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Current Trends and Status of Municipal Solid Waste Management in Jaipur District

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Abstract

The amalgamation of traditional and modern trends of municipal solid waste management (MSWM) as well as the challenges faced by Jaipur district is the major motivation behind the present study. Municipal solid waste (MSW) generation is increasing day by day and unscientific handling of these waste depositions in Jaipur further degrades the environment and causes various health hazards. The present study is attempted to analyze the major trends and status of municipal solid waste, along with the comprehensive review of the generation, its categorization, collecting, and treatment of municipal solid waste practiced in Jaipur. The current status of municipal solid waste management in the eight zones of Jaipur shall also be analyzed with the help of recent data and annual reports available. It was observed that the public plays an important role and they should be educated to realize the importance of source segregation at generation point as biodegradables, inert and recyclable material for proper waste management. Other suggestions for waste management were also stated. It was concluded that taking proper measures for improving the condition of solid waste in Jaipur has to be considered with immediate effect as the stage of waste collection in some zones of Jaipur are increasing with an alarming rate.

Keywords: Jaipur, Municipal Solid Waste Management, Status, Trends.

Introduction

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 project took a broad system approach to understand Jaipur's solid waste management system. It investigated 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 ragpickers and door-to-door collectors, door-to-door recyclers, NGOs, and private companies. The main problems to implementation of the system include lack of citizen awareness and commitment, no segregation of waste, corruption, technology, and funding. PPPs can help fund larger projects as well as offer expertise, but often the ventures are unprofitable, which discourages companies from undertaking them. Many new projects and regulations such as a new scientific landfill, a composting service, and stricter penalties for littering and dirtying the city are currently underway, which should greatly improve Jaipur's cleanliness (TNN, 2009).

Definition

Waste can be classified into four categories: Municipal solid waste, hazardous waste, biomedical waste, and electronic waste (E-waste). Municipal solid waste (MSW) includes what is thrown out by households and the commercial sector, such as food scraps, yard clippings, and demolition debris. It is important to address because it is the waste that the general public has the most contact with, and has a high political profile because the public is made up of voters. Also, MSW is one of the harder types wastes to manage since it has so many different components, so if it can be managed effectively, then management of other types of solid waste that are more homogenous should be easier to tackle (Zhu, 2007).

Urbanisation and Management of MSW

As of 2011 World Population Review, Jaipur has a population of 3,653,927, which makes it the tenth largest city of India as per census of 2011. Jaipur daily production of solid waste is around 1500-1600 MT/day as per JMC 2014 report, and its lifting efficiency is around 80%,which indicates that rest of the 20% remain on the streets and at the disposal sites. The average per capita solid waste production per day is 355 gram as shown in the table below. There are no data published on the composition of waste in Jaipur in particular, although the figures for India in general are a fairly accurate representation for Jaipur as well. In India, the makeup of waste is roughly 50% biodegradable, 25% inerts (construction and demolition waste), 9% plastic, 8% paper, 4% rags, and 1% glass. The composition of waste varies from season to season. In the summer there is more biodegradable waste because of more vegetation. The amount of plastic in waste has supposedly been decreasing due to the recent ban on plastic carrying bags in Rajasthan beginning August 2010 (GOI, 2014).

Review of Literature

Mathur (2018) highlighted that Waste management and recycling of waste are rapidly achieving major importance for essentially these two reasons: to maintain an acceptable environment free from excessive pollution and to conserve even scarcer and costlier raw materials and energy. The explosive population growth combined with an increasing appetite for consumer goods, has led to an explosion in the amount of garbage we produce. Virtually every aspect of our daily lives generates waste, and it is impossible to think of any man-made process that does not create some waste. The aim of the present paper is to study the relation between the social affluence and the amount of solid waste generated.

The study conducted by Ahluwalia and Patel (2018) presented the assessment of the rapidly rising volume of municipal solid waste, its changing composition, the continuing practice of mixing biodegradable (wet) waste with dry waste at the source of generation, and the growing volume of plastic in the waste. The present system is focused on collection and transportation of largely mixed unsegregated waste. Resource recovery from the waste and safe disposal of the residual waste in scientifically designed landfills are grossly neglected. Rules have now been put in place for sustainable solid waste management, but the capacity to plan and manage the system and ensure the enforcement of the rules is a major challenge.

Objectives of the Study

1. The present objectives of the study was to analyze the major trends and status of municipal solid waste, along with the comprehensive review of the generation, its categorization, collecting, and treatment of municipal solid waste practiced in Jaipur with the help of recent data and annual reports available.
2. The aim of the study was also to examine the current status of municipal solid waste management in the eight zones of Jaipur with the help of field work observations.
3. The study was also aimed at providing possible proposal to improve the current status of solid waste management in Jaipur city.

Research Methodology

Sample

The sample mainly consisted of the waste disposal sites of the eight major zones of Jaipur.

1. Hawal Mahal East Zone
2. Vidhyadhar nagar zone
3. Civil Lines zones
4. Mansarovar zone
5. Sanganer zone
6. Moti Dungri zone
7. Hawa mahal west zone
8. Amer zone

Procedure

The process of segregation, collection, storage, transportation and disposal of solid wastes was interpreted by going in fields and observing the trends and techniques followed by Jaipur Municipal Corporation (JMC).

Statistical Technique

The major techniques used for analysis were inclusive of Primary as well as secondary data. The primary data included field observations and photos of the current scenario of solid waste management processes. The secondary data consisted of district census data, annual reports of JMC, published articles on SWM of Jaipur City.

Situational Analysis of Current Mswm in Jaipur

At the political level, the mayor is at the top, accompanied by a health and sanitation committee, made of up five elected and three nominated members. The administrative hierarchy is headed by a CEO, under whom is a health commissioner, garage commissioner, and a chief engineer (CE). Jaipur is divided into 91 wards grouped into eight zones.

Municipal Solid Waste Generation

Solid waste management for Jaipur is undertaken by Jaipur Municipal Corporation. According to JMC, in 2001 the total waste generation in Jaipur city was 1040 MTPD and for the same period it is 1239MTPD as per Rajasthan Urban Infrastructure Development Project (RUIDP). However according to central pollution control board estimates published in 2004-2005, the amount of waste generated was 904 MTD which instead of being numerically higher is much less then the estimates given by JMC and RUIDP for earlier years this shows a clear inconsistency in recording amount of solid waste data generated .These discrepancies is may be due to unscientific handling of solid waste. The collection efficiency is around 80% of the waste generated. Hence if waste collected is 1200-1300 MTD as shown for 2014 in the below mentioned Table1.2, the actual production is around 1500 MTD (JMC, 2014).

Table 1.2- Zone-wise population, waste generation and waste collection in 2014(JMC, 2014)

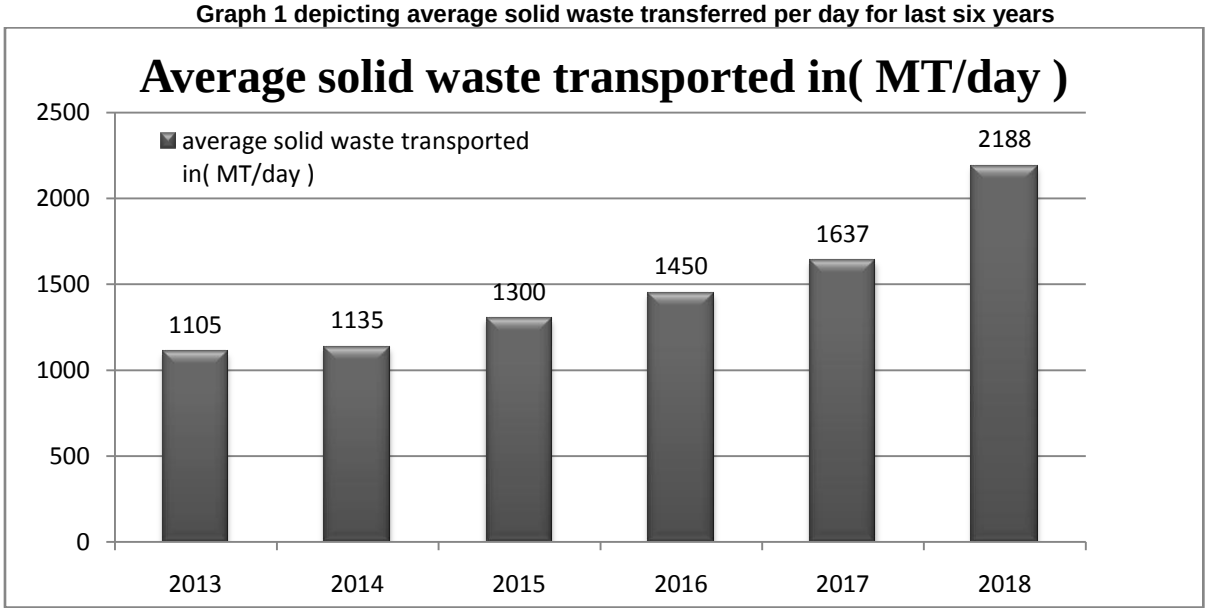
S.no	Zone	Zone wise population	Waste generated (MTD)	Waste collected daily (MTD)
1	Hawal Mahal East Zone	357710	182	170
2	Vidhyadhar nagar zone	728309	371	240
3	Civil Lines zones	535568	273	230
4	Mansarovar zone	365543	186	120
5	Sanganer zone	424564	217	140
6	Moti Dungri zone	291251	149	130
7	Hawa mahal west zone	177918	91	80
8	Amer zone	165300	84	70
		3046163	**1553**	**1180**

Current trend of transported solid waste shows increase in the municipal solid waste transported.

Table 1.3: Source: Nagar nigam Jaipur

Year	Average solid waste generation in(MT/day)
2013	1105
2014	1135
2015	1300
2016	1450
2017	1637
2018	2188

Graph 1 depicting average solid waste transferred per day for last six years



Source: Nagar nigam Jaipur (2018)

As compared to 2001where the generation was around 1040 MT (JMC) the 2013 to 2018 shows far increase in Solid waste transported data and corresponding increase in the generated data. 2188 is almost double of what has been observed in 2001.

Waste Segregation

Duties of waste generators includes: segregation of generated waste into bio degradable, non biodegradable and domestic hazardous waste, but there is no procedure of waste segregation that takes place at the source (either by public or by JMC) in the whole city because of which it is very difficult to separate them later. Although, JMC has recently given contract for solid waste collection to disposal at final landfill site to BVG Company which performs the collection, transportation and disposal of Solid waste to landfill site according to Swachh Bharat Abhiyaan.

Waste Storage and Collection

Duties of Local authorities includes making arrangement for the collection of segregated waste from the households including slums, commercial , institutional , residential premises but waste management is absent in slum and kacchi basti areas where waste is dumped into nallahs (drainage). They are openly throwing their garbages in the backside nallas and empty spaces , drains are chocked and streets are cleaned by sweepers only once or twice in a week and this all causes nuisance and pollution which directly affects the air , water and soil of these areas and further health issues.

Jawahar Nagar Kachhi Basti

Source: Primary survey 2018

Drains and roads are covered by household wastes like polythene, paper, etc. as cleaning of streets not done regularly and hoppers of Nagar Nigam does not come in these areas due to narrow streets and negligence

Drains are chocked by nearby waste; Jawahar nagar kachhi basti area.

Jawahar Nagar Kachi Basti

Source: Primary survey 2018

Residents of Kachi basti dump their solid wastes and other wastes in backside nalas and open space on which stray animals feed which cause nuisance and spread of diseases. Big heaps are formed of this waste and further aggravate the issues of polluted air, water, soil. During primary survey it has been found that there are lot of health issues as the drinking water is not purified which causes health problems and most affected are the children.

Storage of MSW at the source is lacking in most of the places in the city. The waste is collected by different methods in the city. The solid waste management activity in Jaipur consists of citizens throwing the waste into the cubic community bins provided by the JNN with different carrying capacity which is common for both decomposable and non-decomposable waste without any segregation process. The main system of primary collection of waste is street sweeping; generally the sweepers sweep the road and drain and collect the waste into small heaps on the road or into the bins. A sweeper who sweeps the roads put the road wastes into a wheelbarrow, and then transfers the waste to dustbins or collection points. Door to Door waste collection does not involve segregation of biodegradable and non biodegradable. Waste is collected and transferred to dumping sites or transfer station where these are collected by dumpers and compactors for further shifting to landfill sites. This all creates a lot nuisance with stray cattle and dogs spreading the waste.

Road Side Waste Collection And Cattle Feeding On Them And Transfer Station Near 22 Godam

Source : Primary Survey 2018

For house-to house waste collection the

contract for municipal solid waste collection to disposal is given to BVG Company , which involves hopper operated by the company on contract basis that go to every house in morning to collect waste .Waste is collected and stored in containers or hoppers and transported to the disposal sites or transfer stations . Dumper placer and refuse compactors are also used other then trucks and tractors for transporation of wastes. There are basically two types of dumper placer: one can carry a single container of 7 cum carrying capacity, while another one can carry two containers of capacity 2.5 cum each. Compactor is also an important vehicle which has hydraulic lift arrangement for automatic lifting of waste, generally collects the waste from collector bins of 1.1 cum capacity. It has capacity of 14 cumand can carry waste upto 9 tons. The waste transported from small vehicles is first of all collected at the transfer stations and then after loaded into large vehicles for final disposal.

Waste Collector Bins

(Source: Primary survey 2018)

Sometimes these hoppers are not functional on regular day to day basis. The issues here is that (Table 3), there is exponential increase in the solid waste transported (and generated) during last 2 years.

Waste Transportation

Table below shows the types of vehicles used for the collection and transportation of MSW from various points.

Compactor Collecting MSW

Source: Primary Survey 2018

Dumper Placer and Compactor play a major role in transportation. A dumper placer is used to carry waste materials, there are basically two types of dumper placer; one can carry a single container of carrying capacity 7 cum while another one can carry two containers of carrying capacity 2.5 cum each. Compactor is the next important vehicle which generally loads the waste from community bins of 1.1 cum carrying capacity and waste is loaded automatically by hydraulic lift system. It has capacity of 14cum and can carry waste up to 9 tons. As per the current scenario only 2 Dumper placer (named 8990 and 8991) are operating in the civil lines for aprox 10 – 15 bins placed in that area and rest are not in operation from the time contract has been given to BVG company. Most of the bins of capacity 1 cum, 2.5 cum and 7 cum are also lifted from the site and only 1 % is placed in few areas of main roads. In place of Bins dustbins of green and blue colour is placed at every few metres to dump wet and dry waste accordingly.

Dustbins for Wet (Green) and Dry (Blue) Waste

Source: Primary Survey 2018)

The waste transported from small vehicles and hoppers is collected at the transfer stations which are at ,Vidhyadhar nagar ,mansarover , Parsaram , Lal Dungri. In the current scenario, only one transfer station is working which is Lal Dungri transfer station,whose carrying capacity is around 200 TPD and another transfer station is under construction at Jhalana Dungri whose carrying capacity is also around 200 TPD. Lal Dungri transfer station carries the MSW of Hawa Mahal East and West zone, Amer zone, 48, 47 and 51 ward of Moti Dungri zone and 41, 42, 19, 20, 21 ward of Civil line zone. The Jhalana Dungri zone which is under construction will cover the Sanganer zone, Civil line zone and Moti Dungri zone. In other zones, the waste collected from source is

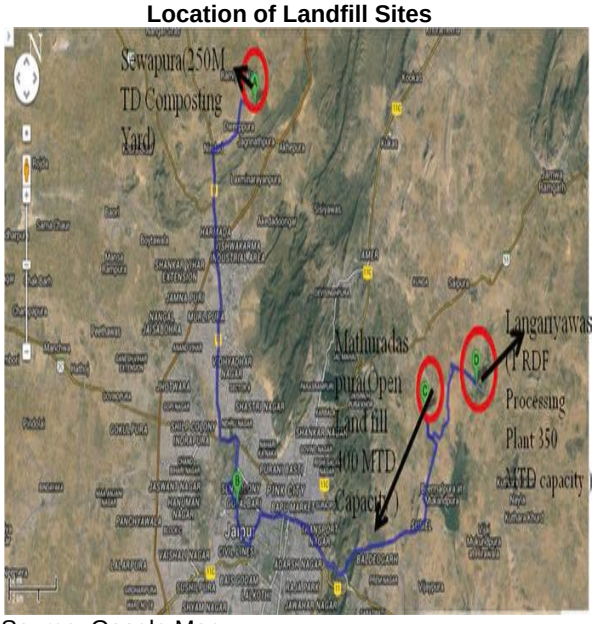
directly go to the disposal sites.

Because there is only one transfer station is in working condition, the vehicles have to carry and transport the MSW in many number of times. 1 compactor perform 2 round in the morning and 1 round in the evening in Moti Dungri zone, and in generally each transport vehicle perform 2-3 rounds in a day to transfer MSW from source to the disposal sites (JMC, 2018).

Disposal of wastes

The Jaipur city has a total 530.65 acres area for waste disposal sites (CPCB). There are three main sites for waste disposal and they are at Mathuradaspura, Sewapura and Langadiawas areas. The total areas of the sites are 108.7, 123.5 and 298 acres. (The area has been given in Bighas, and in Rajasthan, one Bigha is equal) to 2500 sq. m, so the area was 176, 200 and 483 bighas respectively).

Location of Landfill Sites



Source: Google Map

All the waste generated in the city is being depositing at these three disposal sites. All the three sites are open sump sites and no scientific method of waste disposal was adopted at these sites. All the waste is disposed at the landfill site by just openly dumping it.

Mathuradaspura is in operation from past 17-18 years and it is mostly ravine land not suitable for agriculture .initially plan was to fill up the ravines but now this is extended and visible as degraded mountain of solid waste. There is no clear boundary marked of this site, no fences established and it is extending with time, it was observed that within 100 meter of its boundary nearby dairy farms are operating, with some villagers living in the closed vicinity.

As per the site engineer new plant to use this waste is about to come which will be located 4km away from this site, and 20 hectare of land for this purpose has been allotted.

Landfill Site Mathuradaspura

Source: Primary Survey 2018

One MSW processing plant has been established at village Langadiawas site, by M/s Grasim Industries to process municipal solid waste received from Jaipur Municipal Corporation, which is designed to handle aprox 400 TPD of MSW and generation of 130-140 TPD of refuse derived fuel (RDF). 10% RDF is used as substitute of coal in kilns in cement factories in Rajasthan and Madhya Pradesh.

So total waste transported is around 2000 MTD but the processing is currently done for 200-300 TPD this shows a huge gap between generation and its processing including waste to energy so, currently all waste is used as landfill. So here we can conclude from the existing scenario of Jaipur city that he current practices of handling municipal solid waste are old and unscientific. Methods of disposal of waste are also degrading the environment (JMC, 2014).

Results and Findings

From the above discussions, the following major problems related to MSWM have been found:

1. Absence of segregation at the source.
2. Lack of awareness among generators of solid waste
3. Complete negligence of the MSW(Management and handling) rules 2016
4. Limited door to door collection provided through PPP.
5. Inconsistency in record keeping and data management.
6. Shortage of community garbage bins.
7. Open bins for community garbage.
8. Open transportation vehicles.
9. Long routes and high fuel costs resulting in high transportations expenses.
10. Lack of community participation.
11. Service level benchmark not as per national standard.
12. Unscientific disposal practices in open landfills.

Discussion

With growing economy of the urban regions and the state population, generation of municipal solid waste is also on high rise. The plastics usage is despoiling the landscape, affecting health of animals and blocking drainage systems. There is a need to ensure proper segregation, collection, processing and disposal of solid waste. There is a strong demand to develop and implement viable public private partnership models for setting-up and operating composting plants, secure landfills, waste to energy projects and other appropriate techniques for MSW treatment. Segregation of municipal solid waste needs to be enhanced to improve level of efficiencies at the processing levels.

Segregation and recycling of construction and demolition wastes should be implemented. The Supply of compost produced via composting of municipal solid waste to be mandated with the sale of agricultural inputs. Informal sector system which is very important for collection and recycling of various materials needs to be strengthened by giving them employment and enhancing their access to institutional finance and relevant technologies.

There is a strong need to review the various municipal laws and policies to enable the process of registration of societies of recyclers to operate within the framework of law. Local municipal bodies have to play an important role in proper implementation of the important law about plastics "Recycled Plastics Manufacture and Usage Rules". Municipal bodies need to create a general public awareness for reusing, reducing, and recycling of the wastes.

The rules envisage that all cities in the country should set up suitable waste treatment and disposal facilities. The rules also specify standards for leachate control and management, compost quality, and closure of landfill sites.

Hundreds of thousands of people in country like India find livelihood opportunities in the area of waste, like "rag pickers" (known as kabadiwalas in Hindi). A solid waste management project must hence be understood in this informal yet organized setting. In order not to ignore these individuals, they will be prioritized in the job process and offered continuous job in the solid waste management system.

It important that the public, that is ordinary citizens as well as private and public institutions, whose discarded waste is managed and whose environment is improved, should be actively and regularly involved in the system. An important step to engage the public and motivate them is via continuous public awareness campaigns based on an Information, Education, and Communication (IEC) technology. In addition, a special feeling of ownership should be created as each household will contribute to the waste management with at least a monthly fee of INR 20-30.

Motivate individuals such as doctors, headmasters, religious leaders etc., from the concerned communities which will engage as volunteers and help convey the strong message to the public as well as they can function as role-model citizens.

Community based organizations, Local nongovernmental organizations, and other local associations such as Resident Welfare Associations and Women's Associations should be offered training in solid waste management. Via continuous school intervention programmers, youth groups and eco-clubs at schools should be engaged in the waste management system.

Municipal authorities should seek the partnership of local and foreign companies for financial support as well as donations for scientific recycling of inorganic wastes. Private corporations can also be able to sponsor the various waste management projects and receive marketing in return. Local resident welfare committees and samitis which exist everywhere at jhuggies (slums) to middle class housing. They should be actively participating in segregation and collection of waste at the local level

and community level. It is very important to have a public participation.

These committees should be given the collective responsibility of implementing various running schemes of the solid waste management in their areas as a part of the formal system. A core group should be formed and responsible contact persons should be identified. The Municipal Authority may offer various incentives to such communities and can coordinate with them. Covered and leakage free community bins must be places at every places wherever it is possible and at a central point so that they are accessible to every citizen.

When primary survey conducted it was found that 84 % households agreed that appropriate cleanliness is maintained by JMC as compared to previous years while 16 % were not satisfactory and 90 percent household agreed that sweepers are coming to clean the streets and drains 4 to 5 times in a week. So definitely there is improvement in the waste management practice in residential areas, commercial areas but same is not replicated in slum areas and other ignored old city areas.

Conclusions

Therefore, it may be concluded that with rapid urbanization and increasing per capita waste generation rate, the municipal solid waste has become a very important service to be taken care of for a smart and livable city. With increasing level of environment pollution and greenhouse gases, municipal solid waste also holds opportunity for a major resource of renewable energy in international climate agenda. The government as well as public should take some strong initiatives to play their parts in management of these wastes for our healthy livelihood.

Limitations

1. The scope of the study is limited to the Municipal solid waste of Jaipur City.
2. It does not included agricultural, industrial and hospital waste of the city.
3. Study area includes Jaipur Municipal Corporation boundary with old city but does not include total JDA area.

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