IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 8 Issue 8, August 2021
ISSN (Online) 2348 – 7968 | Impact Factor (2020) – 6.72
www.ijiset.com

Solid Waste Management in Shrirampur City, Ahmednagar

Shinde Vijayalaxmi R. M.Sc., SET, UGC-NET, M.Phil.,
Affiliated to Savitribai Phule Pune University, Pune, Maharashtra, India
Department of Environmental Science,, Abeda Inamdar Senior College of Arts, Science and Commerce, Azam Campus, Camp, Pune-411001, Contact number- 9890632120, Email id- vrsnirvana@gamil.com

Abdulmuqit Shaikh, B.Sc. (Environmental Science), Diploma in Sanitary Inspector
Department of Environmental Science, Abeda Inamdar Senior College of Arts, Science and Commerce, Azam Campus, Camp, Pune-411001, Contact number- 9595095357, Email id- samshaikh1604@gmail.com

Abstract:

- Background: Shrirampur is a town located in the district of Ahmednagar with an area of 9.8 sq.kms and has 16 electoral wards with 32 ward councilors and the city is divided in 7 wards on for the purpose of waste collection. The city has a population of 89,282 according to the 2011 census and currently has a population of 95,700 according to their recent population calculations. The city blend of high and low income-residential and commercial units, consisting of high-income apartment complexes, individual bungalows, housing societies, shops, etc...; which served well for a pilot of a model ward as, if a sustainable zero waste system is successfully put to test in such an area, its reliability would be high. The city has its own waste dumpsite of 13.5 acres which consists of waste to compost plant, and Sewage Treatment Plant (STP), Waste Recycling plant &Sanitary Landfill are under-construction. The Detailed Project Report (DPR) for this project were passed and the projects are under-construction which will be helpful in making the first city in the district to have successful zero waste management system.
- Objectives: Collection of the waste generated daily in the city, Segregation and management of the dry and wet waste and Composting of wet waste.

- Methods: It includes visit to Shrirampur waste management site. The waste processing is studied in detail along with compost preparation and commercialization.
- Results: The city has current population of 95,700 with daily generation of 24.5 tons of waste, which consists of 14.7 tons of WET waste and 9.8 tons of DRY waste and is outsourced to Disha Environmental Solutions Private Limited, Pune which handles the waste collection and its management. The Biomedical waste management is handed over to Ashvameda Cleansing, Ahmednagar which is a private source agency which handles the waste from all forms of Medical Institutes.
- Conclusion: The Urban Local Body is handing the process of degradation of wet waste and produces nearly about 1,500 tons to 1,600 tons of compost. The obtained compost is self-consumed in some amount and the rest is given to the local farmers at cheap price. The ULB is currently focusing on achieving the trademark of HARIT for the compost which can be further then sold at good price and can be a good source of income in future.
- Abstract word count: 375
- Keywords: STP, Sanitary Landfill, Compost, DPR, ULB, Biomedical waste

Glossary of Abbreviations:

1) DPR- Detailed Project Report
2) STP- Sewage treatment Plant
3) ULB- Urban Local Body

Introduction:

Waste management (or waste disposal) are the activities and actions required to manage waste from its inception to its final disposal. This includes the collection, transport,

treatment and disposal of waste, together with monitoring and regulation of the waste management process.

Waste can be solid, liquid, or gaseous and each type has different methods of disposal and management. Waste management deals with all types of waste, including industrial, biological and household. In some cases, waste can pose a threat to human health. Waste is produced by human activity, for example the extraction and processing of raw materials. Waste management is intended to reduce adverse effects of waste on human health, the environment or aesthetics.

Waste management practices are not uniform among countries (developed and developing nations); regions (urban and rural areas), and residential and industrial sectors. They can all take different approaches.

Materials and Methods:

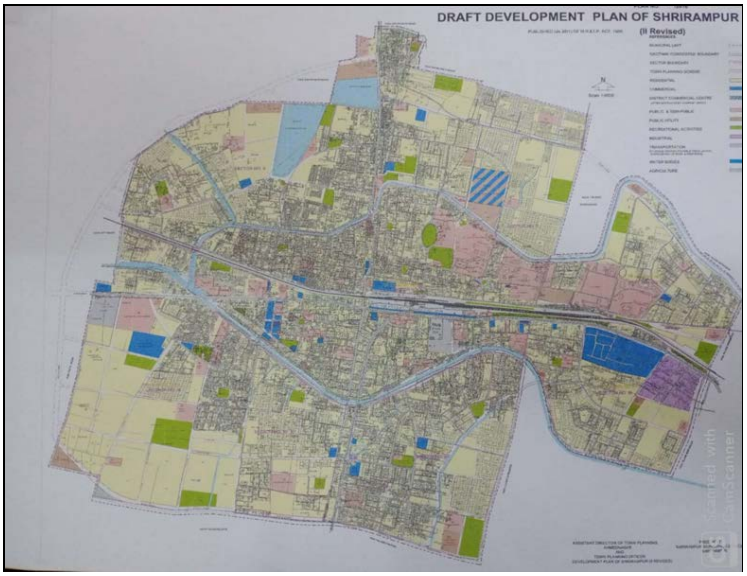

Figure 1: Study area- Shrirampur city

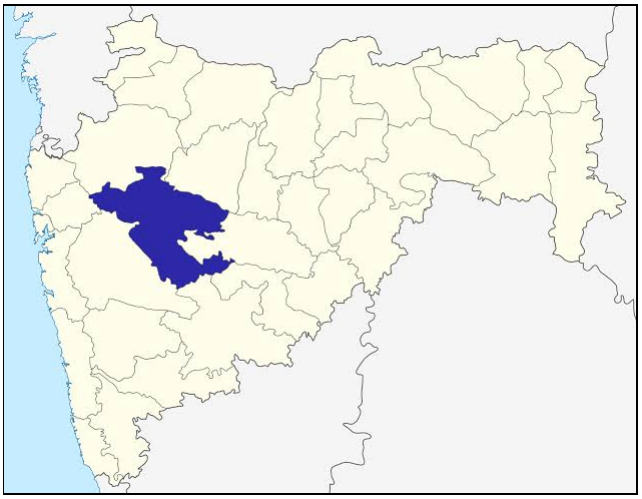

Figure 2: Maharashtra state and Ahmednagar district (blue colour)

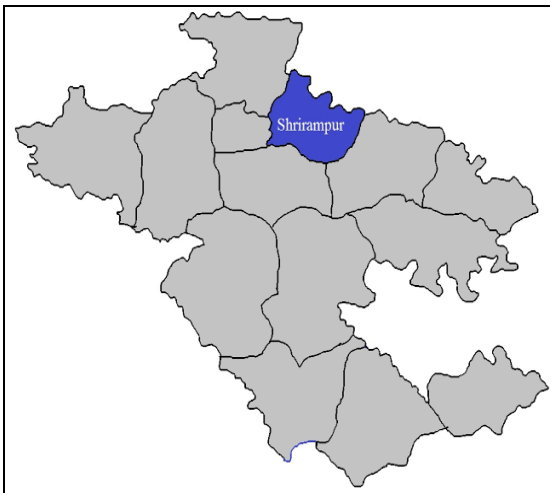

Figure 3: Shriram city of Ahmednagar district

The methodology includes visit to Shrirampur city, detailed study of various types of waste generation process on daily basis, data is collected related to segregation process, handling, processing, composting process and commercialization of the compost generated. The project is carried out for one-year i. e. form June 2019 to May 2020

The wet waste is sent for composting and dry waste is sent to recycling unit and scrap material is handed over to scrap centers.

Figure 2: The Dumping ground of Shrirampur city

Results: After studying the entire process, it is found that, on daily basis 14.7 tons of wet waste is being collected and nearly about 11 tons of waste is sent for composting. The waste processing facility has 450 tons of capacity. The wet waste is treated using windrow composting. The waste is spread evenly and then sprayed with BIO-CULTURE (Decom5b), and then arranged in the Compost bed in windrows. The waste is mixed and moved after every 7-8 days on time interval. The Ward Wise calculation of Dry & Wet Waste is shown below:

Ward No. - 1

Population Of this Ward = 14,000

No. of Houses in the Ward = 3,520

Approx 250 gms/per capita/per day (cities with less than 1 lac population)

Total Waste = (255*14,000)/1000000 tonnes

Total Waste = 3570 Kg

Amount of waste generated = 3,570 Kg

The Wet waste collected from the total waste is 60%.

Therefore,

60% of 3,570 Kg = 2,142 Kg

The Dry waste collected from the total waste is 40%.

Therefore,

40% of 3,570 Kg = 1,428 Kg

Therefore, the amount of Wet waste = 2,142 Kg and Dry waste = 1,428 Kg from ward -1, that is 3570 Kg.

Ward No. – 2

Population of this Ward = 10,700

No. of Houses in the Ward = 2,400

Approx 250 gms/per capita/per day (cities with less than 1 lac population)

Total Waste = (255*10,000)/1000000 tonnes

Total Waste = = 2,728 Kg

Amount of waste generated = 2,728 Kg

The Wet waste collected from the total waste is 60%.

Therefore,

60% = 2,728 Kg = 1,636 Kg

The Dry waste collected from the total waste is 40%.

Therefore,

40% of = 2,728 Kg = 1,092 Kg

Therefore, the amount of Wet waste is 1,636 Kg and Dry waste is 1,092 Kg from ward -2, that is 2,728 Kg.

Ward No. – 3

Population of this Ward = 13,800

No. of Houses in the Ward = 1,200

Approx 250 gms/per capita/per day (cities with less than 1 lac population)

Total Waste = (255*13,800)/1000000 tonnes

Total Waste = 3,519 Kg

Amount of waste generated = 3,519 Kg
The Wet waste collected from the total waste is 60%.
Therefore,

60% of 3,519 Kg = 2,112 Kg

The Dry waste collected from the total waste is 40%.
Therefore,

40% of 3,519 Kg = = 1,407 Kg

Therefore, the amount of Wet waste is 2,112 Kg and Dry waste is 1,407 Kg from ward -3, that is 3,519 Kg.

Ward No. – 4

Population of this Ward = 11,700

No. of Houses in the Ward = 960

Approx 250 gms/per capita/per day (cities with less than 1 lac population)

Total Waste = (255*11,700)/1000000 tonnes

Total Waste 2,983 Kg

Amount of waste generated = 2,983 Kg
The Wet waste collected from the total waste is 60%.
Therefore,

60% of 2,983 Kg = 1,790 Kg

The Dry waste collected from the total waste is 40%.
Therefore,

40% 2,983 Kg = 1,193 Kg

Therefore, the amount of Wet waste is 1,790 Kg and Dry waste is 1,193 Kg from ward -4, that is 2,983 Kg.

Ward No. – 5

Population of this Ward = 12,000

No. of Houses in the Ward = 2,580

Approx 250 gms/per capita/per day (cities with less than 1 lac population)

Total Waste = (255*12,000)/1000000 tonnes

Total Waste = 3,060 Kg

Amount of waste generated= 3,060 Kg
The Wet waste collected from the total waste is 60%.
Therefore,

60% of 3,060 Kg = 1,836 Kg

The Dry waste collected from the total waste is 40%.
Therefore,

40% 3,060 Kg = = 1,224 Kg

Therefore, the amount of Wet waste is 1,836 Kg and Dry waste is 1,224 Kg from ward -5, that is 3,060 Kg.

Ward No. – 6

Population of this Ward = 14,000

No. of Houses in the Ward = 2,480

Approx 250 gms/per capita/per day (cities with less than 1 lac population)

Total Waste = (255*14,000)/1000000 tonnes

Total Waste 3,570 Kg

Amount of waste generated = 3,570 Kg
The Wet waste collected from the total waste is 60%.
Therefore,

60% of 3,570 K g = 2,142 Kg

The Dry waste collected from the total waste is 40%.
Therefore,

40% 3,570Kg = 1,428 Kg

Therefore, the amount of Wet waste is 2,142 Kg and Dry waste is 1,428 Kg from ward -6, that is 3,570 Kg.

Ward No. – 7

Population of this Ward = 19,500

No. of Houses in the Ward = 6,560

Approx 250 gms/per capita/per day (cities with less than 1 lac population)

Total Waste = (255*19,500)/1000000 tonnes

Total Waste = 4,972 Kg

Amount of waste generated = 4,972 Kg
The Wet waste collected from the total waste is 60%.
Therefore,

60% of 4,972 Kg = 2,983 Kg

The Dry waste collected from the total waste is 40%.
Therefore,

40% 4,972 Kg = 1,989 Kg

Therefore, the amount of Wet waste is 2,983 Kg and Dry waste is 1,989 Kg from ward -7, that is 4,972 Kg.

Discussion: Details of the waste Transportation system: -

The ULB has 16 compartmentalized (mini-truck) vehicles assigned for door-to-door collection of waste with capacity of 800 kg. Another 9 tractors are specially assigned for collection of waste specially from commercial and bulk waste areas. It is found that 100% collection of waste is practiced in the city. 75% of the waste is collected in the form of segregated waste. And the rest of the waste is segregated at the dumpsite by the rag-pickers implemented under DAY-NULM.

Ward wise average 250 to 400gms per capita waste is generated per day.

Conclusion:

1) Shrirampur Municipal Council has successfully accomplished the 100% collection of waste in the city limits and is working on 100% segregated waste collection. And ULB annually collects about 8,942.5 tons of treatable waste.
2) The ULB very well handles the process of degradation of wet waste which annually produces nearly about 1,500 tons to 1,600 tons of compost.
3) The obtained compost is self-consumed in some amount and the rest is given to the local farmers at cheap price.
4) The ULB is currently focusing on achieving the trademark of HARIT for the compost which can be further sold at good price and can be a good source of income in future. To accomplish the same, ULB has sent compost sample to the Mahatma Phule Krishi Viddhyapith, Rahuri.
5) Though the compost is still not certified but has effective and good responses received from the local authorities.
6) The dry waste in 100% recycled. And the Recycled waste is a good of revenue for the ULB.

7) They are currently focusing of cleaning of the legacy waste and have proposed very efficient techniques of waste remediation. And are working on implementing techniques like segregation (using machines), recycling (making fuel out of the plastic waste) and are working for betterment of the composting facilities.

Conflict of Interest statement: There is no conflict of Interest.

Funding statement: There is no funding for the project / research done.

Acknowledgement: I would like to thank Municipal Corporation of Shrirampur city and the people working at dumping area and processing unit for giving the information required to complete the project.

References:

1. Artz, N. S. (1990) "Integrated Solid Waste Planning for a Regional Area," Franklin Associates, Ltd., presented at the First U.S. Conference on Municipal Solid Waste Management, Washington, DC.
2. Barlaz, M., 1998: Carbon storage during biodegradation of municipal solid waste components in laboratory-scale landfills. *Global Biogeochemical Cycles*, 12(2), pp. 373-380.
3. Bernache-Perez, G., S. Sánchez-Colón, A.M. Garmendia, A. Dávila-Villarreal, and M.E. Sánchez-Salazar, 2001: Solid waste characterization study in Guadalajara Metropolitan Zone, Mexico. *Waste Management & Research*, 19, pp. 413-424.
4. Bingemer, H.G. and P.J. Crutzen, 1987: The production of CH_4 from solid wastes. *Journal of Geophysical Research*, 92(D2), pp. 2182-2187.

5. CalRecovery, Inc., 2005: Solid waste management. Report to Division of Technology, Industry, and Economics, International Environmental Technology Centre, UNEP, Japan, Vols. 1 and 2. <www.unep.or.jp/Ietc/Publications/spc/Solid_Waste_Management/index.asp>, accessed 13/08/07.
6. Cointreau, S., 2001: Declaration of principles for sustainable and integrated solid waste management, World Bank, Washington, D.C., 4 pp.
7. Chen, P.M.,G.D.France,and S.A.Sharpe (1992) "Financing Solid Waste Disposal Projects in the 1990s," presented by S. E. Howard at the National Conference of State Legislatures, Kansas City, MO.
8. Cointreau-Levine, S., 1994: Private sector participation in municipal solid waste services in developing countries, Vol.1, The Formal Sector. *Urban Management and the Environment*, 13, UNDP/UNCHS (United Nations Centre for Human Settlements), World Bank, Washington, D.C., 52 pp.
9. "Composting for Facilities Basics." EPA. Environmental Protection Agency. Web. 7 Mar. 2015. <http://www.epa.gov/epawaste/conserve/composting/basic.html.
10. Du, W., Q. Gao, E. Zhang, 2006a: The emission status and composition analysis of municipal solid waste in China. *Journal of Research of Environmental Sciences*, 19, pp. 85-90.
11. Du, W., Q. Gao, E. Zhang, 2006b: The treatment and trend analysis of municipal solid waste in China. *Journal of Research of Environmental Sciences*, 19, pp. 115-120.
12. "Eartheasy." Composting: A Guide to Making Compost at Home, Using Compost Tumblers, Bins & Other Composters. Web. 8 Mar. 2015. http://eartheasy.com/grow_compost.html.
13. "Environmental Problems: Landfills." LoveToKnow. Web. 7 Mar. 2015. <http://greenliving.lovetoknow.com/Environmental_Problems:_Landfills>.

14. "Full Cost Accounting for Municipal Solid Waste Management: A Handbook." Web. 8 Mar. 2015. <http://www.epa.gov/osw/conserve/tools/fca/docs/fca-hanb.pdf>.
15. "GAIA : Landfills." GAIA : Landfills. Web. 8 Mar. 2015. <http://www.no-burn.org/section.php?id=86>.
16. Giegrich, J. and R. Vogt, 2005: The contribution of waste management to sustainable development in Germany. Umweltbundesamt Report FKZ 203 92 309, Berlin.
17. Haith, Professor. "Solid Waste Engineering." , . 12 Feb. 2015. Lecture.
18. "History of RCRA | Wastes." EPA. Environmental Protection Agency. Web. 8 Mar. 2015. <http://www.epa.gov/solidwaste/laws-regs/rcrahistory.htm>.
19. Horning, C.(1991) "Laws Give New Shape to Solid Waste Contracts and Finance," Solid Waste & Power, vol. 5, no. 7.
20. Johannessen, L.M. and G. Boyer, 1999: Observations of solid waste landfills in developing countries: Africa, Asia, and Latin America. Report by Urban Development Division, Waste Management Anchor Team, World Bank, Washington, D.C.
21. Kaseva, M.E., S.B. Mbuligwe, and G. Kassenga, 2002: Recycling inorganic domestic solid wastes: results from a pilot study in Dar es Salaam City, Tanzania. *Resources Conservation and Recycling*, 35, pp. 243-257.
22. Lee,W.B.,and E.T.Ashdown (1992) "Financing Waste Facilities during the Credit Crunch,"World Wastes, vol. 35, no. 3.
23. MacCarthy,R.N.(1991) "Financing Recycling Facilities," Waste Age, vol. 22, no. 3.
24. "Municipal Solid Waste." EPA. Environmental Protection Agency. Web. 7 Mar. 2015. <http://www.epa.gov/epawaste/nonhaz/municipal/>.

25. "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012." Web. 7 Mar. 2015. <http://www.epa.gov/solidwaste/nonhaz/municipal/pubs/2012_msw_fs.pdf>.
26. NSWMA (1992) The Cost to Recycle at a Materials Recovery Facility, National Solid Wastes Management Association.
27. Ojeda-Benitez, S., and J.L. Beraud-Lozano, 2003: Characterization and quantification of household solid wastes in a Mexican city. *Resources, Conservation and Recycling*, 39(3), pp. 211-222.
28. Ollis, R.W. (1992) "Financing Recycling Programs," Waste Age, vol. 23, no. 3. Turbeville,W. C. (1990) "Cutting Waste Facility Finance Costs," Waste Age, vol. 21, no. 5.
29. Shrirampur Municipal Council.
30. Thorneloe, S., K. Weitz, S. Nishtala, S. Yarkosky, and M. Zannes, 2002: The impact of municipal solid waste management on greenhouse gas emissions in the United States. *Journal of the Air & Waste Management Association*, 52, pp. 1000-1011.
31. Thorneloe, S., K. Weitz, and J. Jambeck, 2005: Moving from solid waste disposal to materials management in the United States. Proceedings of the Sardinia '05, International Solid and Hazardous Waste Symposium, published by CISA, University of Cagliari, Sardinia
32. "Waste Business Journal." WBJ Weekly News Bulletin: Week of Oct. 3-9, 2012 Story: 1. Web. 9 Mar. 2015. <http://www.wastebusinessjournal.com/news/wbj20121003A.htm>.

Tables:

Details of the waste from all the 7 wards:

Ward No.	Name of Ward Incharge	Contact No. of Ward Incharge	Present Population	No. of Houses	Expected Dry waste in TPD	Expected Wet Wastes in TPD
1	Madan Bagde	9139000902	14,000	3,520	2.1 TPD	2.7 TPD
2	Rupesh Karosiya	9359455829	10,700	2,400	1.6 TPD	1.3 TPD
3	Subhash Shelke	9284478260	13,800	1,200	2.3 TPD	2.7 TPD
4	Subhash Shelke	9284478260	11,700	960	1.4 TPD	1.4 TPD
5	Dilip G. Gaikwad	8237365412	12,000	2,580	1.8 TPD	2.5 TPD
6	Dilip G. Gaikwad	8237365412	14,000	2,480	2.1 TPD	2.7 TPD
7	Pralhad Jadhav	9767527829	19,500	6,560	2.7 TPD	2.7 TPD
TOTAL =			**95,700**	**19,700**	**14 TPD**	**16 TPD**

Table 1: Expected amount of waste according to 250 gms. per person formula**.**

Sr. No.	Ward No.	Population	Amount of Wet Waste	Amount of Dry Waste	Amount of Total Waste
1	Ward -1	14,000	2,142Kg	1,428Kg	3570 Kg.
2	Ward -2	10,700	1,636 Kg	1,092Kg	2,728 Kg.
3	Ward -3	13,800	2,112 Kg	1,407Kg	3,519 Kg.
4	Ward -4	11,700	1,790 Kg	1,193 Kg	2,983 Kg.
5	Ward -5	12,000	1,836 Kg	1,224 Kg	3,060 Kg.
6	Ward -6	14,000	2,142 Kg	1,428 Kg	3,570 Kg.
7	Ward -7	19,500	2,983 Kg	1,989 Kg	4,972 Kg.
Total		**95700**	**14641 Kg**	**9761 Kg**	**24402Kg**

Table 2: Actual amount of waste generated

Sr. No.	Ward No.	No. of Gates Giving Segregated waste	No. of Gates Giving Mixed waste	Total No. of Gates	Whether mixed waste is collected in separate bag? (Yes/No)
1	Ward- 1	450	00	450	**Yes**
2	Ward-2	304	75	380	**Yes**
3	Ward-3	230	00	230	**Yes**
4	Ward-4	195	00	195	**Yes**
5	Ward-5	290	76	365	**Yes**
6	Ward-6	410	00	410	**Yes**
7	Ward-7	530	00	530	**Yes**
Total =	**07**	**2409**	**151**	**2560**	**Yes**

Table 3: Details of gates where waste is ward wise collected

Sr. No.	Ward No.	Population	Amount of Plastic waste Generated	Amount of Plastic waste Processed
1	Ward -1	14,000	1.2 Kg	1.2 Kg
2	Ward -2	10,700	2 Kg	2 Kg
3	Ward -3	13,800	1 Kg	1 Kg
4	Ward -4	11,700	0.8 Kg	0.8 Kg
5	Ward -5	12,000	0.9 Kg	0.9 Kg
6	Ward -6	14,000	1 Kg	1 Kg
7	Ward -7	19,500	1.3 Kg	1.3 Kg
Total		**95,700**	**8.2 Kg**	**8.2 Kg**

Table 4: Details of dry waste generated and treated daily

Ward No.	Population	Amount of Wet Waste Generated	Amount of Total Wet Waste Collected	Amount of Wet Waste sent for Composting
Ward -1	14,000	2,142Kg	2,142Kg	1,714 Kg
Ward -2	10,700	1,636 Kg	1,636 Kg	1,309 Kg
Ward -3	13,800	2,112 Kg	2,112 Kg	1,690 Kg
Ward -4	11,700	1,790 Kg	1,790 Kg	1,432 Kg
Ward -5	12,000	1,836 Kg	1,836 Kg	1,469 Kg
Ward -6	14,000	2,142 Kg	2,142 Kg	1,714 Kg
Ward -7	19,500	2,983 Kg	2,983 Kg	2,347 Kg
Total	**95,700**	**14,355 Kg**	**14,355 Kg**	**11,675 Kg**

Table 5: Summary of wet waste collected and sent for composting

Sr. No.	Date	Total Wet Waste	Total Waste processed	Bin No.	Compost Quantity in tons
1	5/2/2021	18 tons	18 tons	3	3.5
2	10/2/2021	24 tons	24 tons	3	3.6
3	15/2/2021	22 tons	22 tons	5	2.4
4	20/2/2021	16 tons	16 tons	5	3.4
5	25/2/2021	21 tons	21 tons	4	2.5
6	1/3/2021	23 tons	23 tons	4	1.5
7	6/3/2021	19 tons	19 tons	6	3.5
8	11/3/2021	25 tons	25 tons	6	3.5
9	16/3/2021	22 tons	22 tons	2	3.5
10	21/3/2021	19 tons	19 tons	2	2.5
11	26/3/2021	26 tons	26 tons	1	3.4
12	31/3/2021	22 tons	22 tons	1	2.3
13	5/4/2021	25 tons	25 tons	7	3.5
14	10/4/2021	20 tons	20 tons	7	3.3
15	15/4/2021	26 tons	26 tons	8	2.8
16	20/4/2021	24 tons	24 tons	9	3.6
17	25/4/2021	18 tons	18 tons	8	3.2
18	30/4/2021	24 tons	24 tons	9	2.8
19	5/5/2021	22 tons	22 tons	10	2.8
20	10/5/2021	16 tons	16 tons	11	3.5
21	15/5/2021	21 tons	21 tons	10	3.1
22	20/5/2021	23 tons	23 tons	11	3.9

Table 6: Details of compost generated (for reference)

Figures:

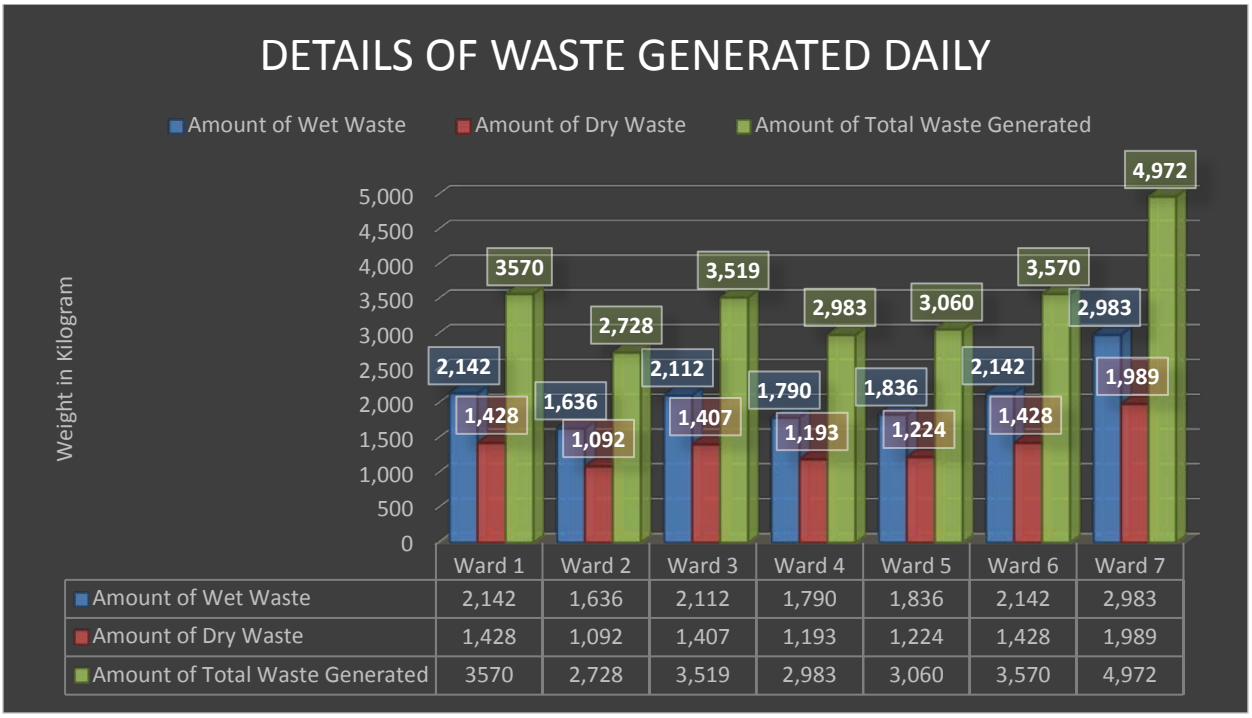

Figure 4: Details of waste generated daily

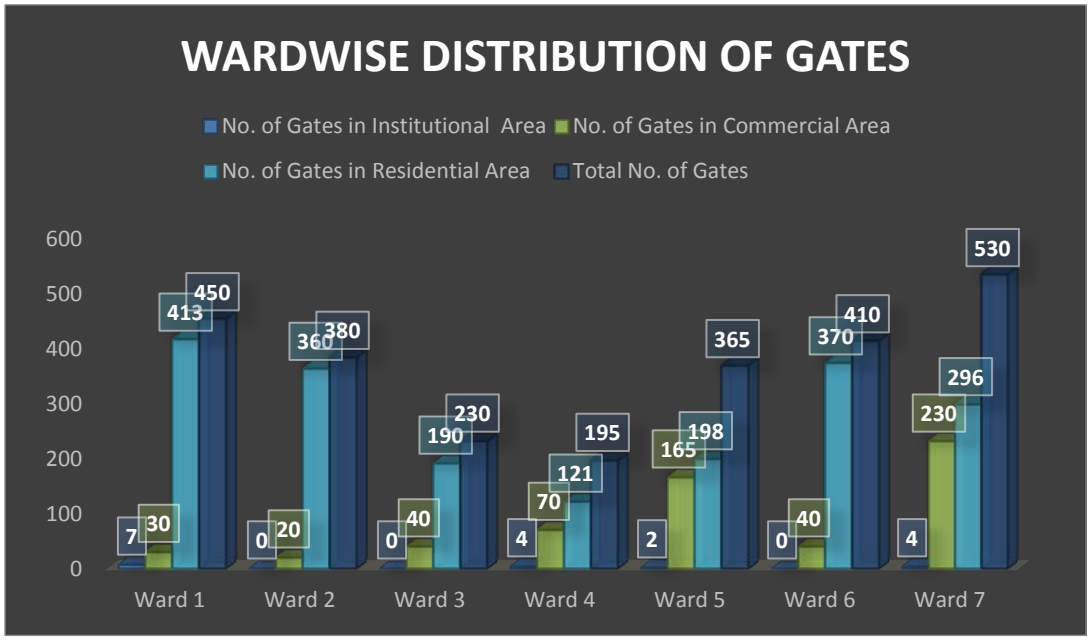

Figure 5: Ward wise distribution of gates

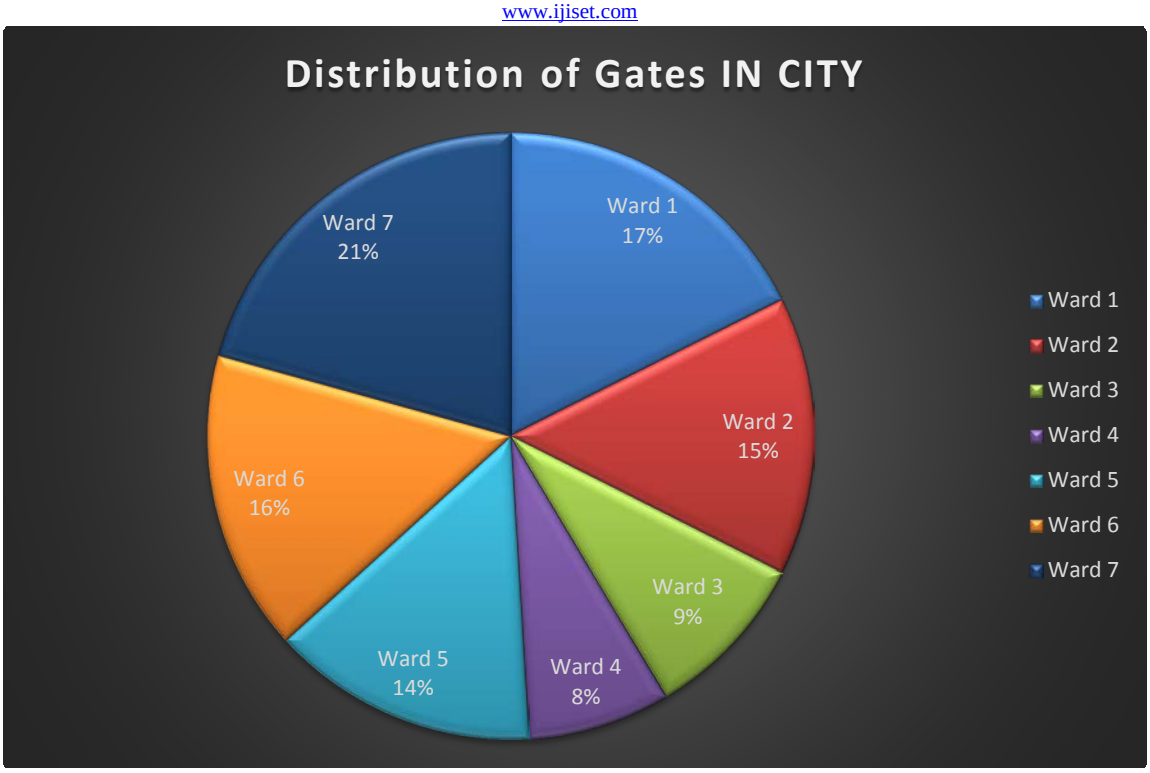

Figure 6: Distribution of collection gates in the city

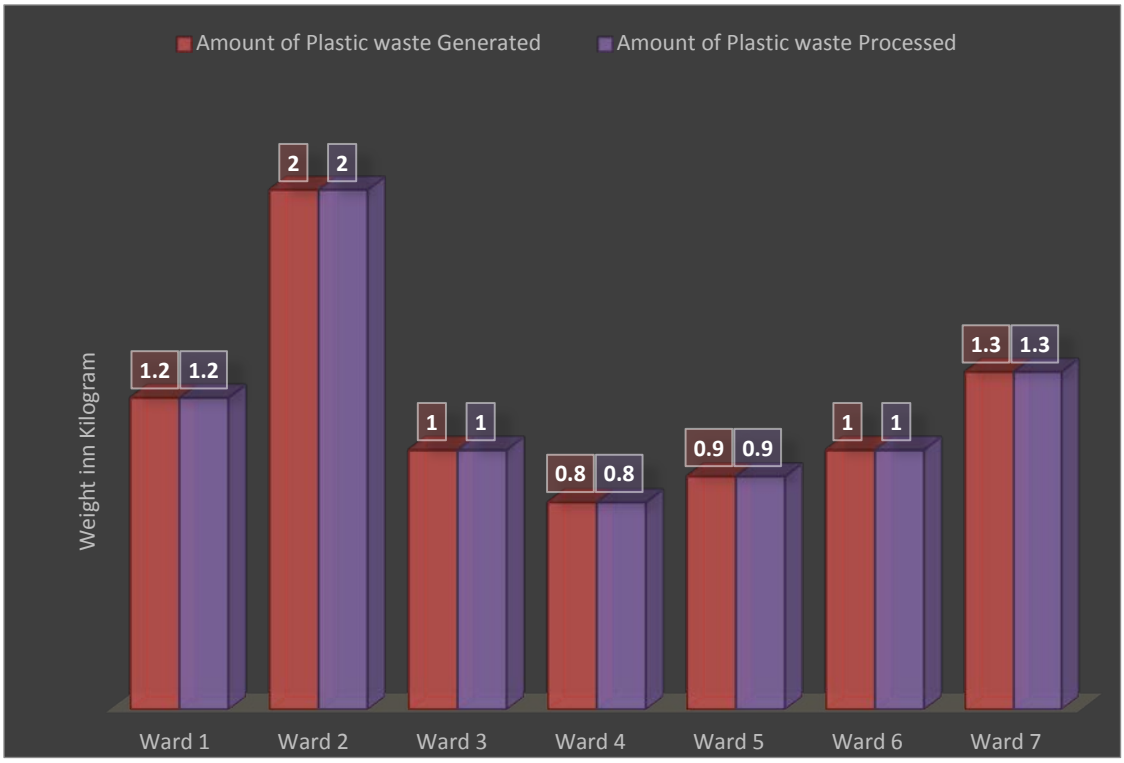

Figure 7: Details of Dry waste generated ward wise

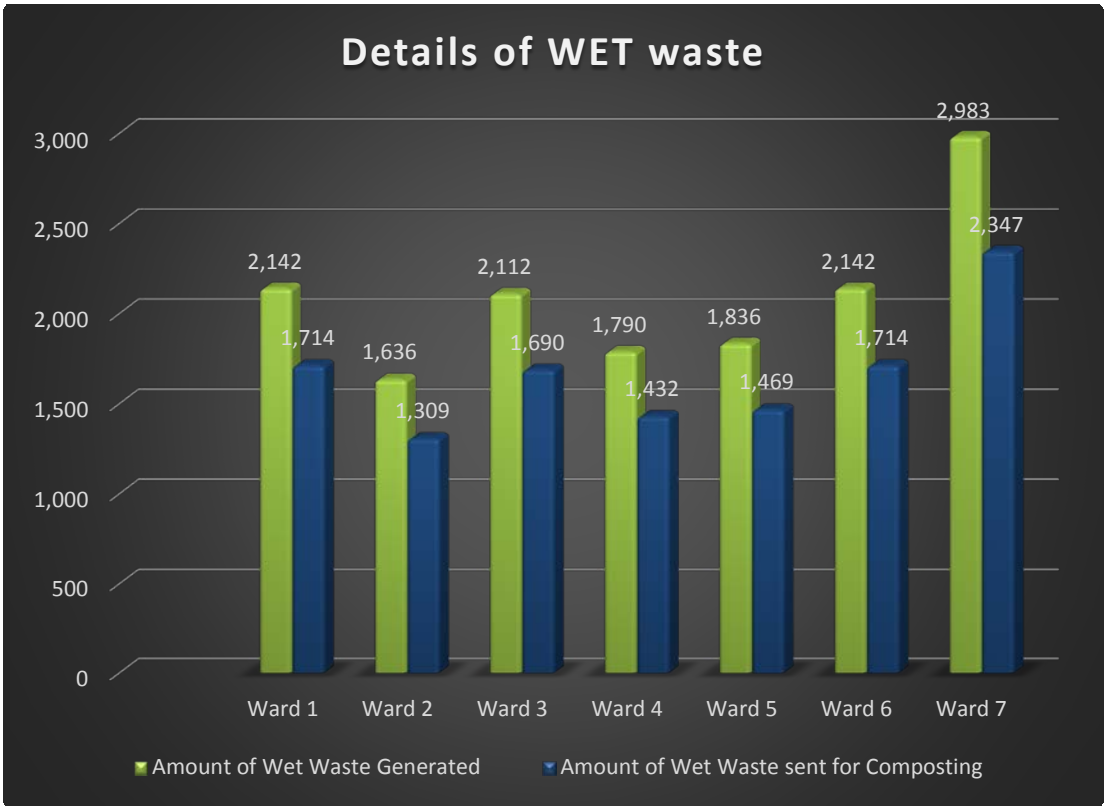

Figure 8: Details of wet waste generated

Figure 9: Segregation of Dry waste at dumpsite using MRF facility

Figure 10: The ready compost