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Solid Waste Management in Wani Town

Divya V. Shejao[1], Dr. P. A. Kadu[2]
P.G.Student[1], Associate Professor[2]
Department of Civil Engineering
Prof. Ram Meghe Institute of technology and Research, Badnera[1], SGB Amravati University, India[2]
Corresponding Author's Email: -*divyashejao28@gmail.com[1]*

Abstract

Solid Waste Management is a worldwide phenomenon and a big challenge all over the world for human beings. The problem of solid waste management (SWM) is also prevailing in the Wani city. Therefore the present study is undertaken to find out the problems and prospects of Municipal Solid Waste in Wani city. The detailed investigation was made regarding the methods of practices associated with sources, quantity generated, collection, transportation, storage, treatment and disposal of Municipal Solid Waste in wani city. The data concerning to SWM is obtained from authentic record of municipal council, interacting with people and through questionnaire and individual field visits. This study reveals the present system of MSWM in Wani city. There is improved situation in management post SWM rules 2016,segregation at source though have long way to go, storage and secondary segregation at municipal designated plant has been successfully carried out. The composting units have been created at the lalguda, bhalar road plant which reduces the burden of landills and dumping sites.

Keywords: *Municipal Solid waste, Wani Municipal Council, Waste Sources, Dumping Sites*

INTRODUCTION

Municipal solid waste is the trash or garbage discarded day to day in a human settlement. Waste generation involves activities in which materials are identifiedas no longer value and are either thrown away or gathered together for disposal.The primary source of municipal

solid waste includes waste generated in domestic, institutional, commercial activities, garden and municipal services.

The domestic wastes are high in quantities and vary with time and season. It is generally comprised of organic and inorganic constituents. Nowadays the quantity of organic waste decreasing and the quantity of metals, plastics and paper is increasing, indicating that there is growing preference for consumption of packaged food in recent years.

Effects of Municipal Solid Waste

Municipal solid waste if disposed improperly will cause the following impacts on the environment.

1. Groundwater contaminations by leachates generated by waste dump.
2. Surface water contaminations by the run-off from the waste dump.
3. Release of green house gases.
4. Acidity to surrounding soil.
5. Bad odour, rodents and unhygienic waste dump area.
6. Fires within dumping site.

STUDY AREA- WANI CITY

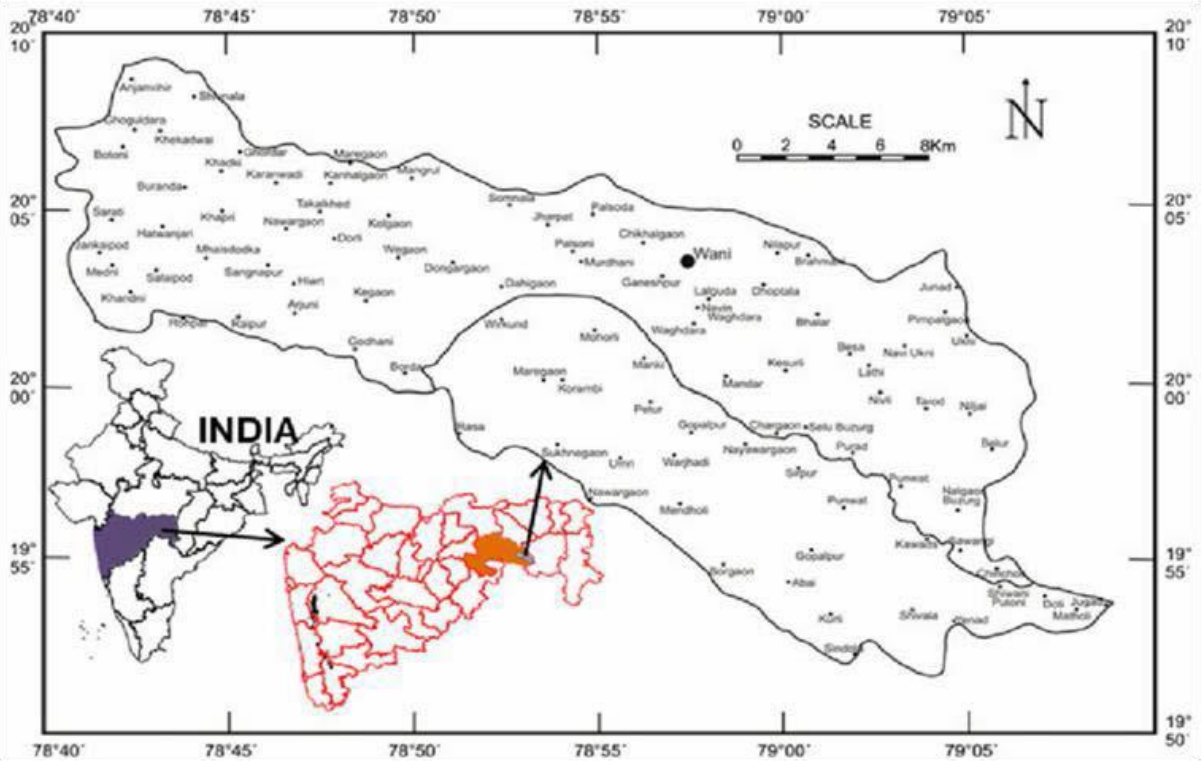

Figure:- 1 Wani location on Map

Wani is located in eastern part of Yavatmal district and borders Chandrapur district. Despite being a tehsil, Wani is commercial hub for nearby area due to its strong market and its crucial geographical location.WCL-western Coalfields Limited, A subsidiary of Coal India Limited has a coal mining area- Wani North Area in the surroundings of Wani city. There are coal mines like Ukni, Pimpalgaon, Junad, Kolarpimpri, Rajur, Kumbarkhani, Ghonsa, Neeljai, Naigaon etc.

Necessity of Solid Waste Management

- Due to growth in population & urbanization the generationof solid waste has increased significantly.
- Solid waste has many bad influences over development ofcity or village.
- Diseases, odour pollution are the major threats arise due tosolid waste.
- Major countries in India are producing more than 1000tonnes per day of solid waste. Major part of this waste istreated by land filling which has its own influences overland & environment.
- Proper SWM provides facility of collection, segregation,transportation, & treatment of waste.
- This reduces odour pollution & risk of diseases, also goodmanagement improves the aesthetics of the city.
- Though SWM is complex to execute but with modern ecofriendlytechniques & disciplinary work. It is possible toachieve needful.

Mismanagement and Health Effects

The report of WHO (1971) has mentioned various health effects of solid waste some of them are given following. (World Health Organization Technical Report Series)

- Solid waste varies significantly throughout the world because It depends largely on climate, living standard, &further social factors, as society becomes industrialized the percentage of commercial, industrial, , agricultural waste increases, this adds new potential threats to human health& safety World Health Organization Technical Report Series

- Most wastes are heterogeneous & it May vary seasonally so there is no single fixed approach to the problems, though two different categories exist universally, fermentable & non fermentable, the second one degrades very slowly which become problem. World Health Organization Technical Report Series.

- Generally solid waste should not contain some fecal matter or urine in it. The mixture of such material with solid waste makes it difficult to collect properly, however these conditions are present in many developing countries due to variation in way of life style. Such things also increase chances of spreading of diseases in society. World HealthOrganization Technical Report Series.

- Harm from waste is also due to inflammability of waste,the nuisance of flies breading will be more in area as well as role of rodents, flies, and rats is great in disease spreading.

- Many times open waste dumps provide a amount of foodfor rodents, these can grow their population, It has seen that the rodents like rat, mice, are responsible to plague,histoplasmosis, marine typhus etc.

- Incomplete combustion of solid waste can producesundesirable pollutants like particulate matter, sulfur dioxide, hydrocarbons, nitrogen oxide whichcan cause dangerous health effects on those who inhale it.

- Rain water when passes through waste sites there are chances of contamination due to bacteria present in waste, In general normal permeable soil does not contain bacterial load more than dozen but waste can contaminate water significantly & subsequently increases the chances of diseases spreading.

- The study of WHO revels that the infection of worms &related organisms was three times that in control group. Although it is certain that vector insects & rodent can transmit diseases but it is always difficult to understand the relationship between sources of infection & population affected.

REVIEW OF LITERATURE

Junaid Ahmad. Malik PG College Videsha, India (2021).

Review of Waste Management Technology for Sustainable Agriculture: Waste Management. It considers waste management in terms of vermin composting as an approach in agriculture. In this project the waste management is undertaken to recycle the wastes so as to reduce the ill effects of wastes on environment, health, and aesthetics. There are several kinds of wastes produced such as agricultural wastes, municipal wastes,

industrial waste, mining waste. Some wastes are more hazardous such as medical wastes and nuclear wastes. Various techniques are used for the management of wastes which includes land filling, incineration, anaerobic digestion, paralysis, plasma gasification, recycling, composting.

Anaerobic digestion produces biofuel in the form of biogas. Plasma gasification results in the generation of electricity from wastes. Recycling of wastes involves the collection, sorting, and reprocessing of wastes into new products. Vermicomposting is the preferred form of composting as it results in the formation of vermicomposting called black gold due to the presence of rich nutrients and growth promoting factors in it.

Ankita Majumdar (2019) - A technical report of the solid waste management of Mumbai.This project stated that the municipality has turned out to work on a decentralized manner with the help of NGOs and various organizations. Though decentralized system run on smaller scales, but with the effective participation of people as stakeholders gave rise to the waste traders or "raddiwallas" who are seen at various spots of the cities, who sell the recyclable wastes to make their fruitful use. Due to all these approaches, decentralized system is leading to a greater success in recent times. Advanced locality model is a type of optimization model for SWM system. As per the model, three plants were installed, of which, 1st plant is community compost plant, 2nd is mechanical 5aerobic compost plant, 3rd plant follows sanitary land filling techniques. These plants ultimately turn wastes into useful products like manure, converting landfill gas into CNG etc.

The amount of waste generation cannot be reduced but with proper recovery of the wastes, the problem of solid waste management can be resolved. The principle of 4R: Reduce, Reuse, Recycle and Recover should be adopted. Various methods like biomethanation, gasification, incineration, vermicomposting, aerobic composting etc. should be introduced for the proper maintenance of SWM.

METHODOLOGY

Research Methodology can be studied on -

1. Survey based collection of data.
2. To evaluate the data collected and representing the preset modules in use for the waste management.

COLLECTION

Door-to-door Collection

The Municipality workers are involve in collection of solid waste on door to door service in all the wards of Wani city engaging garbage vehicles. The collection process is carried out in mornings all over city.

Street Sweeping

Most of the areas swept by Solid Waste Management workers are the commercial areas like Shivaji Chowk, Gandhi Chowk, areas with public offices and residences of public officers and areas having other renowned public figures residing in. Though it also engages private workers on contract basis it doesn't covers all the areas.

Transportation

The collection of Municipal Solid Waste is done by door to door at source and is collected in specially designed vehicles exclusively for waste collection purpose.

Fig 1.2 SWM vehicles

Storage

Fig1.3 Dry Waste Storage

The Waste collected is stored at lalguda, bhalar Road site of Wani Municipal Council. Then the collected waste is sent for different contractors based on bidding process like tendering. Also as per SWM Rules 2016, Waste is also sent back to big brands like Proctor and Gamble India Pvt Ltd and Ultratech Cement Pvt Ltd as Extended Producers Responsibility Program.

Treatment & Disposal

The secondary segregation of various dry waste in terms of plastic, metals, bottles and cardboard is done at lalguda , bhalar road storage facility Recently built Dhoptala Solid Waste Treatment Unit near wani have helped to process the waste.

Composting

Decomposition of organic matter in the waste in the presence of oxygen with the help of micro-organisms or worms (such as red wigglers or earthworms) produces compost or vermicomposting, which is a humus rich soil conditioner. Wani Municipality has dedicated wet waste composting blocks of rectangular shape with total capacity of 124 Tonnes per day.

Recycling of Non-Biodegradable Waste

Recycling involves recovering and reprocessing usable materials that otherwise might end up as waste. The recovered material can be transformed into useful products that can pre-empt consumption of virgin resources in manufacturing. Use of recycled materials usually requires a fraction of the energy needed to manufacture a product compared with manufacturing the same product with virgin materials. It also helps save energy and associated greenhouse gas emissions across the multiple phases of product lifecycle, e.g., during extraction and manufacturing, and from decomposition. Commonly recyclable materials include paper, cardboard, glass, plastics, metals, etc.

1. Biomethanation

A technically more advanced method for bio-chemical conversion of biodegradable waste is anaerobic decomposition or biomethanation. With the action of microbes in the absence of oxygen, the organic matter is broken down with the release of biogas which contains methane. The gas can be used in place of conventional fuels like LPG or CNG.Biomethanation can also be practiced locally at small scale or at large centralized plants. Biomethanation plant can be operated at decentralized level (up to 5 TPD) or centralized level depending on the feasibility of the implementation

and waste inflow. The overall performance of the biomethanation plant is greatly influenced by the input feed specification, and the plant requires segregated biodegradable MSW (e.g., hotel and restaurant waste, market waste) for optimal plant performance. Several small-scale biomethanation plants (0.5 TPD to 10 TPD) have been installed in a number of Indian cities like Pune, Bengaluru, Mumbai, Delhi, Coimbatore, Matheran, Vadodara and Nasik. These plants produce electricity from biogas, which is used to run streetlights in the neighborhood.

2. Dry Waste Processing

Refuse Derived Fuel, incineration and gasification are three principal ways in which combustible dry solid waste can be processed to generate energy. It is important to note that solid waste is neither the most efficient nor the most cost effective way of generating energy. Waste to Energy plants have to be seen as elements of an integrated solid waste management system with due precautions to maintain emission norms.

3. Refused Derived Fuel (RDF)

Waste other than biodegradable, which is non-recyclable and non-hazardous in nature but possesses high calorific value can be used for energy recovery through the process of combustion. To increase the energy output, the waste is shredded, dried and then compressed into pellets or briquettes, called Refuse Derived Fuel (RDF). These can be used in many industries in place of coal for heat generation. However, the temperature of the furnace should be maintained strictly at 1000 °C or above so that toxic air pollutants such as dioxins and furans are not released upon the combustion of RDF.

4. Incineration

Mass incineration or burning of mixed waste without much pre-processing is a widely practiced method in India which reduces volume and generates heat energy. This process risks the release of toxic gases into the atmosphere especially when the feedstock waste includes heavy-metallic substances, PVC and other halogenated compounds. Presence of wet waste and inert materials like soil and debris also reduces the calorific value of the feedstock, thus dropping the furnace temperature below the required 1000 °C.

5. Combustion

A more refined process of thermally treating such stream of waste is sometimes referred to as controlled combustion. The heat energy generated is used in a steam-turbine engine to produce electricity. An

integrated plant which has both waste processing and energy generation units is commonly referred to as a waste to energy (WtE) plant.

6. Gasification

Processes like pyrolysis, gasification and plasma-gasification are conversion technologies that turn high calorie dry waste into useful products such as syngas, ethanol and bio-char, etc. Gasification converts much of the carbon in any material into gaseous form, as the name itself suggests, upon heating in the controlled presence of oxygen. The gas so obtained is called synthesis gas or syngas and has several applications including electricity generation.

RESULTS AND DISCUSSION

Evaluation of Data

Dry Waste

In order to research the project the data of previous 3 months that are November 2021, December 2021 and January 2022 have been collected. The amount of dry waste collected by the Wani Municipal Council and sent for processing has been shown in the following table.Processing Capacity of Dry Waste Plant is 155 TPD SWM Plant Wani-Location-Survey no.106, Lalguda, Bhalar Road, Wani.

Table 1 Details of December 2021-Dry Waste

Date	Total Dry Waste Collected (in TPD)	Quantity Send to Processing (in TPD)	Total Processed Dry Waste (in TPD)	%of Processing
01-11-2021	8.400	8.400	8.400	100%
02-11-2021	8.500	8.500	8.500	100%
03-11-2021	8.350	8.350	8.350	100%
04-11-2021	7.210	7.210	7.210	100%
05-11-2021	7.110	7.110	7.110	100%
06-11-2021	6.900	6.900	6.900	100%
07-11-2021	7.100	7.100	7.100	100%
08-11-2021	7.200	7.200	7.200	100%
09-11-2021	8.050	8.050	8.050	100%
10-11-2021	8.100	8.100	8.100	100%
11-11-2021	8.350	8.350	8.350	100%
12-11-2021	8.110	8.110	8.110	100%
13-11-2021	8.270	8.270	8.270	100%
14-11-2021	6.900	6.900	6.900	100%
15-11-2021	7.500	7.500	7.500	100%
16-11-2021	7.870	7.870	7.870	100%
17-11-2021	7.900	7.900	7.900	100%
18-11-2021	8.240	8.240	8.240	100%

19-11-2021	7.950	7.950	7.950	100%
20-11-2021	7.200	7.200	7.200	100%
21-11-2021	7.310	7.310	7.310	100%
22-11-2021	7.120	7.120	7.120	100%
23-11-2021	8.200	8.200	8.200	100%
24-11-2021	8.180	8.180	8.180	100%
25-11-2021	8.050	8.050	8.050	100%
26-11-2021	8.200	8.200	8.200	100%
27-11-2021	8.100	8.100	8.100	100%
28-11-2021	7.510	7.510	7.510	100%
29-11-2021	7.400	7.400	7.400	100%
30-11-2021	7.960	7.960	7.960	100%

Details of Wet Waste

Processing capacity of wet waste at SWM Plant Wani is-124 TPD.

Table 2.Details of Wet Waste –November 2021

Date	Total Wet Waste Collected (in TPD)	Send to Processing Plant (in TPD)	Rejected Waste (in TPD)	Processing Capacity (in TPD)	Total Waste Processed (in TPD)	%of waste Processed
01-11-2021	4.900	4.900	0	124	4.900	100%
02-11-2021	5.200	5.200	0	124	5.200	100%
03-11-2021	5.230	5.230	0	124	5.230	100%
04-11-2021	5.280	5.280	0	124	5.280	100%
05-11-2021	5.200	5.200	0	124	5.200	100%
06-11-2021	5.080	5.080	0	124	5.080	100%
07-11-2021	5.400	5.400	0	124	5.400	100%
08-11-2021	5.840	5.840	0	124	5.840	100%
09-11-2021	4.20	4.20	0	124	4.20	100%
10-11-2021	4.120	4.120	0	124	4.120	100%
11-11-2021	4.280	4.280	0	124	4.280	100%
12-11-2021	3.960	3.960	0	124	3.960	100%
13-11-2021	3.900	3.900	0	124	3.900	100%
14-11-2021	5.190	5.190	0	124	5.190	100%
15-11-2021	5.400	5.400	0	124	5.400	100%
16-11-2021	4.250	4.250	0	124	4.250	100%
17-11-2021	4.580	4.580	0	124	4.580	100%
18-11-2021	4.320	4.320	0	124	4.320	100%
19-11-2021	4.460	4.460	0	124	4.460	100%
20-11-2021	5.100	5.100	0	124	5.100	100%
21-11-2021	5.280	5.280	0	124	5.280	100%
22-11-2021	5.480	5.480	0	124	5.480	100%
23-11-2021	4.120	4.120	0	124	4.120	100%
24-11-2021	4.320	4.320	0	124	4.320	100%
25-11-2021	3.940	3.940	0	124	3.940	100%

26-11-2021	4.220	4.220	0	124	4.220	100%
27-11-2021	4.600	4.600	0	124	4.600	100%
28-11-2021	4.800	4.800	0	124	4.800	100%
29-11-2021	5.200	5.200	0	124	5.200	100%
30-11-2021	4.480	4.480	0	124	4.480	100%

Sanitary Landfill

Table:- 3 Details of Sanitary Landfill –November 2021

Date	Total Wet Waste Collected	Send to Processing Plant	Rejected Waste	Processing Capacity	Total Waste Processed	%of waste Processed
	(in TPD)	(in TPD)	(in TPD)	(in TPD)	(in TPD)	
01-11-2021	0.010	0.010	0	15	0.010	100%
02-11-2021	0.020	0.020	0	15	0.020	100%
03-11-2021	0.010	0.010	0	15	0.010	100%
04-11-2021	0.150	0.150	0	15	0.150	100%
05-11-2021	0.100	0.100	0	15	0.100	100%
06-11-2021	0.120	0.120	0	15	0.120	100%
07-11-2021	0.140	0.140	0	15	0.140	100%
08-11-2021	0.180	0.180	0	15	0.180	100%
09-11-2021	0.210	0.210	0	15	0.210	100%
10-11-2021	0.190	0.190	0	15	0.190	100%
11-11-2021	0.170	0.170	0	15	0.170	100%
12-11-2021	0.020	0.020	0	15	0.020	100%
13-11-2021	0.010	0.010	0	15	0.010	100%
14-11-2021	0.100	0.100	0	15	0.100	100%
15-11-2021	0.120	0.120	0	15	0.120	100%
16-11-2021	0.140	0.140	0	15	0.140	100%
17-11-2021	0.180	0.180	0	15	0.180	100%
18-11-2021	0.210	0.210	0	15	0.210	100%
19-11-2021	0.190	0.190	0	15	0.190	100%
20-11-2021	0.170	0.170	0	15	0.170	100%
21-11-2021	0.120	0.120	0	15	0.120	100%
22-11-2021	0.140	0.140	0	15	0.140	100%
23-11-2021	0.180	0.180	0	15	0.180	100%
24-11-2021	0.100	0.100	0	15	0.100	100%
25-11-2021	0.120	0.120	0	15	0.120	100%
26-11-2021	0.140	0.140	0	15	0.140	100%
27-11-2021	0.180	0.180	0	15	0.180	100%
28-11-2021	0.210	0.210	0	15	0.210	100%
29-11-2021	0.190	0.190	0	15	0.190	100%
30-11-2021	0.170	0.170	0	15	0.170	100%

CONCLUSIONS

Table .4 Changes in Waste Collection over Past 2 Years

Sr. no	Total Waste collected In Each month of year	Total Waste collected Year 2020 In tonnes	Total Waste collected Year 2021 In tonnes	Total Waste collected Year 2022 In tonnes
1	January	362.102	408.520	452.407
2	February	363.410	410.445	454.180
3	March	369.950	416.820	456.860
4	April	Lockdown	420.593	457.120
5	May	Lockdown	420.602	458.740
6	June	Lockdown	423.325	
7	July	380.251	426.777	
8	August	378.520	430.248	
9	September	380.140	436.418	
10	October	389.582	432.622	
11	November	390.450	436.77	
12	December	402.880	449.303	
	Total	3020.835	5027.010	

Table.5 Average Waste Generated Per Day

Sr no.	Ward no.	No of gates	Dry waste (TPD)	Wet waste (TPD)	Mixed waste (TPD)	Hazardous waste (TPD)	Total waste (TPD)
1	1	2031	1.28	0.81	0	0	2.09
2	2	2102	1.19	0.72	0	0	1.91
3	3	1898	1.16	0.75	0	0	1.91
4	4	1953	1.32	0.70	0	0	2.02
5	5	1962	1.14	0.68	0.65	0	2.47
6	6	2205	1.41	0.84	1.45	0.01	3.70
total	6 wards	12151 (TPD)	7.5 (TPD)	4.50 (TPD)	2 (TPD)	0.01 (TPD)	14.00 (TPD)

Table.6 Segregated Waste Generated Per Day

Sr. No	Type of waste	Waste generated in TPD
1	Dry	7.5
2	Wet	4.5
3	Mixed	2
Total		14 TPD

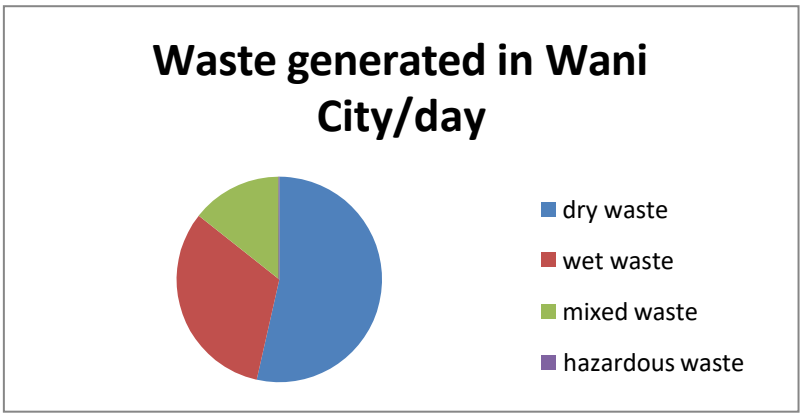

Table.7 MSW CHARACTERISTICS

MSW Management and Operation	Characteristics
Street sweeping	• Labor-intensive • Logistics-intensive • Minimal investment in tool • Limited technical skill
Collection and transportation	• Capital-intensive • Fleet management skills
Processing and disposal	• Capital-intensive • Technically skilled staffing required • Experience of technology deployed

CONCLUSIONS

1. The Wani city council has achieved 100% door to door waste collection service to its citizens covering all the households of the city.
2. Women workforce is higher in this sector than men, compared to other services of Wani Municipal Council.
3. Solid Waste Management in Wani still relies on maximum contract basis workers.
4. Rag pickers and kabadiwalas are still integral part of city's waste management.
5. Solid Waste Management Rules 2016have helped to strengthen the waste management system in Wani city. Extended Producers Responsibility Program have been helped to decrease the load of Solid waste to recycle and reuse at the production units of producers.
6. Cleanliness of the public places is questionable as people are not satisfied about it.
7. Segregation at source is still have long way to go as many citizens actually don't segregate waste .as most of the

citizens don't have separate bins for dry and wet waste.

8. Inspite of door to door waste collection service, empty plots and sites are special targets by its neighbors probably either because of natural habit or inadequate storage bins at homes.
9. Though Wani city council declared itself no garbage vulnerable point, there are many empty plots and such garbage points can be sighted.
10. Post pandemic the Solid Waste Management have improved a lot and health and cleanliness are seen as high priority sectors in terms of actions of decision makers and administrators. As funds allocated to SWM seen rising gradually.
11. New SWM processing plant at Dhoptala is greatly useful in processing solid waste. It have also dedicated composting units which further helps to compost wet waste ,this plant helps a lot in reducing residue to be sent to dumping site situated at Bhalar road.
12. Proper maintenance of dumping site is need of hour as no precaution has been undertaken for its proper management and it is affecting the surrounding area both on humans and environment. Existing Problem in the present Solid waste management and possible solutions for Wani city.

Littering by Residents after Collection

Although the sweeping and collection of waste is often done regularly, residents cause littering waste. Instead of disposing of waste in the garbage bins provided to them, they litter the waste in open. The households particularly from the slums, low income areas and local shopkeepers throw waste onto streets and roads and any available open spaces causing excessive littering and clogging of drainage systems in Wani city. Solution-To combat this problem the municipality should strictly specify and notify residents about the timings of the waste collection so as to avoid the problem of littering. Big containers or bins should be placed outside shops so that the waste is disposed in those bins and penalize the offenderswithheavy fine and punishment.The lack of an adequate policy and regulatory framework further compounds the problem. Legal actions must be taken against the individuals or the industrial units which are found guilty. Wani Municipality Council should also campaign aggressively for more awareness and education about maintaining cleanliness in public areas. Further, the Wani Municipal Council should further reorganize

allotment of municipal budgets to prioritize upgrade of waste infrastructure and services.

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