

Sanitation And Waste Management In Dungarpur District Of Southern Rajasthan: A Case Study

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Abstract

The city's waste was disposed in a dumping area leading to unhygienic conditions that affected the soil condition and also posed a huge risk to public health. The Dungarpur Municipal Council took action by implementing a door-to-door collection system, segregation at the source, and establishing an Integrated Solid Waste Management Center.

Dungarpur has been declared ODF in October 2017. In the Swachh Survekshan Survey-2019, the Dungarpur city bagged third position in the All India Ranking for the small cities. For best sanitation and solid waste management Dungarpur is the only body to receive this award for the fourth consecutive time.

The sanitation workers implemented the door-to-door waste collection system include the dry and wet waste segregation.

Solid waste management ensured chain of routine process of generation, storage, collection, transfer, processing and disposal of solid waste. Training and Awareness programme is needful for educate citizens. The present paper based on the study carried out on sanitation and solid waste management practice by Dungarpur Municipal Corporation.

Keywords: Integrated Solid Waste Management Center, Dungarpur municipal corporation, Swachh Survekshan Survey, ODF (Open Defecation Free)

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I. Introduction

PM Narendra Modi had said in a speech in 2016 "Cleanliness cannot be achieved through Budget allocation. Behavioral change is the solution. It should become a mass movement,". A good solid waste system is like good health, good waste collection service and removal, treatment, and management of solid waste are two of the most vital urban environmental services. Many infectious diseases can be transmitted due to inadequate sanitation, insufficient treatment and incorrect disposal of faeces and inappropriate solid and liquid waste management practices. Research, education, public participation and social media are some of the useful tools for long-term improvement and changes in the ethics and attitude of the public towards proper waste management. Since ancient times in india, 3R-principle (Reduce, Reuse and Recycle) and zero-waste management have been an inseparable part of life in the culture and lifestyle.

Approximately daily generation of 15.5 MT of garbage in Dungarpur city, faced solid waste management challenges. Solid waste in landfills has increased contribution to global warming. Biodegradable waste in landfills releases methane, which has a 34 times higher global warming potential over 100 years as compared to carbon dioxide. The Dungarpur Municipal Council took action by implementing a door-to-door collection system, segregation at the source, and establishing an Integrated Solid Waste Management Center. They enforced a ban on plastic usage, operated a material recovery facility for secondary segregation, and set up a biomethanation plant, Vermicomposting facility, NADEP pits, and a sanitary landfill. Additionally, they managed drainage water treatment and established a Construction & Demolition Waste Collection Center. These paper focussed on Dungarpur Municipal Council solid waste management steps and inovative improved public awareness to get position in Swachh Survekshan Survey.

II. Material And Method

Study Area :- Waste collection center in Dungarpur, Rajasthan is located at Village Bhandariya Ghata, Dungarpur Tehsil, Dungarpur District.



Fig.1- Waste Collection Center, Bhandariya Ghata, Dungarpur

Management agencies :- The Dungarpur Municipal Council's (DMC) had engaged three private agencies for 100% door to door collection, intensive Information, Education and Communication (IEC) campaigns to ensure segregation at source, putting in place a robust monitoring system and most importantly setting infrastructure for treatment and disposal.



Fig . 2.– Dry and Solid Waste Management

The scope of work of the agencies includes sensitization of citizens to segregate wet and dry waste, collection of waste only in a segregated manner and transportation of waste to designated MRF and biogas plant site. DMC provides vehicle for door-to-door waste collection and transportation e.g. vehicle-tippers, tractor and lifter. Sanitary Inspector (SI) of the respective wards is responsible for them monitoring and evaluation of the work done by the agency. Each residential and commercial establishment has been provided with separate green and blue dustbins at a minimal cost so that wet and dry waste (discarded produce, kitchen waste, etc.) is collected separately.

Waste management method:

The treatment is carried out in five different ways where wet waste is treated by the biogas plant which produces both cooking gas and electricity, compost is produced by vermin composting, recyclable paper and solid waste is sent out for recycling, and inert waste which cannot be treated is filled up in sanitary landfills. Therefore, implementing effective waste management strategies, such as recycling, composting, and proper disposal methods, is crucial.

ICT based monitoring of solid waste management in Dungarpur city

All 18 vehicles have GPS tracking system that designated route is followed. In case of delays due to breakdowns, an alternate vehicle is immediately provided.. A bio-metric system monitors the attendance of sanitation workers which is linked with payroll.



Fig. 3.- garbage collection at MRF by van, bio gas plant, biomedical waste van

III. Sanitation Management Steps

Well-Trained Staff

Training programmes for staff and sanitation workers was conducted by DMC on waste segregation, collection of segregated waste and transportation. The workers were oriented on types of waste, segregation of waste at the source, ensuring collection of only segregated waste and transportation of collected waste at designated MRF and biogas plant.



Flow chart of waste management steps

Garbage collection

Waste collection is carried out in 30 wards by door-to-door garbage collection agencies along with three NGOs. The city generates 16 tonne waste per day where 10 tonne is dry waste and 6 tonne comprises wet waste. The garbage collection vehicles have four compartments for dry waste, solid waste, bio-hazardous waste and food collection for the gaushalas. The timings for the collection of waste from the residential areas is 6am to 11am and in the commercial areas it is 4pm to 8pm. The waste collected is 100% segregated and is then sent to the treatment plant which is 5 km away from the city. A user charge of Rs 50 is collected per month per household for waste collection and transportation by the private agencies.

Material Recovery Facility (MRF) for processing of dry waste

After collection, the waste is transported to the MRF and biogas plant facility. Sanitation workers are employed in all the wards for regular manual and mechanized road sweeping in residential and commercial areas. The timings for sweeping are 6 am to 6 pm and 9 pm to 4 am. 46 twin bins have been placed in 5 commercial areas. These bins are also cleaned weekly by jetting machine.



Fig. 4 - Plastic Compressing, bundling machine at MRF

As plastic disposal in landfill and burning has damaging consequences on human and environmental health, recycling is increasing seen as having huge potential to tackle the plastic crisis. Furthermore, people's perceptions may not be based on scientific facts at all, resulting in wrong choices. The non-woven bags, which are 80% polypropylene (PP) and remaining 20% polyester are often mistaken as cloth bags.

Leading Practices in Sanitation and commercial areas is transported to the MRF for further sorting. About 10.6 MT of dry waste is received at the facility per day. 10 waste workers sort the dry waste into plastic, paper, glass, rubber, card box, clothes, etc. The sorted waste is further bundled and sold to NEPRA Environmental Solutions Pvt. Ltd for processing and recycling as per the contract between DMC and NEPRA Environmental Solutions Pvt. Ltd.

Waste pickers who formerly used to scavenge work on the waste dumping site have been engaged at the MRF. They earn 250 daily and are provided with additional benefits of monthly health check-ups. The Municipal Council has also provided gloves and masks for their safety during the sorting process. setting up a bio gas plant for processing of wet waste. The MRF has been constructed on the DMC land.

Biogas plant for secondary segregation of the waste

The ragpickers are deployed in the biogas plant for secondary segregation of the waste where they have also been given residential areas. Everyday 5.62 MT of wet waste is received at the biogas plant for further processing. The wet waste is shredded into slurry and fed in the chamber for further processing. 16 KW of electricity is generated per day. The input capacity of the plant is 7 MT/day and gas generation capacity is 350-400 cum per day.



Fig. 5– Transfer of disposable waste for fermentation

A converter to convert the generated gas into electricity which is used for running the facility. Appropriate use of biodegradable waste to produce organic fertilizer, biogas and electricity has positive environmental impacts, with lower application of chemical fertilizers to the soil and lower dependence on fossil fuels. This helps to realize the vision of 'Waste to Wealth'.

A gaushala

A gaushala has also been set up near the biogas plant to cater to the stray cattle menace with penalties imposed on the people who leave their cattle out in the open.

Organic compost

Since the compost being produced exceeds the requirement of manure at the parks in the city, the excess compost is sold out. The compost produced at the biogas plant is being sold at ₹3 per kg and compost obtained by vermin composting is sold at ₹7 per kg

Biomedical Waste

The Common Biomedical Waste Treatment Facility (CBWTF) is located at Village Bhandariya Ghata, Dungarpur developed by E-Tech Projects has received NOC from the State Pollution Control Board. The CBWTF

treats biomedical waste from various healthcare units to reduce its negative effects. The treated waste can then be disposed of in a landfill or recycled.

Health care institutions produce waste that is infectious and hazardous. Their disposal is a challenge and should not be mixed with household and other municipal waste. The Government of India has prepared the Biomedical waste (Management and Handling Rules) in 1998 with amendments in 2016, to ensure safe disposal of bio-medical waste across the country.

Biomedical waste generated from all the government and private hospitals of Dungarpur, Banswara and Pratapgarh districts can be disposed of in the Common Bio Medical Waste Treatment Plant located at Bhandaria in Dungarpur district.



Fig. – 6 Incineration unit at the Bio-medical waste plant

Both vehicles have been sent to collect bio-medical waste from hospitals in the three districts. After this, the medical waste will be separated and disposed of as per rules. The operator uses vehicles to collect waste from medical institutions across the city. Staff members work at the plant to receive the collected waste and process it. The staff is equipped with personal protective equipment (PPE) and is given routine vaccinations to protect them against infections.

Based on the guidelines of the Biomedical Waste (Management and Handling) Rules, the contractor, representatives of Rajasthan Pollution Control Board (RPCB) and Health Officer of the ULB conducted orientations for staff of medical institutions.

The sessions aimed to make them aware of the need to segregate waste into colour-coded bags to allow for efficient collection and processing. The colour coding to be followed was: Red bag (hazardous waste), Yellow bag (cloth, gauze, medical instruments and the like), Blue bag (human waste) and White bag (sharp objects). Waste is collected only if the waste is segregated and sealed colour coded bags.

A list of facilities from which collection is to be carried out has been provided to the contractor by the ULB. Segregated bags are brought to the plant where the waste is incinerated. The plant runs for 10 hours a day and has a waste processing capacity of 100 kg per hour.

The incineration happens in two chambers- the first/primary chamber where raw waste is burnt at temperatures near 800° +/-50°C.

The vapors and other gases from this process then pass into the secondary chamber where the temperature reaches 1000°C. These gases and their contents are then burnt here following which the flue gases are released out in the open after passing through a wet venturi scrubber in the chimney. The entire process of incineration and release of flue gases is monitored through sensors and the data is available to RPCB in real-time.

Sanitary landfill

DMC has developed a sanitary landfill of 3.5 ton per day capacity for processing of inert waste that cannot disintegrate naturally, either biologically or chemically e.g. glass, plaster, metal, wood, bricks or cement concrete.

Dikrio Ni Wadi

First such fruit garden to inspire daughters, named Dikrio ni Wadi. 500 daughters had planted 500 fruit trees together for environmental purification of air.



Fig. 7 – Sanitary landfill, CBWTF, Dikrio ni wadi, Tulsi garden, Gaushala

Tulsi Garden

For the purpose of purifying environment in waste management center, Tulsi Garden has been built in Dungarpur by the Municipal Council at Bhandaria Ghata of Dungarpur city Where 18 varieties of Tulsi plants have been planted. Varieties of Camphor Tulsi, Loving Tulsi, Van Tulsi, Ajwain Tulsi, Tilak Tulsi, Marva Shyam Tulsi, Brazilian Tulsi (Vishnukanta), Ram Tulsi and Shyam Tulsi are planted in the garden.

IV. Inovative In Waste Management “Reduce, Recycle, Reuse, And Repeat.”

Dungarpur Municipal Council is using and making the best out of discarded items. Selfie points made from waste and garbage in Dungarpur e.g. old tyres, discarded water bottles. Also, the city council collects old parts from motorcycles, cars and bicycles at one place and makes them beautiful. Later all these are mixed and shaped like a big flower.

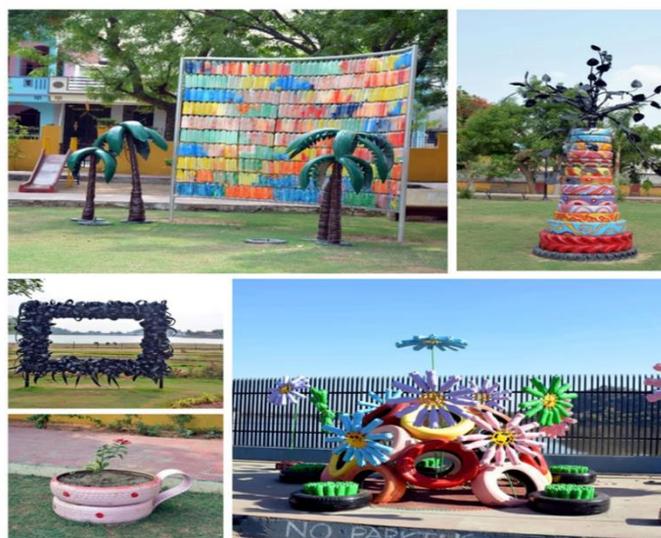


Fig. 8– Best out of waste Selfe point in city

V. Result

In the Swachh Survekshan Survey-2019, Dungarpur ranked third in the All India Ranking for small cities, and first in the "citizen feedback category". In 2020, Dungarpur ranked seventh in India for sanitation, and third among cities with fewer than 100,000 residents. According to the 2021 Swachh Sarvekshan Survey, Dungarpur, Rajasthan has ranked third among cities with a population of 25,000–30,000 for sanitation. Among small cities with population of 25 to 50 thousand, it has been ranked 16th among 3800 civic bodies of the country and number-1 among 212 civic bodies of Rajasthan. Also, it has become the only city in Rajasthan to get 3-star among garbage free cities. Dungarpur civic body has given total marks of cleanliness survey 2022 as 7500. In the results of Swachh Survekshan 2023, Dungarpur Municipal Council has once again remained on top in the state regarding cleanliness. Dungarpur is the only body to receive this award for the fourth consecutive time.

VI. Discussion

Sustainable resource utilization and SWM are global challenges. Rapid increase in waste generation caused by increasing population levels, booming economies and rapid urbanization and industrialization. The municipal council has not only tried to monitor each step of the solid waste management but have been carrying out lectures in schools and colleges on the need to have a clean city. Nagar Parishad motivated the students to aim at making the city clean. They took special lectures in schools in order to educate the students regarding the need to have a clean city.

VII. Conclusion

The way of management of sanitation in city is inspired others. Sanitation is the key point for people's health. Three 'R's of solid waste management i.e. reduce, reuse and recycle must be adopted by all urban centers. Efficiency of waste collection must be improved in cities by bringing about the necessary changes in the design of equipment used by sanitary staff, manpower management and planning. Separate collection of hospital waste must be ensured in every city and incinerators must be installed to deal with this waste. People's participation, social media, NSS and NCC scouts, various competitions e.g. Panting, music and debates could be held on themes of waste management must be encouraged to keep cities clean.

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