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Review Article

Status, Difficulties and Management of Waste in Maharashtra: A Review

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Abstract

Rapid Urbanization method display several challenges before coming up with authorities. Government, native administration tried and is attempting their limit to produce all basic amenities to the current population. whereas doing therefore, one troublesome challenge before administration is to manage waste generated by this massive population. Solid waste generation could be a regularly growing drawback at international, regional and native levels. Solid wastes area unit those organic and inorganic waste materials made by numerous activities of the society, that have lost their worth to the primary user. The quantity, difficulties and waste management practices in municipal solid waste management (MSWM) in Maharashtra state of India is inspiration behind to present study. In this paper, an attempt is made to find current statue of quantity of solid waste generated in various municipal corporation, its collection and management practices. Quantity wise analysis has been made across municipal corporations and details has been reported. The parameters of MSWM is also mentioned. The study concludes that solid waste can be utilizes for many purposes and revenue can be generated, also advancement methods can be adopted to increase output and benefits.

Keywords: *Population; Solid Waste; Generation; Collection Methods; Management; Recycling*

Introduction

Maharashtra is a state in the western peninsular district of India involving a significant bit of the Deccan Plateau. It is the second-most crowded state and third-biggest state by zone in India. Spread more than 307,713 km^2 (118,809 sq. mi), it is flanked by the Arabian Sea toward the west, the Indian conditions of Karnataka and Goa toward the south, Telangana toward the southeast and Chhattisgarh toward the east, Gujarat and Madhya Pradesh toward the north and the Indian association domain of Dadra and Nagar Haveli toward the north west. It is likewise the world's second-most crowded subnational element [1].

In the state of Maharashtra there are total 271 local bodies, comprising of 27 Municipal Corporations, 16- 'A' Class Municipal Council, 54- 'B' Class Municipal Council, 154- 'C' Class Municipal Council, 14- Nagar Panchayat, 06-Cantonment Board generating about 22897.83 MT of municipal solid waste every day, of which the contribution in terms of percentage by the corporation is 84.72%, by A class council is 4.25%, by B class council is 5.04%, by C Class Council is 5.07% and by Others is 0.96%. The overall percentage of treatment is 34.70% i.e. 7945.544 MT/day quantity is treated and the remaining is disposed in an unscientific manner. Out of 27 Municipal corporations, 24 Corporations have obtained Authorization from MPCB for 22 Nos of approved sites having processing and disposal facilities and same are in operations. 109 Nos. of Municipal Councils having partially processing and disposal facilities. A summary statement of all local bodies indicating class, populations, Quantum of Solid Waste generations, status of Authorization and Form-II submission by the local bodies.

The Region wise abstract along with summary statement in the state of Maharashtra is enclosed. The total generation of Solid Waste is 22897.83 MT/day in which terms of total waste generation in the corporation is 84.72%, A class council is 4.25%, B and C Class Council is 5.04% and 5.07% respectively and others is 0.96% [2].

Waste generation scenario

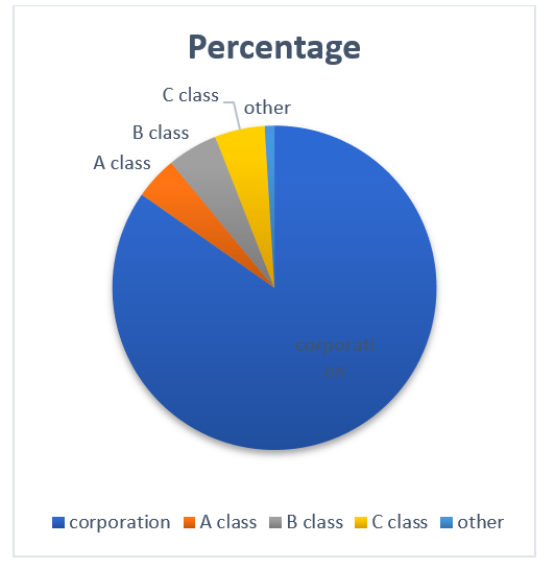

Figure 1: *Percentage wise waste generation.*

Region	Population	Corporation	"A" class	"B" class	"C" class	NP/cant./other
Mumbai	1,39,58,608	7500	-	-	-	-
Navi Mumbai	15,05,620	750	-	-	11	-
Thane	50,57,579	1890	-	36	3	-
Kalyan	32,24,831	1560	221	-	-	14.5
Raigad	7,50,462	90	-	28	61.96	-
Kolhapur	21,25,369	420	140	104	105.25	15.5
Pune	82,16,264	3315	143	171.46	175.515	98
Nashik	54,15,838	1268	98	286.4	174.4	70.78
Amravati	24,07,039	420	30	164.1	115.4	-
Aurangabad	49,95,647	948	188	150.03	308.41	21.5
Nagpur	34,38,543	1100	112	92	70	-
Chandrapur	13,45,775	140	43	115.23	121.39	-
Total	524,41,575	19401.0	975	1155.22	1146.325	220.28

Table 1: *Municipal solid waste generation (MT/day) in the state of Maharashtra (MPCB-2017-18).*

Corporation	19401	84.72%
A class	975	4.26%
B class	1155.22	5.04%
C class	1146.325	5%
Other	220.28	0.96%
Total	22897.83	100%

Table 2: *Corporation waste generation.*

Positing of Maharashtra in waste generation

Maharashtra retained its title as the country's largest generator of solid waste in 2017. In an estimated generation of 22,570 metric tonnes of solid waste in Maharashtra per day as of November 2017. In 2015, Maharashtra also ranked number one in solid waste generation, with around 26,820 metric tonnes per day (mt/d) [3].

Tamil Nadu, Uttar Pradesh, Delhi and Gujarat followed the state in 2017. The total solid waste generated by the country in 2017 amounted to 1,45,626 mt/d. Moreover, the state's capital, Mumbai contributed around 41 per cent of the state's per day solid waste generation. As per the data by the civic body's Environment Status Report 2016-17, 9,400 mt of solid waste is generated every day out of which only 3 per cent is plastic. There has been an increase in transparency of recording the waste collected from households in Maharashtra. We have the highest number of urban bodies - around 260. Out of this, we have 26 municipal corporations, the highest in any state. The waste-collection mechanism in the state is the most effective with around 90 per cent of waste collection ensured. The MPCB has claimed that out of 22,570 metric tonnes of waste that were generated daily, around 1,000 - 1,500 constitute plastic waste, A large portion of the plastic waste comes from packaging [4].

Solid waste management (SWM) experts have said there is a need to address the crisis of mismanagement of solid waste in the state. Under the Swachh Bharat Mission, the Centre had released Rs 200 crore for the SWM for Maharashtra for 2017-18. Although urban cities can limit their solid waste generation, it is important to address whether the waste is disposed or recycled properly. Till now, the SWM Rules, 2016 has not being followed accurately and the city's dumps are being flooded with waste without proper segregation [5].

Composition and characteristics of MSW

Composition and characteristics of Maharashtra municipal solid waste Following major categories of waste are generally found in MSW of Maharashtra [16]:

- Biodegradable Waste: Kitchen waste, leaves and grasses, meat, vegetables and fruits, dead plants etc.
- Recyclable Material: Paper, glass, bottles, cans, metals, certain plastics, etc.
- Inert Waste Matter: C&D, dirt, debris.
- Composite waste: Waste clothing, Packaging materials, waste plastics such as bottles.
- Domestic Hazardous Waste (also called "household hazardous waste") and toxic waste: Waste medicine, e-waste, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, and shoe polish.

MSW in India has approximate [6]

Sr. no.	Waste type	Percentage
1	Compostable	40 - 60%
2	Inert Waste	30 - 50%
3	Recyclable	10% to 30%

Table 3: *Waste composition.*

Sr. no.	Chemical parameter	Percentage
1	Nitrogen content	0.64 ± 0.8%
2	Phosphorus	0.67 ± 0.15%
3	Potassium	0.68 ± 0.15%
4	C/N ration	26 ± 5%

Table 4: *Chemical composition of waste.*

Waste collection and disposal

Waste collection

Isolation: There is no sorted out and logically arranged isolation of MSW either at family level or at network receptacle. Arranging of waste, is generally cultivated by chaotic division and only here and there rehearsed by squander makers. Isolation and arranging take puts under extremely risky and dangerous conditions and the adequacy of isolation is sensibly low as chaotic division isolates just significant disposed of constituents from squander stream which can promise them similarly higher financial return in the reusing market [7]. On various events, because of ill-advised taking care of the isolated constituents got stirred up again during transportation and transfer (CPCB Report, 2013). Absence of isolation deny legitimate logical transfer of waste.

Assortment waste: Created by houses is typically moved into collective containers that are manufactured from metal, produced using concrete or in mix of both. Road sweepings additionally discover its approach to network containers. These people group squander containers are likewise utilized by other fundamental business divisions in the region of transfer receptacles alongside family squander aside from where some business buildings or modern units draw in metropolitan experts for move of their loss to transfer site by paying some sum.

Reuse/reuse: This involves exercises like gathering those materials from the waste, which could be beneficially recovered and used for making new items. Since unsegregated waste is dumped at network canisters, its ideal reusing is preposterous. Be that as it may, cloth pickers typically sifted through and took and sell recyclable material like plastics, glass, and so on.

Transportation modes of transportation for MSWM rehearsed in India: Are Bullock trucks, hand rickshaws, compactors, trucks, tractor, trailers, and dumpers. In littler towns trucks having 5 - 9 ton limit is utilized without satisfactory spread framework. Stationary compactors, portable compactors/shut beats, and canvas shrouded vehicles are utilized in the transportation of MSW and around 65, 15, and 20% of waste is shipped through these compacters, separately. The upkeep of vehicles utilized in for transportation of waste is normally done in workshop run by ULBs yet a large portion of these workshops can do minor fixes as it were. No big surprise, in case of breakdown of these vehicles, the general assortment, transportation and transfer proficiency diminishes definitely. Just hardly any exchange stations can be found in some metropolitan for example Mumbai.

Waste disposal

Disposal in India, almost every city, town, or village adopted unscientific disposal of MSW. The existing practice and technology availability for MSWM for 59 cities have been indicated in figure. Among these cities, 40 cities have shown increase in waste generation, 7 cities show reduction, and it was more or less same for 6 cities. Though there was an increase in population during the decade for these cities, no significant reason was indicated by author for reduction as well as equal amount in waste generation for these cities. However, the possible reason for reduction could be that the waste generated could not reach the designated dumping site and was lost in the city's peripherals, outskirts, along the road, low lying area, along the drain, green areas, etc. Data reveal that uncontrolled open dumping is a common feature in almost all cities. The following disposal practices are in use in hierarchy.

Bio-methanation

Bio-methanation Technology may be a process of anaerobic digestion (AD) which implicates the decomposition of organic matter with the assistance of micro-organisms in oxygen-free surroundings and two major by-products might be achieved, one is biogas containing 60 - 65% methane and other one may be a digested organic sludge with high nutrients contain, used as a fertilizer. MSW with the main fractions of organic waste like garbage, green waste, vegetable waste, market waste, kitchen waste, canteen waste, agricultural waste etc. are the potential feedstocks for AD for biogas production. India becomes the second highest populated country within the world, next to China and 70% of the population depends on agriculture for his or her livelihood. Thanks to rapid climb of urbanisation and populations amount of MSW increases rapidly. It's reported that 85% of total MSW is coming from domestic households and within that 51% is organic waste. Waste management becomes tougher job for developing country like India and within the aspects of minimisation of such problems; waste to energy is that the best choice. Bio-methanation also as AD for biogas production from organic fraction of MSW is one among the foremost socio-economical treatment processes among the opposite biochemical treatment technologies [8].

Vermicomposting

Vermicomposting may be a green technology that converts organic wastes into plant available nutrient rich organic fertilizer. It's also found to scale back heavy metal concentration in contaminated feeding materials. Vermicompost (VC), when used as fertilizer, not only bears positive impact on soil quality, plant growth and yield but also enhances nutritional value of crops produced. Use of VC on soil improves its physiochemical (aggregation, stability, pH, EC, bulk density, water holding capacity (WHC), organic matter (OM), micro- and macro- nutrients.) and biological properties (microbial population, enzymes). It also increases soil structural stability and reduces vulnerability of soil to calamities like erosion. Use of VC in plant growth enhances their development in early also as latter stages of plant growth but proper concentration of VC must be considered for optimum plant growth and production [9].

Thermal composting

Heat, which is extremely important in rapid composting, is supplied by the respiration of the microorganisms as they break down the organic materials. to stop heat loss and to create up the amount of warmth necessary, a minimum volume of fabric is essential: a pile a minimum of 36" x 36" x 36" is suggested. If but 32", the rapid process won't occur. Heat retention is best in bins than in open piles, so rapid composting is simpler if bins are used. additionally, the utilization of bins is far neater. High temperatures favour the microorganisms which are the foremost rapid decomposers; these microorganisms' function at about 160°F (71°C) and an honest pile will maintain itself at that temperature. A thermometer to live temperatures inside the pile is useful although not necessary [10].

Advantages of the thermal composting system include:

1. The assembly of a valuable soil amendment from many organic materials which normally might be wasted.
2. Compost are often doing to be used in as short a time as 14 to 21 days.
3. Thermal composting kills all disease producing organisms if done as described. It does not inactivate heat resistant viruses such as mosaic virus.

4. Insects don't survive the composting process. Though some could also be interested in the pile, if they lay their eggs within the compost the desire destroys them.
5. Most weeds and weed seeds are killed. Some weeds like oxalis bulbs, seeds of burr clover, some *Amaranthus* seeds and seeds of cheese weed isn't killed by the high temperatures within the pile.

Mechanical composting

Though manual methods are preferable in countries where labour is relatively cheap, mechanical processes are preferred (Gotaas 1956) where higher labour costs and limitations of space exist. In 1922, Becari in Italy patented a process employing a combination of aerobic and anaerobic decomposition in enclosed containers. the primary full-scale plant was established in 1932 within the Netherlands by a non-profit utility company-VAM using Van Maanen Process during which raw refuse is composted in large windrows, which are turned at intervals by mobile cranes moving on rails. The Dano Process was developed in Denmark in 1930. Several other processes were subsequently developed using different methods of processing of solid waste using different designs of digester.

The waste is thus subjected to size reduction when the area per unit weight is increased for faster biological decomposition. Size reduction also helps in reducing fly breeding within the decomposing mass. This is often commonly administered either in Hammermills or Rasp mills. Hammermills are high speed (600-1200 revolutions per minute) compact machines but consume large energy. Rasp mills are slow moving large units that need lesser energy. The cost of capital of a hammer mill is a smaller amount but its operating expense is quite that of a rasp mill mainly thanks to the larger energy requirement also as more frequent replacement/retipping of hammers. The stabilisation is administered in open windrows provided over flagstone paved or cement concrete paved ground. These windrows are turned every 5 days to make sure aerobic decomposition. Various sorts of equipment like front loaders/windrows re-shifters are used for turning of windrows. At the top of the three to 4 weeks period, the fabric is understood as green or fresh compost wherein the cellulose has not been fully stabilised. it's hence stored in large sized windrows for 1 - 2 months either at the plant or the farms. At the top of the storage period, it's referred to as ripe compost. it's going to be sometimes subjected to size reduction to suit vegetable garden and horticulture requirements [11].

Pyrolysis/Gasification

Pyrolysis has been examined as a beautiful alternative to incineration for municipal solid waste (MSW) disposal that permits energy and resource recovery; however, it's seldom been applied independently with the output of pyrolysis products as end products. The state-of-the-art of MSW pyrolysis with regard to its technologies and reactors, products and environmental impacts. In this review, first, the influence of important operating parameters like final temperature, heating rate (HR) and duration within the reaction zone on the pyrolysis behaviours and products; then the pyrolysis technologies and reactors adopted in literatures and scale-up plants are evaluated. Third, the yields and main properties of the pyrolytic products from individual MSW components, refuse derived fuel (RDF) made up of MSW and MSW are summarised. within the fourth section, additionally to emissions from pyrolysis processes, like HCl, SO_2 and NH_3, contaminants within the products, including PCDD/F and heavy metals, also are reviewed, and available measures for improving the environmental impacts of pyrolysis are surveyed. It is often concluded that the only pyrolysis process is an efficient waste to energy convertor but isn't a guaranteed clean solution for MSW disposal. supported this information, the prospects of applying pyrolysis technologies to handling MSW are evaluated and suggested [12].

Crushing of food waste

The efficiency of the anaerobic degradation process depends on an efficient system of crushing.

Crusher is an electrical garbage disposer that rids you, of all that unhealthy waste instantly. It disposes off the garbage that's fed into its metal chamber. The heavy-duty blades grind the rubbish in seconds into fine particles and fail down the drain that gives a really clean and

healthy environment. Crusher ensures the foremost hygienic means of waste disposal. Crusher is most hygienic and easier to use which contributes to a healthier environment. It's been designed and built to resist the main explanation for disposer - failure: corrosion and to stay jamming to an absolute minimum. Crusher provides an absolute advantage and protection to each commercial kitchen from drainage blocks, clogging of drains and disease-causing bacteria, which is why disposers like crusher form such a crucial a part of homes world-wide. Garbage disposers allow you to scrub your food scraps and leftovers down the drain. It's an easy, efficient and economical thanks to eliminate your garbage. The operator merely has got to push the food scraps and leftovers down the drain and flip the switch to grind the waste into tiny particles which will easily wash down the drain. Food-waste disposers reduce the quantity and weight of your total waste, saving you money on hauling, liners and labour. Food-waste disposers are simple to work. Just push the waste into the opening and while running cold water, activate the unit. to form sure all the garbage is weakened into minute pieces which will easily flow into the sewage system; the shredder rings on all food-waste disposers have four machine-ground primary-action breaker bars and secondary-action grinding teeth. The 2 hardened chrome steel cutter blocks are replaceable and may be indexed to supply new cutting edges. Servicing food-waste disposers is equally easy. Removing the motor may be a simple matter of removing the bolts-four on the compact and medium-size models that anchor it to the grind chamber. No free rides to stop garbage from "riding" on the middle, continuously spinning around without being processed, the flywheel features a breaker blade mounted at the middle, accelerating the grinding action of the disposer. To further make sure that the garbage is reduced to an appropriate size before passing to the drain line, the Ni-Resist flywheel has slots that undercut the shredder ring [13].

Waste management

Maharashtra is one among the urbanized states within the country. The state has total 271 Nos. of Local Bodies. Urban Development Department, Government of Maharashtra has decided that Local body shall utilized 56.5% of total granted fund within the 12th Finance Commission and from JNNURM for effective implementation of Solid Waste Management Rules. The Bio-medical waste and industrial hazardous waste generated within the area of local bodies isn't mixed with MSW and such waste is disposed of separately in accordance with provisions made under BMW Management Rules, 2016 and unsafe and Other Wastes [14]. For the disposal of Hazardous waste, common Hazardous waste treatment and disposal facility are developed within the State (4 nos.). For the disposal of the Bio-medical waste, Common Bio-medical waste treatment facilities are provided (36 nos.). The main constraint for the effective implementation of MSW Rules and fixing of waste processing facility for local bodies is non-availability of suitable land. Considering the constraint, the Urban Development Dept, Govt of Maharashtra has passed order regarding formation of District level committee in every District under the Chairmanship of District Collector. the most object of district level committee is to spot and select waste processing and landfill sites. The Committee comprises of 11 members of varied concerned department. The District level committee while identifying the acceptable location for landfill and waste processing site, a care is taken that the location should be far away from habitation clusters, forest, water bodies, monuments, wet lands and places of important cultural, historical and non-secular aspect including CRZ areas [4]:

1. Out of 271 ULBs within the State of Maharashtra, most of the local bodies have adopted composting methodologies to a part of waste and rest goes for dumping.
2. Municipal Corporation of Greater Mumbai started Bio-Reactor Landfills.
3. Site of capacity 3000 MT/Day at Kajur MSW Site.
4. Pune and Kolhapur Municipal Corporation has started the waste to energy plant.
5. Aurangabad Municipal Corporation has proposed to put in waste to energy plant.
6. Pune Municipal Corporation has adopted decentralized waste processing approach. they need provided following decentralized processing facility at different location.

Sr. No.	Name of ULB	MSW Treated Qty/Day	MSW Processing facility
1	Municipal Corporation of Greater Mumbai	3000.0	Bioreactor landfill, composting, RDF, Leachate treatment
1	Navi Mumbai M. Corporation.	750.0	Segregation, Aerobic Composting, RDF, Plastic recycling and Leachate treatment system, SLF
2	Uran M. Council	2.0	Composting and Vermicomposting, RDF
1	Thane M. Corporation	60.0	Bio Methanation
2	Mira-Bhayander M. Corporation	40.0	Segregation, RDF and Dumping
3	Vasai Virar City M. Corporation, Palghar M. Council, Jawahar M. Council	Nil	Dumping
4	Dahanu M. Council	Nil	Composting
1	Kalyan Dombivali M. Corporation.	29.0	Bio-methanation Composting. 930 KVA W to E Plant
2	Bhiwandi Nizampur City Mun. Corporation.	Nil	Dumping
3	Ulhasnagar M. Corporation	8	Composting
4	Ambernath M. Council.	3.0	Vermicomposting
5	Kulgaon Badlapur M. Council	37	Bio Methanization and composting
6	Murbad Nagarpanchayat, Shahapur Nagarpanchayat	Nil	Dumping
1	Khopoli M. Council	6.0	Bio Methanation
2	Panvel M. Corporation	90.0	Composting, SLF
3	Matheran M. Council	5.2	Bio Methanation
4	Roha M. Council	2.6	Bio Methanation
5	Karjat M. Council	6.0	Composting, Vermicomposting
6	Murud Janjira M. Council, Mahad M. Council, Shriwardhan M. Council, Pen M. Council, Alibag M. Council	Nil	Dumping
1	Kolhapur M. Corporation.	107.0	Composting, Bio Methanization, RDF, Waste to Energy (0.2 MW)
2	Chiplun M. Council.	5.0	Composting
3	Khed M. Council	2.5	Bio Methanation
4	Dapoli Nagar Panchayat	3.0	Bio Methanation, (3.0 T/D)
5	Malvan M. Council, Ratnagiri M. Council	Nil	Dumping
6	Rajapur M. Council	1.1	Vermicomposting
7	Sawantwadi M. Council	5.0	Composting and Vermicomposting
8	Kankwali Nagar Panchayat	Nil	Dumping
9	Vengurla M. Council	3.0	Composting, Vermicomposting, RDF and Power generation

10	Ichalkaranji M. Council	40.0	Composting
11	Kurundwad M. Council	2.80	Composting
12	Kagal M. Council	8.5	Vermicomposting, Waste to Energy (0.5 MW)
13	Gadhinglaj M. Council	4.0	Vermicomposting, composting
14	Malkapur M. Council	Nil	Dumping
15	Panhala Hill Station M. Council	0.504	Composting
16	Vadgaon M. Council	3.0	Composting
17	Jaysingpur M. Council	Nil	Dumping
18	Sangli Miraj Kupwad M. Corporation	70.0	Composting
19	Urun Islamapur M. Council	18.0	Composting Vermicomposting
20	Vita M. Council	15.0	Composting Vermicomposting, RDF
21	Ashta M. Council	3.5	Composting
22	Tasgaon M. Council, Jath M. Council	Nil	Dumping
23	Guhagar Nagar panchayat	1.0	Composting
1	Baramati M. Council	19.0	Composting, Bio Methanation
2	Indapur M. Council, Jejuri M. Council, Daund M. Council	NIL	Dumping
3	Bhor M. Council	3.5	Vermicomposting, composting
4	Saswad M. Council	12.3	Composting
5	Pune M. Corporation	1078.0	Composting, Vermicomposting RDF,25 Bio Methanation plant, Waste to Energy.
6	Dehu Road Cantonment Board	8.0	Composting
7	Khadki Cantonment Board	12.0	Composting
8	Pune Cantonment Board	20.0	Vermicomposting, Landfill
9	Junnar M. Council	5.8	Composting
10	Pimpri Chinchwad M. Corporation	470.0	Mechanical Composting, Vermicomposting RDF, waste to energy plant is under installation.
11	Satara M. Council	18.0	Composting
12	Karad M. Council	32.5	Bio Methanization, Pit Compositing
13	Wai M. Council	5.60	Composting
14	Mahabaleshwar M. Council	4.2	Composting
15	Panchgani M. Council	7.2	Composting
16	Rahimatpur M. Council	1.2	Vermicomposting
17	Phaltan M. Council	5.2	Composting
18	Mhaswad M. Council	2.0	Vermicomposting
19	Solapur M. Corporation	150.0	Waste to Energy

20	Barshi M. Council, Shirur M. Council, Dudhani M. Council, Mangalwedha M. Council, Maindargi M. Council, Sangola M. Council, Chakan M. council, Rajgurunagar M. council, Kurduwadi M. Council, Karmala M. Council	Nil	Dumping
21	Akkalkot M. Council	7.95	Composting
22	Talegaon Dabhade M. Council	18.0	Composting, Vermicomposting
23	Alandi M. Council	16.0	Composting
24	Pandharpur M. Council	36.0	Composting, Biomethanation
25	Lonavala M. Council	43.16	Composting, Biomethanation, Landfill
26	Malakapur Nagar Panchayat	8.0	Composting, Vermicomposting
1	Nashik M. Corporation.	501.0	Composting, Leachate Treatment, RDF, Biomethanation, SLF, Plastic processing plant, Carcass incineration
2	Yeola M. Council	4.0	Composting
3	Nandgaon M. Council	6.0	Composting
4	Sinnar M. Council	5.6	Vermicomposting
5	Manmad M. Council	10.0	Composting
6	Bhagur M. Council	0.8	Composting
7	Satana M. Council	8.0	Composting
8	Malegaon M. Corporation	204.0	Composting Vermicomposting
9	Trimbakeshwar M. Council	4.0	Composting Bio Methanation
10	Igatpuri M. Council	3.85	Composting
11	Ahmednagar M. Corporation	125.0	Mechanical Composting, Leachate treatment
12	Kopargaon M. Council	18.0	Composting
13	Pathardi M. Council.	5.0	Composting
14	Rahuri M. Council	2.9	Vermicomposting Composting
15	Rahata. M. Council	Nil	Dumping
16	Deolali Pravara M. Council	3.25	Composting
17	Shirdi Nagar Panchyat, Jalgaon M. Corporation., Bhusawal M. Council, Parola M. Council, Savda M. Council, Raver M. Council, Yawal M. Council, Faizpur M. Council, Jamner M. Council, Dhule M. Corporation., Shirpur M. Council, Nandurbar M. Council, Navapur M. Council, Shahada M. Council, Taloda M. Council, Bodwad Nagar Panchayat, Chandwad M.Council	NIL	Dumping
18	Sangamner M. Council	25.0	Composting, Vermicomposting
19	Shrigonda M. Council	2.16	Composting
20	Shrirampur M. Council	9.5	Composting Vermicomposting
21	Pachora M. Council	2.0	Composting

22	Erandol M. Council	8.0	Composting, RDF
24	Amalner M. Council	6.6	Composting
25	Chalisgaon M. Council.	20.0	Vermicomposting
26	Chopada M. Council	8.0	Composting.
27	Dharangaon M. Council	3.0	Composting
26	Deolali Cantonment Board	0.5	Vermicomposting
27	Ahmednagar Cantonment Board	6.0	Composting
28	Bhadgaon M. Council	2.0	Composting,
29	Karjat Nagar panchayat	1.96	Composting
30	Parner Nagar Panchayat	1.0	Composting
1	Amravati Corporation M.	Nil	Dumping
2	Akot M. Council	Nil	Dumping
3	Achalpur M. Council, Akola M. Corporation, Telhara M. Council, Balapur M. Council, Murtizapur M. Council, Patur M. Council, Sindkhed Raja M. Council, Deulgaon Raja M. Council, Mehakar M. Council, Lonar M. Council, Buldhana M. Council, Shegaon M. Council, Khamgaon M. Council, Chikhali M. Council, Nandura M. Council, Malkapur M. Council, Jalgaon-Jamod M. Council, Washim M. Council, Karanja Lad M. Council, Mangrul Pir M. Council, Risod M. Council, Warud M. Council, Anjangaon Surji M. Council, Morshi M. Council, Dhamargaon Rly M. Council, Shendurjana Ghat M. Council, Chandur Rly M. Council, Daryapur M. Council, Chikhaldara M. Council, Chandur Bazar M. Council	Nil	Dumping
1	Jalna M. Council, Ambad M. Council, Bhokardan M. Council, Dharur M. Council, Jintur M. Council, Sonpeth M. Council, Hingoli M. Council, Osmanabad M. Council, Omerga M. Council, Jintur M. Council, Hingoli M. Council, Sonpeth M. Council, Purna M. Council, Purna M. Council, Osmanabad M. Council, Omerga M. Council, Tuljapur M. Council, Nanded-Waghala M. Corporation, Loha M. Council, Hadgaon M. Council, Mudkhed M. Council, Kinwat M. Council, Biloli M. Council, Umari M. Council, Kundalwadi M. Council, Mukhed M. Council, Phulambri Nagar Panchayat, Himaytnagar Nagar Panchayat, Ardhapur Nagar Panchayat, Mahur Nagar Panchayat, Bhokar M.Council, Cantonment Board Aurangabad, Degloor M. Council, Murum M.Council	NIL	Dumping
2	Partur M. Council.	2.35	Composting

3	Beed M. Council	18.0	Vermicomposting
4	Ambajogai M. Council	10.0	Composting, Vermicomposting
5	Majalgaon M. Council	2.0	Composting
6	Georai M. Council	1.3	Composting, Vermicomposting
7	Parbhani M. Corporation	6.0	Composting, Landfill
8	Gangakhed M. Council	3.5	Composting, Landfill
9	Manwat M. Council	5.3	Composting, Vermicomposting
10	Selu M. Council	8.0	Composting, RDF
11	Pathri M. Council	4.5	Composting, Landfill
12	Kalamnuri M. Council	2.0	Composting Vermicomposting
13	Basmat M. Council	4.47	Composting
14	Parli (V) M. Council	21.0	Composting Vermicomposting
15	Latur M. Corporation	90.0	Mechanical Composting and Land Fill
16	Ausa M. Council	9.0	Composting
17	Nilanga M. Council	10.57	Composting
18	Udgir M. Council	13.0	Composting
19	Ahmadpur M. Council	2.5	Composting
20	Georai M. Council	1.3	Composting, Vermicomposting
21	Parbhani M. Corporation	6.0	Composting, Landfill
22	Gangakhed M. Council	3.5	Composting, Landfill
23	Manwat M. Council	5.3	Composting, Vermicomposting
24	Selu M. Council	8.0	Composting, RDF
25	Pathri M. Council	4.5	Composting, Landfill
26	Kalamnuri M. Council	2.0	Composting Vermicomposting
27	Basmat M. Council	4.47	Composting
28	Parli (V) M. Council	21.0	Composting Vermicomposting
29	Latur M. Corporation	90.0	Mechanical Composting and Land Fill
30	Ausa M. Council	9.0	Composting
31	Nilanga M. Council	10.57	Composting
32	Udgir M. Council	13.0	Composting
33	Ahmadpur M. Council	2.5	Composting
34	Bhoom M. Council	0.30	Composting
35	Paranda M. Council	0.80	Composting
36	Naldurg M. Council	1.7	Composting
37	Kallam M. Council	1.5	Composting and landfill
38.	Aurngabad M. Corporation, Paithan M. Council	NIL	Composting
39.	Gangapur M. Council	2.0	Composting
40.	Vaijapur M. Council	2.0	Composting
41.	Kannad M. Council	1.0	Composting

42	Khultabad M. Council	NIL	Dumping
43	Sillod M. Council	6.0	Composting
44	Kandhar M. Council	1.0	Vermicomposting
45	Dharmabad M. Council	6.0	Composting
1	Nagpur Municipal Corporation.	200.0	Composting, RDF
2	Kamptee M. Council	10.0	Composting
3	Ramtek M. Council	6.0	Composting
4	Katol M. Council	10.0	Composting, Vermicomposting
5	Saoner M. Council	4.0	Composting
6	Khapa M. Council	1.5	Composting
7	Kalmeshwar M. Council	2.0	Composting
8	Mohpa M. Council	1.2	Composting
9	Wardha M. Council	29.0	Composting
10	Deoli M. Council	3.0	Composting
11	Sindhi (Rly.) M. Council, Arvi M. Council, Bhandara M. Council., Tumsar M. Council, Gondia M. Council, Tiroda M. Council, Hinganghat M. Council, Pulgaon M. Council, Mowad M. Council, Narkhed M. Council	NIL	Dumping
12	Umred M. Council	5.0	Composting
19	Pauni M. Council	4.8	Vermicomposting
1	Chandrapur M. Corporation	20.0	Composting, RDF, Biogas.
2	Ballarpur M. Council	21.0	Composting
3	Rajura M. Council	3.2	Composting
4	Mul M. Council	3.0	Composting
5	Bramhapuri M. Council	12.0	Vermicomposting Composting
6	Bhadrawati M. Council.	8.0	Composting, Vermicomposting
7	Warora M. Council, Pusad Mun. council, Wani Mun. Council, Darwha Mun. Council, Pandharkawda M. Council, Ghatanji M. Council, Arni M. council	NIL	Dumping
8	Gadchiroli M. Council	3.0	Vermicomposting
9	Desaiganj M. Council (Wadsa)	8.0	Composting
10	Yavatmal Mun. Council	10.0	Vermicomposting
11	Umarkhed Mun. Council	16.80	Vermicomposting
12	Digras M. Council	4.0	Composting
13	Ner Nawabpur M. Council	6.0	Composting
14	Chimur M Council	1.7	Composting
15	Nagbhid M Council	4.32	Composting

Table 5: *Present status of ULBS in Maharashtra (Maharashtra pollution control board Annual report 2017 - 2018).*

Challenges

1. Ecological awareness and citizen participation to segregate waste at source, door-to-door collection and disposal in appropriate collecting bin is imperative. The notice plays a crucial role in MSWM and augments the efficiency of waste management stream. It's the foremost critical introduce the entire process of MSWM, which helps in handling solid waste resulting in ultimate success. However, in India, this scenario reveals that there's almost no segregation of garbage at source which results in various environmental problems and it becomes very difficult to segregate waste at transfer station or in landfill or treatment site. Also, thanks to lack of coordination among the residents and lack of planned cities in India, the residents throw garbage improperly. Aside from this, the community bins aren't located within the close vicinity and therefore the number of ULBs employees isn't adequate as per population residing therein area [15].
2. India may be a vast country divided into different zone, different food habits and different living standard thereby producing waste of various types. Till date, no comprehensive studies are conducted to hide most cities and towns of India to characterize the waste generated and disposed on landfill. The policy-makers believe the limited source of data available from few places thereby are unable to supply appropriate solutions for the type of waste produced for a specific region.
3. With the increase, challenge to supply adequate infrastructure in populated area and new landfill site selection is vital. Most of the landfill sites are running beyond their capacity in metropolitan cities. Inadequate support to cater to waste management problem aggravates it. Thanks to financial crunch ULBs don't have adequate infrastructure to supply suitable solutions.
4. ULBs aren't implementing MSWR adequately as revealed by various government reports; thus, it's difficult to manage the MSW properly. There's a requirement to make dedicated group of officers and skilled staff for ULBs with specialization in MSWM. Adequate training and hands-on experiments would enable them to spot bottlenecks at implementation level and take appropriate action. Work study can identify bottlenecks within the whole system and financial auditing can suggest the ways to reinforce commitment of the staff engaged. However, no such proactive approach was attempted by ULBs.
5. There is resistance of local citizen for notification of landfill site in their locality and thus selection of latest site is difficult and every one the prevailing landfill sites are running beyond their capacity.
6. There is less dialogue between Central and government. Delay in submission of data from State to Central delays appropriate level implementation at ground level. Such lack of coordination for specific action plan and poor strategy at implementation level by ULBs are main hindrance.
7. Environmentally benign practices are the necessity of the hour to deal with the just about exponential growth of MSW. For this, appropriate technological solutions through PPP are required. However, lack of competency and insufficient support are major threats to ULBs for development of MSW infrastructure. There's need for PPP to implement management and handling with the newest technology/know-how with the topic experts' firms and corporations. Establishment of the great public governance in compliance with secured regulatory framework and appropriate support and strict contract implementation is required for the success of PPP. Capacity building and availability of skilled labor, familiarity with new and also as best practices available for SWM, financial incentives for identifying new techno-feasible solutions, appropriate and quick decision at ULBs level for smooth implementation are real challenges.
8. India remains struggling to form waste-to-energy project a hit story. There's a requirement to import economically feasible and proven technologies. Aside from this, suitably characterized and segregated waste must be provided to waste-to-energy plants as per its requirement.
9. For improving MSW collection efficiency and source segregations, rag-pickers are often engaged through organized sector. However, thanks to lack of recycling industries and acceptance of society this vast potential has been ignored.

Conclusion

The aim of this study is to present the status of MSW and other important aspects like challenges for integrated SWM, prevailing practices of MSWM and therefore the rules concerning waste management in Maharashtra. In developing countries like India, it's important to plan and implement sustainable low-cost SWM strategies. Lack of awareness, inappropriate technical knowledge, inadequate funding, unaccountability, implementation of legislation and policies are major reasons for the failure of MSWM. Major disposal waste methods around UBLs are found to be dumping and waste treatment data is found to be missing in many UBLs. Issues like proper site selection, adequate support, and improper human resource management, are often overcome with enhanced capacity, improved procedures and training. the answer to the issues related to development and adoption of appropriate technologies and lack of trained manpower would require at realistic time-frame and not only central government bodies, but state governments even have to require various actions for strengthening MSWM within the country. The intricacies that would arise during implementation should be taken under consideration, in order that decisions and methods are often supported ground actualities.

Rules of SWM got to be taken in such how that these take under consideration the bottom realities and permit time for suitable processes and mechanisms to be developed. Proper organized sector for reuse and recycling of waste must be put *in situ* to get more employment and revenue, aside from reducing the load on transportation and landfill.

Improvement in collection and disposal can be made and advance technologies can be adopted of MSW.

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