Solid Waste Management and Handling at the Ward Level in Greater Mumbai

A NAGAR Report

December 10, 2014

Research Team
Ms. Eesha Chirmuley & Ms. Snehal Sunil Bhosale, Students of College of Social Work, Nirmala Niketan

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Under the Guidance of

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Equally, with deep gratitude we record the untiring efforts of Ms. Kunti Oza and Mr. Subhash Rane, acknowledged as the leading advocates on Management of Solid Waste in Mumbai.

Anand Akerkar
Chairman

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ABBREVIATIONS

AIILSG	All India Institute of Local Self Government, Mumbai
BEST	Brihanmumbai Electric Supply and Transport
C&D	Construction and Demolition
CPCB	Central Pollution Control Board
IETC	International Environmental Technology Centre
JO	Junior Overseer
MCGM	Municipal Corporation of Greater Mumbai
MPCB	Maharashtra Pollution Control Board
MSW	Municipal Solid Waste
MT	Metric Tonne
MTPD	Metric Tonnes Per Day
ND	Nuisance Detectors
NEERI	National Environmental Engineering Research Institute
SMPA	*Swachha Mumbai Prabodhan Abhiyan*
SPSS	Statistical Package for Social Sciences
SWM	Solid Waste Management
TDP	Tipper Dumper Placer
ULB	Urban Local Body
UMP	Urban Management Programme
UNEP	United Nations Environment Programme
WEDC	Water, Engineering and Development Centre, UK

EXECUTIVE SUMMARY

As a city, Mumbai has been a giver of all kinds of opportunities one can eye for! This city is blessed with diverse invaluable assets – right from natural heritage to National Park, from historic forts to science centres. All the inhabitants and visitors of Mumbai have much to enthrall themselves. However, one cannot shy away from the fact that today, the stinking dirt and filth is strewn in most of Mumbai's lanes and alleys. The handling and management of solid waste generated within the city have been grappling with numerous issues which demand immediate attention for the lack of space for dumping grounds. NAGAR has been long advocating this issue and has successfully run a pilot project for segregation of waste. We have achieved another milestone in the form of this report which could help in remedying the abysmal situation of solid waste management within Greater Mumbai.

The purpose of the report is to throw light on the current scenario of management and handling of solid waste under the jurisdiction of MCGM at the ward level. For this purpose, the descriptive research methodology has been utilized under which 23 ward offices out of 24 were surveyed to obtain the required information. Based on this information, this report attempted to provide standard operating procedures for MCGM for improving the standards of the 'delivery of service'. It also provides for the specific plans in order to deal with bulk generators of the waste effectively.

Overview of Findings:

- A degree of discrepancy was found between the data given by MCGM officials and that of being displayed on MCGM's website which highlighted the issues of want of reliability and transparency
- Awareness campaign for segregation of the waste at source by citizens was either not present or was not planned for future implementation in as many as 15 wards. Here, it is pertinent to note that an allocation of Rs. 44 crores for such an awareness campaign was made by MCGM in its budget for the financial year 2014-2015.
- It was reported that, apart from households, the slums constituted as the major bulk generator of waste within the city followed by hotels and markets. However, no special provision was in place to deal with bulk generators apart from provision of separate vehicles to collect the bulk waste. Unfortunately, these separate vehicles as well are dismal in number. In case of slums, the scheme, '*Swachha Mumbai Prabodhan Abhiyan (SMPA)*', initiated for spreading awareness about segregation of waste and encouraging house-to-house collection, was found to be engulfed in various malpractices including corruption.

- Inadequate transport facilities including, provision for separate vehicles to collect dry waste and wet waste separately.
- There was a mismatch between the number of collection points found in each ward with respect to its geographical size and the amount of waste generated per day in the respective wards.
- Though the waste collected by the MCGM is measured every day, there was no attempt made by them to reduce the waste being disposed off on the dumping ground. In way, it nullified the objective of weighing waste.
- Inadequate and inappropriate safety gears provided to waste collectors
- Haphazard mechanization of vehicles to collect waste
- No uniformity was found in the appointment of workers in relation to the size of the ward. The optimum use of the workforce is one thing among others that needs attention. Also, the brewing anguish between MCGM workers and contractual labourers is a matter of concern.
- The number of Nuisance Detectors (NDs) or Junior Overseers (JOs) appointed to charge penalty in case of violation of Cleanliness byelaws are highly negligible taking into consideration the size of the wards and the population it contains.
- There are NO processing facilities available at any of the dumping grounds to process the waste before disposing it. Hence, it can be said that the MSW (Management and Handling) Rules, 2000 are not being implemented in all the municipal wards with respect to the processing of the waste.
- All of the dumping grounds available have reached their carrying capacity. The ward officer in whose ward a particular dumping ground is located has no say whatsoever in the selection and management of that site, despite being responsible for the health of citizens living within the vicinity of that dumping ground!
- There is no practice of segregating waste due to the paucity of infrastructure for separate collection and hence the non-availability of wet waste processing facility at any of the ward offices.

Some recommendations emerging from NAGAR's report are as follows:

- The recommendations submitted by the Hon'ble Supreme Court appointed Barman Committee of 1998 need to be implemented promptly and strictly.
- Also, the Municipal Solid Waste (Management & handling) Rules, 2000 and the Cleanliness Byelaws, 2006 must be effectively implemented.
- Proper standard operating procedures must be laid down for the team of cleaners.
- A fixed time and day schedule must be devised for collection of waste and the citizens / residential associations must be duly informed about it.

- Separate vehicles must be allotted for collecting bulk waste generated at places like slums, markets, hotels, hospitals and malls. A mechanism for e-waste collection should also be in place.
- Where provisions like separate litter bins exist, they should be periodically monitored for effective functioning.
- Transfer Stations must be maintained by the MCGM to weigh separately different kinds of wastes as to which can be processed and which cannot be processed. This will be effective for target reduction of waste going to the landfills.
- MCGM must use separate trucks / vehicles for carrying bulk waste of one type.
- MCGM must identify land for processing different kinds of waste.
- 'Dry waste sorting centres' can be raised on a temporary basis once a week.
- MCGM can set up a 'Research and Development' (R & D) wing under the Solid Waste Management department that can work on the innovative approaches to process waste by conducting training programmes / workshops.
- MCGM must fix the inert waste generation limit for bulk waste generators in the city. For every amount of extra inert waste garbage generated, bulk waste generators will be charged with garbage tax.
- The garbage carriers – bins and vehicles – must have measurement indicators.
- Buffer zones or No-Development zones must be maintained around the processing units and disposal sites as well.
- There has to be a closure plan for every landfill site.
- Any violation, under the MSW Rules 2000 and any other laws on Solid Waste Management, must be strictly penalized. Nuisance Detectors must be empowered to maintain vigil.
- This report has also formulated specific plans based on a People-Public-Private Partnership model for areas generating bulk waste of one type. These areas are slums, markets, hotels, hospitals, construction sites and malls.
- Some of the social activists consulted by the researchers provided constructive solutions to tackle the SWM problem – right from segregation and reduction of waste at source to composting and transforming solid waste to bio-fuel!

The ingenuity of the authorities concerned, shameful disdain of legal provisions and apathy of the citizenry has eroded the city's picturesque impression. Lest, we don't act soon, the filth lying all-over the city will doom its radiant persona!

I. Introduction

1. Introduction

In India, Solid Waste Management (SWM) is one of the mandatory functions to be performed by Municipal Authorities of the Urban Local Bodies (ULBs), obligated by the 74th Constitutional (Amendment) Act, 1992. Hence, it is the responsibility of the Municipal Corporation of Greater Mumbai (MCGM) to manage and handle the solid waste generated within its limits. This report, therefore, throws light on the situation at the ward offices of MCGM, the primary unit of its administration, with reference to SWM.

As per the Environment Status Report of Brihanmumbai 2013 – 2014, the approximate quantity of solid waste generated in Mumbai is over 10060 metric tonnes per day (MTPD). The numbers pose a humungous challenge before the inadequately equipped MCGM and pose as a potential health crisis for the citizens of Mumbai.

The characteristics and quantity of the solid waste generated in a region is not only a function of the living standard and lifestyle of the region's inhabitants, but also of the abundance and type of the region's natural resources. In an attempt to accelerate the pace of growth and development of a particular region, the solid waste management within the region may fail to get adequate attention. As a consequence, it would incur severe penalty at a later time in the form of adverse impact on public health & safety, environment along with resources being needlessly lost. Hence, it is better to utilize resources when the region is in a better position to take appropriate measures than trying to resolve penalty at a later time. The efforts taken for solid waste management should be in congruence with that of the attainment of advance of development.

The first task would be to understand the magnitude of the problem and the infrastructure available to meet the challenge. At the onset itself, the researchers found it disheartening that the statistics pertaining to SWM varied across agencies. As per the Maharashtra Pollution Control Board (MPCB) Status Report, 2013-14, the total waste generation per month amounts to 14500 metric tonnes, as on 1st April, 2014. As per the MCGM's website presently (February, 2014) Mumbai has garbage (MSW) production to the tune of 6500 tons per day. It also produces nearly 2500 tons of construction and demolition (C&D) waste per day. And as stated above, the recent Environment Status report quotes different figures altogether. Amidst the entire conundrum, the gravity of the situation lies uncertain. According to a study by NEERI, Municipal Solid Waste (MSW) generation in Mumbai is expected to rise by 4 times by 2051. In view of this conclusion, it is certain that the authorities need to upgrade the standards of current services they provide the city.

This report analyses the current scenario of the solid waste management and handling under the jurisdiction of the Municipal Corporation of Greater

Mumbai (MCGM) at every ward level and also attempts to put forth certain suggestions which can be taken into consideration while improving standards of the 'delivery of service'. The survey covers 23 wards, out of the total 24 wards under the MCGM. Due to the apathy of the concerned ward office, the survey could not cover 'L' ward.

2. Identification of Research Problem

Mumbai has been overwhelmed by its own success, making its management a casualty. Everything is scarce, from space disappearing under illegal concrete, to water being supplemented by tankers. Usable pavements and carriageways have also become a rarity. Only garbage is plentiful!

For the want of clean and health city, it was felt that the city needs a separate agency for the management and handling of Solid Waste Management. The need for visible cleanliness and transformation of solid waste into sustainable energy solutions is the need of the hour!

3. Objectives

The objectives of the report are:

1. To study the current scenario of management and handling of solid waste management under the jurisdiction of MCGM at the ward level.

2. To suggest standard operating procedures for management and handling of waste in general

3. To prepare specific plans for management and handling of bulk waste at the ward level depending upon the type of bulk waste generated in the concerned ward

II. Review of Available Literature

1. Theoretical background

Municipal solid waste management (MSWM) is a major responsibility of local governments, typically consuming between 20% and 50% of municipal budgets in developing countries. It is a complex task which depends as much upon organisation and cooperation between households, communities, private enterprises and municipal authorities as it does upon the selection and application of appropriate technical solutions for waste collection, transfer, recycling and disposal. Furthermore, waste management is an essential task which has important consequences for public health and well-being, the quality and sustainability of the urban environment and the efficiency and productivity of the urban economy. In most cities of developing countries, waste management is inadequate: a significant portion of the population does not have access to a waste collection service and only a fraction of the generated waste is actually collected. Systems for transfer, recycling and/or disposal of solid waste are unsatisfactory from the environmental, economic and financial points of view. (UMP, 1996)

The increasing volume and complexity of waste associated with the modern economy is posing a serious risk to ecosystems and human health. **Every year, an estimated 11.2 billion tonnes of solid waste is collected worldwide and decay of the organic proportion of solid waste is contributing about 5 per cent of global greenhouse gas emissions.** Of all the waste streams, waste from electrical and electronic equipment containing new and complex hazardous substances presents the fastest-growing challenge in both developed and developing countries. (UNEP)

Poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary landfills contribute to contamination of drinking water and can cause infection and transmit diseases. The dispersal of debris pollutes ecosystems and dangerous substances from electronic waste or industrial garbage puts a strain on the health of urban dwellers and the environment. (UNEP)

The solution, in the first place, is the minimization of waste. Where waste cannot be avoided, recovery of materials and energy from waste as well as remanufacturing and recycling waste into usable products should be the second option. Recycling leads to substantial resource savings. For example, for every tonnes of paper recycled, 17 trees and 50 per cent of water can be saved. Moreover, recycling creates jobs: the sector employs 12 million people in Brazil, China and United States alone. (UNEP)

The UNEP International Environmental Technology Centre (IETC) in Japan supports the implementation of integrated solid waste management

systems. Its work also focuses on the proper treatment of special wastes (electronics, agricultural biomass, plastics) in developing countries. IETC aims to optimize the management of solid waste by involving all stakeholders in the process through pilot projects at local level.

2. Statistical data on Solid Waste Management

- Municipal Corporation of Greater Mumbai has been divided into 24 wards categorized under – 1) Island city 2) Western Suburbs 3) Eastern Suburbs (the three administrative units of Mumbai) *(www.mcgm.gov.in, accessed on 21/09/2014)*

  - Population of City = 1 Crore 20 Lakhs
  - Floating Population = 30 Lakhs
  - Services to be given to = 1.5 Crores
  - Garbage generation/capita/day:
    - developed area = 450 gm
    - slums = 250 gm
    - floating population = 150 gm
  - Classification of Municipal Solid Waste:
    - Wet waste / day = 4500 Tonnes
    - Silt and debris waste / day = 2000 Tonnes
    - Bio medical waste / day = 25 Tonnes
    - Dry waste / day = 500 Tonnes
    - Total Garbage generation/day = 7025 Tonnes
    - Tree cutting / day = 120 Truck load
    - Seasonal variation - 25% in April, May & June

(http://www.karmayog.com/cleanliness/bmcstatsdata.htm, accessed on 21/09/2014)

  - Classification of Solid Waste:

Table 2.1: Types of Waste

Wet Waste	Dry Waste
Remnants of Fruits, Vegetables Food, grains Leaves, flowers, grass Meat, fish, eggs Coconut Kitchen waste Hair, nails Tea powder Used cotton & paper	Metal Wire, cable Plastic, polythene bags Rubber, thermocol Dry Papers Glass & glass bottles, pet bottles Any recyclable material

- Composition of Solid Waste in Mumbai

Table 2.2: Composition of Waste

Sr. No.	Type of Waste	Percentage
1	Food Waste (organic - wet)	54
2	Wood, Cloth (organic - dry)	15
3	Sand, Stone & Fine earth	12
4	Plastic	9
5	Recyclables (Paper & Metal)	10
	Total	100

Source: MCGM's Environment Status Report, 2013-2014

- Capacities of Dumping grounds in Mumbai

Table 2.3: Status of Dumping Grounds

Disposal Site	Area (Ha) of filling (m*)	Max R.L. of filling (m)	Min R.L. of filling (m)	Total Vol. (cu m)	No of years in use*	No of years can b used**
Deonar	132	56.00	26.00	27	84	Capacity almost over
Mulund	25	45.00	28.00	5	43	1

Source: MCGM's Environment Status Report, 2013-2014

- The composition of garbage in India constitutes lower organic matter and high ash or dust contents. The recyclable content in solid waste varies from 13 to 20 per cent whereas; compostable material is about 80 to 85 per cent.

- An average of about 7,025 metric tonnes per day of solid waste is estimated to be generated in Mumbai. Of this, 5,000MT is general municipal waste, about 2,000 MT is silt and construction debris and about 10MT is biomedical waste. *(MCGM)*

- The report 'Solid Waste Management in Class 1 Cities in India' presented by the Committee constituted in 1998 by the Hon'ble Supreme Court of India states that waste generation ranges from 200gms to 500gms per capita per day in cities ranging from 1 lakh to over 50 lakh population. **Waste generation is expected to rise from 48 million tonnes to 300 million tonnes by 2047 as projected by Central Pollution Control Board.** *(CPCB)*

III. Research Methodology

This chapter explains the key concepts and their operational definitions. It also includes research design, sources of data, sampling size, along with the tools used for data collection, data processing and limitations of the report.

1. Concepts and Operational definitions

Awareness campaign

Awareness campaign includes a comprehensive effort that includes multiple components (messaging, grassroots outreach, media relations, government affairs, budget, etc.) to help reach a specific goal. A public awareness campaign is **not** just billboards, television commercials, social media or fundraising. It is more or less encouraging people to adopt certain behavior. *[http://www.free-training.com/osha/ppe/intro/def101.htm]*

Bio-medical waste

Rule 3.4 of the Greater Mumbai Cleanliness and Sanitation Bye-laws, 2006:
"Bio-medical waste means the waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological and including categories mentioned in Schedule IV of the Bye-laws"

Buffer zone

Rule 3 (v) of Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013 as notified by Ministry of Environment & Forests on 2nd July, 2013:
"Buffer zone means a zone of no-development which shall be maintained around landfills, processing and disposal facilities of municipal solid waste"

Bulk generators of waste

Rule 3 (8) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"bulk generator means the owner, occupier or any other person representing owners and occupiers of any housing society or complex with 200 or more households / units, first and second grade restaurants; star and non-star hotels; markets, industrial estates and shopping complexes / malls and includes government or public office building, or other users such as clubs, gymkhanas, "marriage halls", recreation / entertainment complexes that are specifically identified and notified by the Assistant Commissioners of the concerned Ward will also be considered as bulk generators"

Rule 3 (x) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Generator of wastes means persons or establishments generating municipal solid wastes"

Rule 3 (23) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"Generator of waste means any person generating Municipal Solid Waste within the limits of Municipal Corporation of Brihanmumbai"

Rule 3.7 of the Greater Mumbai Cleanliness and Sanitation Bye-laws, 2006:
"bulk generator means the owner, occupier or any other person representing owners and occupiers of any housing society or **housing** complexes, restaurants; hotels; markets, industrial estates and shopping complexes / malls and includes **any** government or public office building, or other users such as clubs, gymkhanas, marriage halls, recreation / entertainment complexes, **hospitals, educational institutions, commercial establishments or other establishment sources** / **premises** that are specifically identified and notified by the Assistant Commissioner **and** / **or any other person** / **agency authorised by Municipal Corporation of Greater Mumbai** of the concerned ward to be so"

Central Pollution Control Board
Rule 3 (vi) of Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013 as notified by Ministry of Environment & Forests on 2nd July, 2013:
"Central Pollution Control Board (CPCB) means the Central Pollution Control Board constituted under sub-section (1) of Section 3 of the Water (Prevention and Control of Pollution) Act, 1974"

Clean-up Marshals
As per the data available on MCGM website, accessed on 14th Feb. 2014, in order to implement Greater Mumbai Cleanliness and Sanitation Byelaws 2006, MCGM has adopted an innovative way, namely, the deployment of 'Clean up Marshals' through private security agencies in different wards of the city. They are termed as 'Litter cops' as they are responsible for charging fines on people who do not abide to the above mentioned Byelaws meant to do away with littering on the roads.

Collection
Rule 3 (v) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Collection means lifting and removal of solid wastes from collection points or any other location"

Rule 3 (12) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"Collection means lifting and removal of solid wastes from **fixed** collection points or any other location"

Rule 3.7 of the Greater Mumbai Cleanliness and Sanitation Bye-laws, 2006:
"Collection means lifting and removal of solid wastes from **designated** collection points or any other location"

Collection at source

Rule 3 (13) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"Collection at source means the collection of Municipal Solid Waste by BMC directly from within the premises of any building or common premises of a group of buildings. This is also referred to as "house-to-house collection" or "door-step collection"

Community waste storage centre

Rule 3 (14) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"Community waste storage centre means any storage facility set up and maintained collectively by owners and / or occupiers of one or more premises for storage of Municipal Solid Waste in a segregated manner in the premises of any one of such owners / occupiers or in their common premises"

Composting

Rule 3 (vi) of Municipal Solid Wastes (Management and Handling) Rules, 2000: "Composting means a controlled process involving microbial decomposition of organic matter"

Construction and demolition waste

As per the Construction & Demolition and De-silting Waste (Management and Disposal) Guidelines, 2005 (Part A: Definitions):

"Construction & Demolition and De-silting Waste (C&D Waste) means solid waste resulting from construction, re-modelling, repair, renovation or demolition of Structures or from land clearing activities or trenching or de-silting activities. "Structures" for the purpose of this definition means buildings of all types (both residential and non-residential), utilities, infrastructure facilities and any other type of man-made structure. C&D waste include, but are not limited to bricks, concrete rubble and other masonry materials, soil, trees, any type of vegetation, rock, wood (including painted, treated and coated wood and wood products), land clearing waste, wall coverings, plaster, drywall, plumbing fixtures, non-hazardous insulation, roofing, waterproofing material and other roof coverings, asphalt pavement, glass, plastics, paper, gypsum boards, electrical wiring and components containing no hazardous materials, pipes, steel, aluminum and other non-hazardous metals used in construction of Structures. Provided however, C&D waste shall not include (even if they result from construction, re-modelling, repair, renovation or demolition of Structures or from land clearing activities) any hazardous waste as defined under the Hazardous Wastes (Management and Handling) Rules, 1989"

Rule 3 (vii) of Municipal Solid Wastes (Management and Handling) Rules, 2000:

"Demolition and Construction Waste means wastes from building materials debris and rubble resulting from construction, re-modelling, repair and demolition operation"

Rule 3 (16) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"Construction and Demolition Waste (C&D waste) means **non-hazardous** waste from building materials, debris and rubble resulting from construction, re-modelling, repair and demolition operations"

Datak Vasti Yojana
Rule 3 (17) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"*Datak Vasti Yojana* (Slum Adoption Scheme) means the scheme referred to by this name which is **operated** by BMC through Community Based Organisations for achieving cleanliness in slums"

Rule 3.7 of the Greater Mumbai Cleanliness and Sanitation Bye-laws, 2006:
"*Datak Vasti Yojana* (Slum Adoption Scheme) means the scheme **adopted** by the Municipal Corporation of Greater Mumbai through Community Based Organisations for achieving cleanliness in slums"

Disposal
Rule 3 (vii) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Disposal means final disposal of municipal solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality"

Rule 3 (x) of Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013 as notified by Ministry of Environment & Forests on 2nd July, 2013:
"Disposal means final disposal of municipal solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality **and source of bird attraction**"

Rule 3 (j) of E-waste (Management and Handling) Rules, 2010:
"Disposal means any operation which does not lead to recycling, recovery or reuse and includes physio-chemical or biological treatment, incineration and deposition in secured landfill"

Dry waste
Rule 3 (16) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"Dry waste means the category of Municipal Solid Waste referred to at Rule 5.1 (6) of these Rules"

This report refers to 'Dry waste' as containing of metal, wire, cables, plastic and polythene bags, rubber, dry papers, glass and glass bottles and any other such recyclable material.

Dry waste sorting centre

Rule 3 (20) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"Dry waste sorting centre means any designated land, shed, kiosk, or structure located or any municipal or Government land or in a public space which is authorised to receive & sort dry waste"

E-Waste

Rule 3 (m) of E-waste (Management and Handling) Rules, 2010:

"E-waste means waste electrical and electronic equipment, whole or in part included in, but not confined to equipment listed in schedule – I and scraps or rejects from their manufacturing process, which is intended to be discarded"

Extended producer responsibility (EPR)

Rule 3 (n) of E-waste (Management and Handling) Rules, 2010:

"Extended producer responsibility (EPR) means responsibility of any producer of electrical and electronic equipment, for their products beyond manufacturing until environmentally sound management of their end-of-life products"

Food waste

According to UN Regional Information Centre for Eastern Europe (UNRIC), food waste is food that is discarded or lost uneaten. [*http://www.unric.org/en/food-waste?layout=default*]

This report refers to Food waste as kitchen waste, fish/meat waste, waste generated from hospital canteens, hotels and so on.

Ghanta-gadi

Rule 3 (24) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"*Ghanta-gadi* means the bell-ringing vehicle provided by BMC for point-to-point collection of Municipal Solid Waste"

Hazardous waste

Rule 3 (25) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"Hazardous waste means waste that can catch fire, react, or explode under certain circumstances, or that is corrosive or toxic"

As per the Construction & Demolition and De-silting Waste (Management and Disposal) Guidelines, 2005 (Part A: Definitions):

"Hazardous means a substance that exhibits any one or more of the following characteristics: (i) ignitability, (ii) reactivity, (iii) corrosivity or (iv) toxicity"

Household

A household consists of one or more people (minimum five members, with reference to India) who live in the same dwelling and also share at meals or living accommodation, and may consist of a single family or some other grouping of people. *[Haviland, W. A. (2003). Anthropology, Belmont, CA: Wadsworth; http://en.wikipedia.org/wiki/Household#cite_note-1]*

Inert solid waste

Rule 3 (27) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"Inert solid waste means any solid waste or remnant of processing whose physical, chemical and biological properties make it suitable for sanitary landfilling"

Landfilling

Rule 3 (xi) of Municipal Solid Wastes (Management and Handling) Rules, 2000:

"Landfilling means disposal of residual solid wastes on land in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emissions, slope instability and erosion"

Rule 3 (28) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"landfill means a waste disposal site for the deposit of residual solid waste in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emissions, slope instability and erosion"

Market

Section 3 (ll) of Mumbai Municipal Corporation Act, 1888:

"Market includes any place where persons assemble for the sale of, or for the purpose of exposing for sale, meat, fish, fruits, vegetables, animals intended for human food or any other articles of human food whatsoever, with or without the consent of the owner of such place, notwithstanding that there may be no common regulation of the concourse of buyers and sellers and whether or not any control is exercised over the business of or the persons frequenting the market by the owner of the place or by any other person"

Section 2 (f) of the Maharashtra Non-biodegradable Garbage (Control) Act, 2006:

"Market includes any place where persons assemble for exposing for sale, meat, fish, fruits, vegetables, food, or any other articles for human use or consumption with or without the consent of the owner of such place, notwithstanding that there may be no common regulation for the concourse of the buyers and the sellers and whether or not any control is exercised over the business of, or the persons frequenting the market by the owner of the place or by any other persons"

Municipal Solid Waste

Rule 3 (xv) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Municipal solid waste includes commercial and residential wastes generated in a municipal or notified area in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes"

Rule 3 (34) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"Municipal Solid Waste includes commercial, residential and other waste generated in the Municipal Corporation of Brihanmumbai area in either solid or semi-solid form excluding industrial hazardous waste, but including treated bio-medical waste"

Municipal Solid Waste Management

Rule 3 (xviii) of Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013 as notified by Ministry of Environment & Forests on 2nd July, 2013:
"Municipal Solid Waste Management" means the collection, segregation, storage, transportation, processing and disposal' of municipal solid waste, including reduction, re-use, recovery, recycling in a scientific and hygienic manner"

Nuisance Detectors

Rule 3 (36) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"Nuisance Detectors means those employees of BMC who are appointed by BMC to enforce these Rules by detecting instances of contraventions of any of these rules and collecting fines as specified for contravention of the same"

Rule 3.32 of the Greater Mumbai Cleanliness and Sanitation Bye-laws, 2006:
"Nuisance Detectors (NDs) means those employees of Municipal Corporation of Greater Mumbai, who are appointed by Municipal Corporation of Greater Mumbai to detect act of Public Nuisance etc. under the Bye-laws"

"A sweeper level person to detect and apprehend any nuisance creator in public places under Bombay Police Act"
('Observations of Solid Waste Management in Bombay, 1992', Compiled by Manfred Scheu and Adrian Coad, published by WEDC and AIILSG, Bombay)

Pelletisation

Rule 3 (xvii) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Pelletisation means the process whereby pellets are prepared which are small cubes or cylindrical pieces made out of solid wastes and include fuel pellets which are also referred as refuse derived fuel"

Point-to-point collection
Rule 3 (42) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
“Point-to-point collection means the system of collection of Municipal Solid Waste from specific pick-up points as designated by BMC, up to which the generator must bring the collected and stored waste for delivery to a *ghanta-gadi*”

Processing
Rule 3 (xviii) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Processing means the process by which solid wastes are transformed into new or recycled products"

Rule 3 (44) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
“Processing means any scientific process by which solid waste is treated for processing for the purpose of recycling or making it suitable for landfilling”

Recycling
Rule 3 (xviii) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Recycling means the process of transforming segregated solid wastes into raw materials for producing new products, which may or may not be similar to the original products"

Rule 3 (47) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
“Recycling means the process of transforming segregated **non-biodegradable** solid waste into raw materials for producing new products, which may or may not be similar to the original products"

Refuse removal charges
Rule 3 (47) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
“Refuse removal charges means fees or charges notified by BMC from time-to-time for collection, transportation and disposal of Municipal Solid Waste from different categories of waste generators. It includes “trade refuse charges” as made applicable to various categories of licensees”

Safety gears
Safety gears constitute specialized clothing or equipment worn by employees for protection against health and safety hazards such as face mask, hand gloves, gumboots, rain-coat and so on.
[http://www.free-training.com/osha/ppe/intro/def101.htm]

Segregation
Rule 3 (xxi) of Municipal Solid Wastes (Management and Handling) Rules, 2000:

"Segregation means to separate the municipal solid wastes into the groups of organic, inorganic, recyclables and hazardous wastes"

Rule 3 (xxvi) of Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013 as notified by Ministry of Environment & Forests on 2nd July, 2013:
"Segregation means to separate the municipal solid wastes into the groups of organic, inorganic, recyclables, **industrial** hazardous wastes **and e-waste**"

Rule 3 (50) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:
"Segregation means to separate the Municipal Solid Waste into the specified groups of bio-degradable, hazardous, bio-medical, construction and demolition, bulk garden and horticultural, and all other inert waste"

Separate bins
This report refers to 'separate bins' as different collection bins used for discarding wet waste, dry waste, hazardous waste and any other type of waste separately.

Slum area
According to the Census of India 2011, the concept of slums and their definition vary considerably across the States depending upon the socio-economic conditions or local perceptions. But physical characteristics in most of these slums are essentially the same. They are usually a cluster of hutments with dilapidated and infirm structures having common or no toilet facilities, suffering from lack of basic amenities, inadequate arrangement for drainage and for disposal of solid wastes and garbage. These inadequacies make the living conditions in slums extremely suboptimal, unhygienic and results in usually higher incidence of air and water borne diseases for the dwellers.

State Pollution Control Board ***(Here, Maharashtra Pollution Control Board – MPCB)***
Rule 3 (y) of E-waste (Management and Handling) Rules, 2010:
"State Pollution Control Board means the concerned State Pollution Control Board or the Pollution Control Committee of the Union Territories constituted under sub-section (1) of section 4 of the Water (Prevention and Control of Pollution) Act, 1974

Storage
Rule 3 (xxiii) of Municipal Solid Wastes (Management and Handling) Rules, 2000:
"Storage means the temporary containment of municipal solid wastes in a manner so as to prevent littering, attraction to vectors, stray animals and excessive foul odour"

Swacha Mumbai Prabodhan Abhiyan (SMPA) [Also known as ***Vasti Swachata Yojana***]

This scheme was launched on 1st February, 2013 with a motto, "Cleanliness – from the Heart to the City". It is to be implemented in the slums of Mumbai city and Mumbai suburban areas. The work areas are divided in units. One unit is equal to 200 households or 1000 population. Every eligible NGO can implement this scheme in an area covering minimum 5 units or maximum 18 units.

This scheme was launched to involve registered NGOs within the limit of the relevant administrative ward to assist MCGM in SWM through SMPA. It involved tasks like creating awareness for citizen participation, promoting cleanliness and chalk out plan for implementation of this Scheme; Keep the units clean throughout the day; Classify waste; Compost waste; Eliminate mosquito-thriving sites; establishing a sense of civic discipline among the citizens by spread of positive thinking towards SWM. Also, an informal structure of "Neighbourhood Committee" is to be formed for a population of 1 to 5 units.

A "*Swachata Prabodhan* Advisory Committee" is to be formed under the Chairmanship of the Municipal Commissioner which will meet every 3 months to review the implementation.

Every year the list of NGOs ('common pool') will be updated in the months of May and November. The appointment of an NGO which doesn't begin the work within 5 days of its appointment will stand cancelled and it will be removed from the list. In its place, NGOs from the waiting list can be appointed.

Fund allocation for the scheme: funds will be allocated at the rate of Rs. 5400 /- per unit / per month. Initially, funds will be allocated for two months. These funds are to be used for purchasing tools and equipments for cleaning, daily cleaning, monitoring & management expenses. For creating awareness and educating the people, additional funds of Rs. 600/- per unit / per month have been allocated.

There are provisions for charging penalty on the non-performing NGOs. A table listing penalties is incorporated in the Scheme Circular itself.

The appointed NGO has the rights to penalise citizens who violate the Cleanliness laws, as per the Cleanliness laws 2006. NGOs can collect voluntary contribution upto Rs. 20/- per household and upto Rs. 50/- per shop.

Outstanding NGOs will be felicitated with cash prizes (First prize – Rs. 5 lakhs, Second Prize – 3 lakhs and Third Prize – 2 lakhs). Appointment of NGOs performing below 65% will be cancelled.

Transportation

Rule 3 (xxiv) of Municipal Solid Wastes (Management and Handling) Rules, 2000:

"Transportation means conveyance of municipal solid wastes from place to place hygienically through specially designed transport system so as to prevent foul odour, littering, unsightly conditions and accessibility to vectors"

Transport Vehicles

As per the Construction & Demolition and De-silting Waste (Management and Disposal) Guidelines, 2005 (Part A: Definitions):

"Transport vehicles means the vehicles meeting the relevant Euro standards for fuel and emission as per National Auto Fuel Policy for India that will be used by the Authorised Agencies exclusively for the transportation of the C&D Waste and adhering to RTA requirements / traffic police regulations"

Treated Bio-medical wastes

Rule 3 (xxx) of Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013 as notified by Ministry of Environment & Forests on 2nd July, 2013:

"Treated bio-medical wastes means the wastes generated in hospitals and health care institutions which have been prescribed as treated under the Bio-medical Waste (Management and Handling) Rules, 1998, as amended time to time"

Urban Local Bodies

According to the Census of India 2011, the definition of urban area is as follows:

1. All places with a municipality, corporation, cantonment board or notified town area committee, etc.
2. All other places which satisfied the following criteria:
   - **a)** A minimum population of 5,000;
   - **b)** At least 75% of the male main working population engaged in non-agricultural pursuits; and
   - **c)** A density of population of at least 400 persons per sq. km.

[http://publicadministrationtheone.blogspot.com/2012/09/urban-local-government-municipal.html]

Vermi-composting

Rule 3 (xxvi) of Municipal Solid Wastes (Management and Handling) Rules, 2000:

"Vermi-composting is a process of using earthworms for conversion of bio-degradable wastes into compost"

Ward

Rule 3 (56) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"Ward means an administrative ward of BMC unless specified otherwise"

Ward office

Rule 3 (57) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006:

"Ward office means the office of an administrative ward which is headed by an Assistant Commissioner of BMC"

Waste pickers

Rule 3 (xxxiii) of Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013 as notified by Ministry of Environment & Forests on 2nd July, 2013:

"Waste pickers mean the individuals or groups of individuals engaged in the collection of municipal solid waste"

Waste processing facility

This report refers to 'Waste processing facility' as any plant by which solid wastes are transformed into new or recycled products.

Waste processing methods

According to this Report, Waste processing method includes any scientific process by which solid waste is treated for processing for the purpose of recycling or making it suitable for landfilling e.g. composting, vermin-composting, pelletisation, biogas generation and so on.

Wet waste / Bio-degradable waste

Section 3(4) of Municipal Solid Waste (Prohibition of littering and Regulation of segregation, storage, delivery and collection) Rules 2006:

"Bio-degradable waste includes the waste of plant and animal origin e.g. kitchen waste, food and flower waste, leaf litter, garden waste, animal dung, fish/meat waste"

This report refers to 'Wet waste' as remnants of fruits and vegetables, food grains, flowers, leaves, grass, meat, fish, eggs, kitchen waste and such other biodegradable waste material.

2. The research design

This report has followed the 'Descriptive' research design methodology using the technique of surveying. The descriptive research attempts to describe, explain and interpret conditions of the present i.e. "what is'. The purpose of a descriptive research is to examine a phenomenon that is occurring at a specific place(s) and time. A descriptive research is concerned with conditions, practices, structures, differences or relationships that exist, opinions, processes that are going on or trends that are evident. The Descriptive research design methods include correlation research, case study, ethnography, survey etc.

This report attempts to put forth the present scenario of Solid Waste Management in the city of Mumbai. It analyses the current practices undertaken by the MCGM in the management and handling of municipal solid waste and based on the analysis, provides for more effective plans to be implemented at the ward level.

3. Sources of data

The sources of data were of two types: primary and secondary. The primary data was gathered by interviewing the concerned authorities at the ward offices related to Solid Waste Management Department. This primary data is the major base of report. The secondary data was collected by referring to books, journals, newspaper articles, internet sites and other works that were relevant.

4. Sampling

The universe for the survey was all the 24 ward offices. The survey was conducted by selecting 23 units of the universe i.e. 23 ward offices of the total 24 under Municipal Corporation of Greater Mumbai.

5. Tools for data collection

The rationale for choosing the interview schedule and collecting information was to gather primary data. Keeping in view the purpose of the survey, the relevant questions to get the required information, regarding solid waste management at the ward level across the city, were discussed by the researchers and meaningful questionnaire was prepared for the same.

A structured questionnaire was used in order to conduct the interviews. It included twenty questions, both close-ended as well as open-ended. While collecting the data, the researcher used certain amount of probing and encouraging strategies to gain the response and answers to the questions asked.

The above mentioned questionnaire can be referred in the *Section X Appendices, Part A* of the same document.

6. Data Processing

For the purpose of data processing, the responses were translated into numerical symbols. All the responses of close-ended questions were pre-coded while the responses of the open-ended questions were examined, categorized and then coded. This data was then transferred to the code sheets on the computer and then processed and analysed using the Statistical Package for Social Sciences (SPSS).

7. Limitations of the Report

There were a few factors which limited the report. The very first being the apathy of the officials at one of the wards, which cut short the report from covering the entire universe of data. Secondly, the discrepancy between the data available on MCGM's official website and the data given by the concerned ward officials. The MCGM website does not record the date on which the site was last updated. Hence, the information available has no mention of the time and date as and when it was filtered. This questions the authenticity of the information available on MCGM's official website.

IV. Data Collection

Since, the report attempts to analyse the current situation of solid waste management at the ward level, the researchers decided to visit all 24 wards under the jurisdiction of MCGM to collect the required information. Hence, the letter addressing to the ward officer of respective ward was drafted. The letter also had a copy of NAGAR's previous project with MCGM named 'Cuffe Parade Pilot Project' enclosed with it. *(Section X Appendices, Part B)*

The planned visits began on 14th August, 2014 and concluded on 11th September, 2014. Out of 24 wards, the required information about the solid waste management process was obtained from 23 wards. The list of wards visited to accomplish the purpose of this report is given in the *Section X Appendices, Part C* of this document.

After the successful collection of information through ward visits, this information was stored using SPSS (Statistical Package for Social Sciences) tool. Relevant codes were created based on the questionnaire to categorize the information obtained from the ward officials. After the coding, the information was analyzed further.

V. Data Analysis and Interpretation

1. Discrepancy in the MCGM's databases

Table 5.1: Varied data by MCGM

Wards	Waste generated per day in metric tonnes (As told by officials)	Waste generated per day in metric tonnes (As displayed on the website)
A Ward	370	400
B Ward	200	190
C Ward	265	265
D Ward	450	415
E Ward	388	525
F/North Ward	536	461
F/South Ward	300	512
G/North Ward	730	720
G/South Ward	325	420
H/East Ward	380	400
H/West Ward	300	350
K/East Ward	555.5	700
K/West Ward	450	600
M/East Ward	380	322
M/West Ward	393	310
N Ward	280	265
P/North Ward	450	370
P/South Ward	380	260
R/Central Ward	660	325
R/North Ward	200	200
R/South Ward	350	350
S Ward	350	425
T Ward	225	230

As can be seen from the **table 5.1**, the data given by the public officials and displayed on their website do not match in more than half the wards. In some cases, the amount of waste generated per day within a ward as given by officials is given in a range with gap of 50 metric tonnes though it is measured every day. **Such discrepancy puts forth the question of reliability and accuracy with respect to the waste handling process at the ward level.** It is interesting to note that the officials are unknown to the magnitude of the problem which they have to tackle daily.

Each citizen along with the government and other regulatory authorities must have access to accurate data about the whole process which ensures transparency and efficiency in functioning.

2. Impact of MCGM's awareness campaign for Segregation

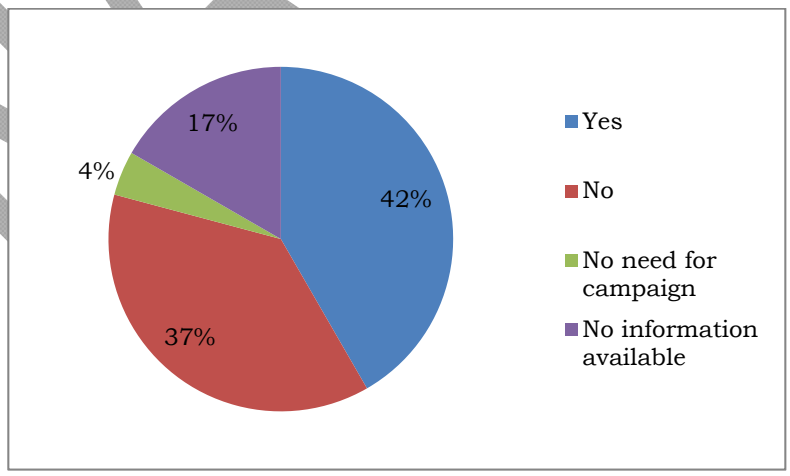
Table 5.2: Wards that segregate waste

Segregation of waste at the source	
Wards where it is DONE	A, F/N, G/N, H/W, M/W, P/N, R/S, S **(8 wards)**
Wards where it is NOT DONE	B, C, D, E, F/S, G/S, H/E, K/E, K/W, M/E, N, P/S, R/C, R/N, T **(15 wards)**

The major bulk of municipal solid waste in all the wards comes from the households within that ward. The data in **table 5.2** shows that in 8 wards, out of 23 visited, people segregate waste though it is not done at a large scale. This has been achieved mainly because of active presence of Advanced Locality Management (ALM) movement within these 8 wards and some of the co-operative housing societies are segregating and processing the waste on their own. However, MCGM has claimed that it has served 16.6 lakh notices to both households and non-residential structures in last one year to comply with segregation of waste and hence, segregation of waste is being carried out in 75% of households since the dry waste collection service began in Feb., 2014. (Indian Express, 2014) It again contradicts with the data collected from ward office visits.

3. Plan for future awareness campaigns

Figure 5.1: Awareness Campaigns



Though it is appreciable to know that 42% of the ward offices visited have shown positive outlook towards maintaining current awareness campaign or planning the same in future, almost equal number of ward offices have either no such campaign planned or do not feel the need to have such campaign in place. This seems to be in contradiction with the MCGM's recent move, in an effort to ensure 100% segregation of waste in the city, that is, to start **public awareness campaign for which Rs. 44 crores have been allocated in its 2014-2015**

budget. (Indian Express, 2014). For an awareness campaign to be effective, the MCGM must lead by example. **Demonstrations and workshops on segregation of waste along with adequate infrastructure to handle segregated waste will gain public confidence to segregate at source!** Hence, a separate agency, on the lines of BEST, can handle the needs to motivate the people and lead by example.

4. Bulk waste generators (apart from households)

Table 5.3: Bulk Generators

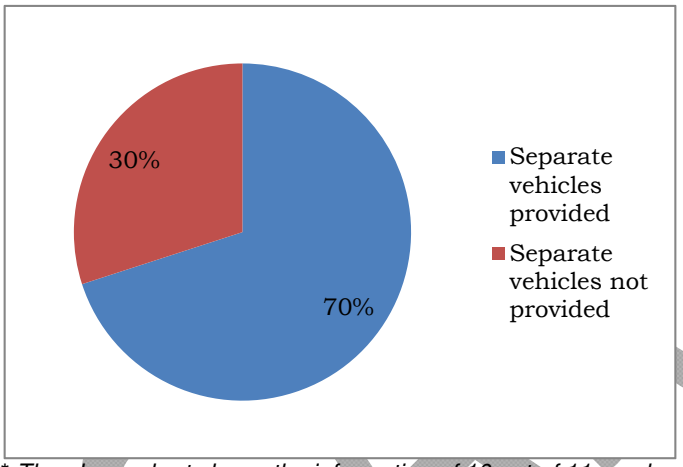
Bulk Generators (other than households)	No of wards
Clubs	1
Commercial estates	2
Construction sites	1
Hawkers	1
Hospital	10
Hotels	11
Malls	4
Markets	11
Shops	1
Slums	**15**

As told by MCGM officials, there are 15 wards (62.5 %) where slum areas are one of the major bulk generators of the municipal solid waste followed by hotels and markets. MCGM has employed '*Swachha Mumbai Prabodhan Abhiyan (SMPA)*' to spread awareness about segregation of waste and to encourage house-to-house collection from slum areas. It was observed that a few ward level officers mentioned that the earlier scheme of "*Dattak Vasti Yojana*" was transformed into the new '*Swachha Mumbai Prabodhan Abhiyan (SMPA)'.* **Hence, it is important to verify whether the reasons for this change in the scheme are a namesake or substantial.** Also, the results of the above mentioned scheme are yet to be seen across the city. The report finds that there is a need to integrate innovative approach to handle the waste generated from slum areas along with the awareness campaign.

In case of hospitals as major bulk generators, there is a separate department of Solid Waste Management (SWM) under MCGM which handles the untreated bio-medical waste generated by all the hospitals in Mumbai.

In 11 of the 23 wards of MCGM, hotels also constitute one of the major bulk generators of waste. The following pie chart shows that 70% of the wards provide separate vehicles (Large Compactors) to collect hotel waste mainly consisting of food waste which is a welcome step. However, such a bulk waste mainly consisting of biodegradable wet waste is not processed by the wards. **It is in vain when attempts to deal with waste are half-hearted as collection is done but there are no processing units for food waste in Greater Mumbai.**

Figure 5.2: Special Collection vehicles*



** The above chart shows the information of 10 out of 11 ward offices where hotels formed one of the bulk generators*

5. Need for special Vehicles and Machinery

The collection and transportation of the huge amount of waste is a matter of concern for any municipal authority. For this purpose, MCGM operates a huge fleet of big compactors, mini compactors, TDP (Tipper Dumper Placers), closed body vehicles, jeeps, trucks and such other vehicles. There is also an attempt to mechanise the available machinery whereby new vehicles are assembled like the semi-mechanised vehicles used for loading of solid waste from the collection bin into the compactors. **It can be analysed, as part of another study, whether such mechanization is effective – both efficiency and cost wise, handled and monitored in a proper manner and is upgraded as and when required.**

However, it is interesting to note that MCGM had sent notices and penalised the cooperative housing societies (Indian Express, 2014) for not segregating waste, but the authority did not provide separate vehicles to collect segregated waste. **Where there is no infrastructure to support public action, it is bound to happen that all efforts to create awareness or send notices and warnings or even penalize will not resolve the issue!**

6. Utility of collection bins

The collection bins are the containers where the solid waste collected from house-to-house is dumped at one point. It is from here the waste is loaded into the vehicles by MCGM workers. This report has tabulated the data on existing

collection bins with regard to the geographical area of the wards and the amount of waste generated in that ward per day.

Table 5.4: Biggest five wards (area-wise)

Ward	Area of the ward in sq km	Waste generated (Metric tonnes/day)	No. of collection bins	Avg no of collection bins per sq km
S Ward	64	350	219	3
P/North	46.67	450	200	4
T Ward	45.42	225	180	4
M/East Ward	32.5	380	200	6
P/South Ward	29.56	380	180	6

Table 5.5: Smallest five wards (area-wise)

Ward	Area of the ward in sq km	Waste generated (Metric tonnes/day)	No. of collection bins	Avg no of collection bins per sq km
C Ward	1.78	265	46	26
B Ward	2.84	200	23	8
E Ward	7.32	388	64	9
G/North Ward	9.07	730	428	47
G/South Ward	10	325	83	8

From the **tables 5.4 and 5.5**, it is evident that the correlation between area of the ward and waste generated in it per day cannot be established. For instance, G/North ward ranks one of the smallest wards; however, it generates more amount of waste per day than any other ward. Hence, the density of the ward must also be taken into consideration while specifying locations for collection bins. This ward also has the highest number of collection bins which is justifiable keeping in view of the amount of waste generated per day within the ward. However, one needs to explore as to how effectively these many collection bins in such a small area are managed and if adequate infrastructure facilities are in place. Because it seems completely unmanageable to handle 47 collection bins per sq km in a busy area like G/North ward.

There should be correlation between the waste generated per day within a ward and the number of collection bins unless the waste is being generated from too few places and in bulk. However, wards, smaller in size,

happen to have more number of collection bins on an average per sq km than that of wards which are larger in size. It implies that the waste is not collected from too few places and in bulk. In such a case, it means that either the data provided by the officials is not authentic or they themselves are not aware about it.

It has been found that none of the wards provide separate collection bins to collect dry waste and wet waste separately. The situation is slightly better with respect to the provision of the separate litter-bins for dry waste and wet waste at the roadside. **Out of 23 wards, 13 wards have the provision for the same and remaining wards still do not provide separate litter-bins.** It is interesting to know that of these 23 wards, 16 wards have the awareness campaign for the segregation of waste either in place or planned to be implemented in future but 5 of these wards do not have provision of separate litter-bins at the roadside. **It is case of having policies framed and ready to implement but there is no adequate infrastructure facilities provided for the implementation.**

7. Purpose of measuring waste

It has been observed that the waste generated per day within a ward is measured every day with the help of weighing machine which is placed at the respective dumping grounds. However, the officials seem to be indifferent to the purpose of this activity which is to evaluate the reduction of waste being disposed at the dumping grounds so that they are not overfilled than their respective capacities. It has no meaning beyond a procedural activity which defeats the purpose. Hence, it is important that collected waste is sorted for processing in different ways – like composting, recycling, pelletisation and so on and measured separately at the transfer stations. The rest of the waste which cannot be processed must then be taken to the dumping grounds. This requires a system in place and records to be kept in order to set targets for reduction of waste going to the landfills.

8. Faulty machines, inevitable manual work

There has been an attempt to bring some form of mechanization in the waste collection process by the MCGM under which collection bins are made in such a way that they can be lifted by the compactor or such vehicle and emptied into the waste carrying vehicle without workers needing to manually do the task. The problem arises when the waste is thrown not just in the bins but also in the area surrounding that bin which needs to be collected and loaded manually. In such cases, the issue of health and safety of workers involved in this process comes to the fore. It has been found that all wards provide safety gears which consist of facemasks, hand gloves, safety shoes, and gumboots in general to their workers. **Whether these safety gears are adequately provided and provide sufficient protection remains to be verified.**

Also, it is to be seen whether the semi-mechanisation proves to be efficient or more troublesome as there are many obstacles that halt this task such

as no up-gradation of instruments, breaking of handles of collection bins and so on.

Hence, mechanization in the solid waste management process is a welcome step but its timely maintenance is of vital importance. This is where a public private partnership agreement of the MCGM needs to be carefully worded.

9. Requisite Workforce, Dubious Output

Table 5.6: Workforce in biggest five wards (area-wise)

Biggest Five Ward Offices (area-wise)	Area of the ward (sq.km)	No. of MCGM workers	No. of contract workers	Total
S Ward	64	975	998	1973
R/Central Ward	50	1062	466	1528
P/North Ward	46.67	1200	917	2117
T Ward	45.42	750	300	1050
M/East Ward	32.5	786	1055	1841

Table 5.7: Workforce in smallest five wards (area-wise)

Smallest Five Ward Offices (area-wise)	Area of the ward (sq.km)	No. of MCGM workers	No. of contract workers	Total
C Ward	1.78	1600	20	1620
B Ward	2.84	900	*	900
E Ward	7.32	1849	267	2116
D Ward	8.03	1900	171	2071
G/ North Ward	9.07	1200	220	1420

** The total number of contract workers was not known to the concerned official*

As it can be seen from the **tables 5.6 and 5.7**, though the biggest five wards employ workers ranging from 1000 to 2000, the smallest five wards also have the same number of employed workers. This shows that **there is no uniformity in the appointment of workers in relation to the size of the ward.** Also, it can be found that in some wards, where the area is large, there are comparatively less number of workers that are insufficient to reach various pockets of the ward and hence, there is improper implementation leading to dubious results. **That is, the visible cleanliness in all those wards with huge workforce, whether employed by MCGM or on contract, is not seen evidently.**

A dedicated professional staff and trained workforce for the management and handling of solid waste at ward level is a pre-requisite to

tackle a huge amount of waste as large as 10600 MT/day generated in Mumbai.

10. Need for Empowered Officials

It was found that all the 23 ward officials interviewed were aware about the penalty provisions under the Cleanliness and Sanitation Byelaws, 2006 under which people can be fined for flouting the laws. Nuisance detectors and Junior Overseers are appointed to charge these fines on the people who litter on roads or cause nuisance. These two authorities charge fines on the spot and provide receipt to the offenders.

Table 5.8: ND / JO in biggest five wards (area-wise)

Biggest Five Ward Offices (area-wise)	Area of the ward (sq.km)	No. of officials to charge fine
S Ward	64	5 – ND
R/Central Ward	50	15 – JO
P/North Ward	46.67	3 – ND
T Ward	45.42	5 – ND
M/East Ward	32.5	6 – ND

**ND = Nuisance Detectors; JO = Junior Overseers*

Table 5.9: ND / JO in smallest five wards (area-wise)

Smallest Five Ward Offices (area-wise)	Area of the ward (sq.km)	No. of officials to charge fine
C Ward	1.78	3 – ND
B Ward	2.84	1 – ND
E Ward	7.32	4 – ND
D Ward	8.03	1 – ND
G/ North Ward	9.07	2 – ND

**ND = Nuisance Detectors; JO = Junior Overseers*

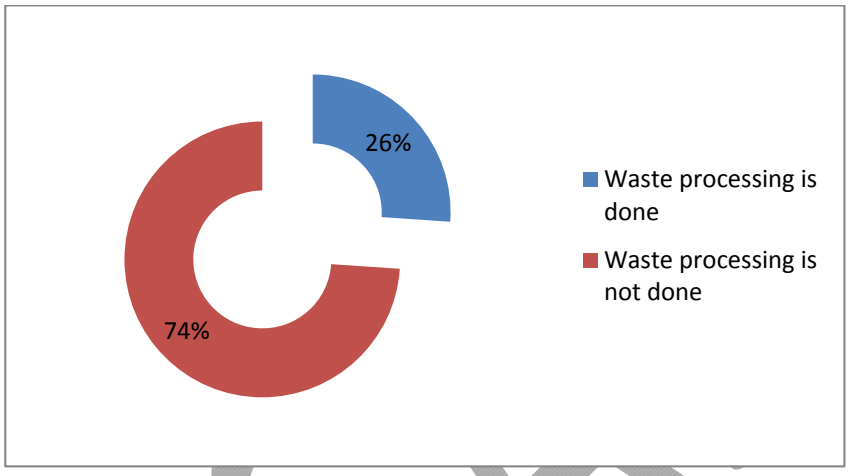
There are a lot of vacancies as far as the appointment of NDs is concerned resulting in an inadequate number of authorities to be vigilant against violation of Cleanliness Byelaws. Whereas, 15 to 21 Junior Overseers are appointed in each ward depending on the area and the sectors in the ward.

From **tables 5.8 and 5.9**, it can be concluded that the number of nuisance detectors employed vary in every ward. Also, this is not due to the size of the ward, but rather due to lack of personnel. For instance, with reference to **table 5.8**, S ward being the biggest ward has 5 NDs whereas M/ East ward which is half its size has more or less same number of NDs. Similarly, with reference to **table 5.9,** D ward and B ward have only one ND despite difference in their ward size. Hence, it can be inferred that there is no consistency, uniformity and efficiency in regulating the activities of the people which create a vulnerable situation. **The need of the hour is to transform these NDs / JOs into empowered officials by use of technology for surveillance and action!**

11. Need for waste processing facility

None of the wards have processing facility operated exclusively by the MCGM that transforms the solid waste into recycled products. However, the waste is being processed in some of the wards by the housing societies, private agencies etc. with or without the guidance of MCGM.

Figure 5.3: Waste processing by NGOs / Private agencies at ward level



Ghatkopar (situated in **N ward**) has a waste processing unit where waste is transformed through a process of fuel pelletisation. It has been outsourced to a private agency that monitors the unit daily and the ward office monitors it on a monthly basis. **R/Central ward** has outsourced the waste processing work to an organization known as *Stree Mukti Sanghathana,* which processes waste by composting method. In **G/North ward**, there is one 'Dharavi Segregation Site' where waste is processed by composting method. The **H/East ward** has functional vermi-composting pit within the Government Colony. Another vermi-composting plant is set up in the area of *Shantinagar* by a private agency. Some of the housing societies have built composting pit within their premises. **There is, however, no difference in the amount of waste generated and the amount of waste disposed at the dumping ground in case of N, R/C and G/N wards**. The amount of waste generated and disposed cannot be equal if the wards have some kind of processing units available.

In **M/East ward**, there is a biogas plant which generates electricity out of collected waste. The obtained electricity is provided to the *Shatabdi* hospital situated within the ward. MCGM monitors this Biogas plant by visiting the plant every month or as per the convenience of the concerned official. *Stree Mukti Sanghathana* also processes around 2-3 metric tonne of waste per day. It is to be noted that MCGM does not process the waste but only monitors the plant.

In **F/South ward**, *Stree Mukti Sanghathana, Aakansha Samajik Pratishthan* and other such organisations process around 3 metric tonne of waste

everyday though recycling of dry waste and composting of wet waste. Here again MCGM has no role in processing the waste.

As is evident, there are few instances of processing the waste; it is appalling to know that there is not much difference in the amount of waste disposed at the dumping ground. **Hence, the waste is not being processed as per the MSW (Management and Handling) Rules, 2000!**

12. Abysmal status of landfill sites

At present, there are only two dumping grounds that are functional – at Deonar (located in M ward) and at Mulund (located in T ward). Recently, Kanjurmarg dumping ground, located in S ward, was cleared of all the legal hurdles and will soon be functional for dumping of waste (Indian Express, 2014). It is important to note that the **ward officers** of aforementioned wards where the dumping grounds are located **neither have any say in the decision-making process for ascertaining the location of the dumping ground within their own ward nor do they demand for the requisite infrastructure required for safe dumping.**

Dumping grounds come under the jurisdiction of the state government, whereas the area surrounding the dumping ground is to be administered by the ward officer. **Though the law gives primacy to ULBs for management and handling of solid waste, the resources are controlled by the state.** It results in friction among authorities and the citizens are left at the helm of these two confronting authorities!

Even when the provisions for operating a dumping site are elaborately mentioned in the MSW Rules, 2000, the dumping sites / land fill sites are inefficiently managed and operated. A mere dumping of waste, without sorting or weighing or treating leads to harmful and unsafe conditions. As per the MPCB report, 2013-2014, all the landfill sites are unscientifically managed / operated. Further, there is no proper plan or vision regarding the renewal and transformation of the landfill site into safe open space once it reaches its capacity.

Some officials mentioned that they had no knowledge about the sustainability of landfill sites; some stated that the landfill could sustain only for 2 years and there would be a necessity to renew it and few informed that the dumping ground has already reached its capacity. **The recently published MCGM's Environment status report 2013 – 2014 states that the Deonar dumping ground has reached its capacity and the Mulund dumping ground can function only for a year!**

This scenario calls in for a well planned transformation of landfill sites in a phased manner with a target reduction in dumping of waste. Only non-degradable waste which cannot be further processed should be allowed to dump at the dumping site.

13. Change begins at the ward office

While interacting with the social workers and also with the experts in the field of Solid Waste Management, a reference of a circular about setting up a composting pit in the ward office building came to our notice. **There is only one ward office that has set up composting pit in its building**, though it is neither attended nor properly maintained by the concerned ward office staff. Whereas, other ward offices have not even attempted to construct a pit in their premises. Also, it was mentioned by some officials that the ward offices receive inadequate funds to maintain these pits and there is lack of manpower for the maintenance of these pits.

Composting pits within the ward office buildings would prove to be good demonstration sites for composting. In fact, the ward offices must do this to lead by own example.

14. Status of Clean-up Marshals

During the course of the survey, the officials informed that the clean-up marshal campaign has not been functioning. The clean-up marshal campaign was revoked following the failure to prevent people from littering on roads; threatening and blackmailing the hospital authorities as well as incurring extorting amount of money for the interests of the company. *(BMC scraps clean-up marshal scheme, 2013)*

In place of this scheme, the MCGM has employed nuisance detectors to charge offenders with fine.

15. Fragile status of schemes

All the ward offices except for one implement various schemes in their areas namely, *Swachha Mumbai Prabodhan Abhiyan* (SMPA), Hyderabad Pattern and Manning and Mopping.

Earlier functioning scheme *Dattak Vasti Yojana* was replaced by SMPA. MCGM introduced *Dattak Vasti Yojana* in 2001 in slums where it did not provide cleanliness services. However, the scheme ran into controversy in 2011, when allegations of misappropriation of funds and corruption were made. **In the new policy of SMPA, work done by groups employed will be inspected and photographs taken at the end of the day to track progress.** MCGM has outsourced its work to various NGOs and agencies that work on generating awareness among the people regarding the segregation of waste through rallies, posters, street plays, and campaigns. Their motive is to increase house to house collection in the slum areas.

Under Hyderabad pattern, the MCGM has outsourced work to the NGOs that focus on cleaning and sweeping the crowded and occupied roads where the MCGM services cannot reach. The MCGM monitors their work and functioning.

Manning and mopping is an afternoon service where, the waste is collected by the MCGM workers.

There needs to be a cohesive scheme implemented by all the wards in order to give the scheme a proper framework and terms of reference. It is more or less a piece meal approach to a rather grave and urgent situation. Such approach varying at different wards and change of policy with change in authority will only lead to waste of vital monetary and human resources.

Campaigns require a well cut-out objective and plan of implementation in a phased manner. A network of NGOs and CBOs would serve this purpose.

16. Expectations from NGOs

The officials stated that as an NGO, NAGAR should work on generating awareness among the people regarding the management of solid waste. It should organize campaigns, street plays; distribute pamphlets, posters which will enable in changing the mindset of the people especially the floating population. It should also seek help from the media in creating awareness by making schools and the youth as their target groups. This will help in imbibing good etiquettes in the future generation.

VI. NAGAR's achievements in the field of SWM

NAGAR, as a not for profit organization established in 2000, has worked on three big projects. They are as follows:

Cuffe Parade Pilot Project (2001): NAGAR, with the help of MCGM (then BMC), SMS (*Stree Multi Sanghathana*), CPRA (Cuffe Parade Residents' Association) and ICPE (Indian Centre for Plastics in the Environment), was successful in encouraging the cooperative housing societies in Cuffe Parade area to segregate waste into dry and wet waste. This dry waste was collected by the rag-pickers appointed by *Stree Mukti Sanghathana* and the sorted waste was sold to the scrap dealers. It was an eight month project which covered 38 buildings in that area in the first month and incorporated upto 80 buildings at the end. The revenue generated increased from Rs. 1210 / month in the beginning of the pilot project to Rs. 30262 / month at the end of the eighth month. It is surely a replicable model!

Review of Advanced Locality Management (ALM) (2005): In this project, the SWM cell of the All India Institute of Local Self- Government (AIILSG), Mumbai, and the erstwhile constituent of NAGAR, CLEAN-Sweep Forum (CSF), under the assistance of the US-Asia Environment Program (US-AEP) of USAID, came together as study partners to examine the ALM system and suggest necessary steps to revitalize this effective movement of people's participation in management of solid waste and helped in review the ALM concept in the municipal set-up.

People Public Private Partnership (PPPP) Model for SWM (2014): NAGAR participated in the Prime Ministers' campaign for "Swachh Bharat" (Clean India) through the official website – www.mygov.nic.in. NAGAR prepared a PPPP model as a blueprint for collaboration between the people (including civic organisations), public sector and the private sector. The model proposed the ways by which the decision-making process and measures can be implemented with defined roles and assigned tasks for each – people, public and the private – and thus, improve the solid waste management and handling in the city of Mumbai. **This report is an extension of the PPPP Model.**

NAGAR has, also, effectively contributed in drafting the Cleanliness and Sanitation Byelaws, 2006 and Eco-Housing Initiative undertaken by the MCGM.

VII. Survey Experiences at Ward Offices

- There were instances where, the concerned officials were very co-operative and provided all the information which was related to the subject of the survey. They were very clear about the contribution of government in the management of waste and were not manipulative in their stance. There were officials who have gone out of their way to improve the current status of the Solid Waste Management in the city of Mumbai and also suggested ways through which NAGAR, as an NGO, could contribute to reduce the burden of garbage on the dumping ground.

- Some officials seemed to be disconnected to the efforts and refused to provide any information in relation to the subject of the survey. They were not supportive and seemed to be superficial in their approach towards the survey. But, it was astonishing to experience the co-operative behaviour of the staff employed in the very same ward offices.

- In one of the ward offices, the entry gate displayed a message saying that the use of plastic is prohibited in the area and the rule is being implemented at all levels. This, however, needs to be supported by actions. As this signage can prove to be effective only when acted upon.

- The issue of hereditary employment came to the fore during discussion. SWM seems to be the only department working under MCGM which employs '*safai kamgars*' on the heredity principle, mainly because of the issues concerning caste and ownership of houses allotted to '*safai kamgars'*. Whether this is a formal practice or a co-opted informal arrangement is not clear.

- The political influence is hindering the waste management process at the ward level. For example, penalty implementing authority does not charge offenders because of such undue influence. The friction between the legislative and the executive, even at the lowest rung of governance, hinders the decision making ability at the local level.

- According to the officials at the ward level, the measures, brought in to increase accountability and transparency and hence efficiency on the part of MCGM officials by reporting each activity through email communication, preparing reports, auditing and so on defeat the purpose as they provide less time for the actual implementation of work. The technical staff is overburdened with clerical work.

- In one of the wards, it was found that biomedical waste was being mixed with other waste generated at the hospital and all was dumped into the collection bin on the road. While collecting such waste, there were

incidences when used syringes would fall from the bins while loading waste into the trucks. There have been complaints from the workers of getting hurt because of such syringes. In one such incident, prescription letter of a doctor was found along with the waste containing syringe from which the concerned doctor was traced and charged with the penalty of Rs. 20,000. However, the root of the problem needs to be addressed here, that is, the safety of workers which needs immediate action.

- It was pointed out by one of the ward officials that the funds allocated by the MCGM for SWM department were inadequate to carry out any innovative approach for the processing of waste within the ward. Also, it was suggested that there should be a 'Research and Development' department to work out innovative methods, bring mechanization in the SWM process for which allocation of funds is necessary.

- It was mentioned by one of the ward officials that there is lack of coordination and cooperation among different departments of MCGM and also different government authorities which bring obstacles in the process e.g. roadsides cannot be swept off waste if vehicles are parked along the roadsides and department concerning the same does not seem to be cooperative to resolve the issue.

- One of the ward officials narrated an instance where a Nuisance Detector and some workers of an NGO were beaten by some people in the slum area for officially charging the penalty under 'Greater Mumbai Cleanliness and Sanitation Byelaws 2006'. When they (ND and NGO concerned) went to the Police station, of the relevant jurisdiction, to register a complaint, it was not registered due to political influence and the concerned ward officer had to write a letter to the concerned police official to get the complaint registered.

VIII. Suggestions and Recommendations

A. Standard Operating Procedures

Effective Implementation

1. Prompt and Strict Implementation of the Recommendations submitted by the Barman Committee in 1998, appointed by the Supreme Court. *(Section X Appendices, Part D & E)*

2. The framework and procedure for management and handling of municipal solid waste must be uniform and in keeping with the existing MSW Rules, 2000. Any public authority revising the procedure or issuing any new policy / order must present such a policy / order with appropriate reasons for doing so through wide public consultation.

3. The data displayed on the MCGM's official website should be updated on a regular basis indicating the data and time of the last update. By doing this, the authenticity and accuracy of the information can be verified.

4. The MCGM's awareness campaign to segregate waste at source should have a targeted approach with tangible goals to achieve the stated purpose in specified period of time. Immediately thereafter, the entire process needs to be evaluated to verify if the targets have been achieved. Demonstrations and workshops on segregation of waste along with adequate infrastructure to handle segregated waste will gain public confidence to segregate waste at source! *(Sample plan for awareness campaign available with NAGAR)*

5. Wide publicity and dissemination of the programme must be done. This could be via charts and posters bearing pictorial representation of wet waste, dry waste and hazardous waste displayed at prominent public places in the city, say, railway stations, bus-stops, malls and movie theatres. Also, a short ad-film can be broadcast at the cinema halls, schools and colleges, on BEST-TV, etc. *(Sample charts & Posters for SWM available with NAGAR).*

6. Proper budgeting: Allocation of funds giving specific line-items is very important. These must include equipments, safety gear, trucks, processing, salaries of employees, awareness campaigns and so on. A social audit of the same must be mandatory at the end of every financial year.

7. The resources required by the MCGM must be categorized and quantified on monthly / quarterly / annual basis. For instance, brooms, safety gear (coat, gloves, mask, shoes, etc) required by sweepers on

monthly basis; dust-bins, wheeled carts, tricycles, etc. required by cleaners on quarterly bases; trucks, compactors, etc. on an annual basis. This will help estimate the budget required and utilization of funds for the same. Registers of such allocation must be maintained and kept open for public view at the ward level.

8. People belonging to the age group of 60-65 years, if willing, can be organized to form groups to spread awareness regarding the importance of segregation of waste, composting and to monitor areas and report nuisance activities to NDs. Their area of work must not exceed a radius of 5 km from their residence. Extraordinary efforts and successful feats will be awarded by publicity on MCGM website. Such scheme can be implemented in a slum area as well. NGOs can work as nodal agencies to enlist volunteers.

9. Eliminate public collection bins (TDPs) in a phased manner so that garbage cannot be seen in public spaces at all and visible cleanliness can be ensured. Even compactors must not be on the roads as they are an eyesore due to poor upkeep and leaching on to the road.

10. House to house collection must be the ultimate aim and area timings as to when the *ghant-gadi* / waste collection vehicle will come must be displayed on notice boards at prominent public places in every ward. These boards can be placed at such locations where waste is stored temporarily. The aim must be to eliminate this practice. A toll free number can be provided (displayed on the notice board and on the website), to be called in case the vehicle does not come in time or when there is need of vehicle on special occasions like festivals, etc.

Team of Cleaners

Sweepers, Waste Collectors and Waste vehicle personnel form a team in maintaining cleanliness. Proper working procedure must be laid down by the MCGM to be strictly followed by the teams (both public and private) and monitored and implemented by the supervisors under the direct authority of the Assistant Municipal Commissioners of each ward.

1. **Sweepers** (*employed by public/private*) must work in teams of two and be allotted a specific area / road for daily sweeping of roads. 1st sweeper sweeps the road and the 2nd sweeper moves with a hand cart to store waste temporarily. The 2nd sweeper can also move on a tricycle, carrying 4-6 containers.

2. **Waste collectors** (*employed by private entity*) must collect wet waste daily and dry waste once / twice a week stipulated as per the requirement of that area. The revenue generated from the sale of

collected dry waste must be shared between the waste collectors and the MCGM in ratio of 80:20 respectively. The wet waste can be sent for composting via MCGM collection trucks / vehicles.

3. **Waste vehicle personnel** (*employed by public/private*) must pick up different kind of waste in different vehicles. Separate trucks for dry and wet waste can be hired from private entity of bought by MCGM. Also, separate trucks should be allotted to bulk wastes (like food waste, market waste, bio-medical waste) which run on scheduled time / day as per the requirement of the bulk waste generator (e.g. hotels, markets, industries, slums, etc.). Waste vehicle personnel must be trained for handling different kinds of waste appropriately.

Collection of segregated waste

1. A fixed time and day schedule must be devised after conducting the pre-tests *(as mentioned under 'VIII. 2. Specific Plans')* and strict implementation of the same be carried out. Waste must be collected at specific time, say from 7.00 a.m. to 9.00 a.m. and where a second round is required, say from 8.00 p.m. to 10 p.m. as well.

2. Major bulk generators of waste apart from households include slums, markets, hotels and hospitals.

   a. All hotels having physical space should be mandated by MCGM to do insitu composting; biodegradable waste from vegetable markets and to some extent, similar waste from hospitals can directly be sent to the wet waste / biodegradable waste processing units, if available, as it consists of one type of waste only, i.e. wet waste.

   b. Waste collected from the slum areas must be segregated at source and collected by the MCGM in separate trucks – wet waste collected every day, at least twice a day; and dry waste collected once / twice a week, on specified day/s.

   c. E-waste or hazardous waste must be treated and disposed. Such waste must be collected in separate e-waste bins once a week at a specific time by the MCGM / private agency or rag-pickers authorized by MCGM. The State Ministry of Environment & Forest must empower the MCGM for collection and safe disposal of e-waste.

Temporary Storage of waste

1. There exists a provision for separate litter bins to store dry waste and wet waste. However, there should be inspection of these litter bins at a specific time period for routine maintenance. The litter bins must carry

pictorial information inscribed on the bins to indicate which is for dry waste and wet waste. Also, they must be colour coded, i.e. green for wet waste and white for dry waste. *(Colour codes are mentioned in MSW Rules, 2000)*

2. The **garbage bags** used to store segregated garbage must be of the requisite quality as per the specifications laid down by law, i.e. **above 50 microns**.

3. MCGM must provide for separate containers for different markets – a) vegetable & fruit; b) fish & poultry. This will help process a) & b) separately.

4. Transfer Stations must be maintained by the MCGM to weigh separately different kinds of wastes as to which can be processed and which cannot be processed. This will give an estimate of land required for dumping waste that cannot be processed. Also, this will be effective for target reduction of waste going to the landfills.

Transportation of different kinds of waste

1. MCGM must use separate trucks / vehicles for carrying bulk waste of one type. An estimate of what type of bulk waste can be transported in which type of vehicle can be ascertained after the aforementioned test survey.

2. Trucks/Vehicles carrying debris must carry a permit card wherein details of the waste producer, quantity of the waste and Corporation's permission to carry that waste are mentioned. Failing to do so, the owner of the debris will be fined and/or license of the driver of that vehicle be cancelled.

3. There should be proper collection of refuse removal charges, as mentioned under the Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006, and record of the same must be maintained in a register open for public view.

Processing different kinds of waste differently

1. MCGM must identify land for processing different kinds of waste. For instance, space below the flyovers, behind public toilets, inside BEST depots, within large housing complexes (if they agree voluntarily), within the ward office premises, at the dumping grounds, within the premises of large industries (if they agree voluntarily) and so on.

2. To further segregate dry waste, 'Dry waste sorting centres' can be raised on a temporary basis once a week on the land identified by the MCGM for this purpose or on land available at transfer stations or dumping grounds. However, after segregation, cleanliness of this land must be maintained.

3. The processing units can be set up on the basis of public-private partnership. Different kinds of waste must be processed differently. Industrial units that can utilize recycled waste must be identified and such industries must be requested to provide space for recycling waste within their premises.

4. MCGM can set up a 'Research and Development' (R & D) wing under the Solid Waste Management department that can work on the innovative approaches to process waste by conducting training programmes / workshops. Also, it can deliberate on appropriate and efficient use of technology and machines. Also, the schedule for timely maintenance and upgradation of the same must be in place and followed. Appropriate use of machines and timely maintenance can be very beneficial to the workers, especially for their health and safety issues.

5. Extended Producer Responsibility (EPR) must be applied for processing of e-waste.

Disposal of inert waste

According to R. 3 (27) of Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006, "Inert solid waste means any solid waste or remnant of processing whose physical, chemical and biological properties make it suitable for sanitary landfilling"

1. MCGM must fix the inert waste generation limit for bulk waste generators in the city. For every amount of extra inert waste garbage generated, bulk waste generators will be charged with garbage tax. Also, there must be target reduction of waste being disposed at the landfill. Only inert solid waste can be disposed at the landfill.

2. The garbage carriers – bins and vehicles – must have measurement indicators. This will show the waste generated within a specific area on field itself.

3. Dumping grounds need to be dealt with scientifically. MCGM must devise a plan to revive space of dumping grounds and make way for processing units or plan towards closure of those grounds in a phased

manner. These grounds need to be converted into public open spaces, when the objective of target reduction of waste is accomplished.

4. Buffer zones or No-Development zones must be maintained around the processing units and disposal sites as well.

5. There has to be a closure plan for every landfill site.

Monitoring for effective implementation

1. Nuisance Detectors should be provided with a vehicle with GPS system to make rounds on the area/s allocated to them. This will help efficiently monitor implementation of the Greater Mumbai Cleanliness and Sanitation Byelaws 2006 and penalize the offenders at the scene of offence itself. The GPS tracking will ensure efficiency of monitoring to some extent.

2. There should be monthly inspection of litter bins by the concerned authority of the SWM department so as to keep the bins in functional quality.

3. As part of MCGM's awareness campaign, institutions segregating waste can be listed on MCGM's website and wide publicity can be given to those who segregate. Also, slogans and posters can include names of people / organizations that help keep their vicinity clean.

4. Any violation, under the MSW Rules 2000 and any other laws on Solid Waste Management, must be strictly penalized.

B. Specific Plans

For every plan, a test survey is required.

Test survey: It is an estimate for factors like time, frequency, infrastructure and workforce required and to be utilized to its optimum. It has a specific time period (say, 15 days) to experiment and ascertain the above mentioned factors. The results from such a test survey would ensure uniformity and consistency in functioning.

Slums

Role of People:

- To store dry waste and wet waste separately in colour coded bins. A community waste storage centre within the slum can be raised for a temporary period and clusters may be formed in the slum area to

maintain that centre. Waste from such a centre can then be transferred to the waste collection trucks at a specific time.

- NGOs:
  - If the dry waste is not recyclable within the community area, rag-pickers may be allowed to utilize such waste at an interval of once or twice a week (as concluded by a test survey). NGOs can be authorised by the Corporation on no cost basis for organizing rag-pickers (for NGO). Each such NGO would be assigned a particular area based on the number of households and rag-pickers that they organize. If the waste cannot be utilized by the rag-pickers as well then such waste should be transferred to Corporation's dry waste collection vehicle at the prescribed time and day of the week. (as concluded by a test survey)
  - Equip rag-pickers – provide them with identity cards, safety gears.
  - To organize Youth groups and any other such group existing within the community for the purpose of utilizing wet waste within the slum area. Depending upon the availability of the space, potted plants can be grown. The manure for the same can be prepared from the wet waste without building large-scale composting pit.
  - The remaining wet waste can be transferred to Corporation's waste collection vehicle at the prescribed time. (as concluded by a test survey)
  - To act as a resource centre for information on handling and management of waste. Also, there are people who work at individual level to process waste and transform it into some usable/tradable goods. NGOs can maintain registry of such people and also organize their sessions with the slum population. It will enable the reduction of quantity of waste generated from the area to a large extent.
  - Organise training workshops or sessions for the youth or other such groups or interested individuals to utilize wet waste as manure for the potted plants. The training would be a general one and not a technical one.
  - Implementation of Greater Mumbai Cleanliness and Sanitation Byelaws 2006, charge fines on people not abiding by the laws mentioned in the form of receipt. (As existing under SMPA)

- Waste cannot be disposed off on open sites, in lanes or on roads. It has to be given to the Corporations' waste collecting vehicle at a time prescribed by it.
- Strictly follow the rule not to use plastic bags made up of material less than 50 micron which cannot be recycled.

- Can use MCGM's helpline number (1916) and grievance redressal mechanism dedicated to complaints related to SWM

Role of Public entities:

- Provide separate truck to collect dry waste twice a week.
- Wet waste, if required, should be collected in 2/3 shifts per day (as concluded by a test survey). Time should be pre-determined and notified to everyone in the area. Signboard displaying the same should be placed in the premises.
- Provide permission to NGOs for organizing rag-pickers. Allocate them the number of households in a particular slum area on the basis of number of households and rag-pickers enrolled in the organization. This is to be on no cost basis for NGOs.
- Provide incentives to inhabitants in the form of recognition /awards
- Meeting with all NGOs quarterly to review the progress, Incur penalty from non-performing NGOs
- Strictly implement the ban on plastic bags made up of material less than 50 micron which cannot be recycled. Confiscation of licenses of producers of such plastic bags.
- Provision of a sign board displaying the toll free number of the corporation in case the Corporation's waste processing vehicle doesn't arrive at a prescribed time of the day

Role of Private entities:

- Arrange for cleanliness drive once in every month, preferably on first Sunday. Women participation can be given high priority for such drives.
- Provision of infrastructure, bins to store and collect waste, brooms etc.
- Provision of funds to NGOs to carry out sessions/workshops for utilization of waste

Markets

Role of People:

- Dry waste should be stored separately within the premises of the designated market and transferred to the Corporation's waste collecting vehicle which would collect dry waste twice a week at pre-notified day and time.

OR

Dry waste should be stored separately within the premises and given to rag-picker organisations at a specified interval. NGOs can be authorised by the Corporation for organizing rag-pickers. Each such NGO would be assigned a particular area based on the size of the

market & total waste generated (as concluded by a test survey) and rag-pickers that they organize.

- Wet waste should be transferred to the large containers placed at suitable locations in the Market's premises
- Waste cannot be disposed off on open sites, in lanes or on roads. It has to be given to the Corporations' waste collecting vehicle at a time prescribed by it.
- Strictly follow the rule not to use plastic bags made up of material less than 50 micron which cannot be recycled.
- Can use MCGM's helpline number (1916) and grievance redressal mechanism dedicated to complaints related to SWM

Role of Public entities:

- Allocate different market areas to Private agencies by signing an MoU depending upon the size and waste generated by the market
- Identify places for the composting of wet waste such as BEST depots, below Flyovers, behind public toilets, Ward offices, Dumping grounds, within compounds of large industries etc. Allocate such identified places to Private agencies for processing the market waste at subsidized rent
- For every market, a Nuisance Detector can be appointed for monitoring
- Meeting with all NGO/Private representatives quarterly to review the progress, also with market associations. This should be compulsory for all partners.
- Strictly implement the ban on plastic bags made up of material less than 50 micron (limit set by Government) which cannot be recycled. Confiscation of licenses of producers of such plastic bags.

Role of Private entities:

- Provision of large size containers with lids for the storage of market waste at suitable locations on partial/full cost recovery
- Provision of litter bins at reasonable distances ranging from 25 – 250 meters depending upon local condition/requirement
- Provision of incentives to market establishments in the form of awards, coupons etc.
- Provision of wet waste processing facility within the ward
- Transportation of wet waste that can be transformed to retrieve energy to the processing unit
- Maintenance of the processing facility
- Self-audit of the processing unit every month
- Quarterly meeting with the Corporation's SWM dept in-charge officer for grievance redressal and suggestions/feedback.

Hotels

Role of People:

- Hotel management can make provision for visible sign boards having gentle instructions like 'Do not waste food and water', 'Keep premises clean' 'Do not ask for plastic bags' and so on. Customers can simply follow the instructions.
- Customers can insist on separate color coded bins to store dry waste and wet waste.
- Food waste is to be stored in the separate containers provided by private agency
- NGOs:
    - NGOs can be authorised by the Corporation on no cost basis for organizing rag-pickers. Each such NGO would be assigned a particular area based on the number of hotels and rag-pickers that they organize. If the waste cannot be utilized by the rag-pickers as well then such waste should be transferred to Corporation's dry waste collection vehicle at the prescribed time and day of the week. (as concluded by a test survey)
    - Equip rag-pickers – provide them with identity cards, safety gears
    - Implementation of Greater Mumbai Cleanliness and Sanitation Byelaws 2006, charge fines on people not abiding to the laws mentioned in the form of receipt. (As existing under SMPA)
- Strictly follow the rule not to use plastic bags made up of material less than 50 micron which cannot be recycled.

Role of Public entities:

- Enlist NGOs and authorize them for organizing rag-pickers. Allocate them the number of hotels in a particular area on the basis of number of rag-pickers enrolled in the organization. This is to be on no cost basis for NGOs.
- Contract with private entities, sufficiently rated by credit rating agencies, to collect and process wet waste from hotels depending upon their proposal for processing waste. A model expression of interest should be devised to be incorporated in the contract after public consultation.
- Can provide collection bins/containers for storage of food waste and other waste.
- Identify places for the processing of wet waste and allocate such identified places to Private entity for processing of the market waste at subsidized rent. All Hotels having physical space should be mandated by MCGM to do insitu composting. This should apply to all private commercial facilities such as clubs, hotels, hospitals, industries, malls, commercial complexes etc. Such commercial establishments can

appoint authorised NGOs on payment / under a contract to compost waste within their premises, including collection & disposal of dry waste. Or set up automated systems available for such purposes. This would lessen the burden on the MCGM. Maybe this should be a general point placed at a suitable point in these recommendations.

- Quarterly evaluation of the processing unit set up by private entities and meeting with concerned official of the private entity for grievance redressal and suggestions/feedback
- Strictly implement the ban on plastic bags made up of material less than 50 micron which cannot be recycled. Confiscation of licenses of producers of such plastic bags.

Role of Private entities:

- Provision of colour coded bins for the separate storage of dry and wet waste. Bins should be of design compatible with the corporation's waste collection facility.
- Provision of wet waste processing facility within the ward
- Transportation of wet waste that can be transformed to retrieve energy to the processing unit
- Maintenance of the processing facility
- Self-audit of the processing unit in every month
- For Dry Waste:
  Option 1: Dry waste should be stored separately within the premises and to be transferred to Corporation's waste collecting vehicle by the appointed private entity which would collect dry waste everyday at pre-notified day and time.

  Option 2: Dry waste should be stored separately within the premises and given to rag-pickers at a specified interval. NGOs can be authorised by the Corporation on no cost basis for organizing rag-pickers. Each such NGO would be assigned a particular area based on the size of the market & total waste generated (as concluded by a test survey) and rag-pickers that they organize.

Hospitals

Role of People:

- To store dry waste and wet waste separately in colour coded bins.
- Hospital management should store bio-medical waste separately and hand it over to MCGM's bio-medical waste collection truck at a specified time daily. No such waste shall be disposed off on the roadside, lanes, in collection bins or on any open space.
- Strictly follow the rule not to use plastic bags made up of material less than 50 micron which cannot be recycled.
- Can use MCGM's helpline number (1916) and grievance redressal mechanism dedicated to complaints related to SWM

Role of Public entities:

- Provision of infrastructure to collect, transport and disposal of bio-medical waste.
- Can provide collection bins/containers for storage of bio-medical waste and other waste.
- Contract with private entities, sufficiently rated by credit rating agencies, to collect and process waste from hospitals depending upon their proposal for processing waste
- Identify places for the processing of wet waste other than bio-medical waste (consisting of food waste from canteen etc) and allocate such identified places to Private entity for processing of the wet waste at subsidized rent
- Quarterly evaluation of the processing unit set up by private entities and meeting with concerned official of the private entity for grievance redressal and suggestions/feedback
- The MCGM charges trade refuse charges to all commercial establishments. These should be discontinued for those establishments who carry out insitu composting and handling of dry waste. The concerned provisions in the relevant laws have to be amended to incorporate this.
- Strictly implement the ban on plastic bags made up of material less than 50 micron which cannot be recycled. Confiscation of licenses of producers of such plastic bags.

Role of Private entities:

- Provision of separate bins for the storage of dry, wet and bio-medical waste. Bins should be of design compatible with the corporation's waste collection facility.
- Provision of wet waste processing facility within the ward
- Transportation of wet waste to the processing unit, where it would be converted into energy
- Maintenance of the processing facility
- Self-audit of the processing unit in every month

<u>Construction sites</u>

Role of People:

- Can contact MCGM on helpline (1916) for disposal of debris under 'Debris on call' scheme

Role of Public entities:

- Trucks/Vehicles carrying debris should have the information about the waste producer, quantity of the waste and Corporation's permission to

carry that waste. Failing to do so, the owner of the debris will be fined and/or license of the driver of that vehicle be cancelled.

- They must maintain a register of kind of debris waste generated and manner in which it was disposed, including day, date and time of generation and disposal.
- Nuisance Detector can charge fine for improper disposal of C&D waste on roads, lanes, in collection bins, on any open spaces or into any water bodies including the sea and bay area.

Role of Private entities:

- They must maintain a register of kind of debris waste generated and manner in which it was disposed, including day, date and time of generation and disposal.
- Can recycle and reuse C&D waste. Also, buy or utilize recycled debris for peripheral construction purpose.

Malls

Role of People:

- To store dry waste and wet waste separately in color coded bins.
- NGOs:
  - NGOs can be authorised by the Corporation on no cost basis for organizing rag-pickers. Each such NGO would be assigned a particular area based on the number of malls and rag-pickers that they organize. If the waste cannot be utilized by the rag-pickers as well then such waste should be transferred to Corporation's dry waste collection vehicle at the prescribed time and day of the week. (as concluded by a test survey)
  - Equip rag-pickers – provide them with identity cards, safety gears
  - Implementation of Greater Mumbai Cleanliness and Sanitation Byelaws 2006, charge fines on people not abiding to the laws mentioned in the form of receipt. (As existing under SMPA)
- Strictly follow the rule not to use plastic bags made up of material less than 50 micron which cannot be recycled.
- If feasible, space can be identified within the mall for treatment of waste on a smaller scale. The treatment can be by way of transforming waste to energy which can be utilized for the mall itself. The management of the mall can maintain the facility.

Role of Public entities:

- Enlist and authorise NGOs for organizing rag-pickers. Allocate them the number of malls in a particular area on the basis of number of rag-pickers enrolled in the organization. This is to be on no cost basis for NGOs.

- Strictly implement the ban on plastic bags made up of material less than 50 micron which cannot be recycled. Confiscation of licenses of producers of such plastic bags.
- For every mall, a Nuisance Detector can be appointed for monitoring.

Role of Private entities:

- Provision of separate bins for the storage of dry and wet waste. Bins should be of design compatible with the corporation's waste collection facility.
- Provision of wet waste processing facility within the ward
- Transportation of wet waste to the processing unit, where it would be converted into energy
- Maintenance of the processing facility
- Self-audit of the processing unit in every month

IX. Conclusion

It has been fifteen years since the Municipal Solid Waste (Management & Handling) Rules, 2000 were passed. Yet, the city administration seems to be grappling with the nuances of it. The city of Mumbai has been adrift with stench and dirt laden streets, not a bearable sight for a Mumbaikar! With the fast pace of urbanization, the citizens and the city administration, both alike, have forgotten their loyalties to the land and have started amassing benefits alone . The escalating generation of solid waste has posed a grave situation and resulted in a case of mismanagement of solid waste. Such situation demands for equally critical solutions.

After careful analysis, this study concludes that the MCGM ward officials lack a discreet vision and astute planning required for managing and handling the humungous amount of waste in a burgeoning city like Mumbai. Hence, the study provides for a way forward. It suggests some standard operating procedures to be followed for effective implementation of MSW Rules at the ward level itself. It also provides some beneficial specific plans to be implemented while dealing with bulk generators of waste within the city.

As an advocacy-based organisation, we strive to bring together all stakeholders involved in this process in order to protect and preserve our radiant city from becoming a large dumping ground stinking with dirt and filth.

X. Appendices

A. Questionnaire prepared for this survey

1. How much amount of waste is generated in the ward per day?

2. Is the waste collected from households segregated by the people at the source?

2.1. If yes, how did you communicate with the people to create such awareness?

2.2. If no, it means that the people either do not know how to segregate the waste or they are not willing to do it. In either case, have you planned any awareness campaign so that waste generated from the household is segregated at the source itself? How?

2.3. Was the difference between dry and wet waste communicated to the people? In what way?

3. Which are the major bulk generators of waste apart from household in this ward?

3.1. In case of Slums,

3.1.1. What is the population of the slum area present in this ward?

3.1.2. Is there any special provision for collecting waste from the slum areas?

3.2. In case of Hospitals,

3.2.1. How many hospitals are there in your ward?

3.2.2. Is there any special provision for collecting waste from the hospitals?

3.2.3. How is the bio-medical waste handled in this ward?

3.3. In case of Hotels,

3.3.1. How many (big) hotels are there in your ward?

3.3.2. Is there any special provision for collecting waste from the hotels?

3.3.3. How is food waste handled in this ward?

3.4. In case of other waste generators,

3.4.1. What kind of waste generator?

3.4.2. Is there any special provision for collecting waste from these generators?

4. What kind of vehicles and machinery used to collect the waste in this ward?

5. How many collection points are there in this ward?

6. Are separate bins provided at these points to collect dry waste and wet waste separately?

6.1. Are separate litter bins provided at the roadside?

7. Is the collected waste measured every day?

7.1. If yes, what is the instrument used to measure the waste?

7.2. Where is the waste measured?

8. Is the waste loading at these collection points done manually by workers?

8.1. If no, how is the waste handled?

9. How many workers (Safai kamgar, motor loaders, mukadam etc) are employed by MCGM in this ward for solid waste management department?

9.1. On permanent basis

9.2. On contract basis

9.3. Altogether

10. Do you provide safety gears to workers?

10.1. If yes, what are the things included in the safety kit provided to them?

11. Is there any provision in the law to impose penalty on the people for creating nuisance in the process such as littering on the road, non-segregation of waste etc?

If yes-

11.1. Who is the implementing authority to impose penalty?

11.2. How is the penalty charged and collected?

11.3. How many Nuisance Detectors (ND) are available for this ward?

12. Is the clean-up marshal campaign still active in this ward?

12.1. If no, how is the work handled which previously used to be done by clean-up marshals?

13. Is there any waste processing facility in this ward?

If yes –

13.1. What is the method used for the waste processing?

13.2. Are these waste processing facilities monitored?

13.2.1. If yes, how often are these facilities monitored?

14. Does this ward have landfill site within its boundary?

14.1. If yes, name of landfill site

14.2. If no - Which landfill sites are utilized to dispose the waste collected from this ward?

15. Do you have a say in the process of selection of landfill sites within your ward boundary?

15.1. If yes, how much influence does the decision made at the ward level have in the process?

16. How long will the presently used landfill site sustain?

17. How much amount of waste is disposed on the landfill sites per day?

18. Does this ward office have composting pit for processing wet waste generated in the office's premises?

19. Do you have any ward level schemes to increase efficiency in the solid waste management process?

19.1. If yes, what are the schemes implemented at the ward level?

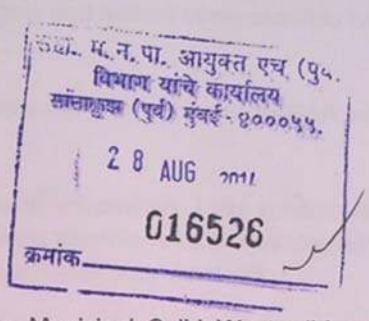
20. What are the ways in which NAGAR can help MCGM in the SWM process?

B. Letter to the Ward Officers (Acknowledged Copy)

NAGAR

Advocacy - Governance - Renewal

To,
Shri. Ajitkumar Baburao Ambi
H East Ward Municipal Office Building,
1ST Floor, Prabhat Colony,
Santacruz (E),
Mumbai 400051



Subject: Request for information on Municipal Solid Waste (Management & Handling) in your ward

Dear Sir,

I am writing to you on behalf of NAGAR, a not for profit organization established in 2000, born out of the passion of several ordinary citizens with a goal to improve life in the city of Mumbai. One of our programs is to transform the scenario of Solid Waste Management (SWM) in Mumbai.

We plan to spread awareness about the pressing need for segregation of waste at source and reduce the burden on landfills. **We have participated in the Prime Minister's campaign for "*Swachh Bharat*" (Clean India) on his web portal www.mygov.nic.in. For this, we have prepared a comprehensive People Public Private Model for Solid Waste Management in Mumbai. We have taken up the task to research ward-wise situation of SWM.**

In keeping with this, we would like to know specific information on municipal solid waste & its management and handling in your ward. We realize that your ward is burdened with the ever increasing amount of garbage generated and its management. Hence, we wish to partner with your ward in order to tackle this issue effectively.

We require the following information –

- How much amount of municipal solid waste is collected per day on an average in this ward?
- What are the major sources of waste generation?
- How the waste generated is handled by the available machinery?

Cecil Court, 3rd Flr, M. Kavi Bhushan Marg, Colaba, Mumbai 400 001
Tel: 22882018 Telefax: 22021621 Email: info@nagar.org.in Website: www.nagar.org.in

Sir, I would like to humbly inform you that we have done a pilot project, **"Cuffe Parade Pilot Project"**, along with MCGM and ICPE in 2001 which was a success. We would like to share its experience regarding the same and extend every possible help on this issue.

Looking forward to a positive co-operation between your ward and NAGAR with the aim of cleaner and greener city...

I request you to kindly provide us the required information. I am sending Ms. Snehal Bhosale, a student from College of Social Work, Nirmala Niketan working with us as an intern to collect the above mentioned information from your ward office.

Thanking you in anticipation.

Regards,

Anjali Pandit

Associate Director

Encl.: Highlights of Cuffe Parade Pilot Project

CUFFE PARADE PILOT PROJECT

Date: 18th April, 2001

Partners: Indian Centre for Plastics in the Environment (ICPE), NAGAR and MCGM (BMC).

Purpose: To segregate waste as a means not only to ease the municipal burden but also to encourage that it is the most responsible and environment friendly thing to do. **The focus was segregation has to become a way of life.**

Driving factors: shortage of space for landfills in a city like Mumbai and lack of availability/allocation of adequate funds for waste treatment.

We also had a specific goal: to create a replicable model for the collection, storage and re-cycling of 'dry' waste and only 'dry' waste in Mumbai city keeping within the system the ubiquitous rag picker, traditionally so invaluable in reducing the Solid Waste burden on our landfills.

Area of operation of the project: 52 buildings in Cuffe Parade which had been 'educated' in the past

Time-frame: 3 months

This partnership between the BMC-NAGAR-ICPE was ably supported by the Stree Mukti Sanghatana (SMS), an NGO that works with lady rag-pickers and the local Community Based Organisation (CBO) - the Cuffe Parade Residents' Association (CPRA).

The role of each was clearly delineated:

CPRA - communication with constituent buildings.
SMS - hands on education about segregation, appointment and supervision of rag-pickers and monitoring the progress of individual buildings towards segregation.
ICPE - sponsorship of costs – honorariums, uniforms for rag-pickers, project promotion, misc. expenses etc
NAGAR - providing administrative support and direction of the pilot project, co-ordination between the various parties and advocacy of the concepts involved.
BMC - the most important player, responsible for the provision of a tempo service for collection of 'dry' waste from these buildings, as well as a shed (at Suraksha Garden) for 'sorting' and storage of that waste by our rag-pickers.

System followed:

- Waste is segregated by the residents of the area at source
- Daily collection of this segregated 'dry' waste is done in a separate tempo manned by two or three lady rag-pickers, now part of the Stree Mukti Sanghatana (SMS). The tempo has banners advertising the segregation campaign
- This waste is then off-loaded at a 'shed' in the Suraksha Garden, Cuffe Parade.
- Here it is 'sorted' into different categories by the rest of the rag-pickers (they take turns on the tempo and at the shed)
- Then it is stored till adequate quantities of the different varieties of waste are collected (usually for a fortnight)
- This is then sold in bulk for better-than-market rates to a scrap dealer who takes it to Dharavi directly

Ours has been a holistic attempt to avoid the litter and fire hazards that are a part and parcel of the traditional recycling chain, and to facilitate the transfer of waste directly from 'user' to 'destination'.

The time-frame of 3 months for the project proved to be unrealistic and was extended for another 4 months. Similarly, the project rolled out to another 40 buildings with extension to another 60 on the anvil. It is, in the main, considered to have been a successful project and has received kudos from all concerned. This can be clearly seen from the chart provided:

	April	May	June	July	Aug.	Sept.	Oct.	Nov.
No. of buildings	38	45	47	47	51	53	71+11	80
No. of Rag-pickers	5	4.9	6.32	6.15	5.2	5.3	6.12	7
Total Quantum Of 'dry' waste collection (in kgs.)	603	3396.5	5530	4838.5	4731	57715	6574	10847
Total amount of money generated (in Rs.)	1210	9509	14826	14848	14130	20554	19626	30262
Earnings per Day per Rag-pickers (in Rs.)	48.41	69.30	83.78	96.57	93.70	138.84	103.44	144.10

From the 'dry' waste data collected we have collated the percentages of different types of waste as collected and received at Suraksha garden: Paper - 67.68%, Plastic - 28.43%, other - 3.89%.

A quick look at the chart above is a recap of our successes:

1. **Resource conservation:** Presently, over 10,000 kgs of 'dry' waste per month (in just the pilot area) is recycled. Multiplied manifold this would be a tremendous saving to the economy not to mention its environmental advantages.
2. **Income generation:** Rs. 30, 000 generated in the last month out of unwanted commodities! **Yes, there is money in waste.**
3. **Generation of livelihood:** Seven persons from an under-privileged section of society earning a living, with scope for generation of a lot more employment. **Moreover, a holistic attempt has been made to improve their nature of work e.g. we actively discouraged them from rummaging in garbage areas as it is unhygienic, disease causing and downright inhuman. Their brief was only to pick up segregated 'dry' waste** just as it was the declared duty of the residents to take responsibility for waste of their own creation/generation i.e. a duty to segregate waste so that some underprivileged member of society does not have to physically separate this waste after them!

In a review of this project we feel that the most important factor is that this hands-on project has been an excellent learning experience for all of us. **Perhaps our biggest achievement in those eight months has been in changing the mindset of the people in the project area. In the Cuffe Parade pilot we proved that this could be done if there was the will to do it.**

This can only be accomplished as a partnership between the user, producer, NGO / CBO, and the BMC. Each has a role to play and must play it responsibly. The citizen must take responsibility for the waste he is generating. Industry must exhibit an **'extended producer responsibility'**. The NGO / CBO is vital in the beginning as a catalyst for change and for co-ordination and direction of the project and the many parties involved. However, it must be a diminishing role as otherwise the set system will never be self-sustaining. As for the **BMC - the buck stops with it!** The bottom line is that the ultimate responsibility is that of the BMC. It must take upon itself the goal of making this work and the only way to do so is to show that it means business, even if it means increasing its work load by occasional levying of penalties. If only the BMC had the will to do this, it does not need the ubiquitous NGO or even sponsorship. It has the funds - it only needs to allocate them well.

We at NAGAR are sure that this is a replicable model. However care should be taken that the following suggestions are addressed in order to ensure its success:

1. It should be preceded by massive and concerted city-wide media blitz to popularise this concept i.e. awaken the citizens' sense of responsibility as well as remind them of their liability if they do not do so
2. Standard operating procedures to be set-up and circulated to all wards as a guideline and some uniformity to be followed so that two citizens from far flung parts of the city are equally aware of segregation and the consequences of not doing it
3. Clear guidelines to, and education of, the BMC staff itself - on segregation, its imperative need, their responsibilities and the consequences of failure
4. Setting-up of clear time-frames for each stage of implementation
5. Pinpoint responsibility at each stage of implementation
6. Formation of a Core Committee to meet on a regular basis for brainstorming and planning
7. Pinpoint the Officer/Leader who will undertake overall co-ordination and monitoring of the project

C. Wards visited by the researchers for this survey

WARD	ADDRESS & AREA
A Ward	'A' ward Office Bldg.,134 'E' Shahid Bhagat Singh Marg, Near R.B.I., Fort, Mumbai-400 001
	Area: 12.5 sq. km.
B Ward	'B' ward Office Bldg., 121, Ramchandra Bhatt Marg, Opp. J. J. Hospital, Mumbai-400 009.
	Area: 2.84 sq. km.
C Ward	'C' ward Office Bldg., 76 Shrikant Palekar Marg, Near Chandanwadi Electric Cementry, Mumbai-400 002.
	Area: 1.78 sq.km.
D Ward	'D' ward Office Bldg., Jobanputra Compound, Nana chowk, Mumbai-400 007.
	Area: 8.03 sq.km.
E Ward	'E' ward Office Bldg., 10, Shaikh Haffizuddin Marg, Byculla, Mumbai-400 008.
	Area: 7.32 sq.km.
F/North Ward	'F/N' ward Office Bldg., Plot.No.96, Bhau Daji Marg, Matunga, Mumbai-400 019.
	Area: 12.94sq.km.
F/South Ward	'F/S' ward Office Bldg., Jagganath Bhatankar Marg & Dr.B.A.Road Junction, Parel Naka, Mumbai-400 012.
	Area: 14 sq.km.
G/North Ward	'G/N' ward Office Bldg., Harischandra Yewale Marg, Behind Plaza Cinema, Dadar, Mumbai-400 028.
	Area: 9.07 sq.km.
G/South Ward	'G/S' ward Office Bldg., N.M.Joshi Marg, Elphinstone, Mumbai-400 018.
	Area: 10 sq.km.
H/East Ward	'H/E' ward Office Bldg., Plot No.137 TPS-5 Prabhat Colony, Santacruz (E), Mumbai-400 051.
	Area: 18.53 sq.km.
H/West Ward	'H/W' ward office Bldg, Saint Martin Road, Behind, Bandra Police Station, Bandra (West), Mumbai-400 050.
	Area: 11.55 sq.km.
K/East Ward	'K/E' ward Office Bldg., Azad Road, Gundavali, Andheri(East), Mumbai-400 069.

	Area: 28 sq.km.
K/West Ward	'K/W' ward Office Bldg., Paliram Road, Near, S.V.Road, Opp. Andheri Railway Station, Andheri(W), Mumbai-400 058.
	Area: 23.28 sq.km.
M/East Ward	'M/E' ward Office Bldg., Shraradbhau Acharya Marg, Near Natraj Cinema, Chembur, Mumbai-400 071.
	Area: 32.50sq.km.
M/West Ward	'M/W' ward Office Bldg., Sharadbhau Acharya Marg, Near Natraj Cinema, Chembur, Mumbai-400 071.
	Area: 19.37 sq.km.
N Ward	'N' ward Annex Bldg., Jawahar Road, Ghatkopar (E), Mumbai-400 077.
	Area: 25.96sq.km.
P/North Ward	'P/N' ward Office Bldg., Liberty Garden, Mamletdarwadi Marg, Malad (West), Mumbai-400 064.
	Area: 46.67sq.km.
P/South Ward	'P/S' ward Office Bldg., Mithagar Nagar Municipal School Sabhagruha, Goregoan (West), Mumbai-400 062.
	Area: 29.56sq.km.
R/Central Ward	'R/C' ward Office Bldg., Palika Mandai Bldg., S.V.Raod, Near Boriwali, Rly,Stn., Boriwali (West), Mumbai-400 092.
	Area: 50sq.km.
R/North Ward	'R/N' ward Office Bldg., below Sangeetkar Sudhir Phadke Flyover Bridge, Jaywant Sawant Marg, Dahisar (West), Mumbai-400 068.
	Area: 18sq.km
R/South Ward	'R/S' ward Office Bldg., Mahatma Gandhi Cross Road No.2, Near S.V.P.Swimming pool, Kandivali (West), Mumbai-400 067.
	Area: 17.78 sq.km
S Ward	'S' ward Office Bldg., Lalbahadur Shashtri Marg, Near Mangatram Petrol Pump, Bhandup (West), Mumbai-400 078.
	Area: 64sq.km.
T Ward	'T' ward Office Bldg., Lala Devidayal Marg, Mulund (W), Mumbai-400 080.
	Area: 45.42 Sq.km.

D. Highlights of the Barman Committee Report

The Hon'ble Supreme Court of India constituted a Committee in 1998, under the Chairmanship of Mr. Asim Barman, the then Municipal Commissioner, Calcutta Municipal Corporation, for suggesting improvements in SWM practices in Class I cities in India. The Committee, after detailed deliberations on the subject with representatives of several States and ULBs, submitted the report incorporating recommendations for improving SWM practices. It was found that many of the recommendations made by the Committee are not being implemented by the MCGM. Hence, the first task that the MCGM should undertake to improve the SWM scenario is to promptly and strictly implement the recommendations of the Barman Committee, 1998. Following are the highlights of the recommendations:

I. Bins

Wet waste should preferably **NOT** be disposed of in plastic carry bags. Use of metal or plastic container with a lid is advised for the storage of wet waste.

A. Households

A private society, association of flats/multi-storeyed buildings should provide community bins for their members for storage of wet domestic waste and dry waste separately. Such waste would be collected by the local body from the designated spot. (This system exists in Navi Mumbai.)

B. Shops/Offices/Institutions/Workshops

In case of Shops/Offices/Institutions/Workshops etc, such establishments should provide for such community bins that match with the waste collection and transportation system of the local body after consulting with them. They should keep their waste on-site as and when generated in a suitable container and direct their members to transfer waste into the community bins before the **prescribed time on a daily basis.**

C. Hotel and Restaurants

In case of Hotel and Restaurants, they should **refrain from disposal of their waste into municipal street bins or containers**. Instead they should store their waste on-site in sturdy containers of not more than 100 Lt capacity. The waste should be **collected once or twice daily** through a contract given by the association of hotels and restaurants or at their request **by the local body on a cost recovery basis.**

D. Markets

1. In case of Vegetable/Fruit markets, depending on the size of the market, the **local body should provide** large size containers with lids for the storage of market waste **at suitable locations on full/partial cost recovery.**

2. Meat and Fish markets should have sturdy containers (of size not exceeding 100 Lt) having a lid, handle on top or on the side and a rim at the bottom of the container **within the premises of that market**.

E. Hospitals and other such establishments

Hospitals/Nursing homes/Pathological laboratories/Health care centres and/or such establishments should refrain from throwing bio-medical waste on the streets or open spaces as well as into the municipal dust bins or the domestic collection sites. (The researchers found out that in some wards the bio-medical waste was being thrown along with other waste by some of the hospital authorities.) Also, they should keep **color-coded bins or bags** for the storage of bio-medical waste including amputated limbs, tissues, soiled bandages, used injection etc.

F. Construction waste

Construction waste should be stored only within the premises of the building and only in exceptional cases where it is not possible to store such waste within the premises, the waste producer should take **prior permission of the local authority for temporary storage** of the waste in such a way that it does not hamper the traffic, the waste does not get spread on the road and does not block the surface drain or storm water drain.

The local body should **prescribe the rate per ton** for the collection, transportation and disposal of construction waste and debris and notify the same to the people. The waste producer needs to **deposit the fee in advance** and charges should be doubled for those who fail to do so.

II. Rag-pickers

The local body may mobilize NGOs or co-operatives to take up the work of **organizing street rag-pickers** and convert them to doorstep waste collectors so that they stop picking up soiled and contaminated solid waste from the streets, bins or disposal sites and improve their lot by collecting recyclable waste from the doorstep at regular intervals of time. Rag-pickers may also be given **identity cards** by the NGOs for increasing their acceptability in society. NGOs and/or the Corporation may support such waste collectors by giving them bags and tools required for collection of recyclable waste from the doorsteps.

III. Segregation Awareness

The local bodies may actively associate resident associations, trade and industry associations, CBOs and NGOs in **creating awareness** among the people to **segregate recyclable material at source** and hand it over to a **designated waste collector identified by the NGO**. The local body should give priority to the segregation of waste at the source by shops and establishments and later concentrate at the household level.

IV. Collection

A. Allocated Area

Each sweeper may be given a hand-cart having detachable containers (preferably 4-6) of 30 to 40 Lt capacity each. A bell may be affixed to the hand-cart or a whistle may be provided to the sweeper in lieu of a bell. **Each sweeper shall be given a fixed area or beat for sweeping plus a fixed number or stretch of houses for the collection of waste**. It is suggested that in congested or thickly populated areas, 300 running meters of road length and the adjoining houses may be given to each sweeper, whereas in less congested areas 500 running meters of the road length with adjoining houses may be allotted to a sweeper depending upon the density of population in the given area and local conditions. In low density areas even 750 running meters of road length and houses can be given. Normally 150 to 250 houses coupled with the above road length may be taken as a yardstick for allotment of work to an individual sweeper.

B. No House-to-House Collection

No sweeper should be expected or directed to do house-to-house collection by asking for waste at the door as this will affect his/her energy and productivity. Instead the sweeper should ring the bell or blow the whistle announcing his/her arrival and start sweeping the street. The people on hearing the bell or whistle should put their domestic/bio-degradable waste into the hand-carts of the sweeper.

C. Private Sweepers

In private societies, complexes and multi-storeyed buildings, normally no sweepers are provided by local bodies; hence private sweepers are generally engaged.

D. Slum Area

The local body may engage a private contractor for collection the waste from Slums and the provision of community bins for the storage of bio-degradable waste. **Performance certification by a 'Mohalla Committee'** may be insisted upon in such cases.

E. Dairy and cattle breeders

The dairy and cattle breeders having sheds within the city limits should be asked to move the cattle sheds outside the city limits if population of the city is above 5 lakh. Such waste producers should be directed not to stack the cow dung or any other stable waste within their premises or on the roadside as it creates insanitary conditions.

V. Sweeping of Public Streets

1. Daily sweeping of public streets is essential for which a schedule of street cleaning should be prepared, prioritizing the roads requiring daily cleaning and the ones which need to be cleaned periodically.
2. The sweepers and other staff involved in the collection, transportation and disposal of waste as well as supervision of sanitation services should be given their statutory weekly off by rotation by dividing the staff into seven groups and each group getting weekly off on one of the days of week. It would be useful in cities where no cleaning is presently done on Sundays.
3. The local body should take measures to **prevent burning** of tree leaves and other waste by sweepers on the roadside. Action should be taken against erring employees. Leaves could be rapid-composted and used locally as organic manure for roadside plantations if open spaces are available nearby for composting.
4. The workforce is advised to use long-handled brooms which will not require bending and hence will reduce fatigue and back pain among the workforce and increase their productivity. While making such brooms, a metal blade which can scrape the material sticking on the street should be fixed on the top of the broom or a separate matal scrapper may be given to the sweepers.
5. Each sweeper engaged in street sweeping should be given a metal tray and a metal plate for facilitating easy transfer of street sweepings from the streets into the handcart.
6. Litter bins should be provided at all railways stations, bus stations, in market places, where people gather or wait in queues and on important roads at reasonable distances ranging from 25 to 250 meters depending upon local condition. The removal of waste from the litter bins should be done by sweepers during their cleaning operations.

VI. Storage

All open waste storage sites should be abolished expeditiously and all dust bins made of cement pipes, metal rings, masonry construction should be replaced in phased manner by a temporary waste storage facility in the form of a neat mobile closed-body large container, or a parked vehicle.

VII. Processing

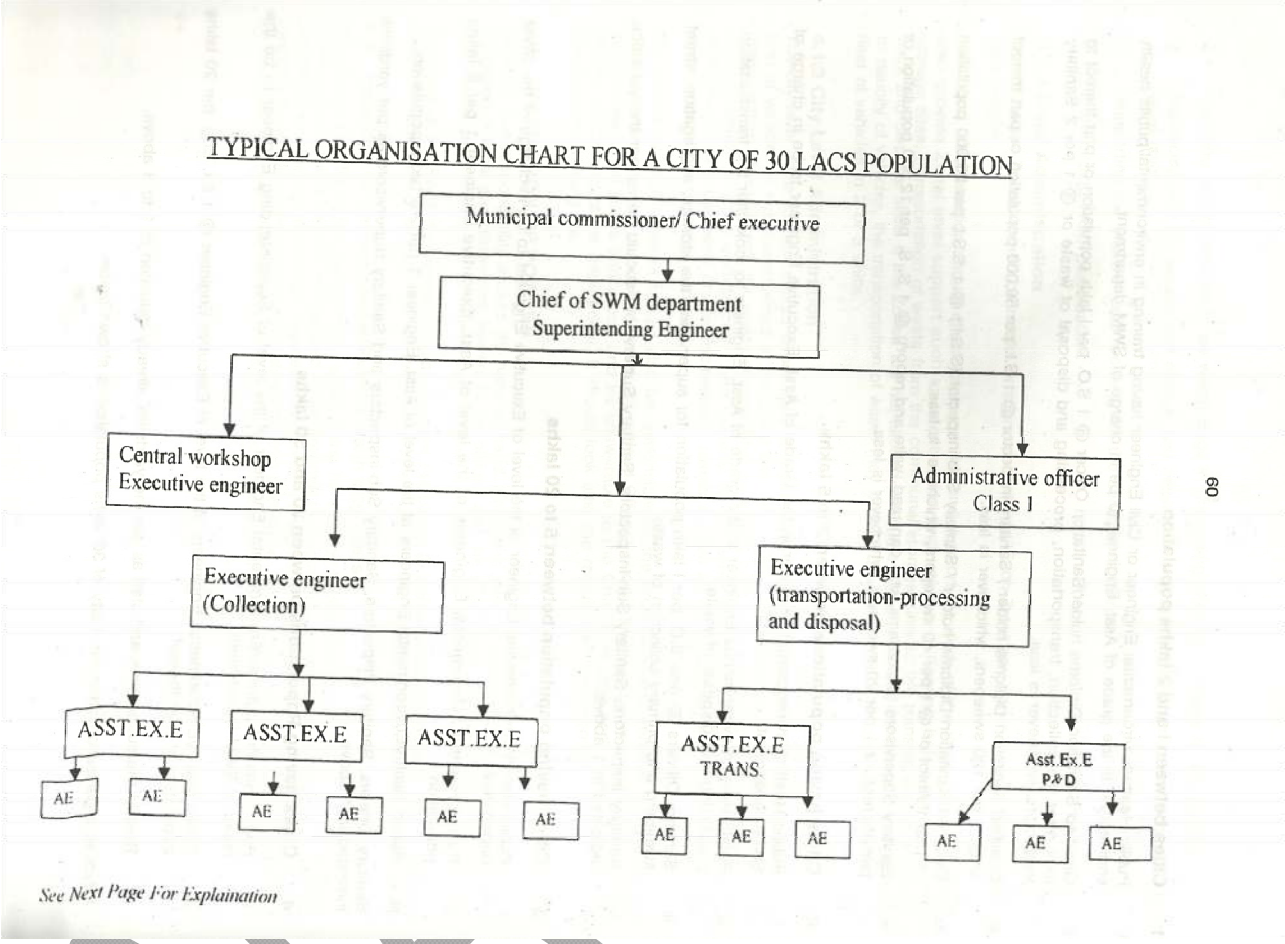
1. The incineration of general municipal waste is not recommended for various reasons; however incineration of specified Bio-medical waste is unavoidable and is strongly recommended for the maintenance of health of the citizens.

2. While looking for sites for processing and disposal of waste, the local body must identify suitable locations for- a) Weighbridge b) Composting area c) Site for the disposal of rejects d) Making a secured landfill for the disposal of hazardous waste
3. The authorities controlling the industries and environment should direct industries to switch over to the use of re-usable or eco-friendly packaging material and meanwhile eco-surcharge should be levied on hard-to-recycle or ecologically unfriendly packaging to encourage compliance.

VIII. Incentives and Penalties

Urban local bodies can announce 'Ward-of-the-month' award.

E. Organizational Chart given in the Barman Committee Report



F. Laws related to Solid Waste Management

1. Mumbai Municipal Corporation Act, 1888
2. Water (Prevention and Control of Pollution) Act, 1974
3. Hazardous Wastes (Management and Handling) Rules, 1989
4. Constitutional (74th Amendment) Act, 1992
5. Bio-medical Waste (Management and Handling) Rules, 1998
6. Municipal Solid Wastes (Management and Handling) Rules, 2000
7. Construction & Demolition and De-silting Waste (Management and Disposal) Guidelines, 2005
8. Greater Mumbai Cleanliness and Sanitation Bye-laws, 2006
9. Maharashtra Non-biodegradable Garbage (Control) Act, 2006
10. Municipal Solid Waste (Prohibition of littering and regulation of segregation, storage, delivery and collection) Rules, 2006
11. E-waste (Management and Handling) Rules, 2010
12. Draft Rules of Municipal Solid Waste (Management and Handling) Rules, 2013

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