

## Public Awareness and Participation in Solid Waste Management Programs - A Study of Jodhpur, Rajasthan

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### Abstract

Rajasthan is the largest state (area) of India formed on 30<sup>th</sup> March 1949. Jodhpur is the second largest city in Rajasthan, established somewhere around the 15<sup>th</sup> century. It is known as the Gateway to the Thar. The region was the seat of the erstwhile Marwar Kingdom. Jodhpur is famous for its Rajputana style of architecture as well as the traditional folk art and craft. Tourism is the key economic driver for the city and tourists from across the world visit Jodhpur to see these monuments and experience the local culture. The city sees its major inflow of tourists in the winter months between November and February. The city of Jodhpur has a population of nearly 10.33 Lakh people (Census, 2011). The city is also home to 217 slum and slum-like settlements (Slum Free City Plan of Action, 2014) covering nearly 20,000 households. Jodhpur is also known as the Sun city in the world. The Administrative activities of the city are carried out by the Jodhpur Nagar Nigam (JNN) having 2 Networks – Jodhpur Nagar Nigam South and Jodhpur Nagar Nigam North. These Nigam's are headed by Mayors. the municipal commissioner. The city has been working towards the improvement of its infrastructure and supply of basic municipal services under schemes like the Swachh Bharath Mission (SBM) and Atal Mission for Rejuvenation and Urban Transformation (AMRUT). The city has achieved 100% of its set IHHL target under SBM. The city has 98% coverage of individual toilets as per the SLB 2019-19. The city has more than 80% of sewerage coverage and generates nearly 130MLD of wastewater. The city has a functional capacity to treat 120MLD of wastewater. Under the AMRUT mission, a new STP of 40MLD capacity is under construction to augment the gap in treatment capacity.

**KEYWORDS:** Solid waste management (SWM), Waste Water Treatment, Environmental impact, Waste Treatment Systems (WTS), Awareness.

### Introduction

In 1459, Jodhpur city was founded by Rao Jodha, who was a Rajput chief of the Rathore clan. The surrounding territory was successfully conquered by him, leading to the establishment of a kingdom that came to be recognized as Marwar. Originating from the nearby town of Mandore, Jodha first made it the capital of his new state; however, the capital was soon relocated to Jodhpur, still within Jodha's lifetime. The strategic positioning of the city on the road that connected Delhi to Gujarat facilitated its role as a thriving trade hub. It was able to profit handsomely from the trade of various commodities including opium, copper, silk, sandalwood, dates, and other goods. Mandore served as the capital of his emerging state, possibly due to its existing infrastructure and strategic location. However, recognizing the potential of Jodhpur, Rao Jodha made a significant decision to shift the capital to Jodhpur. This decision was visionary, considering Jodhpur's location and its growth potential.

Jodhpur's strategic location on the vital road linking Delhi to Gujarat was of monumental

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importance. This location was instrumental in establishing the city as a major trading hub in the region. The 15th and 16th centuries were periods of significant trade activity in the Indian subcontinent, with goods being traded within the region as well as with the Middle East, Africa, and Europe. Jodhpur's thriving trade in opium, copper, silk, sandalwood, dates, and other tradable goods was facilitated by its accessibility and connectivity to major trade routes. The trade not only brought wealth to the city and its inhabitants but also influenced the cultural and architectural development of Jodhpur.

Jodhpur is also known as the judicial district of Rajasthan as one the high court is in Jodhpur (Rajasthan has two high courts one in Jaipur and another in jodhpur).



Figure 1. Jodhpur city view

To maintain the city's beauty, hygiene, and road network inside the city, road swiping, and maintaining the gardens a municipal corporation plays a vital role. Before 2019 there was one municipal corporation in Jodhpur and now they are having 2 municipal corporations south and north.



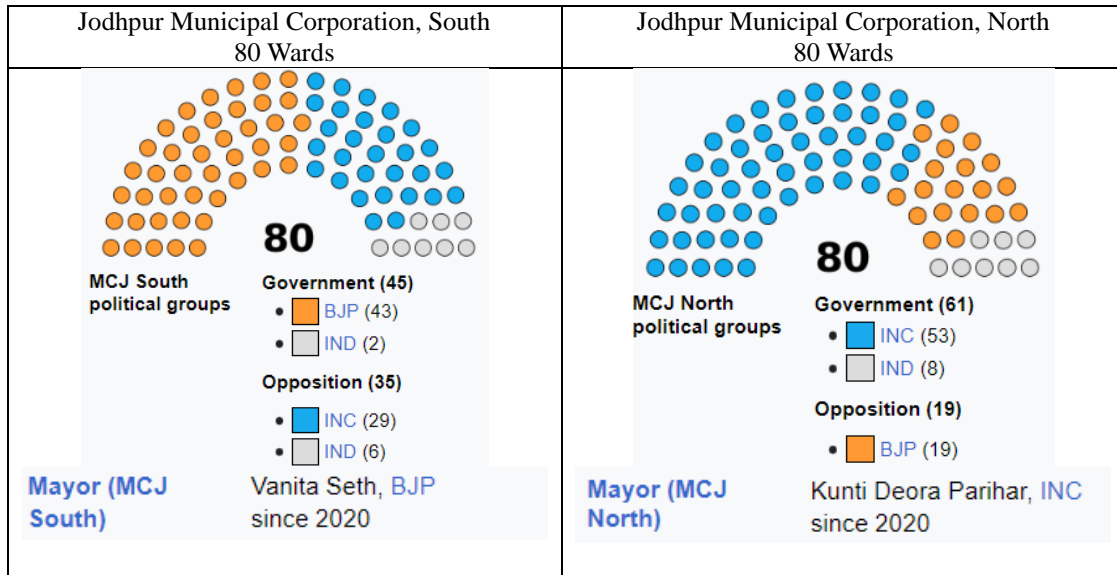
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Jodhpur Municipal Corporation's functions vary depending on the laws and regulations of the Rajasthan state. However, some common responsibilities are:

- Providing and maintaining public infrastructure, such as roads, bridges, water and sewage systems, and public parks.
- Administering and enforcing local laws and regulations, such as building codes and zoning regulations.
- Collecting and managing local taxes and fees.
- Providing public services, such as fire protection, waste management, and public transportation.
- Planning and implementing local development projects.

Both the Municipal Corporation are accountable to the citizens of Jodhpur it serves and is typically required to hold regular public meetings and elections. It may also be subject to oversight from higher levels of government, such as a state or federal agency.



Here in this case study my emphasis is on the waste management done by the municipality the overall waste of the city whether the waste is from the houses, hotels, gardens, road sweeping, and other types (solid waste management), collection, transportation, segregation, recycling, and at last dumping.

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### 1. Why proper Municipal Solid Waste (MSW) management is needed?

MSW management issues observed across India, including in Jodhpur, are not unique but reflect a broader challenge facing many developing countries. They stem from a combination of systemic inadequacies and resource constraints. The outdated and inefficient institutional frameworks in place for waste management often lack the agility and responsiveness needed to deal with the complexities of modern waste management. The shortage of working manpower is another critical issue, hindering the efficient collection, segregation, and processing of waste. This situation is exacerbated by inadequate financial resources, which limit the ability to invest in necessary infrastructure and technologies. The choice of technologies for waste management frequently does not align with the specific needs and capacities of the area, leading to inefficiencies in waste processing and disposal.

In the case of Jodhpur, a historic city renowned for its cultural heritage and architectural marvels, these deficiencies are experienced to varying degrees. The rapid urbanization and population growth in Jodhpur amplify the need for a substantial improvement in its MSW management practices. To elevate the standards of health, sanitation, and the urban environment, it becomes imperative for the city to address these challenges effectively.

In the context of Jodhpur, these challenges are not merely theoretical but have tangible impacts on the lives of its residents and the environment. The historical and cultural significance of the city, combined with its growing population and urbanization rates, necessitates a robust and sustainable approach to waste management. Improving MSW management practices in Jodhpur involves not only addressing the immediate deficiencies but also adopting a holistic and forward-looking strategy that incorporates sustainable technologies, community engagement, and effective governance mechanisms. Such efforts are crucial for preserving the city's heritage while ensuring a clean, healthy, and sustainable environment for its current and future residents.

The adverse effects on the environment due to the inefficient management of waste disposal are well known. These are as follows:

- Water pollution on the Ground and Surface.
- Pollution of air due to the bad odor comes out of the waste.
- Emission of CO<sub>2</sub> (Carbon di Oxide) leading to greenhouse gases.
- Harmful effects of rats, stray animals, flies, mosquitoes, germs, and other insects.
- Garbage heap leads to acidification of the soil (leakage of acids).
- Probability of diseases and epidemics.
- Rag Pickers coming in contact with Health-related problems.

### 1. Collection of solid waste in the city

As above discussed, the city is divided into 160 wards each part of the municipal corporation (South / North) has 80 wards and they collect the waste from these wards in a planned way.

The waste from door to door has been collected in ward wise system the movable small vehicles are sent door to door to collect the biodegradable waste and non-biodegradable waste separately. The collection of waste from door to door is carried out by different agencies in some of the wards it is done by municipality vehicles and in some of the wards it is done by private companies (hired by the municipality). Some of the wards have diesel vehicles, some of the wards with manual hand trolleys, and some by CNG vehicles.

Still, in some areas, collection bins are there and these bins are emptied by the municipal vehicles, the road swiping is collected manually by the municipal people and shifted to the collection centers. A designated sweeper, responsible for manually cleaning the roads, covers a specific area. These sweepers collect road waste in a wheelbarrow, subsequently transferring the waste to dustbins or collection points.

#### 1. Transportation of the waste

Transportation of waste is executed via a broad spectrum of vehicles, including but not limited to three-wheelers, tractors, and trucks. This selection of vehicles is pivotal, as each offers unique benefits in terms of maneuverability, capacity, and suitability for different types of waste materials. The process of loading these transport vehicles is carried out manually, which, while traditional, raises concerns regarding efficiency and worker safety. Given their pivotal role in waste management, these vehicles are often employed for two to three shifts daily, underlining the demanding nature of waste transportation.

Also, the process of waste transportation involves a range of vehicles to accommodate the diverse needs of waste management, it is fraught with challenges. These include the manual loading of vehicles, the use of these vehicles across multiple shifts without adequate numbers to support demand, a lack of synchronization with waste collection and storage facilities, and the concerning practice of transporting waste without proper coverage. Addressing these challenges is crucial for enhancing the efficiency, safety, and environmental sustainability of waste transportation systems.



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### 1. Municipal techniques of waste disposal

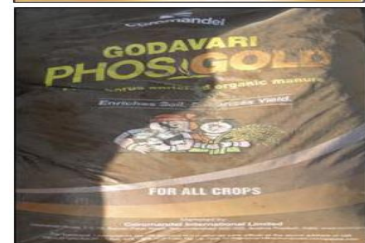
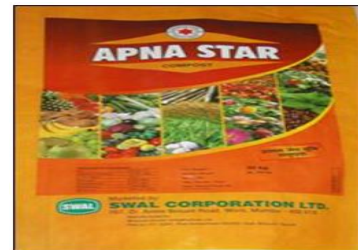
The Municipal Solid Waste Treatment & Processing Plant, covering an area of 48 acres in the village of Keru, Jodhpur, which is located 30 kilometers away from the Ratanada Airport, is operated by M/s U P L Environmental Engineers Ltd. This processing plant emerged as a result of a Central Government scheme aimed at establishing Municipal Solid Waste processing plants in air-based towns. The National Buildings Construction Corporation (NBCC) submitted the Detailed Project Report (DPR) for Jodhpur under the Solid Waste Management scheme to mitigate the bird-hit menace to Indian Air Force (IAF) aircraft in Jodhpur. The approval for this project came from the Central Public Health and Environmental



Engineering Organization (CPHEEO), a department under the Ministry of Urban Development (MoUD), and funding was sanctioned for its implementation. Commissioning of the processing unit in Keru village, with a daily capacity of 200 MT, was completed in February 2012, and it began receiving waste for compost and vermicompost production in November 2012. However, the quantity of waste received daily is only about 100MT, which after screening, is utilized for composting and bio-composting.



The waste received contains diverse materials such as polyethylene, rubber, stones, iron, sand, cloth, wood, foam, leather, and vegetables. By using this waste, the processing unit produces compost under two brand names, PhosGold and Godavary, which are sold in Sikandarabad and locally under the brand name Apna Star Compost, respectively. The daily production of compost ranges from 10-15 MT, selling for 1-2 Rs/Kg. Windrow technology is employed for manufacturing the compost, which involves water being sprayed onto the waste three times a week. The process of composting begins with proper segregation of the waste and maintaining the moisture content. Subsequently, the segregated waste is fed into trommel machines of 35 mm and 16 mm sizes respectively. The waste that is rejected by these machines is then sent to a landfill area, which spreads across 20 acres. Following the curing process, which involves maintaining the moisture content to 15%, the waste destined for compost is further processed



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through refinement (using sieves of 6mm, 4mm, and 2mm) and metal separation sections. After a 40-day process and mixing with rock phosphate in a ratio of (630 grams of compost: 370 grams of rock phosphate), the final product is packaged and sold in the market under a trade name.

In addition to composting, vermicomposting of organic waste is conducted at the plant. A total of 68 huts have been provided for this purpose, the production of vermicompost is 1 to 3 MT monthly, sold at a rate of 2-3 Rs/Kg.

Concerns have been raised regarding on-site fires at the landfill, occurring multiple times a month. A 50 KL water tank is on-site to address firefighting needs, and the municipality's fire brigade is also notified when such incidents occur.

The boundary of the plant area is fenced, though some sections are damaged due to animal movement at night. Approximately 1000 trees, including species like Babool, Ashoka, Neem, and Kaner, have been planted around the facility, enhancing its green cover.

A carcass plant located near the waste processing plant processes dead animal flesh into feed. However, the disposal of dead animals in front of the carcass plant has led to severe air pollution and an unbearable smell, attracting scavengers like vultures, which poses a risk of air accidents.

The Jodhpur RSPCB has reported that the MSW processing site is not operating effectively. Despite repeated renewal notices from RSPCB, the authorities at the site have not taken serious corrective actions.

## **2. Final Disposal**

The Municipal Solid Waste (MSW) of Jodhpur city was being indiscriminately disposed of on unauthorized sites, or used to fill up pits or level out low-lying areas. There existed a particular dumping site at Keru, located 15 kilometers away from Jodhpur, where approximately 300-350 tons of untreated MSW found its way daily. This site was notably positioned in the catchment area of Kaylana water storage tank and Umaid Sagar, both critical to the Public Health and Engineering Department (PHED) and the Irrigation Department respectively. This practice blatantly disregarded the health hazards stemming from the potential contamination of surface water, which was being supplied to the city of Jodhpur for drinking purposes.

Furthermore, the waste processing site, equipped with a municipal landfill spanning an area of 20 Acres, was also established in this vicinity. Near this site, a Carcass plant operated, converting the flesh of dead animals into Murgi-Daana. The area in front of the Carcass plant frequently became a dumping ground for dead animals, posing a serious environmental nuisance. Observations further revealed that the municipality workers were neglecting to transport waste to the sanctioned landfill site, opting instead to dump the waste along roadsides.

Additionally, incidents of fire occurring within the municipal waste were reported to be a common occurrence. Upon such incidents, the fire brigade was promptly informed to address the situation. A severe negligence towards environmental health and safety standards, directly affects the well-being of Jodhpur's population and its surrounding ecosystems. The continuation of these practices not only

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jeopardizes public health but also contravenes regulations designed to safeguard environmental integrity. Responsible authorities must reevaluate waste management protocols, ensuring adherence to environmental laws and promoting sustainable waste disposal practices.

### Conclusion

The outdated, inefficient institutional framework, a shortage of working manpower, inadequate financial resources, improper choice of technologies, inadequate coverage of areas, and poor short- and long-term waste management planning are a few reasons why the Municipal Solid Waste (MSW) management system in India fails to reach the desired level. Similarly, the city of Jodhpur faces these deficiencies to varying degrees, highlighting the urgent need for substantial improvements in the city's MSW practices. By enhancing these practices, Jodhpur can improve health, sanitation, and the urban environment, keeping pace with rapid urbanization and a growing population. The well-known adverse effects of unsystematic waste disposal on the environment further underscore the necessity of reform.

As a historical city experiencing rapid urban growth, the pressures on its waste management system are immense. To meet the standards of health, sanitation, and urban living that its residents deserve, Jodhpur must address these deficiencies head-on. This includes investing in modern waste processing technologies, expanding service coverage, enhancing workforce capacity and motivation, securing adequate funding, and adopting a forward-looking approach to waste management planning.

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