The Municipal Solid Waste Management System of Jaipur: A Case Study

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ABSTRACT

Solid waste management is a worldwide phenomenon. Improper management of solid waste (SW) causes hazards to inhabitants. It is a big challenge all over world for human beings. Jaipur's rapid development has resulted in its infrastructure lagging behind population and industrial growth, which is especially evident in the unsightly and unsanitary piles of solid waste (garbage) on the roads. This study discloses that how the system is carried out, some obstacles to its success, and the role of Public Private Partnerships (PPPs). The findings indicate that there is a multiple-tiered hierarchical system. The system involves a formal sector comprised of female and male sweepers, permanent and impermanent workers, and an informal sector of rag pickers and door-to door collectors, door-to-door recyclers, NGOs, and private companies. A comprehensive study was done regarding collection, transportation, handling, storage, disposal and treatment of solid generated in Jaipur city. This study discloses that there is no proper mechanism in the city for treatment of solid waste generated, this leads to dumping of waste in open areas which affects Environment as well as humans living in that vicinity. It was observed that there was a huge gap in making policies and implementing the rules at the ground level.

The study of municipal solid waste management (MSWM) in Jaipur city adopted a structured approach to identify the current status of MSWM which included key stakeholders like communities, informal sector, municipal authorities and private entrepreneurs. The study incorporated a stepwise approach, following the trail of municipal solid waste (MSW) i.e. from its generation, segregation, collection, storage, transportation to disposal. The methodology involves primary and secondary data collection to find out the current situation of municipal solid waste management (MSWM). From the study it was found that the Jaipur Municipal Corporation (JMC) is not following the standard procedure of handling MSW. JMC gives priority to few areas while handling the MSW in comparison to others which further deteriorates the situation of MSWM.

KEYWORDS: **Solid waste management (SWM), Public Private Partnerships (PPPs), solid waste (SW), municipal solid waste management (**MSWM), Jaipur Municipal Corporation (JMC).

1. INTRODUCTION:

Municipal solid waste (MSW) is one of the major environmental problems of the urbans and sub-urbans. Rapid industrialization and population explosion in India has led to the migration of people from villages to cities, which generate thousands of tons of Municipal Solid waste daily. The municipal solid waste amount is expected to increase significantly in the near future as the country strives to attain an industrialized nation status by the year 2020. Solid waste management (SWM) has become a global issue and is of a major concern, especially in developing countries, due to various environmental problems, such as pollution of air, soil and water and generation of greenhouse gases from landfills. The problem of ineffective municipal solid waste management (MSWM) is also prevailing in the urban environment of Jaipur. Therefore, the present study was undertaken to find out the current status, problems and prospects of Municipal solid waste management in Jaipur city.

1.1 Importance of proper MSW management:

In India, solid waste management falls short of the desired level as the systems adopted are out-dated and inefficient, institutional weakness, shortage of human and financial resources, improper choice of technology, inadequate coverage and lack of short and long term planning are responsible for the poor state of affairs. The city of Jaipur is also facing these deficiencies in varying degrees and there is a need to make substantial improvement in the MSW practices prevailing in the city to raise the standards of health, sanitation and urban environment keeping pace with the rapid urbanization and growing population.

1.2 Need for the study of MSW Management of Jaipur:

Solid waste management is a worldwide phenomenon. Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of that pose risks to the environment and to public health. Situation of Jaipur Municipal Solid Wastes is not different, commonly known as trash or garbage, are the solid wastes generated from different locality of the city. Some of these wastes have been proved to be extremely toxic and infectious. The uncontrolled and unscientific dumping of such wastes has brought about a rising number of incidents of hazards to human health. The problem of municipal solid waste management (MSWM) is also prevailing throughout the urban environment of Jaipur and need to improve at the large scale. Therefore, the present study was taken to find out the problems and prospects of Municipal solid waste in Jaipur city.

1.3 Project Objective

• To find out the current status of Municipal Solid Waste Management in Jaipur. Realizing the need for proper and scientific management of solid waste, the Municipal Solid Waste (Management & Handling) Rules, 2000 were notified by the Ministry of Environment and Forests, Govt. Of India has given the standards of MSWM.

• To suggest feasible solutions for the improvement in Municipal Solid Waste Management in Jaipur in coherence with societal, legal, environmental and technological aspect.

1.4 STATUS OF MSWM IN JAIPUR CITY:

Jaipur's daily production of solid waste is almost 1150 MT/day. Out of which around 250 MT still remains on the streets and roads, that means lifting efficiency is around 80%. The per capita solid waste generation per day is around 430 gm, which with a family size of almost five, results in 1.65 kg/day.

- MSW generation estimate by JMC: 1250 TPD
- No system for Segregated Waste Collection.
- Primary stage collection:

a) Door to door in outer areas.

b) Collection from disposal point/depot.

- Secondary stage collection from 3500 marked and 1000 unmarked collection point/depot.

No. of collection bin : 1400
1.1 cum capacity : 1000
3.0 cum capacity : 340
7.0 cum capacity : 6

2.0 METHODOLOGY:

Municipal solid waste management is a vital issue to be addresses in the preparation of the scheme of integrated solid waste management. The expression solid waste has come into use only recently after the solid waste handling and management rules came into operations.

2.1 COLLECTION OF PRIMARY DATA Various methods will be adopted for data collection such as:

2.1.1 Survey: The survey will be conducted to obtain data of per-capita generation, collection, transportation, treatment, recycle and disposal of municipal solid waste.

2.1.2 Interview: By interview method information will be collected from personnel engaged in policy making, law enforcing, solid waste management and handling and general public, stake holders regarding waste handling and management.

2.1.3 Observation: By observing data both quantitative and qualitative will be obtained on present urban solid waste handling and management.

2.1.4 Sample Collection: Samples of municipal solid waste are collected from different landfill site, transportation vehicles and from the point of generation of waste.

2.2 COLLECTIONS OF SECONDARY DATA: Secondary data will be used to retrieve the information about various areas such as:

➢ Present environmental status

➢ Municipal solid waste generation

➢ Map of the study area

➢ For city location, climate, population data, details about landfill sites, transportation of waste

➢ City spatial growth, ward wise use, population density, slumps, commercial areas, institutional areas, hospital waste, soil structure and type, water bodies, highways, sensitive sites etc.

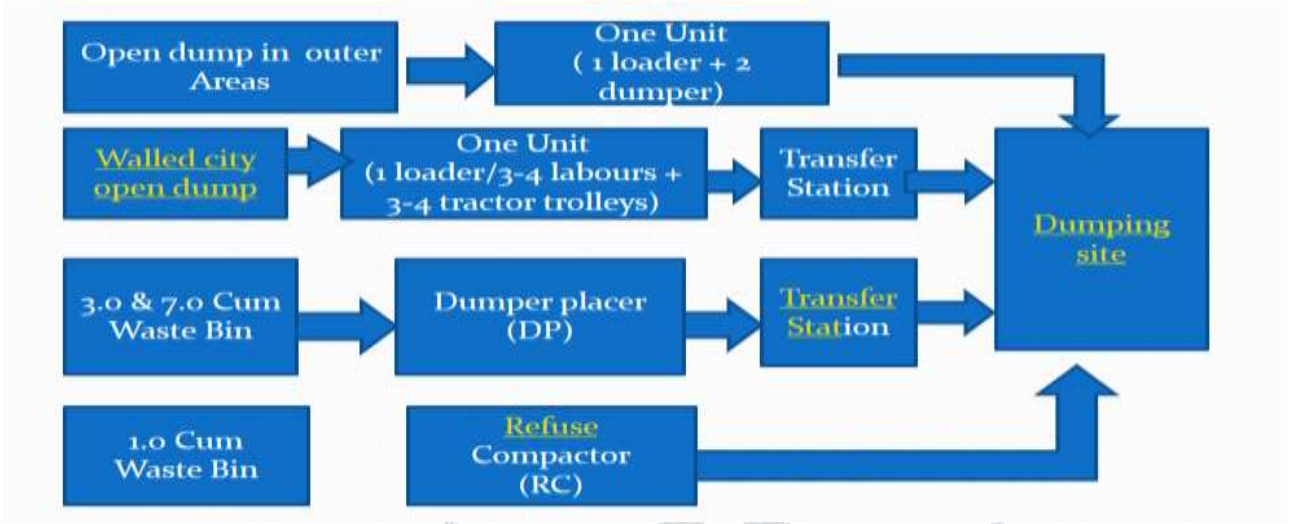
➢ Reports of Jaipur municipal corporation for the data of waste handling and management covering swiping of streets, collection of waste, manpower deployed, allocation of resources, techniques adopted for waste handling.

➢ Collection of information from different personnel of JMC about waste collection techniques, segregation, storage and bins, transportation, disposal vehicles for transportation, bins for storage etc.

2.3 Transportation- Modus Operandi of SWM

The waste is collected from different sources/establishment by various methods. The solid waste management activity in Jaipur consists of wastes generator throwing the waste into the different types of bins provided by the JMC system at different transfer station.

Fig.1 Transportation- Modus Operandi of SWM



2.4 JMC Transport Resources:

The Jaipur municipal corporation (JMC) is collect the municipal waste through the loader, dumper, refuse compacter, dumper placer, tractor trolley etc. Data of transport of municipal waste was collected from JMC which is shown in Table 1. Table 1 reveals that majority municipal waste is transport on the basis of contract which can lead the delay in whole transport system.

Table 1: JMC Transport resources

S.No.	Vehicle	JMC	Contract	Total
1	Loader	9	52	61
2	Dumper	21	46	67
3	Refuse Compacter (RC)	19	0	19
4	Dumper placer(DP)	34	0	34
5	Tractor Trolley	12	165	177
6	Dozer	2	2	4
7	JCB	6	6	12
8	Road Sweeper	1	4	5
9	Battery Riksha	22	0	22
10	Auto Tipper (500 kg)	20	0	20
11	Auto Tipper (900 kg)	20	0	20
	Total	166	275	441

2.5 Transfer Stations:

Only three Zones HawaMahal East, HawaMahal West and Moti Doongri has two Transfer station at Lal Doongri, Delhi Bypass Road and Jhalana. Rest of the Zones do not have Transfer station (TS) due to unavailability of land and transport directly to Dumping site.

3.0 Processing and Disposal:

There are three landfill sites in Jaipur city for disposal of waste from whole city namely Mathuradaspura, Sewapura and Langriyawas having the total are of 859 bigha. Mathuradaspura and Sewapura are unscientific open dump sites which are deteriorating soil and ground water quality. The details of all three landfill sites are discussed below:

1. Mathuradaspura: This site is located 17 km far in the east direction of Jaipur city. According to study conducted this sites receives around 350 tonnes of waste per day. Total area of Mathuradaspura site is 176 Bigha.

2. Langadiyawas: This site is located 21 km far in the east direction of Jaipur city and it is only 4 Km far from Mathuradaspura site. The total area Langariyawas is 483-bigha. This is the only scientifically developed sanitary landfill site of the city. Langriyawas receives 460 Tonnes of waste per day.

3. Sewapura: This site is situated 20 Km. far in the north direction of Jaipur city The total area of the site is around 200-bigha. This site receives 250 Tonnes of waste per day which includes waste.

4.0 Waste to Energy(WTE) Plant:

Waste to energy plant is Proposed at Langdiawas on PPP mode. Estimated cost is 180 Crore of plant. (Capacity of 7 MW from 650 TPD MSW) Facility of segregation and moisture will reducing by drying in plant.

5.0 SWM rules in Jaipur:

Provisions of solid waste management (SWM) and status of SWM in Jaipur is summarized in Table 2.

Table 2: Provisions of SWM Rules in Jaipur

S.N.	Provisions of SWM Rules	Status in Jaipur
1	Storage of SW at source and prohibition of open dumping.	Storage at source in limited outer areas. Open dump at street, drains and vacant plots.
2	Regular Cleaning of roads in municipal area	Regular cleaning in walled city and some institutional roads only. JMC attribute this to lack of labor and mechanical sweepers.
3	Segregated collection at source	No system for Door to door segregated collection of SW. 80% mixed MSW .
4	Covered secondary storage	Only 1400 bins , 30% of required
5	Covered transportation	Only 20% to 30% by RC and DP. Adhoc arrangement of covering Dumpers and trolleys by Plastic & Canvas sheets.
6	Processing of MSW	Only 20 -30 %
7	Disposal at Secured Landfill Facility (SLF)	SLF is not in working condition.

5.1 Challenges and action required:

Challenges and action required in Jaipur city is summarized in Table 3 regarding solid waste management.

Table 3: Challenges and Action Required

S.N.	Challenges	Action Required
1	Awareness, Behavior. NIMH attitude.	Behavioral change of Jaipurites. Community participation. Awareness for Reduce, Reuse and Recycle.
2	3500 secondary collection site. Only 1400 bins	Secondary collection sites need to be reduced with covered bins at all places.
3	No segregated door to door collection of SW	Segregated door to door collection.
4	City is expanding in South (Tonk Road) and West (Ajmer Road).	Establishment of SLF and Processing plant in South & West of city.
5	No. of Transfer station. Only 3 zones have 2 TS.	All Zones should have atleast one TS.
6	No Secured Landfill Facility (SLF)	Langdiawas LF needs to be started.

7	Huge Construction & Demolition waste	Establishment of C&D waste disposal site, land already earmarked at bambala.

6.0 Conclusion:

All the Functional Elements i.e collection & storage, transfer and transportation, processing and treatment, disposal of solid waste management of Jaipur city were studied. Based on the analysis following conclusions were made:

- Waste is not separated into degradable and non-degradable categories, so mixed waste is generated which is difficult to handle.
- Primary method of collection and storage is community bins and street sweeping. Number of sweepers and waste bins are calculated and it was found that both are insufficient in number and they are not properly distributed according to requirement in whole city.
- Transportation vehicles capacity is found in excess than requirement but due to improper management of vehicles there is even shortage of vehicles in some wards.
- After quantification of whole system proper distribution of number of sweepers, transportation and communal bins is suggested in each ward of Jaipur city by considering population and waste generation data.
- Most of the waste of Jaipur city is directly disposed into landfill sites which pollutes soil and ground water therefore hazardous potential index of these landfill sites and it was found that Mathuradaspura and Sewapura landfill sites need to be converted into sanitary landfill sites.

7.0 SUGGESTIONS:

A. In improving collection mechanism:
Waste must be collected at pre-informed timings.

B. In improving storage of solid waste:
The transfer station needed to be so designed such that the waste can directly be transferred into a large vehicle or container. Large vehicles having containers with a capacity of 20-30 cubic meters are typically used for disposal sites which are at long distance.

C. **In improving Transportation of solid waste**:
Under the 2000 rules, the transport vehicle must be covered. In the beginning, municipal authorities needed to provide a cover for existing vehicles. The transport of waste can be managed and monitored centrally and through a large decentralized settlement.

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