *Includes 391 KMC health workers.c © 2012 Global Journals Inc. (US) ear 2012 Y c) Processing MSW At present KMC is not processing the waste collected. The MSW without segregation is being dumped in the dumping site Gargeyapuram dumping yard located 18 km from Kurnool. At the dumping site there is one JCB Proclainer is operating .]*

Figure 20: Table 5 :

7

Category of waste	House hold	Market	Hotels	Commercial areas	Street sweeping	At the dumping site	Average composition of MSW
Food waste/Vegetable/fruits (Fermentable)	70.7	91	90	10	13	20.5	49.6
Plastic/Rexene	8.6	2	4.5	37	40	9	17.5
Paper/Cardboard	6.7	2	1.5	25	12	10	9.7
Cloths/Jute	1.5	0.2	-	10	5	12	4.7
Stones/Rubbles	-	-	-	4	14	14	5.3
Dirt particle &Fine	5.8	5	2	9	12	21	8.6
Metals &Glass	0.2	-	0.5	5	3	4	2.2
Bones	0.1	-	1.5	-	-	1.5	0.5
Coconut	7	0.6	-	0.9	-	3.5	0.8

Figure 21: Table 7 :

[Apathy of Municipal Authorities] , *Apathy of Municipal Authorities*

[Www and Org (2004)] , Toxicslink Www , Org . july 5, 2004.

[Data provided by The Health Officer Kurnool Municipal Corporation] *Data provided by The Health Officer Kurnool Municipal Corporation*, Kurnool, Andhra Pradesh.

[Lack of financiers to create awareness] *Lack of financiers to create awareness*,

[Lack of knowledge and skilled manpower for treatment and disposal of waste] *Lack of knowledge and skilled manpower for treatment and disposal of waste*,

[Lack of powers to collect spot fines. 11. Lack of financial resources for procurement of tools and modern vehicles. Constraints for *Lack of powers to collect spot fines. 11. Lack of financial resources for procurement of tools and modern vehicles. Constraints for increasing treatment and disposal facility are*, 10. (Lack of adequate litter bins in the city)

[Lack of public awareness, motivation and education] *Lack of public awareness, motivation and education*,

[Lack of publicity through electronic and printing media] *Lack of publicity through electronic and printing media*,

[Lack of sufficient knowledge on benefits of segregation] *Lack of sufficient knowledge on benefits of segregation*,

[Lack of support from the state Government] *Lack of support from the state Government*,

[Municipal Solid Waste (Management Handling) rules, 2000. Ministry of Environment and Forest] *Municipal Solid Waste (Management & Handling) rules, 2000. Ministry of Environment and Forest*, Government of India.

[Municipal Solid Waste (Management Handling) rules, 2000. Ministry of Environment and Forest] *Municipal Solid Waste (Management & Handling) rules, 2000. Ministry of Environment and Forest*, Government of India (Schedule-II

[No system of primary collection from the door step References Références Referencias] 'No system of primary collection from the door step'. *References Références Referencias*,

[Non-availability of appropriate land] *Non-availability of appropriate land*,

[Non-cooperation from household, trade and consumers] *Non-cooperation from household, trade and consumers*,

[Residents to change/negligence/reluctant personal in ULB] *Residents to change/negligence/reluctant personal in ULB*,

[Unwillingness on part of the citizens to spend on separate bins for recycling] *Unwillingness on part of the citizens to spend on separate bins for recycling*,