Solid Waste Management: A Case Study of Jaipur City

Sudarshan Kumar, Somendra Sharma, Suraj Jaluthriya
Department of Civil Engineering,
Poornima Group of Institutions,
Jaipur (Rajasthan), India

***Abstract*– Solid Waste Management is a major concern worldwide. Inadequate handling of generated solid waste causes serious hazards to environment as well as living beings. This worldwide problem is also predominating in Jaipur city also. This case study is done to look out for obstacles and prospects of Solid Waste in Jaipur. Acomprehensive study was done regarding collection, transportation, handling, storage, disposal and treatment of solid wastegenerated in Jaipur city. The data acquired related to SWM was collected through site visits and interfacing with people. 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 causes various problems to environment as well as humans living in that vicinity.**

Key Words: Solid waste management, Individual field test, Urban environment, Environmental Pollution

I. INTRODUCTION

Like many cities of India, Jaipur is undergoing rapid development. In Jaipur, the population was 2.34 million according to the 2001 census, and is now estimated to be over 3.5 million Solid waste management is an important part of urban and environmental management, like other infrastructural services has come under great stress, consider low priority areas, solid waste management was never takenup sincerelynor by public nor by concerned agency or authorities and in present time the solid waste is impacting our heath, environment and well-being. Waste minimization is a techniquewhich isused for waste reduction, primarily through reduction at source, it also includes recycling and re-use of waste materials. The benefits ofminimizing of waste is both environmental friendly and of less cost. To execute proper waste management, various points have to be considered such as: Source reduction, Onsite storage, Collection & transfer, Processing, and Disposal. Solid waste may be defined as production of unacceptable substances which is left after they are used once [1].With the increase in various sectors exponentially, more inputs are required. This necessarily means more output is also produced, and established itself in a large amount of waste. “Waste” is simply something that is no longer deemed useful and is dumped. However, a change in approach to view waste as a resource rather than as something useless is the first step needed to decrease it. Waste can be divided into four categories: solid waste, hazardous waste, biomedical waste, and electronic waste. Municipal solid waste (MSW) includes what is thrown out by households and the commercial sector, such as food leftover, yard abstract, and construction debris. It isvery important to consider because it is the waste that the normal 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 of wastes to manage as it has many different elements, so if it can be managed efficiently, then management of other types of solid waste that are homogenous by nature will be easy to manage.

Jaipur’s daily production of solid waste is almost1150 MT/day. Out of which around200-250 MT still remains on the streets and roads, that means lifting efficiency is around 80%. The per capita solid waste generation per day isaround 450 gm, which withafamily size of almostfive, results in 1.75 kg/day.There is none of data published on the composition of waste in Jaipur, although the figures of India in generally are reasonably accuratedepiction for Jaipur also. In India, thecomposition of waste is around 50% biodegradable, 25% inertwaste 9% plastic, 8% paper, 4%scraps, and 1% glass. The composition of different wastes keeps varying from season to season. In thesummer time there is more biodegradable waste produced because of more vegetation.The composition ofplastic in waste has probably been decreasing due to the recent ban on plastic bags in Rajasthan from beginning August 2010[2].Solid waste management was selected as the topic of this study because it is a visible environmental sustainability issue that India is confronting, since Jaipur is a rapidly developing city, effective waste management practices is especially needed. The objective of the study was to learn as much as possible about Jaipur’s SWM through a broad-based approach.

Management of the transfer station or community bin.Secondary collection and transport to the waste disposal site. Waste disposal in landfill sitesbut in most of the Indian cities open dumping is the Common Practices which ispolluting environment and Public health.

A. Main sources of Solid Waste

Household waste, Commercials waste, Hotels, Clinics and dispensaries waste, Construction and demolition waste, Horticulture, Sludge

B. Solid Waste Management in Jaipur

Central Pollution Control Board conducted a study on the status of Municipal Solid Waste Collection, Treatment & Disposal in and around Jaipur City in 2007-2008. Most of the population of the city does not store the waste at source and instead disposes the waste into the garbage bins, roads, open

spaces, drainage pipes, etc. Isolation of recyclable waste is not practiced. Most of the recyclable material is also disposed of with domestic and trade waste. Therefore, recyclable waste is generally found mixed with rubbish on the streets, into the garbage bins and at the dumping zones from where part of this waste is picked up by the street sweepers. There is no door-to-door collection systemavailable of waste except in case of few housing societies. Street sweeping is thus the only process of primary collection of waste. There has been a momentous increase in the production of solid waste in Jaipur over the last few decades. The daily predicted generation of municipal solid waste in Jaipur city is about 1050 to 1150 TPD (tonnes per day), which is collected through street sweepers and from community waste storage sites. Thewaste generally transported every day is 900 TPD, which is about 85% of the waste generated in the city. Remaining solid waste is transported through specialdrives which happen weekly. This report further explain about SWM of Jaipur city is that the main system of primary collection of waste is street sweeping. There are about6400 streets sweepers in the city for street cleaning. Some roads are cleaned each day and some are cleaned periodically, twice a week or once in a week. Transportation of waste is done through a variety of vehicles such as 3-wheelers, tractors and trucks. Thevehicles are loaded manually with help of labours and these are used for 2-3 shifts in a day. Insufficient number of transport vehicles is also a major concern. The transportation system also does notis in sync with the systemof primary collection and waste storage facilities.

C. Status of SWM in Jaipur City

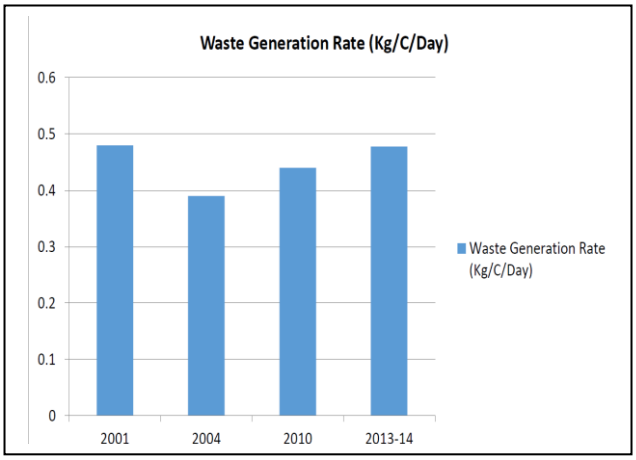
It was seen that there was lack of community garbage collection facility in slums; slum dwellers community dump their garbage nearby the living area.

The refuse bins in old Jaipur area were very dirty and overflowing. People often threw thegarbage outside the garbage bins. The inconvenience of huge garbage on streets and sorting by the sweepers or moving stray animals on thestreets represent very ugly scene.

It was observed at many places in the morning, thick black smoke spreaded over large areas on the roads due to burning of fallen leaves, plastics and other wastes.

Most of the drains along the road and even main sewer lines near Mother Dairy, Bais Godam, Durgapura and Pratapnagar were found blocked due to indiscriminate dumping ofGarbage

Graph I. Waste generation rate



The use of commercial trucks with or without hydraulic system for waste transportation was very common in Jaipur City. It has a carrying capacity of 3.5 to 8.0 Tonwaste at a time. Garbage from the roadside garbage bins is lifted manually and thrown into thetrucks. Besides this, tractor, dumper placer, mobile compactor etc. were also used to transportwaste to the dumping site.

JMC had one mechanized sweeping machine to pick garbage from not reachable places.Presently, JMC uses this machine on highways, mainly in traffic congested areas.

D. Quantities of Waste Generated and its characteristics in City

Waste Quantity-916 TPD
Waste Generation Rate-0.59 kg/c/day
Compostables-45.50%
Recyclables-12.10 %
Moisture Present-21%

E. System Implementation

Solid waste is managed by the JMC.Sweepers bring the waste to a municipal bin. Two to three sweepers come to one container. The JMC bought about 800 waste disposal bins to be distributed throughout the city. In theory, one-cubic-meter waste disposal bins with a storage capacity of half ton of waste are placed every 250 meters along streets. Currently 55 of the 77 wards have containers; the wards of the Old City are notcontainerized due to past objections, likely regarding space concerns.Those containersthat are in usage are often in very poor condition, with holes so big that waste is spilling out the sides. There are approximately 40 such bins in Civil Lines, according to a permanent garbage worker who works there. In Civil Lines at least, JMC lorries are observed to arrive around 7:30 AM to remove the waste. Two large bins of 2.5 or 3.5 cubic meters can fit on each lorry. Each bin is mechanically hoisted up onto the back of the lorry, and in its place an empty bin is left. In other areas such as along JLN Marg, residents dispose of their own waste in community bins which are shared by about 20-25 homes. A municipal van comes daily topick it up.

F. Issues in waste management in Jaipur

There is a rate of 10-20% absenteeism at thework place.30 At times, rather than coming to work, workers will just send someone else in their place. There are about 100 days off a year (including Sundays) when the formal sector workers do not collect garbage and it just sits on the streets. However even the percentage Jaipur spends on staff salaries seems disproportionately high. This is likely a result of hiring more employees every year without increasing each of their duties accordingly, so more people are covering the same work. The C/N ratio ranges from 20 to 30. Calorific value ranges between 800-1000 Kcal/kg. In cities, the major fraction is compostable materials is 40-60% and that of inert 30-50%. The organic fraction increases while moving from rural to urban areas. The percentage of recyclable waste is verymuch low as these are picked up by the street sweepers from the houses. Treatment and disposal methods in use in India for MSW mainly include land filling, composting and very few wastes to energy initiatives (incineration, RDF and bio methane). Jaipur is also facing the similar situation where open, uncontrolled and poorly managed land filling is common.

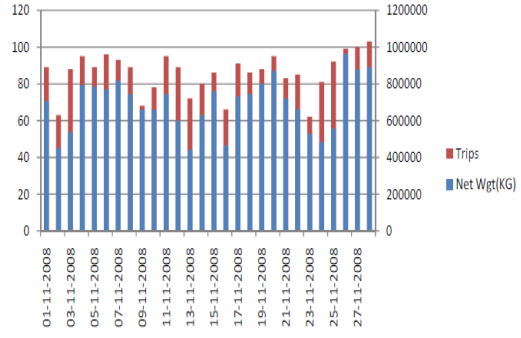
G. Disposal sites in Jaipur

Mathura Das Pura: This site is located in the east of the city. Total area for the site was 176 Bighas. This site is the old most site and is about 17 Km from the main city. Approximately 300-400 TPD of garbage is being dumped every day at this site.

Langariyawas: This site is located in the east direction of the city, 3-4 Km from the Mathura-Das-Pura. The area of this landfill site is 483 bigha.

Sewapura: This site is located at a distance of 20 Km from the main city on Jaipur-Delhi highway. Its total area is 200 bigha.Approximately, 200-300 TPD of garbage was being gone every day to this site.

Total amount of waste dumped in these 3 dumping sites and vehicles taking number of trips to these sites in a particular time period (source JMC)



II. CONCLUSION

The overall objective of this study was to investigate Jaipur's solid waste management system by how the system is implemented, the successes and challenges and how those challenges are being addressed, and the nature of public-private partnerships and how they can be improved. At the conclusion of the study, it was found that Jaipur's waste management system involves many types of workers who all have specialized jobs, including government executives in political and administrative positions, a permanent and impermanent faction in the formal sector, the informal sector and private contractors. The formal sector seems to be carrying out their duties effectively and on time, and there are few complaints from citizens about their interaction with waste service providers. Still there are many areas for improvement, including better law implementation and reinforcement, reduction of corruption, updated technology, better-trained staff, more manpower, increased education and awareness, and more funding. With growing population and economy of the urban regions in the state, generation of municipal solid waste is on the rise. The usage of plastics is despoiling the landscape, blocking drainage systems, and affecting health ofanimals. There is a need to ensure proper collection, segregation, processing and disposal of solid waste.

III. SUGGESTIONS

A. In improving collection mechanism

Waste must be collected at pre-informed timings.The arrival of waste collectors should be announced through methods such as ringing a bell.
Waste can be kept inside or outside the house.Different bins for different varieties of wastes must be kept so that each category of wastewill follow a different path.

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.The design and capacity of transfer stations and storage equipment largely depends on thequantity of waste and on type of vehicles used for primary and secondary waste.

C. *In improving Transportation of solid waste*

Under the 2000 rules, the transport vehicle must be covered. In the beginning, therefore,municipal authorities needed to provide a cover for existing vehicles.The transport of waste can be managed and monitored centrally and through a largedecentralized settlement. In either case, municipal officers should ensure the efficiency ofthe arrangement. Transport services can be contracted out to private operators.The transport system must be coordinated with the secondary storage system of waste toprevent manual and multiple handling of waste.

D. In improving Disposal of solid waste

Treatment of organic waste -Household waste can contain 40 or 50 percent organic waste. Waste from vegetable markets contain even higher in amounts. As organic waste cause major hygienic and environmental problems in cities and at landfills, the 2000 rules mandate improved management and treatment of this fraction before final disposal [3]. Several treatment methods for organic waste are available like composting, anaerobic digestion, Incineration etc.

Treatment of Inorganic Waste-The inorganic portion of municipal household waste can be divided into recyclable materials and non-recyclable materials. The earlier recyclable materials are separated from the solid waste, the higher their value and the easier will be the further processing methods. The appropriate treatment method for inorganic waste will depend on its physical and chemical characteristics and also on its reuse potential. In India, the principal treatment method for inorganic waste is recycling.

E. Disposal in Landfills

In areas falling under the jurisdiction of "development authorities," it is the responsibility ofauthorities to identify the landfill sites and to handover those sites to the concernedmunicipal authority for development, operation, and maintenance of the site.Landfill sites must be selected to make use of a nearby waste processinfacility.Landfillsites must be large enough to last for 20 to 25 years. [3]

REFERENCES

[1] L Oliver "Solid waste management of Jaipur-An overview and analysis". 2011
[2] Amit Singh "Municipal Solid Waste Management in current Status and Way"2011
[3] Rahul Nandwana and R C Chhipa "Impact of Solid Waste Disposal on Ground Water Quality in Different Disposal Site at Jaipur, India".2014