

**MUNICIPAL SOLID WASTE MANAGEMENT: A CASE
STUDY OF JAIPUR CITY, RAJ.**

A

DISSERTATION

Submitted in the partial fulfillment for the degree of

Master of Science

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This is to certify that **MAHENDRA SINGH YADAV S/o Shri Vishram Yadav** has conducted his MSc. Dissertation work titled “**Municipal Solid Waste Management :- A case Study of Jaipur City (Raj.)**” under my supervision. This dissertation is being submitted to fulfill the partial requirement of the degree of M Sc. Environmental Science of the Department of Environmental Science, University of Rajasthan, Jaipur, Rajasthan.

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DECLARATION

This is to certify that dissertation entitled, “**Municipal Solid Waste Management: - A Case Study of Jaipur City, (Raj.)**” submitted by me in partial fulfill for the award of the degree of M Sc. (Environmental Science) of Department of Environmental Science, University of Rajasthan, Jaipur (Rajasthan) is a record of the original work carried out by me. The matter embodied in this dissertation has not been submitted for the award of any other degree or diploma.

Date:

Jaipur

MAHENDRA SINGH YADAV

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Without you I could have done nothing

Without you I'd surely fail

Without you I would be drifting

Like a ship without a sail

I am aware of this fact that if there were no footstep for me to follow, no inspiration would have moved me to go on and probably this work would not have seen the light of the day. It is my privilege to thank my esteemed and erudite supervisor.

*I wish to express my deep sense of gratitude and response to my eminent research supervisor **Mr. Sudhir Verma**, Assistant Prof Department of Environment Science of St. Wilfred's PG College, Jaipur Who has consistently provided his necessary and valuable guidance, supervision and encouragement, constant help and constructive suggestion and scintillating discussion throughout the course of the present investigation without which the work few lines can hardly do justice. Indeed, I shall never be able to repay his obligations.*

MAHENDRA SINGH YADAV

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ABSTRACT

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.

Chapter No. 1

Introduction

Introduction

Like many cities in India, Jaipur is undergoing rapid development. The country's GDP has been increasing at 8% per year. In Jaipur, the population was 2.34 million according to the 2001 census, and is now estimated to be over 3.5 million^{2, 3}. The process of development involves effects of globalization such as a growing economy, imported resources, information and technology sharing, and more extensive infrastructure. As the growth of various sectors has exploded, more inputs are required. This necessarily means more output is also produced, manifesting itself in a large volume of waste. "Waste" is simply something that is no longer deemed useful and is discarded. However, a shift in attitude to view waste as a resource rather than as something useless is the first step needed to reduce it.

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 of 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 (McDougall et al, 2008).

Jaipur's daily production of solid waste is around 1100 MT/day. Of that amount, 200-250 MT remain on the streets, meaning lifting efficiency is around 80%.⁴ The per capita solid waste production per day is 350 g, which with an average family size of five results in 1.75 kg per day.⁵ 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.⁶ The composition of waste varies from season to season. In the summer there is more biodegradable waste because of more vegetation.⁷ The amount of plastic in waste has supposedly been decreasing due to the recent ban on plastic carrying bags in Rajasthan beginning August 2010.

Hazardous sanitary conditions from epidemics provided the impetus for taking solid waste management seriously and establishing a proper management system. The pneumonic plague of 1994, which started in the city of Surat, Gujarat, awakened the government to the severity of the need for proper sanitation. In response, in 1995, The Bajaj Committee was formed to make recommendations on proper SWM.

Another impetus towards current SWM reforms was the Public Interest Litigation (PIL) filed by Mrs. Almitra H. Patel in 1996 against the Union of India and heard in India's Supreme Court. After many hearings, in 1998 the Supreme Court ordered the formation of a committee under the direction of Mr. Asim Burman, commissioner of the Kolkata Municipal Corporation to oversee SWM in Class-I cities. (Class-I cities are those with a population of over one million, and Class-II cities are those with a population less than one million.) One of the main recommendations of this committee was to include the private sector in SWM in order to receive assistance with funding and specialized expertise. Mrs. Patel was also instrumental in the drafting of the Municipal Solid Wastes (Management and Handling) Rules 2000, which outline steps that municipal authorities must take to regulate MSW.

Solid waste management was selected as the topic of this study because it is a visible environmental sustainability issue that India is confronting. Jaipur in particular was selected as the study site location because it is large enough to have a complex SWM to examine, but is small enough to be manageable for a study of less than one-month duration. Also, since Jaipur is a rapidly developing city, effective waste management practices are especially urgent. The objective of the study was to learn as much as possible about Jaipur's SWM through a broad-based approach. In particular, the following questions were investigated: (1). Who are all the players in Jaipur's solid waste management, system and how is it implemented? (2). What have been the successes and the challenges in its implementation and how are the challenges being addressed? (3). How do public-private partnerships in solid waste management work, what is their role, and are they successful?

Field work methods involved meetings and interviews with Jaipur Municipal Corporation officials who work at different levels of SWM, NGOs, the head of a waste processing plant under PPP contract, many different types of waste workers,

and Jaipur residents. In addition, site visits to waste collection centers, observation of collection, and shadowing of a recycler on his route were conducted.

The findings indicate that Jaipur, under the direction of the Jaipur Municipal Corporation, is making many strides in the right direction for improving waste management. Measures in progress include implementing of new surveillance measures and fines for fouling public areas, establishing a scientific landfill site and composting plant, drafting plans for a waste management program under contract with a private company, and combating absenteeism with biometric machines. Nevertheless, much room still remains for improvement, including reducing corruption, spreading more awareness to citizens about proper disposal techniques, and better management of financial resources to best cover the city's needs.

Swachh Bharat Abhiyan

Swachh Bharat Abhiyan (Clean India Movement) is a campaign by the Government of India to clean the streets, roads and infrastructure of the country's 4,041 statutory cities and towns. The mission will cover all rural and urban areas. The urban component of the mission will be implemented by the Ministry of Urban Development, and the rural component by the Ministry of Drinking Water and Sanitation.

The campaign was officially launched on 2 October 2014 at Rajghat, New Delhi, by Prime Minister Narendra Modi. It is India's largest ever cleanliness drive with 3 million government employees, and especially school and college students from all parts of India, participating in the campaign. The objectives of Swachh Bharat are to reduce or eliminate open defecation through construction of individual, cluster and community toilets. The Swachh Bharat mission will also make an initiative of establishing an accountable mechanism of monitoring latrine use.

Toilets in Rural Area

Further information. Sanitation -

The government is aiming to achieve an Open-Defecation Free (ODF) India by 2 October 2019, the 150th anniversary of the birth of Mahatma Gandhi, by constructing 12 million toilets in rural India, at a projected cost of 1.96 lakh crore (US\$30 billion).

Prime Minister Narendra Modi spoke of the need for toilets in his 2014 Independence Day speech stating:

Has it ever pained us that our mothers and sisters have to defecate in open? Poor womenfolk of the village wait for the night; until darkness descends, they can't go out to defecate. What bodily torture they must be feeling, how many diseases that act might engender. Can't we just make arrangements for toilets for the dignity of our mothers and sisters?

Modi also spoke of the need for toilets in schools during the 2014 Jammu and Kashmir state elections campaign stating:

When the girl student reaches the age where she realises this lack of female toilets in the school she leaves her education midway. As they leave their education midway they remain uneducated. Our daughters must also get equal chance to quality education. After 60 years of independence there should have been separate toilets for girl students in every school. But for the past 60 years they could not provide separate toilets to girls and as result the female students had to leave their education midway.

Narendra Modi

As of May 2015, 14 companies including Tata Consulting Services, Mahindra Group and Rotary International have pledged to construct 3,195 new toilets. As of the same month, 71 public sector undertakings in India supported the construction of 86,781 new toilets.

Most of these toilets are a type of pit latrine, mostly the twin pit pour flush type.

Hundreds of thousands of Indian people are still employed as manual scavengers in emptying buckets and pit latrines.

Performance



Figure A door-to-door garbage collection van in the city of Indore

Between April 2014 and January 2015, 3,183,000 toilets were built. Karnataka led all States in construction of toilets under the programme. As of August 2015, 8 million toilets have been constructed under the program. As of 27 October 2016, 56 districts in India were ODE. In January 2017, Indore city as well as rural areas were announced open defecation free by the central government.

Plans

The Ministry of Railways is planning to have the facility of cleaning on demand, clean bed-rolls from automatic laundries, bio-toilets, dustbins in all non-AC coaches. The Centre may use its Digital India project in conjunction with the Swachh Bharat Abhiyan to have solar powered trash cans, such as those in many US cities, which send alerts to sanitation crew once they are full.

The Government has appointed PWD with the responsibility to dispose off waste from Government offices.

Chapter No. 2

Objective

Objectives of Proposed Research Work

The present study is undertaken by carrying the objective of overview the role of Jaipur Municipal Corporation in solid waste management in Jaipur City, Which are as follows.-

To study various methods of disposal of waste.

To prepare the measures helping in reduction of solid waste production.

To avoid the exposure to human population living in or nearby the study area.

.- To create awareness among public about severe impact of solid waste hazards on human being.

‘ To identify gaps in our knowledge about safe disposal of solid waste.

.- To suggest the suitable remedial measures towards the abatement in Jaipur city.

- To collect the Information and overall idea of the prevalent situation; deficiency in system and likely requirement of the future information for taking corrective measures for waste management in Jaipur City.

Chapter No. 3

Review of Literature

Review of Literature

Over the years, there has been a continuous migration of people from rural area to cities. The proportion of population rising in urban area has increased. The cities are becoming class I to class II and so on. The increase in the population in class I cities is very high as compared to class II cities. This uncontrolled growth in urban areas has left many Indian cities deficient in infrastructural services such as water supply, sewerage and municipal solid waste management.

Solid waste management is a part of public health and sanitation. The urban local body undertakes the task of solid waste service delivery, with its own staff, equipment and funds. In a few cases, part of the said work is contracted out to private enterprises.

(A) Management of solid waste involves development of an insight into the impact of waste generation, collection, transportation and disposal methods adopted by a society on the environment.

(F1) Adoption of new methods to reduce this impact Municipal solid waste management is a burning issue for every developed or developing country. Various state and central government are involved in it for managing and providing a sustainable methodology. Large no. of NGOs and public private partnerships came forward for the municipal solid waste management. Government bodies are issuing funds for the management and several researches are also being made throughout the country and abroad.

Several workers have given their opinion depending upon the sites after going through the primary and secondary data collection. The review of literature is necessary part of any research work because the future plan of work depends upon the present and past scenario of the piece of work to be done. Emphasis can be laid to the untouched part of the work and focus can be laid on the untouched aspects of the problem.

The present chapter deals with the precious work that has been done on this subject. The literature cited here for the past few years helps us to distinguish between what has been done and what needs to be done. The literature includes both national and international findings by the different researches and workers.

The solid waste management scenario in the recent years has shifted towards a more sustainable approach.

Sharholly et al., 2007 studied about the municipal solid waste management in Indian cities and found it as a major environmental problem of Indian cities. They said that improper management of municipal solid waste causes hazards to inhabitants. They further concluded that lack of resources such as financing, infrastructure, suitable planning and data and leadership are the main barriers in municipal solid waste management. Similarly, the problems cited above were also focused by Ahsan, 1999 while studying the solid waste management plan for mega cities. Ray et al., 2005 studied about the respiratory and general health problems of the inhabitants due to the open landfills of municipal solid waste.

Noorjahan et al., 2012 studied about the status of heavy metals in municipal solid waste. These heavy metals are gaining scientific interest due to its characteristics such as high reactivity, lithophilic nature, toxicity and non-biodegradability (Aurible et al., 2007) heavy metal composition in MSW varies widely depending upon the sources, composting process and geographical location (He et al., Krogman, 1999).

Several other studies also confirmed heavy metal content exceed the specified limits in municipal solid waste (Merian, 1991; Cebula et al., 1995; Pascal et al., 1997; Ciba et al., 1999).

Noorjahan et al., 2012 gave suggestions that high proportion of bio degradable fraction of municipal solid waste generated from any class I city can be used for methane generation and composting. Engineered landfills yards should be planned and constructed in the dumping yard from where methane gas can be transferred and used as green energy as practiced in developing countries.

Isha et al., 2012 found that wide variations in magnitude of municipal solid waste management problem in both developed and developing cities and low and high income cities may be different. Waste stream analysis, material balance and life cycle assessment may be helpful in sustainable landfill management. It may not be possible in the absence of complete understanding and required capacity enhancement along with financial supports and efforts should also be made to break the Ziadat and Henry

(2005) also assessed the municipal solid waste management and focused on recycling the solid waste to overcome the problem.

Rainachandra and Saira (2003) focused on the exploring possibilities of achieving sustainability in solid waste management. They discussed methods to overcome constraints in waste management and the future plans and actions that will bring about a significant change in current waste management practices.

Joseph, 2002 also cited that explosion in world population is changing the nature of solid waste management. He laid emphasis on the prospective of solid waste management in India and found that solid waste is creating large risks to public health and environment. He gave several directions for improving the situation. He also noticed that India is facing a municipal solid waste dilemma for which all elements of the society are responsible. The community sensitization and public awareness is low. There is no system of segregation of organic, inorganic and recyclable wastes at household level. There is an adequate legal framework existing in the country to address MSWM but what is lacking is its proper implementation.

Olivian, 2011 also analysed the solid waste management system of Jaipur and shared his views laying emphasis on establishing more public-private partnerships which can actually take care of the funding problems. The other main difficulties observed by him were poor law enforcement leading to corruption and civilian unawareness other problem were related to out of date technology and lack of trained workers.

Kaushal et al., 2012 estimated the quality and characteristics of municipal solid waste. He made attempts to study the changing trends of MSW and to find its impact on the performance and capacity, planning of recovery, recycle and compost, incineration and landfill Facilities. He reported that the changing pattern of waste composition emphasises the importance of segregation for successful operation of waste management facilities.

Belien et al., 2011 cited several problems related to municipal solid waste collection and management.

Bundela et al., 2010 gave an idea of agricultural application of municipal solid waste; they found that municipal solid waste compost is the most cost effective MSW management option over traditional means such as landfills or incineration as it

enables recycling of potential plant nutrients. Different effects of MSW compost application on soil microbial bioass and actually have been reported by numerous researchers.

Gupta and Sharma 2011, proposed model for integrated planning of solid waste management in Jaipur. They reported that the policies need implementation for bringing the potential improvement in the MSW system in Jaipur. They put forward that that careful attention should be paid for providing a proper characterisation of the system.

Ramachandra and Bachamanda, 2007 cited audit report on municipal solid waste management. They found that waste disposal needs immediate attention and strict monitoring. They advised that setting up of sanitary landfills sites has to speed up and this need to be given top priority. New techniques should be implemented for storage, collection, transfer and transportation due to which many positive changes were observed and have increased the efficiency of the MSWM. They also suggested that proper training and education needs to be provided to the workers and public awareness programmes, health and safety programmes should be conducted regularly.

Ghliasinejad and Abdoli; 2007, observed that transfer and transport of the waste is one of the key functional elements in solid waste management from technical and financial point of view. They concluded that the present system of transfer creates pollution due to highest number of vehicle movement and sometimes the transport is several times. They suggested that for waste compacting should be done prior to loading. Rathi, 2007 presented an optimized model of integrated waste management in Mumbai. They concluded that increasing quality of waste and limited resources makes municipal solid waste management a critical issue. He indicated that community compost plants are the best option whereas sanitary landfills are indispensable for waste management in Mumbai. He suggested that there is a great need for decentralization of local governance and an active cooperative working mechanism amongst local government, private sector and civil society for better MSW management. They also observed that MSWM strategy should differ depending upon the locality.

Magda Magdy and Saleem, 2013 studied the solid waste management in city of Egypt. They found that inefficient collection is the most significant solid waste

problem. They suggested that the problem of MSW can be overcome by encouraging the residents by giving incentives to participate in an integrated MSW management programme where waste is sorted at the point of generation.

Roy et al., 2013 studied urban solid waste management and applied a contingent valuation method. They used primary data to analyse the willingness to pay for a sustainable solid waste management scheme. They suggested that municipal authorities should concentrate on awareness campaigns about the consequences of waste mishandling and benefits of payment for proper waste management.

Due to unscientific and unsystematic disposal of solid waste, various types of diseases and infections are caused. The sewage produced from the refineries, medicinal laboratories, discarded syringes, scrubs, smears and varieties of infectious chaff are frequently disposed. Toxic chemicals if released untreated are highly poisonous. These all have a great impact on soil and ground water in the surrounding area where the solid wastes are being dumped off. Similar problems are also being studied by several researchers. In Jaipur district, as well as Sahni and Gautam, 2010 studied about the toxicants of heavy metals in soil near the dumping site Mathuradaspora. They considered that MSW may be the reason for soil contamination and found that heavy metals like Zn, Pb, Ni, Cu and Cd are hazardous as they are easily absorbed by the agricultural crops and ultimately cause harm to human beings. Similar results were reported by Trueby, 2003 and Adija et al., 2008. Horsfall and Shiff, 1999 and Peplow, 1999 found that animals that graze on such plants which are contaminated by such heavy metals and drink water nearby that area are fully affected as they accumulate heavy metals in their tissues and their milk products of lactating. Gautam et al., 2011 assessed the ground water at a solid waste dumping site and found that the water contains a large amount of heavy metals. They suggested that dumping of municipal solid waste should completely be stopped as it slowly damages the environment. They concluded that leachate formed slowly percolates in the ground water table and ultimately pollutes the ground water.

Sahni and Gautam, 2012 also analysed the air pollutants near the waste dumping site of Jaipur city. They found that the presence of SPM, SO₂ and NO₂ is higher due to MSW dumping at the site. The levels of SPM are higher than the standard limits of CPCB. They suggested that dumping of MSW should be confined to areas which are away from dwelling localities and a methodological disposal of the solid waste is needed to stop such kind of pollution.

Chapter No. 4

Study Area

Rajasthan

Rajasthan (literally, “Land of Kings”) is India’s largest state by area (342,239 square kilometres (132,139 sq ml) or 10.4% of India’s total area). It is located on the western side of the country, where it comprises most of the wide and inhospitable Thar Desert (also known as the “Rajasthan Desert” and “Great Indian Desert”) and shares a border with the Pakistani provinces of Punjab to the northwest and Sindh to the west, along the Sutlej-Indus river valley. Elsewhere it is bordered by five other Indian states: Punjab to the north; Haryana and Uttar Pradesh to the northeast; Madhya Pradesh to the southeast; and Gujarat to the southwest.

Major features include the ruins of the Indus Valley Civilization at Kalibanga; the Dilwara Temples, a Jam pilgrimage site at Rajasthan’s only hill station, Mount Abu, in the ancient Aravalli mountain range; and, in eastern Rajasthan, the Keoladeo National Park near Bharatpur, a World Heritage Site known for its bird life. Rajasthan is also home to three national tiger reserves, the Ranthambore National Park in Sawai Madhopur, Sariska Tiger Reserve in Alwar and Mukundra Hill Tiger Reserve in Kota.

The state was formed on 30 March 1949 when Rajputana — the name adopted by the British

Ra for its dependencies in the region — was merged into the Dominion of India.

Its capital and largest city is Jaipur, also known as Pink City, located on the state’s eastern

side. Other important cities are Jodhpur, Udaipur, Bikaner, Kota and Ajmer.

Geography

The geographic features of Rajasthan are the Thar Desert and the Aravalli Range, which runs through the state from southwest to northeast, almost from one end to the other, for more than 850 kilometres (530 mi). Mount Abu lies at the southwestern end of the range, separated from the main ranges by the West Banas River, although a series of broken ridges continues into Haryana in the direction of Delhi where it can be seen as outcrops in the form of the Raisina Hill and the ridges farther north. About three-fifths of Rajasthan lies northwest of the Aravallis, leaving two-fifths on the east and south direction.

The northwestern portion of Rajasthan is generally sandy and dry. Most of this region are covered by the Thar Desert which extends into adjoining portions of Pakistan. The Aravalli Range does not intercept the moisture-giving southwest monsoon winds off the Arabian Sea, as it lies in a direction parallel to that of the coming monsoon winds, leaving the northwestern region in a rain shadow. The Thar Desert is thinly populated; the town of Jodhpur is the largest city in the desert and known as the gateway of thar desert. The desert has some major districts like Jodhpur, Jaisalmer, Barmer, Bikaner and Nagour. This area is also important defence point of view. Jodhpur airbase is Indias largest airbase and military, BSF bases are also situated here. A single civil airport is also situated in Jodhpur. The Northwestern thorn scrub forests lie in a band around the Thar Desert, between the desert and the Aravallis. This region receives less than 400 mm of rain in an average year. Temperatures can sometimes exceed 54 °C in the summer months or 129 degrees Fahrenheit and drop below freezing in the winter. The Godwar, Marwar, and Shekhawati regions lie in the thorn scrub forest zone, along with the city of Jodhpur. The Luni River and its tributaries are the major river system of Godwar and Marwar regions, draining the western slopes of the Aravallis and emptying southwest into the great Rann of Kutch wetland in neighbouring Gujarat. This river is saline in the lower reaches and remains potable only up to Balotara in Barnier district. The Ghaggar River, which originates in Haryana, is an intermittent stream that disappears into the sands of the Thar Desert in the northern corner of the state and is seen as a remnant of the primitive Saraswati river.

The Aravalli Range and the lands to the east and southeast of the range are generally more fertile and better watered. This region is home to the Kathiarbar-Gir dry deciduous forests ecoregion, with tropical dry broadleaf forests that include teak, Acacia, and other trees. The hilly Vagad region, home to the cities of Dungarpur and Banswara lies in southernmost Rajasthan, on the border with Gujarat and Madhya Pradesh. With the exception of Mount Abu, Vagad is the wettest region in Rajasthan, and the most heavily forested. North of Vagad lies the Mevar region, home to the cities of Udaipur and Chittaurgarh. The Hadoti region lies to the southeast, on the border with Madhya Pradesh. North of Hadoti and Mewar lies the Dhundhar region, home to the state capital of Jaipur. Mewar, the easternmost region of Rajasthan,

borders Haryana and Uttar Pradesh. Eastern and southeastern Rajasthan is drained by the Banas and Chambal rivers, tributaries of the Ganges.

The Aravalli Range runs across the state from the southwest peak Guru Shikhar (Mount Abu), which is 1,722 metres (5,650 ft) in height, to Khetri in the northeast. This range divides the state into 60% in the northwest of the range and 40% in the southeast. The northwest tract is sandy and unproductive with little water but improves gradually from desert land in the far west and northwest to comparatively fertile and habitable land towards the east. The area includes the Thar Desert. The south-eastern area, higher in elevation (100 to 350 m above sea level) and more fertile, has a very diversified topography. In the south lies the hilly tract of Mewar. In the southeast, a large area within the districts of Kota and Bundi forms a tableland. To the northeast of these districts is a rugged region (badlands) following the line of the Chambal River. Farther north the country levels out; the flat plains of the northeastern Bharatpur district are part of an alluvial basin. Merta City lies in the geographical centre of Rajasthan.

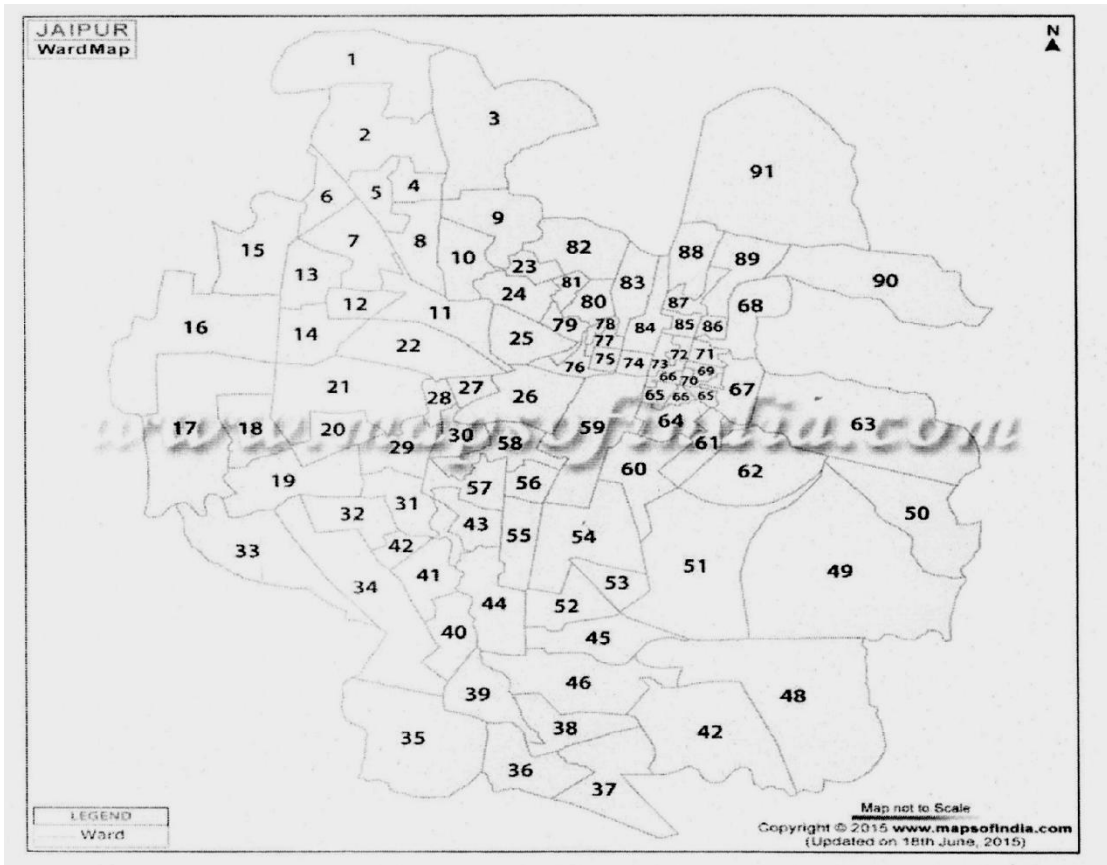
Jaipur

Jaipur is the capital and second largest city (in terms of size) of the Indian state of Rajasthan in Northern India. It was founded on 18 November 1726 by Maharaja Jai Singh II, the ruler of Amer after whom the city is named. As of 2011, the city has a population of 3.1 million, making it the tenth most populous city in the country. Jaipur is also known as the Pink City of India. Jaipur is located 260 km (162 miles) from the Indian capital New Delhi. Jaipur forms a part of the west Golden Triangle tourist circuit along with Agra (240 km, 149 ml). Jaipur is a popular tourist destination in India and serves as a gateway to other tourist destinations in Rajasthan such as Jodhpur (348 km, 216 miles), Jaisalmer (571 km, 355 mi) Udaipur (421 km, 262 mi). and Mount Abu (520 km, 323 mi).

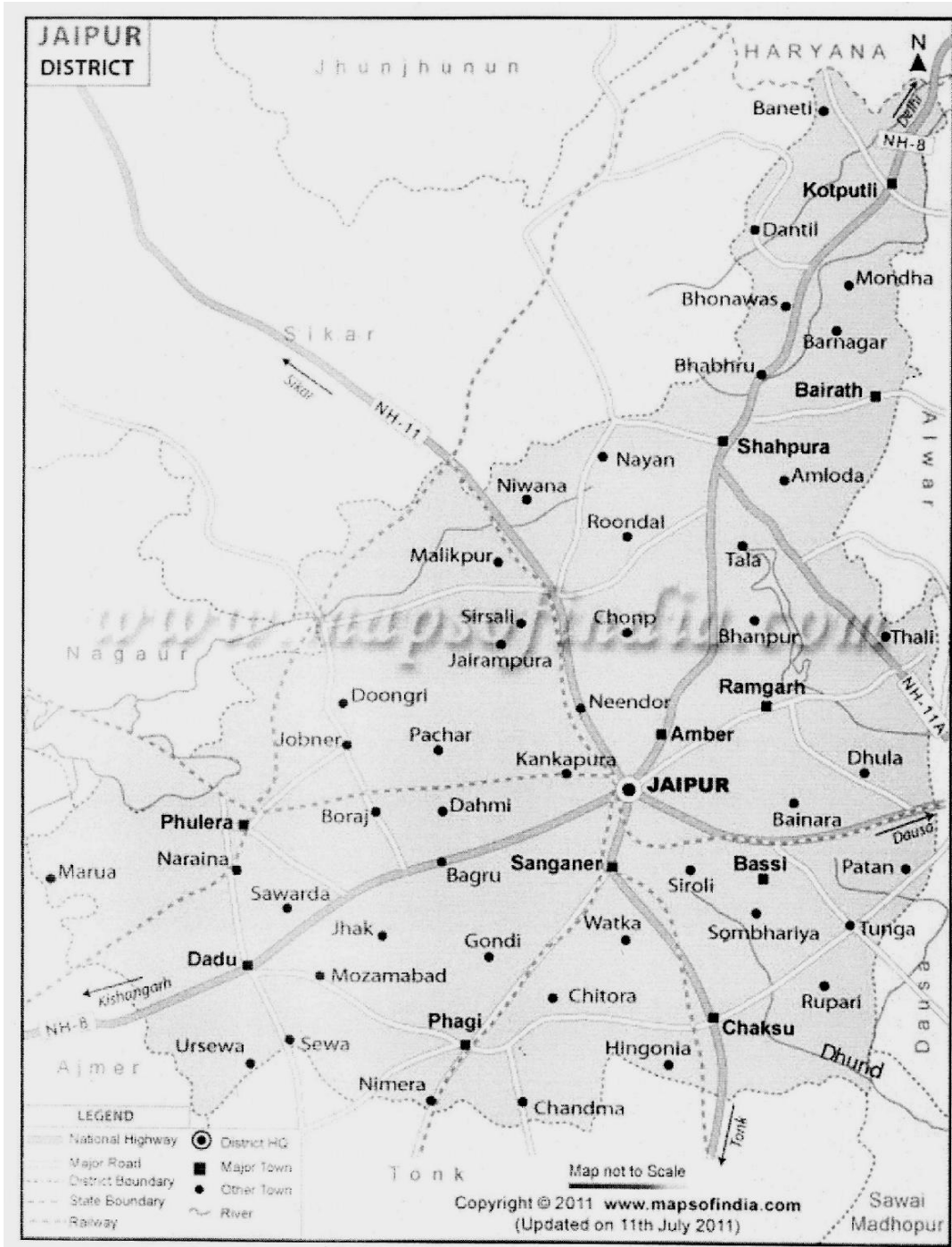
Jaipur City Profile

City Population(2011)	30.73 Lac + 10% Floating
Area:	467 Sq. Km.
Number of Houses:	4.5 Lac (BPL Families : 26127)
Zones:	City is divided into 8 geographical zones :
Wards:	91
Elected Members:	91

Co-opted Member:	-
Ex-officeio Members:	12 (10 MLAs and 2 MPs)
Standing Committees:	15
Budget size:	941 Crore Rs.
Slums:	JNN : 164, JDA- 47, Total - 211
Surveyed Family:	JNN: 43718, JDA- 12753, Total - 56471
BPL Families:	26127



Jaipur ward map



Chapter No. 5

Observation and

Discussion

System Implementation

Solid waste is managed by the Jaipur Municipal Corporation (Jaipur Nagar Nigam). 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) (Appendix A). Jaipur is divided into 77 wards grouped into eight zones. Under the health commissioner, currently Mr. Shakti Singh Sisodia, each zone has a commissioner, a health officer, and a chief sanitary inspector. One sanitary inspector for each ward employs sweepers (safai karamchari) who are monitored by a supervisor (amadar).

The sweepers work in two shifts: a morning shift from 6-10 AM (or 7-11 AM in the winter), and an afternoon shift from 2:30-5:30 PM. The sweepers are usually formal workers paid either by the JMC or by a private contractor, if the ward where they work has been contracted out. In total, 5,644 people are permanent workers for the JMC, while 1,060 are on contract! 1. Permanent workers earn approximately Rs 4,500-6,000 per month. Temporary, impermanent sweepers are hired by the JMC as the need arises, and earn approximately Rs 2,500 per month. All employees have the same working hours (eight hours a day) regardless of salary or permanent/impermanent status. Work is segregated by gender, so the female sweepers and the male sweepers do different tasks, however their salaries are the same.

The female sweepers' tasks involve sweeping the streets with their brooms, and aggregating the waste in piles on the sides of the roads. They are assigned beats (designated area within a ward) to clean. The number of beats or the size of the designated area to be cleaned during their shift is based on population, as regulated by the MSW (Management and Handling) Rules 2000. In congested areas with high population, sweepers clean 250-350 m, in less congested areas, 400 m, and in sparsely populated areas, 500 m. All tools are provided for the sweepers, and are locked in the ward office after every day. The one exception is brooms. Ladies are supposed to bring these on their own, but they are still given Rs 75 every month to buy a new broom. Some use the same broom for 2-3 months to save the extra Rs 75-150, but then their brooms become so short that they have to bend over, straining their backs.

The male “sweepers” de-silt surface drains to ensure that water flow is not blocked, as well as lift up the waste that the women sweepers collected on the street corners and put it in their handcarts. They used to use a wheelbarrow which just had one compartment, but now they are using a cart with six separate buckets—two compartments for the material they cleaned from the surface drains, and four for the rest of the garbage, which can include grass clippings and sticks that residents put out on the street. Many of these workers work together in pairs, sometimes with a family member. One male sweeper interviewed said he and his brother cover about two beats while doing their work, for which they earn approximately Rs 1 700-1 800 per month after deduction. This amount is significantly less than the Rs 4,500- 6.000 permanent workers are supposed to be earning. No reason is accounted for in this discrepancy.

Every year the permanent sweepers who clean drains are given aprons, goggles, gum boots, and masks. According to the JMC, many workers only wear them for a few days and then leave them at home, or they will not wear this equipment in the summer because it is too hot. However, according to a permanent trash worker who works for the JMC, they only got such shoes and gloves a long time ago. Now they do not receive any facilities from the government. He said this is just how the government runs: sometimes they start and sometimes they stop services without explanation. Apparently the JMC used to provide their workers with protective wear but have stopped after they thought the gear was not being utilized.

After their handcarts are full, these male “sweepers” bring the waste to a municipal bin. Two to three sweepers come to one container. The JMC bought 800 waste disposal bins to be dispersed throughout the city. In theory, one-cubic-meter waste disposal bins with a storage capacity of V2 ton of waste are placed every 250 meters along streets. Based on observation, there do not seem to be this many. Currently 55 of the 77 wards are “containerized” (have containers); the wards of the Old City are not containerized due to past objections, likely regarding space concerns. Those containers that 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.

The informal sector plays an equally important role in waste management. It is made up of mainly ragpickers, who sift through garbage in dumping sites and remove those salvageable materials, such as plastics, glass, and metal, which can be sold to scrap dealers for recycling.

Ragpickers are at the lowest strata of the social ladder, those who used to be called “Untouchables” or *harUans* 20. They do their work out of necessity, because they are illiterate and have no other alternative. Others included in the informal sector are door-to-door waste collectors and *kabaris* who buy recyclable materials from door-to-door and sell them at scrap dealer shops. The researcher got to meet on several occasions with a *kabari* and observe his work (Appendix B).

The method for waste collection from houses depends on the community. Currently door-to-door collection is not undertaken by the formal sector, but is being done by the informal sector in some colonies such as in Nemi Sagar Colony of Vaishali Nagar, Sarti Nagar, and Mahaveer nagar. Families pay about Rs 40 per month to the waste collectors for their services. The collectors usually come to a house every day, but at times they can be unreliable—there are some days when they do not come at all. The number of houses they service can range from 60-80 in some neighborhoods, to 150-200 in other neighborhoods. Collectors often work together in pairs, sometimes with a brother or family member, and each earns about Rs 1500 per month.

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 to pick it up. This service started about two or three years ago.

Unfortunately, many of Jaipur’s residents neither get their waste collected from their home nor dispose of it in bins. Instead, they just dump it wherever is convenient and out of sight. Garbage abounds in empty lots next to people’s houses all over the city. Even in wealthier neighborhoods like Shree Rampura Colony, empty lots are taken advantage of as small dumping grounds. It is to empty lots like these, as well as bigger dump yards and dump sites under or near bridges, that rag pickers come to do their business.

Ragpickers can be male or female, and any age. Usually adult men and women do not work together, but rather a group of men and boys, a woman and her mother, or a

woman and a group of children. It is common for working companions to be related. Ragpickers' earnings can vary from Rs 50-100 per day or Rs 100-150 per day for others from four to five hours of work. They usually come to the same place every day to do their work, rather than wander around, likely in order to stay near where they live. After sorting out the recyclable goods and putting them in bags or in a metal container on a cart, the ragpickers take and sell them to a kabari shop, which re-sells them to companies.

Ragpickers working near Gopalpuria Puliya sell their collected materials near a graveyard in Mahesh Nagar, and those working near the bridge by Central Hospital sell at Pata near Sindhi Camp. Some ragpickers are very aware about health concerns such as inhaling toxic fumes from arising from their job, while others are not. When asked if this work is hard, ragpicker Mahaveer says "It's hard—you can get sick from it. You can get cut from glass." But when another ragpicker was asked if there were any health concerns from this work, she said no. Perhaps she gave this answer because she truly was unaware of the health concerns associated with waste. Or perhaps she interpreted the question as an insinuation that her work was unclean and degrading, so she was embarrassed and was defending herself.

After the collection stage, waste is transported and then taken for storage. Upon collecting waste from the municipal containers, JMC trucks take it to one of Jaipur's five or six transfer stations. From there it is brought to a dumpyard or landfill. Jaipur has three such locations where solid waste ultimately ends up. One is at Matheradaspura, which is a 46-hectare dumpyard about 17 km from Jaipur by the Delhi Bypass. Four hundred metric tonnes (MT) of waste per day are dumped there. The second is at Sewapura, a 44-hectare dumpyard about 20 km away on Siker Road. Here 250 MT of waste are taken every day. A company called Infrastructure Leasing Financial Services (ILFS), Ecosmart, will start producing compost at the site under Public-Private Partnership (PPP) in about 18 months. The third is a 121-hectare scientific landfill site at Langariyawas Village, about 25 km outside of Jaipur. Its capacity is 300 MT. Scientific landfills differ from regular landfills in a few ways. The most important distinguishing factor of a scientific landfill is the geomembrane liner. This is fitted along the sides and bottom of the pit so that leachate, or liquid from waste that can contain hazardous material, is prevented from seeping into the ground. The scientific landfill project at Langariyawas, costing 20 Crore, was

undertaken due to the stipulation of the federal MSW 2000 Rules. It has been under construction for about the last year and a half, and is scheduled for completion in about six months.

Problems in Management

One problem that all of India's work force faces is absenteeism, and solid waste management is no exception. In general, there is a rate of 10-20% absenteeism at the work place. At times, rather than coming to work, workers will just send someone else in their place. When confronted about their absence, they will simply offer a bribe to their superior in order to be marked as present. The effect of absenteeism is, of course, a shortage of manpower, which, when coupled with the shortage of machinery and equipment, yields few results. As if absenteeism alone was not bad enough, 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.

To amend the absenteeism problem, the Jaipur Municipal Corporation has installed two biometric machines in their main office, which scan workers' fingerprints as they come into work to ensure attendance as well as stamp a daily card. Soon biometric machines will also be installed in each of Jaipur's eight zone offices. However this effort has been met with resistance by labor unions. In early May 2011 the JMC is expecting a strike by workers in opposition to the installation of the machines. In the event of a strike the JMC usually responds by withholding salaries, taking other factions of the union into confidence (supposedly to have insiders quell the uprising), and employing a temporary workforce.

Another obstacle to thorough waste collection is physical accessibility. Jaipur's widespread area and the constant growth of the city make it hard to monitor all areas. Although the city is systematically divided into eight zones, not all streets of all zones are cleaned by JMC workers. Those streets that are not covered by the JMC are serviced by the informal sector. But even then there are certain areas like slums which are harder to reach and are not as well maintained. Certain areas are given higher priority for cleaning. The old walled city area, areas of historic importance, as well as VIP areas all have top priority, while the outskirts of the city are given less attention.

There are also temporary encroachments in the street such as animals, people, chairs and tables outside shops, and vehicles which sometimes prevent the sweepers from doing their jobs properly. Animals used to be kept on the street more, and would sometimes get in the way, but now there have been efforts to keep them in pens, especially buffalo and camels. Even the people who sleep on the foot paths, as well as vehicles kept on the roadsides prevent all areas from being accessible to cleaning. When people leave for work after 9 AM they take their vehicles with them, but some sweepers have already started working by then. To amend this problem, the number of cars on the road in general should be reduced using a technique such as has been done in Beijing, where no new licenses are issued out to cars.³⁴ Similarly, when shops open at around 10 AM, sweepers may have already serviced the area in front of the shop. Then the shop keepers sweep their shops before the day's work begins, and dump the waste right onto the streets, rather than taking it to the proper disposal bins or waiting until the evening sweeper shift comes.

Although penalties are in place for improper dumping, the fines do not deter many. Fines of up to Rs 20,000 have been collected at one time for vehicles dumping large amounts of garbage. Apparently violators would rather pay the fine than have their vehicles seized.³⁵ Currently new surveillance programs are being initiated to deter residents from soiling public areas. Sanitary inspectors armed with digital cameras to record evidence stand duty on the streets on the look-out for people who dirty their surroundings. As recently as May 2nd, 2011, the Watch Riders Scheme was launched. "Watch Riders" are patrolling police (one per ward) who also have digital cameras and are authorized to fine offenders on the spot. Violations include spitting, urinating, defecating, washing clothes or utensils on the street, allowing pets or kept animals to defecate on streets, and of course, dumping garbage. This new scheme was promulgated for a week to educate people about the new laws, culminating in a rally on May 1st, 2011. Pamphlets were distributed, announcements were made over loudspeaker, and electronic media promotions were dispensed in its promotion. Many of those who are responsible for spoiling the city are uneducated and cannot read and write, so in order to target this group, loudspeaker announcements should be emphasized. This suggestion is in response to the notion held by many SWM workers that Jaipur's laws regarding SWM are good, but the implementation is poor in part due to ignorance by the poor and illiterate.

In addition to the aforementioned areas of improvement, which were proposed by respondents who work in the system, the researcher has another reform suggestion with regards to the JMC's budget. The Jaipur Municipal Corporation's budget is broken down as follows (figures have been rounded to exclude decimals). In total 16,344 lakhs per year are spent on Solid Waste Management. Of this, 12,821 lakhs are spent on staff salary, 1,032 on contractor workers' salaries, 492 on electricity and fuel costs, 36 on chemical costs, 251 on repair and maintenance, and 1710 on contractor services. It is interesting to compare the JMC's SWM budget with that of another municipality like Mumbai (although the data acquired for Mumbai are not as detailed). In Mumbai, the total spent on SWM is 1,000 crores per year. Of that amount, 60% goes for transportation, 20% goes towards employee salaries, and 20% is allocated towards operation maintenance.

The numbers cannot be compared completely objectively because the categories are not broken down the same way. However, if one examines Jaipur's budget, combining both the permanent workers and contract workers, a full 85% is spent on staff salaries, compared to a mere 20% in Mumbai (though it is unknown if the actual salary amounts are higher). In general this trend can be explained by the sheer size difference of the cities. Mumbai requires much more equipment and transportation to service its large area and populace, so it makes sense that more funds are allocated towards those efforts. 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 JMC should either increase the duties of each employee, or should instigate hiring freezes and instead spend more money on staff training or buying new equipment.

Public-Private Partnerships (PPPs)

Jaipur has been engaged in public-private partnerships for the last ten years. It has become necessary for the municipality to contract out some of its waste management work because it cannot recruit enough staff to cover SWM in all wards. In those cases private companies are hired.³⁹ The PPP model is ideal because often waste disposal, treatment, and operation necessitate exorbitant start-up costs, which the municipality either cannot afford, or chooses not to spend. The JMC used to levy octroi (a customs

duty) as a source of revenue, but no longer do so due to resistance by various leaders. As a result, The JMC does not have much at their disposal to invest in waste management projects. Private parties, either NGOs or corporations, who are experts in a certain area such as waste management, can thus offer shared cost and responsibility as well as their specific knowledge about the project. The municipality is the owner and oversees the project, providing some resources, while the private company carries out the work. The central government provides the rules for the partnership, the state or municipality oversees the policy, and the State Regulatory Board oversees implementation.

There are various combinations of public and private participation in partnerships. In a turnkey project, the design and construction of a waste facility is led by the municipality and then turned over to a buyer to run. The responsibilities of collection, transportation, and disposal can be given to a private company for a particular period specified (minimum three years), while land is provided by the municipality (according to MSW 2000 Rules). Alternatively, collection and transportation may be handled by a private company, while processing and disposal are overseen by the municipality. Yet another possibility is that collection is done by an NGO, transportation by the municipality, and process, disposal, design, and construction by a private company. The final option is that the municipality is not involved at all. Land ownership, collection, process and disposal are all under the control of a private owner.

Grasim Industries MSW Processing Plant

Grasim Industries, a cement producer and flagship company of Aditya Birla Group, has a contract with the Jaipur Municipal Corporation on BOOT (Build, Operate, Own, and Transfer) basis to operate an MSW plant. The plant, which is established right next to the Langariyawas landfill, outputs Refuse-Derived Fuel (RDF). The RDF is then used to power a cement plant, Grasim's subsidiary Ultratech Cement Limited, in Neemuch, Madhya Pradesh. Contracted under a 30-year contract in 2005 and commissioned in 2007, the facility is India's first fully-automated MSW processing plant. JMC initially provided 25 acres of land. They also deliver 500 MT of solid waste every day. After giving 20 lakh as a security deposit to prove their earnestness in undertaking the project, the rest of the management is left up to Aditya Birla

Group. Aditya Birla hired a German company called Doppstadt to build the whole plant facility and outfit it with their state-of-the-art technology. They have also sublet their labor contract to Pratham Envirotech Pvt. Ltd. at Hyderabad. Fifty workers are employed at the plant.

The garbage has to undergo many transformations before it reaches its final product of RDF. The five general steps in the process are size reduction, homogenization, metal separation, segregation, and further size reduction. As JMC lorries carrying garbage lifted from the city enter the plant, the garbage is weighed at the weigh station before being dumped. Next, workers manually remove large and dangerous items such as batteries, big stones, tires, dead animals, and heavy machinery. What remains is loaded with a payloader into the preshredder, which reduces the grain size from 0-1000mm to 0-200 mm. Subsequently it is sent into an integrated conveyor, over which a magnetic separating machine is installed. The magnetic separator removes all the metal to be recycled for the metal industry. After that is separation of biodegradable organic material from sand and grit by way of a trommel screen (separation by size). The sand and grit is to be taken away by farmers to be mixed with manure and used as fertilizer. The heavier pieces that come from the trommel screen, such as glass and ceramics, go to the ballistic separator (separation by density). The heavy, inorganic fraction gets dumped in the landfill, whereas the light, organic fraction is sent for further homogenization and fine shredding. This further size reduction results in a final grain size of 0-50 mm. What results is garbage fluff, which is sent 400 km away to Grasim's UltraTech cement plant.

However, this garbage fluff is still fairly low in calorific value. Therefore, in the last cycle of homogenization and shredding, plastic is added to increase the calorific value (recall that there is not much plastic in the waste because it has already been removed by ragpickers.) This plastic is purchased from Sainath Enterprises at Rs 3/kg, or Rs 3000/MT. Sainath Enterprises employs ragpickers to pick non-recyclable plastic (like cracker and cookie wrappers as opposed to plastic bottles).

Although the plant is doing a good service for waste management, Grasim has been suffering financially, and has lost about 20 crore just funding operational costs. About 12-15 lakh per month of the operational costs are fixed. Because there are no variable costs, Grasim has to pay whether or not they are producing RDF fuel. Since the waste

initially has a high rubble and low plastic content, there is low heat value, which makes the production of enough RDF fuel to cover costs near-impossible. Of the 500 MT of waste per day that JMC provides, the RDF plant is supposedly capable of producing 150 tons of RDF per day, (roughly a 30% recovery of useable refuse), but in reality it is more like a 5-6% recovery rate.

One reason the waste has such a high composition of rubble is because the garbage truck drivers' pay is based on the weight of the waste. Since a worker will earn about Rs 400 per truckload, or 4 MT of waste, he will add "useless waste" like construction debris to the garbage to make it heavier. Unfortunately, the construction debris cannot even be bought by cement companies to be re-ground into cement because it is mixed up with all the other garbage so it smells too bad. Furthermore, cement companies are already established near their source of material at a limestone quarry, so they have no motivation to spend money on extra transportation cost to go all the way to the plant to buy the smelly construction debris. It is due to reasons like this that it is difficult to re-sell any of the waste for profit.

Grasim Industries is practically running this RDF plant as charity. But there is a catch— because they are providing this waste management service they are more likely to get favors later from the government in other work they do. That is, the government will make things easier for them and will not get in their way. One other benefit of doing this service is that they are awarded carbon credits for using RDF fuel and thereby save 9% of the coal that would otherwise be burned to run the cement plant.

According to a JMC health officer who prefers to remain anonymous, the above information regarding low garbage value is not portrayed entirely accurately. The JMC only recently became responsible for the transport of garbage to the Grasim plant. On June 10, 2010, the transportation contract between Grasim and the other companies who were responsible for bringing the waste to the plant was nullified. It was those other companies' workers who were paid based on weight and who added construction material to the waste. The JMC workers who transport the waste now are not paid by weight and have no such incentive. Grasim blames the JMC for not sending them high quality garbage, but for the past year at least, the amount of construction material sent to the plant ought to have been reduced.

Mr. Gupta, the project manager of Grasim Industries, says that the main reason they are only able to produce 5-6% instead 30% RDF from the received waste is due to its poor caloric content. But according to the aforementioned anonymous health officer, inadequate technology is also a culprit. The plant was commissioned as recently as four years ago, yet even since then new companies have come out with superior RDF processing technology. Although Grasim's contract is supposed to last until 2035, it is possible that it may be nullified in favor of a more efficient company taking up the job. (This nullification would be justified on the grounds that Grasim sometimes refuses to take all the garbage that is offered to them by the JMC, which is a clause provisioned in the contract.) At an RDF plant in Mumbai, for example, 80% of the waste received is converted to RDF, leaving only 20% to be dumped in the landfill. The owner of that plant in Mumbai has had such success in fact, and made sufficient profit as to establish 20 other such plants nearby.

In addition to PPPs taking the form of a partnership with the government, it can also take the form of a partnership with an NGO. There are two NGOs in Jaipur working on SWM: Satya an NGO (referred to hereafter as Satya), and the Centre for Communication Development

(C DC).

NGO #1, Satya

Under the SWM Rules 2000 there were no provisions for SWM in military camps. To address this issue, five years ago a tn-party agreement was formed between Satya, JMC, and Jaipur's Military Station. Satya provides the labor, JMC oversees the project, and the Jaipur Military provides the equipment. The Health and Hygiene program initiatives include door- to-door waste collection within the military compound, which cost 3.28 lakh in 2007 alone (last year for which there is data). Luckily, unlike some of the other SWM projects contracted under PPP, Satya has not lost any money. The compound is divided into three areas—the official's area, the officer area. and the regency area. Dustbins are stationed throughout the campus, and afterwards waste is transported to the dumpyard at Matheradapura. Through regular training of the 137 workers with regards to garbage handling protocol, including the necessity of wearing gloves and which types of garbage produce which kinds of hazardous gases, the program has been met with success.

Although this PPP is a success story, Satya has not always had such luck in partnerships with the JMC. From 2005-2007 Satya experimented with door-to-door collection in ward 20 as well as in Chitrakoot, Vaishali Nagar. One thousand households were involved from ward 20. Those who could afford to pay would give Rs 30 per month per household for the service of waste pick-up, and those who were poorer were to pay Rs 20 a month.⁴⁹ However, only 100- 200 of the 1000 households actually paid their dues. Because of this, Satya was operating the project at a huge loss. Moreover, 3.5 lakhs have yet to be settled between the JMC and Satya—that is, JMC owes Satya this amount of money and still has not paid.⁵⁰ According to Satya, the JMC was a poor facilitator throughout the whole project and did not provide much support. Due to inadequacies in the government, difficulties in managing payments, and corruption, the partnership was not a smooth one. Ward 20 was taken up as a challenge because the inhabitants of that area were unaware and unmotivated about proper waste disposal techniques. Satya completed the two-year contract, but the project was discontinued afterwards.

NGO #2, Centre for Development Communication

The Centre for Development Communication (CDC) is another NGO which has launched some efforts towards better urban solid waste management. CDC is a market based, rather than a charity-based NGO which maintains a close partnership with the JMC but does not receive financial support for its projects. They operate on the withdrawal model, which means that they work with a city for about five years and then plan to leave so as to encourage self-sufficiency. CDC has established itself in many cities. They have an office in Jaipur and used to work on SWM there in 1995, specifically in door-to-door collection and transportation. Now they have ceased work on these initiatives and instead focus on other social service projects in Jaipur. These social service projects include a Right to Information Campaign, Self-Help Groups and microenterprises, providing social security for the unorganized sector, urban health (e.g. routine check-ups), and institutional development (e.g. economic empowerment and combating forced evictions). A specific current project which indirectly relates to SWM is their food wastage program. This service picks up left-over food from large functions like weddings and distributes it to places like soup kitchens, thus reducing food waste.

Evaluation of PPP success

A prevalent opinion is that public-private partnerships in solid waste management are mostly unsuccessful because they are unprofitable. When private companies who work with SWM receive their funding from the JMC, they run into financial trouble due to JMC's lack of monetary resources. The only PPP that has been successful in Jaipur is the partnership with National Highways. Otherwise, the profit margin is only about 4-5%, which does not make the partnership viable for most companies. Examples like the RDF plant in Mumbai show that businesses involved with the transformation of waste into other uses can, in fact, be profitable. When private corporations enter the business, they do it for profit. On the bright side, currently about tell companies are showing interest for signing a contract for a "Comprehensive Sanitary ProgramS". This program would handle all aspects of SWM from sweeping, to secondary storage, to conversion under the BOOT (Build, Operate, Own, and Transfer) or DBOOT (Design, Build, Operate, Own, and Transfer) design. One company that has expressed interest is a German company called Hanjer Biotech Energies Pvt. Ltd, and their proposal is currently under consideration. According to Mr. Anil Singhal, former executive engineer with the JMC. a step that could be taken to improve the PPP model is to relax and simplify regulations imposed on private corporations. For example, financial flexibility is very limited. A 10% security deposit in cash is required before the initiation of any contracted project, which deters many companies. To attract more companies, Mr. Singhal proposes that a bank guarantee would work better. A bank guarantee allows a company who is entering business with a much bigger entity, like a government, to have a third party (the bank) give their support on the company's behalf. The support takes the form of the guarantee, which is a percentage of the contract. The government requires this guarantee because it often has a hard time analyzing the financial track record and dependability of all the tenders submitting proposals for the contract. So the third party evaluates the company's moveable and immoveable assets, as well as its financial reliability and vouches for the company. If the company does not carry out the contract to the government's satisfaction, the guarantee is invoked and the bank has to pay that amount to the government. This system benefits both the government and the company. It benefits the government because the bank helps assess a company's

financial fitness. The bank guarantee also benefits the company because it does not have to pay up-front in cash.

Grasim industries' contract document indicates that they have an unconditional Performance Bank Guarantee (if they fail to complete the project as laid out in the contract, then the JMC can claim the guarantee). So it seems as though the bank guarantee method is already being implemented with at least one PPP. Grasim also paid a security deposit (but it was only 1%, not 10% of the total cost). Perhaps, then, both the deposit and the guarantee systems can be used, though that option would not necessarily be the best to attract the most tenders.

Another obstacle to the PPP mode's success is corruption. Workers under contracted labor are the most exploited, and sometimes do not even receive minimum wage. Contractors will pay a bribe to JMC to ignore the fact that they are not following wage standards. According to Mr. Sanjay Agarwal, CEO of Satya, 'A PPP can only be successful if there is no corruption. Smooth operation of the partnership requires reciprocal efforts from both parties, so unless both are committed, it is not possible.' Thus it seems that one of the main ways to improve the solid waste management is to reduce corruption. This, of course, is a huge task that will require long-sustained effort. But starting with such legislation as the Right to Information Act and the recent anticorruption Lokpal Bill, progress can slowly be made towards this goal and necessity.

Integration of the Informal Sector

In all the discussion for waste management reforms, one group that is often neglected is the informal sector workers, especially the ragpickers. Often times they are harassed by police or people with a higher social standing, and are forcefully kept far away from dumpyards landfills. Because they are not hired by the municipality or any company, they are also not given formal rights. Recently, for the first time however, ragpickers have been recognized in national legislation.

The Plastic Waste (Management and Handling) Rules 2011 was drafted by the Indian Government's Ministry of Environment and Forests. Some of these new rules include a ban on plastic sachets for packing or selling tobacco or pan, a ban on recycled and compostable plastics for packaging food products, and the implementation of Bureau

of Indian Standards (BIS) regulations on carrying bags. The most radical part about the rules, however, is their inclusion of waste pickers, which is the first time such a special consideration has been made. The rules “require the municipal authority to constructively engage agencies or groups working in waste management including these waste pickers”. Though the rules oblige municipalities to engage the waste pickers, no specific stipulations as to how the municipalities should go about this have been made. It remains to be seen whether or not they will actually follow through, just as many municipal authorities did not meet all requirements of the Municipal Solid Waste (Management and Handling) Rules 2000.

In Jaipur, efforts to integrate the informal sector into the private sector in SWM are not well established. This is likely because most existent PPPs do not deal with collection of garbage—the stage in which the informal sector is most involved—but rather its disposal. Also, training of the informal sector would be too costly, and private companies are mainly concerned with profit. However there is a new integrated SWM plan in the works, in which door-to-door trash collection, including segregation of waste, would be implemented. This plan will go into effect June or July 2011 as soon as the proposal letter receives clearance. Earlier the JMC experimented with door-to-door collection in a few wards under PPP (as previously discussed with CDC), but it failed. Currently bidding is underway for tenders (private companies) to undertake the integrated SWM project. Door-to-door collection is currently performed in some wards by the informal sector. Privatization of this service would displace some of those workers. The JMC might try to incorporate some of them into the system, but they are not sure yet.

Although efforts to integrate the informal sector are only on the horizon in Jaipur, such efforts have already begun to be implemented in other cities, such as Delhi. As of June 2005, Delhi contracted out collection, segregation, transportation, and disposal of solid waste in six zones to three different private companies. Segregation of waste is carried through by workers at the dhalao (either a waste bin, or a small building structure that houses a waste bin). It is further segregated at a central workshop, and those materials that can be recycled are sent for recycling. Before privatization, segregation of waste was only done by ragpickers. Although now the private sector is taking up some of these duties, the informal sector is still very much present. Currently, roughly 300 out of the 500 of the dhalao workers had previously

been ragpickers. For these select few, working conditions, sanitation, and salaries have been greatly improved. The workers' jobs are made easier by the provision of separate bins for biodegradable and nonbiodegradable waste, regular disinfection of the dhalaos, safety equipment and uniforms, sanitation trainings, and steady monthly wages. Only 300 ragpickers have benefited from formal employment, while many more ragpickers continue to work in the same conditions as before. However it is still a sign of progress that private companies are beginning to turn to the informal sector to supply some of their labor.

Community Awareness, Involvement, and Education

Ignorance about good SWM practices and civilian apathy have been mentioned by many as major impediments to better implementation of SWM laws. Awareness about the dire need for waste management reform certainly seems to exist at the governmental level, but is lacking at the citizen level. This is due largely to poverty and illiteracy.

At the governmental level, legislation is being developed that is geared towards putting management on the right track. Expectations, goals, and timelines are presented, holding different parties accountable for different aspects of waste management. For example, the Jawaharlal Nehru National Urban Renewal Mission is a seven year program part of which focuses on responsible urban development and governance, including SWM. It outlines goals for municipal reforms, which sectors are eligible for these reforms, and how funding is to be allocated. Every city that participates is expected to draft City Development Plans (CDPs) describing their policies and agenda for development, as well as Detailed Project Reports (DPRs) identifying areas that require attention and merit the undertaking of specific projects. For example the mission allocates funds to Urban Local Bodies (ULB5) (in Jaipur, the municipal corporation) for building up and attracting PPPs. Two thousand five hundred crore is to be given to the state government as aid specifically towards developing PPPs in SWM.

Similarly, the Municipal Solid Wastes (Management and Handling) Rules 2000 stipulates that it is the responsibility of the municipal authority to implement rules and develop infrastructure as well as file annual reports on the status of its progress. The ULBs were to have made the specified improvements to their SWM system by

December 31st, 2003 at the latest. However, they were unable to meet the guidelines due to lack of resources and mismanagement. Therefore in a Supreme Court hearing on February 3, 2004 it was announced that ULBs must submit an annual progress report to the State Pollution Control Board, which is then passed to the Central Pollution Control Board (CPCB) and the Ministry of Environment and Forests. The CPCB is now coming up with a new timeline for meeting the MSW 2000 guidelines, based on the progress reports of the 59 cities involved.

One of the requirements of the MSW (Management and Handling) Rules 2000 is that municipalities “organize awareness programs for segregation of wastes and shall promote recycling or reuse of segregated materials”. Segregation of waste at the source is an essential and needed development since when all waste is mixed up, it is harder to reconstitute any of the components for reuse, such as construction debris for cement or organic material for fertilizer. The infrastructure to support segregation at the source must needs come hand in hand with civilian responsibility and participation. In addition to segregation at the source, civilian responsibility has to be developed in other aspects of waste management as well.

At the citizen level, NGOs are taking the lead in the area of SWM education. Previously the Centre for Development Communication was introduced as an NGO that has done work in SWM. The effort for which CDC has garnered the most acclaim is the “Swachta Doot-Aple Dan” Project, which won the UN Habitat Scroll of Honour Award in 2004. This project, based in Nagpur, Maharashtra, features door-to-door collection and segregation of waste at the source. Its creation was a response to the problems of dependence on the municipality for waste management, the “not in my backyard” attitude, non-segregation, and stigmatization of waste work. To address these issues, the project provides employment to the socially disadvantaged and creates a sustainable community model for waste management.

A unique feature of the program is its emphasis on education of the public. Employees spend one out of four hours of work on education for proper waste disposal practices. These efforts have helped build community support for the program. Community members show support by using swachta doot waste services exclusively and giving voluntary tips to waste collectors. One shortcoming of this program is that the education portion of it targets only a certain economic class of

people—those who can pay for door-to-door trash pick-up services. Those who need education about waste management the most are those who are uneducated, poor, and illiterate, and do not have access to other ways of learning about good SWM practices through other avenues such as government posted signs.

With an area of 218 km² and a population of around 2.39 million, Nagpur is a smaller city than Jaipur. However, it generates 1000 MT of waste per day, a level very comparable to that of Jaipur. This similarity alone is not enough to suggest that the Swachta Doot-Aple Dan model would necessarily be met with the same success in Jaipur. Because the model relies in part on citizens' support, if Jaipur's residents are not invested in doing their part to contribute to a cleaned city, as was true in the experimental door-to-door collection in Ward 20, then even well-designed SWM may be ineffective.

Findings and Discussion

Thus far, various waste workers' roles in the waste management system have been laid out, as well as problems and how they are being addressed, and an evaluation of PPPs. Because the first question of investigation is more factual, the second two will be focused on here for analysis.

The main difficulties in solid waste management seem to stem from lack of funding, poor law enforcement, and civilian unawareness and apathy. Further problems related to funding include out-of-date technology and lack of trained workers. Within the problem of poor law enforcement is also corruption, as officials take bribes to ignore violations (both by other workers and by civilians).

Establishing more PPPs can actually help take care of some of the funding problems. For example, in the agreement between JMC and Grasim Industries, JMC provides the land and the garbage, and Grasim takes care of the funding for all the machinery, workers, and maintenance. The JMC is not forfeiting anything that is valuable to them; in fact, they are getting the garbage disposal problem off their shoulders. If more PPPs can be established, especially ones that include some of the responsibilities like sweeping that had formerly been under the jurisdiction of the JMC, then the JMC can redirect those funds spent employing the sweepers, and use them instead on other resources like better technology or staff training. The

Comprehensive Sanitary Program, in which a private company will oversee all aspects of waste lifecycle (from generation to ultimate storage), is currently in the works. But in general, more attractive payment options and reduced corruption are necessary both to attract more companies and to make the partnerships run more smoothly.

Although accessibility of garbage bins has not been cited by any respondents as a problem needing attention, personal observation suggests otherwise. In mid-March, the JMC introduced some public waste bins to the little park in Nemi Sagar colony of Vaishali Nagar. They say ‘USE ME, JMC’ on them. They are even shaped like fun cartoon animals to make them more user-friendly. It is encouraging to see that the JMC is providing such services. However public waste bins should not only be limited to parks— they need to be placed throughout the whole city. There are large municipal collection bins in the streets in most areas of the city, but are not actually every 250 meters as they are supposed to be. Most Jaipurites do not want to have to wander in search of one to throw out their paan wrapper. Also, these large bins take up a lot of space, so the areas in which they can be placed are limited. In crowded downtown areas of the Old City, or in commercial districts, smaller bins ought to be placed as well. If people were made aware of them and if they were convenient to use, this would significantly reduce the amount of waste tossed on the streets. The workload would then be lightened for the sweepers, but a new job would also be created as these small bins would need to be emptied into the large bins or collected directly by the lorries.

The study provided many opportunities for learning about the logistics of field research. One challenge that repeatedly occurred while conducting research was unforeseen holidays which rendered impromptu visits to offices difficult as they were closed. On a positive note, many people were more than willing to meet and share their knowledge. Sometimes those willing to help were not actually qualified on the topic of SWM. On one occasion a meeting was arranged with a faculty member of Rajasthan University who offered to meet and discuss Jaipur’s SWM. Upon meeting him, it soon became evident that although he was well-versed in public policy, he did not have much input to give on public policy of SWM. In addition, on two different occasions attempts to visit recyclable collection and sale centers near Sindhi Camp bus station in Jaipur and in Sanganer were unsuccessful because the general location

had been garnered by ragpickers but the exact location was not known. When these locations were reached, no one knew of the exact spot in question and no ragpickers could be found to show the way. From all of these experiences a few lessons emerge. Contacts suggested by others are preferable to those who are simply assumed might be helpful. Also, it is best to have someone who works in the industry and knows exactly where to go accompany the researcher rather than trying to locate a spot from hearsay only.

Conclusions and Way Forward

The overall objective of the study was to investigate Jaipur's solid waste management system by examining: the major players involved and 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 (including ragpickers, recyclable collectors, and scrap dealers), 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 enforcement, reduction of corruption, updated technology, better-trained staff, more manpower, increased education and awareness, and more funding. Public-private partnerships are a prudent strategy to increase efficiency in SWM because specialized companies who are better financially equipped become the overseers of SWM for a particular area or project. However they are very unprofitable for companies, so it has been difficult to attract partnerships. In addition, corruption and unclear communication between the involved parties have interfered in the success of partnerships.

There does not seem to be a large niche for NGOs in SWM. Both the Centre for Development Communication and Satya have stopped door-to-door collection in residential districts due to unprofitability and lack of community involvement. Both of

these NGOs have found other ways to be involved in SWM initiatives in Jaipur. but until corruption and community education initiatives improve, NGOs cannot effectively offer their services.

Upon completion of the study, a few questions present themselves for further investigation. There are a few more details in the topic of system implementation which have not been covered in as much depth, such as which types of places informal door-to-door workers take the trash. Is it just an informal empty lot dumpyard? Similarly, more information about the transfer stations could be looked into. Are they distributed well across the city? Do they create any problems for residents nearby? Following this strand of inquiry, more of the social attitudes about waste and current waste management practices could be investigated in order to understand both the shortcomings from the citizens' side and how to educate them more effectively. In this study, most of the problems in waste management that were focused on were shortcomings from the government side.

Recommendations For Further Study

This study provides a broad overview of how solid waste management works in Jaipur, what some obstacles are to its implementation and how they are being addressed, and surrounding issues with the various players involved. Specific issues included integration of the informal sector, education and awareness endeavors, and some examples of PPPs in action. There are many options for expanding and delving deeper into the subject of solid waste management.

A comparative study could be conducted between the waste management of two cities of similar size and population in which successful programs in one city could be evaluated for possible replication in the other city. Alternatively, successful PPPs that are profitable could be evaluated to see what the company is doing that works well and how. Finally, further study on informal sector incorporation could be pursued. Currently Jaipur does not have any formal plans to incorporate the informal sector into PPPs. Evaluate the feasibility of doing so with limited expenditure on training ragpickers for new tasks, similar to the project undertaken in Delhi.

Chapter No. 6

Municipal Solid Wastes

(Management and

Handling)

Rules, 2000

Ministry of Environment and Forests

Notification

New Delhi, the 25th September, 2000

S.O. 908(E).- Whereas the draft of the Municipal Solid Wastes (Management and Handling) Rules, 1999 were published under the notification of the Government of India in the Ministry of Environment and Forests number S.O. 783(E), dated, the 27th1 September, 1999 in the Gazette of India, Part II, Section 3, Sub-section (ii) of the same date inviting objections and suggestions from the persons likely to be affected thereby, before the expiry of the period of sixty days from the date on which the copies of the Gazette containing the said notification are made available to the public;

And whereas copies of the said Gazette were made available to the public on the 5th October, 1999;

And whereas the objections and suggestions received from the public in respect of the said draft rules have been duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by section 3, 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules to regulate the management and handling of the municipal solid wastes, namely :-

1. Short title and commencement: --

1. These rules may be called the Municipal Solid Wastes (Management and Handling) Rules, 2000.

2. Save as otherwise provided in these rules, they shall come into force on the date of their publication in the Official Gazette.

2. Application .- These rules shall apply to every municipal authority responsible for collection, segregation, storage, transportation,, processing and disposal of municipal solid wastes.

3. Definitions.- In these rules, unless the context otherwise requires ,--

- i. “anaerobic digestion” means a controlled process involving microbial decomposition of organic matter in the absence of oxygen;
- ii. “authorization” means the consent given by the Board or Committee to the “operator of a facility”
- iii. “biodegradable substance” means a substance that can be degraded by microorganisms;
- iv. “biomethanation” means a process which entails enzymatic decomposition of the organic matter by microbial action to produce methane rich biogas;
- v. “collection” means lifting and removal of solid wastes from collection points or any other location;
- vi. “composting” means a controlled process involving microbial decomposition of organic matter;
- vii. “demolition and construction waste” means wastes from building materials debris and rubble resulting from construction, re-modelling, repair and demolition operation;
- viii. “disposal” means final disposal of municipal solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality;
- ix. “Form” means a Form appended to these rules;
- x. “generator of wastes” means persons or establishments generating municipal solid wastes;
- xi. “land filling” means disposal of residual solid wastes on land in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emissions, slope instability and erosion;
- xii. “leachate” means liquid that seeps through solid wastes or other medium and has extracts of dissolved or suspended material from it;
- xiii. “lysimeter” is a device used to measure rate of movement of water through or from a soil layer or is used to collect percolated water for quality analysis;
- xiv. “municipal authority” means Municipal Corporation, Municipality, Nagar Palika, Nagar Nigam, Nagar Panchayat, Municipal Council including notified area committee (NAC) or any other local body constituted under the relevant

- statutes and, where the management and handling of municipal solid waste is entrusted to such agency;
- xv. “municipal solid waste” includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes;
 - xvi. “operator of a facility” means a person who owns or operates a facility for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes and also includes any other agency appointed as such by the municipal authority for the management and handling of municipal solid wastes in the respective areas;
 - xvii. “pelletisation” means a process whereby pellets are prepared which are small cubes or cylindrical pieces made out of solid wastes and includes fuel pellets which are also referred as refuse derived fuel;
 - xviii. “processing” means the process by which solid wastes are transformed into new or recycled products;
 - xix. “recycling” means the process of transforming segregated solid wastes into raw materials for producing new products, which may or may not be similar to the original products;
 - xx. “schedule” means a Schedule appended to these rules;
 - xxi. “segregation” means to separate the municipal solid wastes into the groups of organic, inorganic, recyclables and hazardous wastes;
 - xxii. “State Board or the Committee” means the State Pollution Control Board of a State, or as the case may be, the Pollution Control Committee of a Union territory;
 - xxiii. “storage” means the temporary containment of municipal solid wastes in a manner so as to prevent littering, attraction to vectors, stray animals and excessive foul odour;
 - xxiv. “transportation” means conveyance of municipal solid wastes from place to place hygienically through specially designed transport system so as to prevent foul odour, littering, unsightly conditions and accessibility to vectors;
 - xxv. “vadose water” water which occurs between the ground, surface and the water table that is the unsaturated zone;

xxvi. “vermicomposting” is a process of using earthworms for conversion of biodegradable wastes into compost.

4. RESPONSIBILITY OF MUNICIPAL AUTHORITY: -

1. Every municipal authority shall, within the territorial area of the municipality, be responsible for the implementation of the provisions of these rules, and for any infrastructure development for collection, storage, segregation, transportation, processing and disposal of municipal solid wastes.
2. The municipal authority or an operator of a facility shall make an application in Form-I, for grant of authorization for setting up waste processing and disposal facility including landfills from the State Board or the Committee in order to comply with the implementation programme laid down in **Schedule I**.
3. The municipal authority shall comply with these rules as per the implementation schedule laid down in **Schedule I**.
4. The municipal authority shall furnish its annual report in Form-TI, -
 - a. to the Secretary-incharge of the Department of Urban Development of the concerned State or as the case may be of the Union territory, in case of a metropolitan city; or
 - b. to the District Magistrate or the Deputy Commissioner concerned in case of all other towns and cities, with a copy to the State Board or the Committee on or before the 30th day of June every year.

5. RESPONSIBILITY OF THE STATE GOVERNMENT AND THE UNION TERRITORY ADMINISTRATIONS: --

(1) The Secretary-incharge of the Department of Urban Development of the concerned State or the Union territory, as the case may be, shall have the overall responsibility for the enforcement of the provisions of these rules in the metropolitan cities.

(2) The District Magistrate or the Deputy Commissioner of the concerned district shall have the overall responsibility for the enforcement of the provisions of these rules within the territorial limits of their jurisdiction.

6. RESPONSIBILITY OF THE CENTRAL POLLUTION CONTROL BOARD AND 'HIE STATE BOARD OR THE COMMITTEES: —

1. The State Board or the Committee shall monitor the compliance of the standards regarding ground water, ambient air, leachate quality and the compost quality including incineration standards as specified under Schedules II, III and IV.
2. The State Board or the Committee, after the receipt of application from the municipal authority or the operator of a facility in Form I, for grant of authorization for setting up waste processing and disposal facility including landfills, shall examine the proposal taking into consideration the views of other agencies like the State Urban Development Department, the Town and Country Planning Department, Air Port or Air Base Authority, the Ground Water Board or any such other agency prior to issuing the authorization.
3. The State Board or the Committee shall issue the authorization in Form-III to the municipal authority or an operator of a facility within forty-five days stipulating compliance criteria and standards as specified in Schedules II, III and IV including such other conditions, as may be necessary.
4. The authorization shall be valid for a given period and after the validity is over, a fresh authorization shall be required.
5. The Central Pollution Control Board shall co-ordinate with the State Boards and the Committees with particular reference to implementation and review of standards and guidelines and compilation of monitoring data.

7. MANAGEMENT OF MUNICIPAL SOLID WASTES. --

1. 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. The waste processing and disposal facilities to be set up by the municipal authority on their own or through an operator of a facility shall meet the specifications and standards as specified in Schedules III and IV.

8. ANNUAL REPORTS: —

1. The State Boards and the Committees shall prepare and submit to the Central Pollution Control Board an annual report with regard to the implementation of these rules by the 5th of September every year in Form-IV.
2. The Central Pollution Control Board shall prepare the consolidated annual review report on management of municipal solid wastes and forward it to the Central Government along with its recommendations before the 15th of December every year.

9. ACCIDENT REPORTING. - When an accident occurs at any municipal solid wastes collection, segregation, storage, processing, treatment and disposal facility or landfill site or during the transportation of such wastes, the municipal authority shall forthwith report the accident in Form-V to the Secretary in-charge of the Urban Development Department in metropolitan cities, and to District Collector or Deputy Commissioner in all other cases.

Schedule I

[see rules 4(2) and (3)]

Implementation Schedule

Serial No.	Compliance Criteria	Schedule
1.	Setting up of waste processing and disposal facilities	By 31.12.2003 or earlier
2.	Monitoring the performance of waste processing and disposal facilities	Once in six months
3.	Improvement of existing landfill sites as per provisions of these rules	By 31.12.2001 or earlier
4.	Identification of landfill sites for future use and making site (s) ready for operation	By 31.12.2002 or earlier

Schedule -II

[see rules 6(1) and (3), 7(1)]

Management of Municipal Solid Wastes

S.No.	Parameters	Compliance Criteria
1	Collection of municipal solid wastes	<p>I. Littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. To prohibit littering and facilitate compliance, the following steps shall be taken by the municipal authority, namely: -</p> <p>i.Organising house-to-house collection of municipal solid wastes through any of the methods, like community bin collection (central bin), house-to-house collection, collection on regular pre-informed timings and scheduling by using bell ringing of musical vehicle (without exceeding permissible noise levels);</p> <p>ii.Devising collection of waste from slums and squatter areas or localities including hotels, restaurants, office complexes and commercial areas;</p> <p>iii.Wastes from slaughter houses, meat and fish markets, fruits and vegetable markets, which are biodegradable in nature, shall be managed to make use of such wastes;</p> <p>iv.Bio-medical wastes and industrial wastes shall not be mixed with municipal solid wastes and such wastes shall</p>

		<p>follow the rules separately specified for the purpose;</p> <p>v. Collected waste from residential and other areas shall be transferred to community bin by hand-driven containerised carts or other small vehicles;</p> <p>vi. Horticultural and construction or demolition wastes or debris shall be separately collected and disposed off following proper norms. Similarly, wastes generated at dairies shall be regulated in accordance with the State laws;</p> <p>vii. Waste (garbage, dry leaves) shall not be burnt;</p> <p>viii. Stray animals shall not be allowed to move around waste storage facilities or at any other place in the city or town and shall be managed in accordance with the State laws.</p> <p>2. The municipal authority shall notify waste collection schedule and the likely method to be adopted for public benefit in a city or town.</p> <p>3. It shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority as per para 1(2) of this Schedule.</p>
2.	Segregation of municipal solid wastes	<p>In order to encourage the citizens, municipal authority shall organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials. The municipal authority shall undertake phased programme to ensure community participation in waste</p>

		segregation. For this purpose, the municipal authorities shall arrange regular meetings at quarterly intervals with representatives of local resident welfare associations and non-governmental organizations.
3.	Storage of municipal solid wastes	<p>Municipal authorities shall establish and maintain storage facilities in such a manner as they do not create unhygienic and in sanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely: -</p> <p>i. Storage facilities shall be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility shall be so placed that it is accessible to users;</p> <p>ii. Storage facilities to be set up by municipal authorities or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly;</p> <p>iii. Storage facilities or 'bins shall have 'easy to operate' design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black;</p> <p>iv. Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers.</p>
4.	Transportation of	Vehicles used for transportation of wastes shall be

	municipal solid wastes	covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering. The following criteria shall be met, namely:— i. The storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing; ii. Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.
5.	Processing of municipal solid wastes	Municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize burden on landfill. Following criteria shall be adopted, namely: - (i) The biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified in Schedule-IV; (ii) Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorisation.
6.	Disposal of municipal solid wastes	Land filling shall be restricted to non-biodegradable, inert waste and other waste that are

		<p>not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, land-filling shall be done following proper norms. Landfill sites shall meet the specifications as given in Schedule —III.</p>
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Schedule III

[see rules 6(1) and (3), 7(2)]

Specifications for Landfill Sites

Site Selection

1. In areas falling under the jurisdiction of ‘Development Authorities’ it shall be the responsibility of such Development Authorities to identify the landfill sites and hand over the sites to the concerned municipal authority for development, operation and maintenance. Elsewhere, this responsibility shall lie with the concerned municipal authority.
2. Selection of landfill sites shall be based on examination of environmental issues. The Department of Urban Development of the State or the Union territory shall coordinate with the concerned organisations for obtaining the necessary approvals and clearances.
3. The landfill site shall be planned and designed with proper documentation of a phased construction plan as well as a closure plan.
4. he landfill sites shall be selected to make use of nearby wastes processing facility. Otherwise, wastes processing facility shall be planned as an integral part of the landfill site.
5. The existing landfill sites, which continue to be used for more than five years, shall be improved in accordance of the specifications given in this Schedule.
6. Biomedical wastes shall be disposed off in accordance with the Bio-medical Wastes (Management and Handling) Rules, 1998 and hazardous wastes shall be managed in accordance with the Hazardous Wastes (Management and Handling) Rules, 1989, as amended from time to time.
7. The landfill site shall be large enough to last for 20-25 years.
8. The landfill site shall be away from habitation clusters, forest areas, water bodies monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.
9. A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Departments land-use plans.
10. Landfill site shall be away from airport including airbase. Necessary approval of airport or airbase authorities prior to the setting up of the landfill site shall

be obtained in cases where the site is to be located within 20 km of an airport or airbase.

Facilities at the Site

11. Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
12. The landfill site shall be well protected to prevent entry of unauthorised persons and stray animals.
13. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.
14. The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
15. Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.
16. Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.
17. Safety provisions including health inspections of workers at landfill site shall be periodically made.

Specifications for land filling

18. Wastes subjected to land filling shall be compacted in thin layers using landfill compactors to achieve high density of the wastes. In high rainfall areas where heavy compactors cannot be used alternative measures shall be adopted.
19. Wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material till such time waste processing facilities for composting or recycling or energy recovery are set up as per Schedule I.
20. Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage berms shall be constructed to divert run-off away from the active cell of the landfill.

21. After completion of landfill, a final cover shall be designed to minimize infiltration and erosion. The final cover shall meet the following specifications, namely: --
- a. The final cover shall have a barrier soil layer comprising of 60 cms of clay or amended soil with permeability coefficient less than 1×10^{-10} cm/sec.
 - b. On top of the barrier soil layer there shall be a drainage layer of 15 cm.
 - c. On top of the drainage layer there shall be a vegetative layer of 45 cm to support natural plant growth and to minimize erosion.

Pollution prevention

22. In order to prevent pollution problems from landfill operations, the following provisions shall be made, namely: -
- a. Diversion of storm water drains to minimize leachate generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy conditions;
 - b. Construction of a non-permeable lining system at the base and walls of waste disposal area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous materials (such as aerosols, bleaches, polishes, batteries, waste oils, paint products and pesticides) minimum liner specifications shall be a composite barrier having 1.5 mm high density polyethylene (HDPE) geomembrane, or equivalent, overlying 90 cm of soil (clay or amended soil) having permeability coefficient not greater than 1×10^{-10} cm/sec. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer;
 - c. Provisions for management of leachates collection and treatment shall be made. The treated leachates shall meet the standards specified in Schedule-IV;
 - d. Prevention of run-off from landfill area entering any stream, river, lake or pond.

Water Quality Monitoring

23. Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept in record for future reference. The ground water quality within 50 metres of the periphery of landfill site shall be

periodically monitored to ensure that the ground water is not contaminated beyond acceptable limit as decided by the Ground Water Board or the State Board or the Committee. Such monitoring shall be carried out to cover different seasons in a year that is, summer, monsoon and post-monsoon period.

24. Usage of groundwater in and around landfill sites for any purpose (including drinking and irrigation) is to be considered after ensuring its quality. The following specifications for drinking water quality shall apply for monitoring purpose, namely: -

Sr. No.	Parameters	IS 10500: 1991 Desirable limit (mg/l except for pH)
1.	Arsenic	0.05
2.	Cadmium	0.01
3.	Chromium	0.05
4.	Copper	0.05
5.	Cyanide	0.05
6.	Lead	0.05
7.	Mercury	0.001
8.	Nickel	-
9.	Nitrate as NO ₃	45.0
10.	PH	6.5-5.5
11.	Iron	0.3
12.	Total hardness (as CaCO ₃)	300.0
13.	Chlorides	250
14.	Dissolved solids	500
15.	Phenolic compounds (as	0.001
16.	C ₆ H ₅ OH)	5.0
17.	Zinc	200

Ambient Air Quality Monitoring

25. Installation of landfill gas control system including gas collection system shall be made at landfill site to minimize odour generation, prevent off-site

migration of gases and to protect vegetation planted on the rehabilitated landfill surface.

26. The concentration of methane gas generated at landfill site shall not exceed 25 per cent of the lower explosive limit (LEL).
27. The landfill gas from the collection facility at a landfill site shall be utilized for either direct thermal applications or power generation, as per viability. Otherwise, landfill gas shall be burnt (flared) and shall not be allowed to directly escape to the atmosphere or for illegal tapping. Passive venting shall be allowed if its utilization or flaring is not possible.
28. Ambient air quality at the landfill site and at the vicinity shall be monitored to meet the following specified standards, namely :-

Sr. No.	Parameters	Acceptable levels
(i)	Sulphur dioxide	120 µg/m ³ (24 hours)
(ii)	Suspended Particulate	500µg/m ³ (24 hours)
(iii)	Matter	Not to exceed 25 per cent of the lower explosive limit (equivalent to 650 mg /m ³) (24 hours)
(iv)	Methane	0.4mg/m ³ (400 µg/m ³)
(v)	Carbon monoxide	1 hour average : 2 mg/m ³ 8 hour average: 1 mg/m ³

29. The ambient air quality monitoring shall be carried out by the concerned authority as per the following schedule, namely:-
 - (a) Six times in a year for cities having population of more than fifty lakhs;
 - (b) Four times in a year for cities having population between ten and fifty lakhs;
 - (c) Two times in a year for town or cities having population between one and ten lakhs.

Plantation at Landfill Site

30. A vegetative cover shall be provided over the completed site in accordance with the and following specifications, namely: -
 - (a) Selection of locally adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow;

- (b) The plants grown be such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilised;
- (c) Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition;
- (d) Plantation to be made in sufficient density to minimize soil erosion.

Closure of Landfill Site and Post-care

31. The post-closure care of landfill site shall be conducted for at least fifteen years and long term monitoring or care plan shall consist of the following, namely
- (a) Maintaining the integrity and effectiveness of final cover, making repairs and preventing run-on and run-off from eroding or otherwise damaging the final cover;
 - (b) Monitoring leachate collection system in accordance with the requirement;
 - (c) Monitoring of ground water in accordance with requirements and maintaining ground water quality;
 - (d) Maintaining and operating the landfill gas collection system to meet the standards.
32. Use of closed landfill sites after fifteen years of post-closure monitoring can be considered for human settlement or otherwise only after ensuring that gaseous and leachate analysis comply with the specified standards.

Special provisions for hilly areas

33. Cities and towns located on hills shall have location-specific methods evolved for final disposal of solid wastes by the municipal authority with the approval of the concerned State Board or the Committee. The municipal authority shall set up processing facilities for utilization of biodegradable organic wastes. The inert and non-biodegradable waste shall be used for building roads or filling-up of appropriate areas on hills. Because of constraints in finding adequate land in hilly areas, wastes not suitable for road-laying or filling up shall be disposed of in specially designed landfills.

Schedule IV

[see rules 6(1) and (3), 7(2)]

Standards for Composting, Treated Leachates and Incineration

1. The waste processing or disposal facilities shall include composting, incineration, pelletisation, energy recovery or any other facility based on state-of-the-art technology duly approved by the Central Pollution Control Board
2. In case of engagement of private agency by the municipal authority, a specific agreement between the municipal authority and the private agency shall be made particularly, for supply of solid waste and other relevant terms and conditions.
3. In order to prevent pollution problems from compost plant and other processing facilities, the following shall be complied with, namely :-
 - i. The incoming wastes at site shall be maintained prior to further processing. To the extent possible, the waste storage area should be covered. If, such storage is done in an open area, it shall be provided with impermeable base with facility for collection of leachate and surface water run-off into lined drains leading to a leachate treatment and disposal facility;
 - ii. Necessary precautions shall be taken to minimise nuisance of odour, flies, rodents, bird menace and fire hazard;
 - iii. In case of breakdown or maintenance of plant, waste intake shall be stopped and arrangements be worked out for diversion of wastes to the landfill site;
 - iv. Pre-process and post-process rejects shall be removed from the processing facility on regular basis and shall not be allowed to pile at the site. Recyclables shall be routed through appropriate vendors. The nonrecyclables shall be sent for well designed landfill site(s).
 - v. In case of compost plant, the windrow area shall be provided with impermeable base. Such a base shall be made of concrete or compacted clay, 50 cm thick, having permeability coefficient less than cm/sec. The base shall be provided with 1 to 2 per cent slope and circled by lined drains for collection of leachate or surface run-off;
 - vi. Ambient air quality monitoring shall be regularly carried out particularly for checking odour nuisance at down-wind direction on the boundary of processing plant.

vii. In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:

Parameters	Concentration not to exceed * (mg/kg dry basis , except pH value and C/N ratio)
Arsenic	10.00
Cadmium	5.00
Chromium	50.00
Copper	300.00
Lead	100.00
Mercury	0.15
Nickel	50.00
Zinc	1000.00
C/N ratio	20-40
PH	5.5-8.5

* Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.

Sr. No.	Parameter	Standards (Mode of Disposal)		
		Inland surface water	Public sewers	Land disposal
1.	Suspended solids, mg/l, max	1100	600	200
2.	Dissolved solids (inorganic)	2100	2100	2100
3.	PH value	5.5to9.0	5.5to9.0	5.5to9.0
4.	Ammonical nitrogen (as N), mg/l, max.	50	50	-
5.	Total Kjeldahi nitrogen (as N), mg/l, max.	100	-	-
6.	Biochemical oxygen demand (3 days at 27° C) max.(mg/l)	30	350	100
7.	Chemical oxygen demand, mg/l, max.	250	-	-

8.	Arsenic (as As), mg/l, max	0.2	0.2	0.2
9.	Mercury (as Hg), mg/l, max	0.01	0.01	-
10.	Lead (as Pb), mg/l, max	0.1	1.0	-
11.	Cadmium (as Cd), mg/l, max	2.0	1.0	-
12.	Total Chromium (as Cr), mg/l, max.	2.0	2.0	-
13.	Copper (as Cu), mg/l, max.	3.0	3.0	-
14.	Zinc (as Zn), mg/l, max.	5.0	15	-
15.	Nickel (as Ni) mg/l, max	3.0	3.0	-
16.	Cyanide (as CN) mg/l, max	0.2	2.0	0.2
17.	Chloride (as Cl) mg/l, max	1000	1000	600
18.	Fluoride (as F) mg/l, max	2.0	1.5	-
19.	Phenolic compounds (as C ₆ H ₅ OH) mg/l, max.	1.0	5.0	-

Note : While discharging treated leachates into inland surface waters, quantity of leachates being discharged and the quantity of dilution water available in the receiving water body shall be given due consideration.

The incinerators shall meet the following operating and emission standards, namely:

A. Operating Standards

(1) The combustion efficiency (CE) shall be at least 99.00%.

(2) The combustion efficiency is computed as follows :

$$C.E. = \frac{\%CO_2}{\%CO_2 + \%CO} \times 100$$

B. Emission Standards

Sr. No.	Parameters	Concentration mg/Nm ³ at (12% CO ₂ correction)
1.	Particulate matter	150

2.	Nitrogen Oxides	450
3.	HCl	50
4.	Minimum stack height shall be 30 metres above ground	
5.	Volatile organic compounds in ash shall not be more than 0.01%.	

Note:

1. Suitably designed pollution control devices shall be installed or retrofitted with the incinerator to achieve the above emission limits, if necessary.
2. Wastes to be incinerated shall not be chemically treated with any chlorinated disinfectants
3. Chlorinated plastics shall not be incinerated.
4. Toxic metals in incineration ash shall be limited within the regulatory quantities as specified in the Hazardous Wastes (Management and Handling) Rules, 1989 as amended from time to time.
5. Only low sulphur fuel like l.d.o., l.s.h.s or Diesel shall be used as fuel in the incinerator.

Form—I

[see rules 4(2) & 6(2)]

Application for obtaining authorization

To

The Member Secretary

1.	Name of the municipal authority/Name of the agency appointed by the municipal authority	:	
2.	Correspondence address Telephone No. Fax No.	:	
3.	Nodal Officer & designation(Officer authorised by the municipal authority or agency responsible for operation of processing or disposal facility)	:	
4.	Authorization applied for (Please tick mark)	:	(a) Setting up & operation of waste processing facility (b) Setting up & operation of disposal facility
5.	Detailed proposal of waste processing/disposal facility (to be attached) to include	:	
5.1	Processing of Waste i. Location of site ii. Name of waste processing technology iii. Details of processing technology iv. Quantity of waste to be processed per day v. Site clearance (from local authority) vi. Details of agreement between municipal	:	

	<p>authority and operating agency</p> <p>vii. Utilization programme for waste processed (Product utilization)</p> <p>viii. Methodology for disposal of waste processing rejects (quantity and quality)</p> <p>ix. Measures to be taken for prevention and control of environmental pollution</p> <p>x. Investment on Project and expected returns</p> <p>xi. Measures to be taken for safety of workers working in the plant</p>		
5.2	<p>Disposal of Waste</p> <p>i. Number of sites identified</p> <p>ii. Layout maps of site</p> <p>iii. Quantity of waste to be disposed per day</p> <p>iv. Nature and composition of waste</p> <p>v. Details of methodology or criteria followed for site selection</p> <p>vi. Details of existing site under operation</p> <p>vii. Methodology and operational details of land filling</p> <p>viii. Measures taken to check environmental pollution</p>	:	
	Date		Signature

Form - II
[See rule 4(4)]

Format of Annual Report to be submitted by the Municipal Authority

i. Name of City / Town :.....

ii. Population :

iii. Name of municipal bodyand

Address
.....

Telephone :

Fax :

iv. Name of Incharge dealing with municipal solid wastes
.....with designation
.....

1. Quantity and composition of solid wastes

(i) Total quantity of wastes generated per day

.....

(ii) Total quantity of wastes collected per day

.....

(iii) Total quantity of wastes processed for :

a. Composting :

b. Vermiculture :

c. Pellets :

d. Others, if any, please specify.

(iv) Total quantity of waste disposed by land filling :

.....

- a. No. of landfill sites used :
.....
- b. Area used :
- c. Whether Weigh bridge facilities available : Yes/No
- d. Whether area is fenced : Yes/No
- e. Lighting facility on site : Yes/No
- f. Whether equipment like Bulldozer, Compacters etc. available. (Please specify):
- g. Total Manpower available on site:
- h. Whether covering is done on daily basis: Yes/No
- i. Whether covering material is used and whether it is adequately available.....
- j. Provisions for gas venting provided: Available (Yes/No) /Not available
- k. Provision for leachate collection: Provisions made! Provisions not made

2. Storage facilities

- (i) Area covered for collection of wastes :
- (ii) No. of houses covered :
- (iii) Whether house-to-house collection is practiced :
- (if yes, whether done by Municipality or through Private Agency or Non-Governmental Organisation)
- (iv) Bins :
- Specifications Existing Proposed
(Shape & Size) Numbers for
future.
.....

- a. RCC Bins (Capacity) :
- b. Trolleys (Capacity) :
- (c) Containers (Capacity) :
- d. Dumper Placers :
- e. Others, please specify :

(v) Whether all bins/collection spots are attended for : Yes/No

daily lifting of garbage

(vi) Whether lifting of garbage from dustbins is : Manual/Loader/Others, please manual or mechanical i.e. for example by using specify

of front-end loaders (Please tick mark)

3. Transportation

Existing number	Actually Required/Proposed
i. Truck	
ii. Truck-Tipper:	
iii. Tractor-Trailer	
iv. Refuse-collector:	
v. Dumper-placers	
vi. Animal Cart:	
vii. Tricycle	
viii. Others (please specify)	

4. Whether any proposal has been made to improve solid wastes management practices

5. Are any efforts made to call for private firms etc. to attempt for processing of waste utilising technologies like:

Waste Utilisation	Proposals	Steps taken
Technology		(Quantity to be processed)
i. Composting		
ii. Vermiculture		
iii. Pelletisation		
iv. Others if any, Please specify:		

6. What provisions are available and how these are implemented to check unhygienic operations of:

- i. Dairy related activities:
- ii. Slaughter houses and unauthorised slaughtering:
- iii. Malba (construction debris) lifting
- iv, Encroachment in Parks, Footpaths etc.:

7. How many slums are identified and whether these are provided with sanitation facilities:

8. Are municipal magistrates appointed for Taking penal action : Yes/No

[If yes. how many cases registered & settled during last three years (give year-wise details)]

9. Hospital waste management

- i. How many Hospitals/Clinics under the control of the Corporation:
- ii. What methods are followed for disposal of bio-medical wastes?:
- iii. Do you have any proposal for setting up of common treatment facility for disposal of bio-medical wastes:

iv. How many private Nursing Homes, Clinics etc. are operating in the city/town and what steps have been taken to check disposal of their wastes:

Signature of Municipal Commissioner

Dated :

Form III

[See-rule 6(2)]

Format for Issue of Authorization

File No.: _____

Date: _____

To,

Ref: Your application number _____ dt.

The _____ State Pollution Control Board/Pollution Control Committee after examining the proposal hereby authorizes _____ having their administrative office at _____ to set up and operates waste processing/waste disposal facility at _____ on the terms and conditions (including the standards to comply) attached to this authorization letter.

1. The validity of this authorization is till . After the validity, renewal of authorization is to be sought.

2. The _____ State Pollution Control Board/Pollution Control Committees may, at any time, revoke any of the conditions applicable under the authorization and shall communicate the same in writing.

3. Any violation of the provision of the Municipal Solid Wastes (Management and Handling) Rules, 2000 will attract the penal provision of the Environment (Protection) Act, 1986 (29 of 1986).

(Member Secretary)

State Pollution Control Board/

Pollution Control Committee

Date:

Place:

Form - IV

[see rule 8(1)]

Format of Annual Review Report to be submitted by the State Pollution Control Board/Committees to the Central Pollution Control Board

To
**The Chairman,
Central Pollution Control Board,
(Ministry of Environment and Forests)
Government of India,
'Parivesh Bhawan', East Arjun Nagar,
DELHI- 110 0032.**

1.	Name of the State/Union territory		
2.	Name & address of the State Pollution Control	:	
3.	Board/Pollution Control Committee Number of municipal authorities responsible for management of municipal solid wastes in the State/Union territory under these rules	:	
4.	A Summary Statement on progress made by municipal authorities in respect of implementation of Schedule I [rule 4(3)]	:	Please attach as Annexure-I
5.	A Summary Statement on progress made by municipal authorities in respect of implementation of Schedule II [rules 6(1) and (3), 7(1)]	:	Please attach as Annexure-II
6.	A Summary Statement on progress made by municipal authorities in respect of implementation of Schedule III [rules 6(1) and (3), 7(2)]	:	Please attach as Annexure-III
7.	A summary statement on progress made by municipal authorities in respect of implementation of Schedule IV [rules 6(1) and (3), 7(2)]	:	Please attach as Annexure-IV
Date: _____		Chairman or the Member Secretary	

Place : _____	State Pollution Control Board/ Pollution Control Committee
---------------	---

Form - V

[see rule 9]

Accident reporting

1.	Date and time of accident	:	
2.	Sequence of events leading to accident	:	
3.	The waste involved in accident	:	
4.	Assessment of the effects of the accidents on human health and the environment	:	
5.	Emergency measures taken	:	
6.	Steps taken to alleviate the effects of accidents	:	
7.	Steps taken to prevent the recurrence of such an accident	:	
Date :		Signature :	
Place :		Designation :	

V. Rajagopalan, Jt. Secy.
[F.No.17-2/95-HSMD]



नई व्यवस्था कचरा प्रसंस्करण के लिए लागिडयावास में जमीन देगा निगम प्रशासन

21 वार्डों में फर्म करेगी सफाई

सफाईकर्मियों को व्यवस्था से जोड़ने के लिए 25 वार्डों का जिम्मा मिलेगा फर्म को

जयपुर
 citymunicipalgroup@parika.com
 शहर में पहले परकोटा क्षेत्र के 21 वार्डों में समग्र (आंशिक) सफाई व्यवस्था जिम्मे हथी में दी जाएगी। इसमें अनुबंधित फर्म घर से कचरा संग्रहण, कचरा परिवहन एवं कचरा प्रसंस्करण का काम करेगी। कार्यदेश जारी होने के बाद छह माह के भीतर 25 वार्डों में सम्पूर्ण सफाई व्यवस्था एवं 31 वार्डों में घर-घर से कचरा संग्रहण की व्यवस्था शुरू होगी। प्रसंस्करण प्लांट लगाने के लिए निगम फर्म को लागिडयावास में जमीन देगा।

सीओटी आधार पर अनुबंध
 शहर की बदलते सफाई व्यवस्था को पट्टी पर लाने के लिए राज्य सरकार ने

सम्पूर्ण सफाई व्यवस्था

हनुमानरोड जेठक: वार्ड 23 से 28 व 40
 अक्षय रोड: वार्ड 74 से 77
 सिविल साइंस जेठक: वार्ड 11 से 14, 13, 41 से 43, 53
 हनुमान रोड पश्चिम: वार्ड 62
 जेठक टूकरी जेठक: वार्ड 44, 45, 51
फर्म क्या करेगी: घर-घर से कचरा संग्रहण, सड़क, नाली (से फीट तक), ट्रिआइडर व ग्लोब लैंड की सफाई, कचरा का संग्रहण, परिवहन एवं प्रसंस्करण। छोटे मूत पशु उतारणी।

समग्र सफाई व्यवस्था

हनुमान पूर्व जेठक- 49, 52 से 58, 72, 73
 हनुमान पश्चिम जेठक- 60, 61, 64, 65, 70, 71
 सिविल साइंस जेठक- 13 से 22
फर्म क्या करेगी: नाली-सड़क की सफाई को छोड़कर शेष काम फर्म की करेगी। घर-घर से कचरा संग्रहण करेगी और सड़कों से छोटे मूत पशु उतारणी। नाली एवं सड़क की सफाई, उसका कचरा उठाने, संग्रहण एवं परिवहन का काम नगर निगम खुद करेगा।

घर-घर कचरा संग्रहण

विद्युत जेठक जेठक-1 से 10, 15 से 17, 66 से 68
 सांखरी जेठक- 30 से 34, 35, 37
 गोरी टूकरी जेठक- वार्ड 35, 38, 39, 46, 47, 48, 50
फर्म क्या करेगी: घर-घर से कचरा संग्रहण और उसका परिवहन। शेष काम नगर निगम अपने संसाधनों से करेगा। कचरा प्रसंस्करण प्लांट लगाने के लिए फर्म को नगर निगम प्रशासन की ओर से लागिडयावास में जमीन मुहैया कराई जाएगी।

सफाई व्यवस्था गुडगांव की फर्म ए टू जेड इन्फ्रास्ट्रक्चर के हथी में देने का निर्णय किया है। शहर के सभी 77 वार्डों में सीओटी आधार पर सफाई व्यवस्था को निजी हथी में दिया जाएगा। नगर निगम

में क्वॉलर करीब साढ़े चार हजार स्थाई सफाईकर्मियों को सफाई व्यवस्था से जोड़ने के लिए 77 में से केवल 25 वार्डों का सम्पूर्ण सफाई कार्य निजी फर्म को सौंपा जाएगा। सम्पूर्ण सफाई व्यवस्था में

सफाई का पूरा जिम्मा फर्म का होगा। हनुमान (पूर्व व पश्चिम) तथा एमडी जेठक में परकोटा क्षेत्र एवं उसमें सटे जिन वार्डों में सफाईकर्मियों काफ़ी संख्या में रहने है, वहीं समग्र सफाई व्यवस्था लक्ष्य होगी।

जयपुर की सफाई व्यवस्था गुडगांव की कंपनी को

जयपुर। जयपुर की सफाई व्यवस्था का काम देने के लिए एंपावर्ड कमिटी ने निजी कंपनी का चयन कर लिया है। ए टू जेड इन्फ्रास्ट्रक्चर लि. गुडगांव की काम देने का फैसला किया गया है। जोधपुर की सफाई का ठेका रामकी इन्व्वायरो इंजीनियर्स, दिल्ली को देना तय हुआ है। जयपुर में सफाई व्यवस्था के लिए कंपनी को 671 रुपए प्रति टन और जोधपुर में 8 29.44 रुपए प्रति टन के हिसाब से भुगतान किया जाएगा। कंपनियों को बर्क ऑर्डर देने के बाद दो माह में काम शुरू करना होगा, तीन महीने तक कोई भुगतान नहीं किया जाएगा। ये फैसले नगरीय विकास विभाग के प्रमुख मंचिव जीएम संभु की अध्यक्षता में बुधवार को हुई एंपावर्ड कमिटी की बैठक में हुए।

टेंडर की शर्तों के अनुसार निजी कंपनियों को मुख्य सड़कों पर रात के समय रोड स्वीपर से सफाई करनी होगी। दुकानों के सामने सफाई और कचरा उठाने के लिए सुबह 9 से दोपहर एक बजे तक का समय तय किया गया है। घरों के सामने से कचरा उठाने के लिए सुबह 7 से 10 बजे का समय तय रहेगा।

निगम वसूलोगा यूजर चार्ज

सफाई व्यवस्था को निजी हथी में देने के साथ ही आम लोगों को इसके लिए यूजर चार्ज देना होगा। प्रारंभिक तौर पर यूजर चार्ज के रूप में आवासीय के लिए 30 रुपए प्रति माह और व्यावसायिक स्थानों के लिए 50 रुपए प्रति माह वसूलने की योजना है। यूजर चार्ज की दरों में बदलाव भी हो सकता है।

पार्षदों का दावा सही तरीके से हा रहा ह कचरा निस्तारण

संसाधनों की कमी, स्मार्टसिटी बनाने का अधूरा सपना!



शिवा कॉलोनी

...BIG ISSUE

ये तस्वीरें क्षेत्र की सफाई व्यवस्था को बर्बाद कर रही हैं। पार्षद दावा करते हैं कि उनके इलाके में कचरा निस्तारण सही तरीके से हो रहा है। सुबह 9 से 10 बजे तक कचरा उठा लिया जाता है, लेकिन सफाई आपके सामने ही है। सोडाला पत्रिका ने सुबह 9 से 10 बजे के बीच बाउंड पर जाकर सफाई व्यवस्था की हकीकत के बारे में जाना, तो तस्वीर कुछ इस तरह से दिखी।

सोडाला पत्रिका

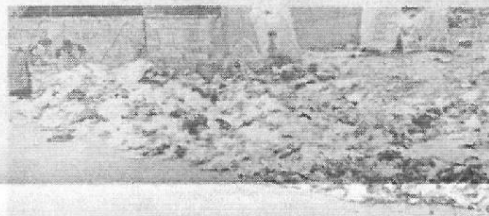
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हसनपुरा • केंद्र के स्वच्छ भारत अभियान में राजस्थान का एक भी शहर 434 शहरों की सूची में 150 स्थान में भी नहीं आया। प्रदेश की राजधानी जयपुर तो सफाई की इस सूची में 215वें स्थान पर जा पहुंचा। इस आंकड़े को लेकर शिवा की बात नहीं है। न हमारे पास कचरा उठाने वाली गाड़ियां ज्यादा हैं और न ही सफाई कर्मचारी। नतीजा पायदान से लड़कना तो था ही। हालांकि सोडाला, मित्रिका लाइन की कई कॉलोनियों में सीधे घर से भी कचरा उठाया जा रहा है, लेकिन इस सुविधा से अभी भी अधिकांशतः क्षेत्र के लोग वंचित हैं। स्थानीय लोगों को समस्या है कि कचरा डिपों से कचरा निचला नहीं उठता। ऐसे में कचरे के ढेर लग जाते हैं। स्थानीय पार्षदों का कहना है कि सुबह दस बजे तक कचरा उठा लिया जाता है, लेकिन सफाई कुछ और ही है।

नंदपुरी...



ज्योतिबा फुले कॉलेज...



500 का जुर्माना, लेकिन...

क्षेत्र में कई जगह कचरा डालने के पीछे बला उठी है। यहां अल-वस्त के कॉलोनी के लोग घर का कचरा डालकर जाते हैं। जहां से केज सुबह किण्व को गाड़ी उठाकर ले जाती है। इतना ही नहीं उत्सर्जन करने पर पांच सौ रुपए का जुर्माना भी है। इसके अलावा भी कोई छान नहीं दे रहा है।

कचरा निस्तारण का काम हो प्रॉपर

कचरे की समस्या को लेकर जब सोडालावासीयों का कहना है कि कचरा निस्तारण के लिए प्रॉपर तरीके से काम होना चाहिए। कचरा फैलने वाले के विरुद्ध कार्रवाई होनी चाहिए। सफाई कर्मचारियों की नियुक्ति कर पब्लिक किया जाना चाहिए। तब ही लोगों का कहना है कि जब तक डोर डू डोर कचरा नहीं उठेगा, तब तक इस समस्या से निजात मिलना मुश्किल है।

मॉनिटरिंग भी जरूरी

नगर निगम नए सिरे से कचरे के प्रबंधन की नीति बना रहा है। केवल नीतियां बनाने से समस्या समाप्त नहीं होगी। इसकी लगातार मॉनिटरिंग भी जरूरी है। यह नीति पूरी तरह से सोडाला और इसके आस-पास के इलाकों में दिखाई दे तो आम जनता को राहत मिले।



सुमेर सिंह, शक्ति नगर निवासी

जनता नगर राकड़ी सहित कुछ इलाके ऐसे हैं, जहां नियमित साफ-सफाई का अभाव आज भी है। सोडाला की आस-पास की कॉलोनियों में भी कचरा संग्रहण के लिए योजनाबाद काम हो, तो बाल बर्ने।



मनोज सोनी, जनता नगर राकड़ी

मदरामपुरा और अन्य इलाकों में भी सफाई के साथ-साथ नियमित कचरा उठाने का काम हो तो लोगों का जीवन स्तर कुछ ठीक हो। रेलवे स्टेशन के बाहर सड़ते टॉयलेट्स शहर की छवि खराब करते हैं।



आरविक सुंद, शिव कॉलोनी राकड़ी

नंदपुरी, रवेज फार्म, शर्मा कॉलोनी जैदि इलाकों के लिए हर सड़क के मोड़ पर कचरा पात्र रखा जाए। मैरिज जार्डन के संचालकों को भी कचरा प्रबंधन व्यवस्थित करने के लिए धार-धार सचेत किया जाना चाहिए।



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Reference

Central Public Health & Environmental Engineering Organization. Solid Waste. Retrieved from <http://cpheeo.nic.in/>

Garg, Ankur, Varun Kumar, and Vaibhav Verma. Public Private Partnership for Solid Waste Management in Delhi: a Case Study. *Proceedings of the International Conference on Sustainable Solid Waste Management, 5 - 7 September 2007, Chennai, India.* pp.552-559. Retrieved from http://www.swlf.ait.ac.th/IntlConf/Data/ICSSWM%20web/FullPaper/Session%20IX/9_07%20Ankur%20Garg.pdf

Government of India, Ministry of Home Affairs, Office of the Registrar General & Census Commissioner, India. Retrieved from <http://censusindia.gov.in/2011common/censusdataonline.html?drpQuick=&drpQuickSelect=&q=Jaipur>

Grasim Industries Ltd., & Harveen. (June 2007). *Harmony: A film on Refuse Derived Fuel from Municipal Solid Waste for a Cleaner Tomorrow.* India: Dhruv Star Communication
Grasim Industries Ltd. Contract Document with the Jaipur Municipal Corporation— BOOT Basis—Build, Own, Operate, Transfer of Land.

McDougall, Forbes R, Peter R White, Marina Franke, and Peter Hindle (2008) *Integrated Solid Waste Management: a Life Cycle Inventory* 2nd ed., Wiley. p1-547.

Ministry of Urban Employment and Poverty Alleviation and Ministry of Urban Development, *Jawaharlal Nehru National Urban Renewal Mission Overview.*

Retrieved from <http://www.jnnurm.nic.in/nurmudweb/toolkit/Overview.pdf>

Municipal Solid Wastes (Management and Handling) Rules 2000. Retrieved from <http://envfor.nic.in/legis/hsm/mswmhr.html>

Post, Johan. Jaap Broekema, and Jason Obirih-Opareh (2003). Trial and Error in Privatisation: Experiences in Urban Solid Waste Collection in Accra (Ghana) and Hyderabad (India). *Urban Studies* 40 (4): 835-852.

Press Information Bureau, Government of India (7 Feb, 2011). Plastic Waste (Management and Handling) Rules, 2011 Notified. Retrieved from <http://pib.nic.in/newsite/erelease.aspx?relid=69649>

Satya an NGO, Annual Report 2006, 2007, 2008. Sharholly, Mufeed, Kafeel Ahmad, Gauhar Mahmood, and R.C. Trivedi (2008).

Municipal Solid Waste Management in Indian Cities—A Review. *Waste Management* 28: 459-467.

Times News Network (2009, August 1). City Lacks Proper Solid Waste Management.

Times of India. Retrieved from http://articles.timesofindia.indiatimes.com/2009-08-01/jaipur/28180332_1_solid-waste-management-transfer-stations-garbage Wilson, David C. (Dec 2010). Comparing Solid Waste Management in the World's Cities. *ENVIS Urban Municipal Waste Management Newsletter, National Solid Waste Association of India*. (21), 2-10.

Zhu, Da Asnani, P. U. Zurbrugg, Christian (Dec 2007). Improving Municipal Solid Waste Management in India: A Sourcebook for Policymakers and Practitioners.

Herndon, VA, USA: World Bank Publications.