



S W A C H H
W O R L I K O L I W A D A
AUDIT REPORT



Audit commissioned

for

Project Swachh Worli Koliwada

by

G5A Foundation for Contemporary Culture and IDFC FIRST Bank

in association with

MCGM, G South Ward, Mumbai

to

Triton Greentech Innovations Pvt. Ltd.

Audit Period: June to September 2018

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1. **Project Swachh Worli Koliwada**

1.1. **Introduction**

Project Swachh Worli Koliwada is a unique, visionary project initiated on June 05, 2018 (World Environment Day) by the G5A Foundation for Contemporary Culture in partnership with the principal donor IDFC FIRST Bank Ltd., MCGM G South Ward and the Worli Koliwada community, all working together to build a self-sustained, Zero Waste neighbourhood.

Through an arts and civic based approach, aims of the project under the aegis of 'My Neighborhood My Responsibility' are to:

- bring community together and reinforce their sense of belonging and ownership
- reinforce social awareness, especially around the issue of solid waste, with an emphasis on the importance of segregation
- develop participatory, ground-up processes and systems, along with the community, MCGM and experts, to implement sustainable solid waste management solutions
- work together with the different agencies and stakeholders to rebuild a clean, healthy, resilient and vibrant neighborhood
- identify avenues for facilitating livelihood opportunities and equip the community with the necessary skills
- eventually develop a process model that is sustainable, scalable and replicable within the ward and eventually in the city

1.2. **About the Partners**

G5A Foundation for Contemporary Culture

The G5A Foundation for Contemporary Culture is a not-for-profit organization that encourages contemporary art and culture that is experimental and courageous, good governance that is inclusive and participatory, and ecosystems that are equitable and resilient.

At G5A, we believe that art and culture have the power to catalyze change for the better - by challenging people to think critically, creatively, and courageously.

Through a series of diverse programs and projects we are committed to nurturing a vibrant, safe, and inclusive platform that encourages the creative and just - in thought and expression.

In doing so, our endeavor is to enrich people's lives, rebuild resilient and responsible communities, and strengthen the cultural fabric of our community and city.

G5A cityLAB is a key pathway of G5A that helps develop participatory and inclusive processes and systemic solutions to make our cities more liveable. By generating and facilitating ideas and interventions through an interdisciplinary approach, cityLAB attempts to create a network that reconnects individuals, empowers communities and builds creative, resilient neighborhoods.

cityLAB

- Is a hub bringing together different stakeholders in the community to share information and best practices, with a special focus on the ideas of citizenship, liveability and sustainability
- Is an outreach initiative that reinforces awareness, skill building, empowerment and leadership, primarily through interdisciplinary art and culture programs
- Is an incubator that explores process models that enhance participatory livelihood opportunities
- Is a partnership network that will facilitate the design of a neighborhood governance (process) model, which is equitable, sustainable, scalable and replicable

For more details, please visit www.g5a.org

IDFC FIRST Bank Ltd.

IDFC FIRST Bank Ltd. provides a range of financial solutions to individuals, small businesses and corporates. The Bank offers savings and current accounts, NRI accounts, salary accounts, demat accounts, fixed and recurring deposits, home and personal loans, small business loans, forex products, payment solutions and wealth management services. IDFC First Bank has a nationwide presence and operates in the Retail Banking, Wholesale Banking and other banking segments. Customers can choose where and how they want to bank: 206 bank liability branches, 102 asset branches, 140 ATMs and 454 rural business correspondent centres across the country, net banking, mobile banking and 24/7 toll free Banker-on-Call service.

As part of IDFC FIRST Bank's Corporate Social Responsibility mission, the Bank partners non-profit organisations and social enterprises that use innovative solutions to solve some of society's pressing social and environmental issues. The Bank's interventions are structured in a way that they not only benefit communities directly, but create a ripple effect that sets the tone for long-lasting advantages.

The Bank funds programmes that are long-term and use a sustainable approach which involves multiple stakeholders (civil society, Government bodies, non-profit organisations). The Bank's partnerships also go beyond funding, to offer advice and guidance on strategy, and implementation of social impact programs on ground.

The CSR mission of the Bank focusses on Education, Livelihoods, Women Empowerment, Health and Financial Inclusion.

MCGM

The Municipal Corporation of Greater Mumbai (MCGM), also known as Brihanmumbai Municipal Corporation (BMC), (formerly the Bombay Municipal Corporation till 1996) is the governing civic body of Mumbai, the capital city of Maharashtra. It is India's richest municipal corporation. The BMC's annual budget exceeds that of some of India's smaller states. It was established under the Bombay Municipal Corporation Act 1888. BMC is responsible for the civic infrastructure and administration of the city and some suburbs.

2. Audit

2.1. Aims

Perform audit at the site to evaluate the existing solid waste management scenario to be able to propose and execute a plan for 'Zero Waste, Self-Sustained' Worli Koliwada

2.2. Objectives

- To study the current solid waste management system in Worli Koliwada
- To identify issues related to solid waste management – with the community and the existing MCGM amenities and services
- To recommend plans for efficient and segregated waste collection systems

2.3. Key Focus Areas

- Aspects related to people's awareness and their current waste management practices
- Solid waste collection system by MCGM
- Efficiency of door-to-door collection of solid waste
- Existing services for collection of waste from non-residential units
- Amenities provided for solid waste management
- Sites vulnerable to open dumping
- Quantity of waste generated in the area
- Composition of waste
- Water supply and sanitation issues

3. Executive Summary

3.1. Highlights of the audit in line with the study

3.1.1. Methodology:

Municipal solid waste audit was carried out in all eight zones of the Worli Koliwada area to study the present solid waste management system. Several aspects such as waste collection system from various establishments, amenities used for waste collection, shoreline clean-up activity, sites vulnerable to open dumping, quantification of waste generated by various establishments and composition of waste were studied through visual observation and interaction with waste collectors and locals for a time span of 15 days. Audit was carried out during various time slots (morning, afternoon and night) to obtain efficient data, as accurate as possible. The slots were as given below.

- a. **Morning audit:** Started at 7am and continued till 1pm
- b. **Afternoon audit:** Started at 11am and ended at 6pm
- c. **Night audit:** Was conducted from 6pm to 12am

The methodology for carrying out the audit was adopted in line with the aims and objectives of the study. Quantitative analysis of waste was done by quantifying waste generated in households and non-residential units using a weighing balance. The composition of waste was ascertained using the coning and quartering method.

3.1.2. Focus/ Target Group description

- 1,040 households were targeted for quantification of solid waste generated. Total samples of households selected were as below:
 - Zone 1: 200 samples
 - Zone 2: 200 samples
 - Zone 3: 130 samples
 - Zone 4: 130 samples
 - Zone 5: 130 samples
 - Zone 6: 130 samples
 - Zone 7: 60 samples
 - Zone 8: 60 samples
- 53 samples from commercial/ non-residential establishments were targeted for quantification of solid waste generated

- Interacted with ten ragpickers and four scrap dealers for involving them in the solid waste management project
- During the audit, data related to waste collection and disposal was also obtained from sanitary workers. Interaction with the locals was carried out to obtain information about their problems related to the waste collection system.
- Also, information related to locality-wise general waste disposal trends were provided by waste collectors
- The ragpickers and scrap dealers mentioned above were interviewed to understand their willingness to work as skilled manpower in dry waste management system
- For quantification of waste, samples were also collected from various non-residential establishments such as meat shop, hotels/ restaurants, canteen, fruits and vegetable shops, market, balwadi, classes, bar, nursing home, clinics, dairy, bakery, tea – coffee stall, paan bidi stall, wine shop, chappal shops, cloth store, tailor shop, medical store, electric store, garage, general store, flour mill, food stall and jewelers.

3.1.3. Key Focus Areas and Key Findings

- **Aspects related to people’s awareness and their current waste management practices like storage of waste and its disposal:** The major reason for improper solid waste management was found to be lack of active contribution from the locals, which may further be attributed to lack of awareness, low education levels, low income levels and lack of pro-cleanliness social norms.
- **Solid waste collection system by MCGM in context with waste collection timing, frequency and efficiency of waste collection, shoreline cleaning and street sweeping in the study area:** The lanes were found to be narrow and accommodations were densely packed. Households were also inaccessible. These issues may lead to countering the MCGM’s door-to-door collection objective making waste collection inefficient. Shoreline cleaning was irregular and there were also few garbage dumping points in the area
- **Amenities provided for solid waste management:** The area had lower than required number of community bins, and the garbage could be observed to spill out of the bin; the situation was worst on days like Thursday and Monday.

- **Identification of sites, which are more vulnerable to open dumping and cleaning:** In all the locations, the waste was dumped in small portions all over the lanes and along the shoreline. There were 3 main dumping places observed along the shoreline, i.e. Ganesh Seva Mandal, Shoreline of Gofa Devi Temple and Navneet Lane and mainly 4 garbage vulnerable areas near Datta Mandir, Pakhari Galli and Achanak Krida Mandal, Kashibai Cottage.
- **Sources of water supply, storage facilities and sanitation facilities as well as its maintenance:** The water was sourced from MCGM in all the zones between 6:30 pm to 10:30 pm. Sanitation facilities were not enough and several stray animals moved freely on streets. Worryingly, street refuse contained significant human fecal matter and manure. The audit highlighted a major issue of lack of sanitation and rampant open defecation in the region.
- **Quantitative analysis of average waste generated by various establishments in the area:** It was observed that among all the establishments, hotels produced the highest amount of waste and coaching classes being the lowest generator.
- **Composition of the waste with respect to type of waste, to determine quantity of recyclable and non-recyclable waste:** Through the analysis it was found that highest quantity was generated in the category of biodegradable waste (2.65 kg) whereas rubber and glass were generated in the lowest quantity (0.095kg each).

3.1.4. Challenges and limitations of the audit exercise

- Respondents (MCGM workers/locals) may not have divulged complete information or given incorrect information in sections of the questionnaire related to waste management, given disclosure issues in admitting the actual facts.
- There may be variation in data related to clean-up activity only during festivals, which was not observed during the duration of the audit.

4. Recommendations

The study area was majorly influenced by improper waste handling practices. The major reason for the same was found to be lack of awareness. Even where waste is being segregated into wet and dry waste, the community in the region is unaware about the importance of proper disposal of waste in the dustbins.

- Foremost activity that needs to be initiated in the region is awareness among the community, wherein people are not just told about segregation of waste but are also explained about the necessity of disposal of waste in dustbins and finally handing over the same to the waste handlers in a segregated manner.
- A waste collection and disposal mechanism needs to be developed wherein waste collection should be done door-to-door or a collection kiosk should be built and installed at various points in the area. This would help to target every household discouraging them to dispose of waste in community bins, shorelines or in open. It is pertinent to note that door-to-door collection is a mandate by local bodies as per SWM Rules 2016.
- Ragpickers play an important role in waste management. Integrating them with the waste management system can lead to sustainable employment creation for them. An SHG or a local community action group of ragpickers can be made and be developed as semi-skilled waste dealers, who can directly sell the recyclable waste to the waste aggregators/ recyclers.
- Proper waste collection facilities such as dustbins (adequate in capacity and number) should be provided as per requirement.
- Creating public awareness through information, education and communication campaign and educating the waste generators is of utmost importance.
- Proper segregation would lead to better options and opportunities for scientific disposal of waste and increase resource recovery.
- Awareness should be carried out among commercial waste generators to keep containers for waste collection/ disposal.
- Sanitary workers and ragpickers should be provided with proper Personal Protective Equipment.
- Community participation in waste management should be initiated in the study area. This should be based on the principle of cooperation and partnership amongst Community Based Organizations (CBOs), Non-Governmental Organizations (NGOs) and the MCGM for managing civic services at the local level. A local committee can be established which will look after the smooth functioning of the system with respect to its planning, implementation and monitoring.

5. Introduction to Solid Waste Management

Waste can be defined as material that is unwanted or unusable and no longer has any value to the person who is responsible for generating it. Various synonyms such as rubbish, garbage, refuse or trash have been used when referring to waste.

However, the term Municipal Solid Waste ('MSW') largely refers to non-hazardous solid waste from the kitchen and post-consumer waste obtained from houses, streets and public places, shops, offices, and hospitals. Management of such waste is most often the responsibility of waste generators, government bodies like municipal or other authorities. Although solid waste from industrial processes is generally not considered MSW, it nevertheless needs to be taken into account when dealing with solid waste because it often ends up in the MSW stream.

A typical waste management system consists of the following elements:

- Waste generation and storage
- Segregation at household level
- Primary waste collection and transport to a transfer station or community bin or an appropriate collection area/ center
- Street sweeping and cleaning of public places
- Management of the transfer station or community bin or the collection center
- Secondary collection and transport to the waste disposal/ processing site
- Secondary segregation (manual and mechanical)
- Waste processing/ treatment (recycle and upcycle)
- Waste disposal in landfills

Human activities create waste, and the ways in which the waste is handled, stored, collected, and disposed of can either protect or pose risks to the environment and to public health. In urban areas, solid waste is generated by households, commercial and industrial enterprises, healthcare and institutional activities, as well as on the streets. In many cities, such MSW contains human and animal excrement as well as hazardous chemical pollutants. These may lead to diseases and injuries, especially among children, ragpickers, and employees in the waste management sector.

Solid waste management ('SWM') includes activities and processes namely segregation, recovery, storage, collection, recycling, processing, treatment or safe disposal. A proper SWM seeks to minimize health, environmental and aesthetic impacts of solid waste. In urban areas, problems and issues of Municipal Solid Waste Management (MSWM) are of immediate importance. Most governments and local bodies have acknowledged the importance of MSWM but rapid population growth overpowers the capacity of most municipal authorities to provide even the most basic services.

Solid Waste Management Rules, 2016 [suppressing **The Municipal Solid Wastes (Management and Handling) Rules, 2000**] notified by Ministry of Environment, Forest and Climate Change, made by Central Government in exercise of the powers conferred by the Environment (Protection) Act, 1986] applies to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes.

Some major rules according to Solid Waste Management Rules, 2016

Duties of waste generators

- Segregate and store the waste generated by them in three separate streams namely bio-degradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors
- Wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities
- Store separately construction and demolition waste, and dispose off as per the Construction and Demolition Waste Management Rules, 2016
- Store horticulture waste and garden waste generated from her/his premises separately in her/his own premises and dispose of as per the directions of the local body from time to time
- No waste generator shall throw, burn or bury the solid waste generated by her/him
- Every street vendor shall keep suitable containers for storage of waste generated during the course of her/his activity
- All resident welfare and market associations shall ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorized waste pickers or the authorized recyclers
- All gated communities and institutions with more than 5,000 sq. m area shall, ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste and handover accordingly

Duties and responsibilities of local authorities and village Panchayats of census towns and urban agglomerations

- Prepare a solid waste management plan as per state policy and strategy on solid waste management
- Arrange for door-to-door collection of segregated solid waste from all households including slums and informal settlements, commercial, institutional and other non-residential premises

- Establish a system to recognize organizations of waste pickers or informal waste collectors and involve them in the process
- Facilitate formation of Self Help Groups and integrate them in door-to-door management
- Set-up material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials; bins for storage with appropriate color codes
- Establish waste deposition centers for domestic hazardous waste and give direction for waste generators to deposit domestic hazardous wastes at this center for its safe disposal
- Direct street sweepers not to burn tree leaves collected from street sweeping and store them separately and handover to the waste collectors or agency authorized by local body
- Provide training on solid waste management to waste-pickers and waste collectors
- Collect separately waste from sweeping of streets, lanes and by-lanes daily, or on alternate days or twice a week depending on the density of population, commercial activity and local situation
- Set-up covered secondary storage facility for temporary storage of street sweepings and silt removed from surface drains
- Collect horticulture, parks and garden waste separately and process in the parks and gardens, as far as possible
- Transport construction and demolition waste as per the provisions of the Construction and Demolition Waste management Rules, 2016
- Educate workers including contract workers and supervisors for door-to-door collection of segregated waste and transporting the unmixed waste during primary and secondary transportation to processing or disposal facility
- Ensure that the operator of a facility provides personal protection equipment including uniform, fluorescent jacket, hand gloves, raincoats, appropriate footwear and masks to all workers handling solid waste and the same are used by the workforce
- Create public awareness through information, education and communication campaign and educate the waste generators
- Allow only the non-usable, non-recyclable, non-biodegradable, non-combustible and non-reactive inert waste and pre-processing rejects and residues from waste processing facilities to go to sanitary landfill
- Detailed SWM Rules, 2016: http://www.moef.nic.in/sites/default/files/SWM%202016_0.pdf

6. Audit Study Area

Worli Koliwada is an area located in southern part of Mumbai, which is a part of the seven islands that formed Mumbai. It is home to various settlers belonging to communities such as Koli, Agri and Bhandari. Also, many people from other parts of the country have found a home in the area. This area is home to the Worli Fort, which is a heritage monument. The Worli Koliwada area also falls in the Coastal Regulation Zone – III and hence, is declared as sensitive as per the Costal Zone Regulation Notification, 2011 as it is bound by sea from three sides. It is also sensitive from a Defence perspective, as the Indian Coast Guard has active operations abutting it. An additional factor that makes Worli Koliwada sensitive from a security viewpoint is its proximity to the Bandra-Worli Sealink. A google earth imagery of the study area is presented in **Fig. 1**.



Figure 1: Google Earth Imagery of Study Area

The geology of the area is largely rocky. The houses in the area are quite dense.

The study area has been divided into eight zones as demarcated by G5A as per their primary research and based on google satellite image. They are:

- Zone 1: Waras Lane to Bhandarwada Lane to Navneet Lane
- Zone 2: Bhandarwada Lane and Navneet Lane to Pakhari Galli
- Zone 3: Pakhari Galli to Sankalp Lane
- Zone 4: Sankalp Lane to Cemetery
- Zone 5: Cemetery to Ghoda Dabka Ground
- Zone 6: Ghoda Dabka Ground to Sai Baba Temple
- Zone 7: Sai Baba Temple road to Church
- Zone 8: Church to Worli Tip Jetty

Methodology:

Initially, a reconnaissance visit was conducted to get a brief understanding of the study area. Two applications, i.e., Locus maps and Google Earth, were used for the study. Area and boundaries of the study site were marked using Google Earth imagery and Locus map was used to understand the boundaries of the zone and track completion of each area of all the eight zones.

An audit was conducted in Zones 1-8 of Worli Koliwada (hereinafter referred to as the 'study area') for a time span of 15 days. The on-field team comprised of 9 members out of which, 4 members conducted the quantification of waste, 4 conducted monitoring of the area and interacted with the locals while one member was assigned for the overall management of the audit.

The audit was conducted in 3 slots:

- **Morning audit:** Started at 7am and continued till 1pm
- **Afternoon audit:** Started at 11am and ended at 6pm
- **Night audit:** Was conducted from 6pm to 12am

2 zones were covered by the team each day, which were again cross-verified by conducting a second visit. Data was collected by individual observation and also by interacting with the locals and MCGM workers.

Sample collection was carried out in all eight zones. Following is the sample size with respect to each zone:

- **Zone 1 and Zone 2:** 200 each
- **Zone 3, Zone 4, Zone 5 and Zone 6:** 130 each
- **Zone 7 and Zone 8:** 60 each

A form mentioning all aspects to be studied was used for collection of data. The form was divided into two columns, one for primary data collection through monitoring (Auditor's observations) and the other for secondary data obtained through studying the views and comments of the locals and workers (people's comments). A copy of the form is given as reference in **Annexure I**.

Following aspects of the present scenario of MSW were studied:

- Waste collection by MCGM, workers deployed per lane, working time, amenities and infrastructure used, community bins provided, and efficiency of cleaning
- Dumping at shoreline and the specific locations vulnerable to waste dumping, cleaning of the shoreline
- Sites vulnerable to open dumping
- Water supply and sanitation issues in the area and its impact on solid waste management

7. Current status of MSWM system

7.1. Quantification of MSW

7.1.1 Methodology and findings

Solid waste quantification was carried out for 8 days. 2 teams with 2 members in each team carried out the quantification of waste from households and commercial establishments. Random sampling method was used to carry out the quantification. Each team was provided with an Electronic Weighing Balance (Model: WH-A14; Capacity: 10gm – 50kg.). A survey sheet was carried by each team during the entire survey, which has been provided in **Annexure II**.

A list of number of samples collected and findings from residential and commercial establishments is given in Table 1.

Table 1: Number of samples and average quantity of waste generated per establishment

Sr. No.	Establishment	Number of Samples	Average waste per sample (kg)
Residential			
1	Households	1040	0.839
Commercial			
1	Meat shop	2	7.45
2	Hotels/ Restaurants	1	10.65
3	Canteen	2	8.35
4	Fruits and vegetable shops	3	3.75
5	Market	1	12.95
6	Balwadi	2	0.75
7	Classes	2	0.35
8	Bar	1	1.85
10	Nursing home	1	3.45
11	Clinics	3	0.950

Sr. No.	Establishment	Number of Samples	Average waste per sample (kg)
12	Dairy	1	2.65
13	Bakery	3	3.850
14	Tea – coffee stall	3	1.55
15	Paan beedi stall	3	0.945
16	Wine shop	1	1.75
17	Chappal shops	2	1.035
18	Cloth store	3	0.585
19	Tailor shop	3	0.450
20	Medical store	2	0.350
21	Electric store	2	0.750
22	Garage	1	1.35
23	General store	3	0.950
24	Flour mill	3	1.65
25	Food stall	3	1.500
26	Jewellers	2	0.850

Images below depict the MSW quantification at various establishments:



Figure 2: MSW quantification from households



Figure 3: MSW quantification from households



Figure 4: MSW quantification from a vegetable store



Figure 5: MSW quantification from a general store

The waste obtained from each household was weighed and average waste generated was calculated accordingly.

7.2 Composition of MSW:

Composition of the MSW provides a description of the constituents of the waste which varies widely from place to place. The composition of MSW is a key aspect in MSW management. It is an important data point to calculate the density of the waste, to decide methodology of collection, treatment and disposal and to ascertain reduction, reusability and recyclability potential of the waste.

Particularly for the study area, the composition study helped in gaining information on the type of waste generated in the area. The information from the composition study can be further used to plan the capacity of composting machine and to determine the quantity of waste that can be recycled.

The most striking factor seen was that the organic content in waste is higher in the low income groups whereas the paper and plastic content in waste is higher in the high income group. This mirrors the difference in consumption pattern, culture and education (Ramachandra et al, 2007), household size (Afroz et al 2010), and prevalent social norms (Ali and Siong 2016).

7.2.1 Methodology and findings:

9 samples were selected in total from 3 different locations (3 samples from each location).

Locations selected for sample collection were as below:

- Community bins near Coast Guard office
- Navneet Lane and
- Community bin near Gonta Galli

Site selection justification: Community bin near Coast Guard office and near Gonta Galli were selected because majority of waste was found to be dumped there and Navneet Lane is prone to excess dumping of waste. Hence, they were suitable options for collecting waste samples.



Figure 6: Sampling sites

The samples were further segregated to measure the contents. The composition of waste was ascertained using quartering and coning method (Source: Swachh Bharat Mission: SWM Manual, Part- II). The method was repeated twice to get an average value.

The images below depict the methodology of ascertaining composition of waste:



Figure 7: Segregation of waste



Figure 8: Weighing of segregated waste

Quartering and coning sampling procedure:

- Samples from all three sampling points were mixed thoroughly
- 6 kg of mixed municipal waste from the waste pile was collected
- The samples were placed as a uniform heap
- The heap was divided into four portions using straight lines perpendicular to each other
- Waste from opposite corners of the divided heap was removed to leave half of the original sample. The remaining portion was again thoroughly mixed and the quartering process was repeated until a desired size was obtained.
- The last remaining opposite fractions of waste were mixed and analyzed for identifying composition of the waste

The process was repeated for two other samples taken from the same source.

MSW is heterogeneous in nature. The samples were segregated into various types like biodegradable waste, plastic, paper, wood, metal, rubber, clothes, etc.

Findings:

Further, the waste was weighed separately and analyzed. Through the analysis it was found that the waste contains biodegradable waste (2.65 kg, 59%), paper (0.36 kg, 8%), plastic (0.515 kg, 11%), wood (0.1 kg, 2%), metal (0.305 kg, 7%), cloth (0.125kg, 3%), rubber (0.095kg, 2%), glass (0.095 kg, 2%) and other waste (0.285 kg, 6%). Composition of all types of waste is given in Fig 9.

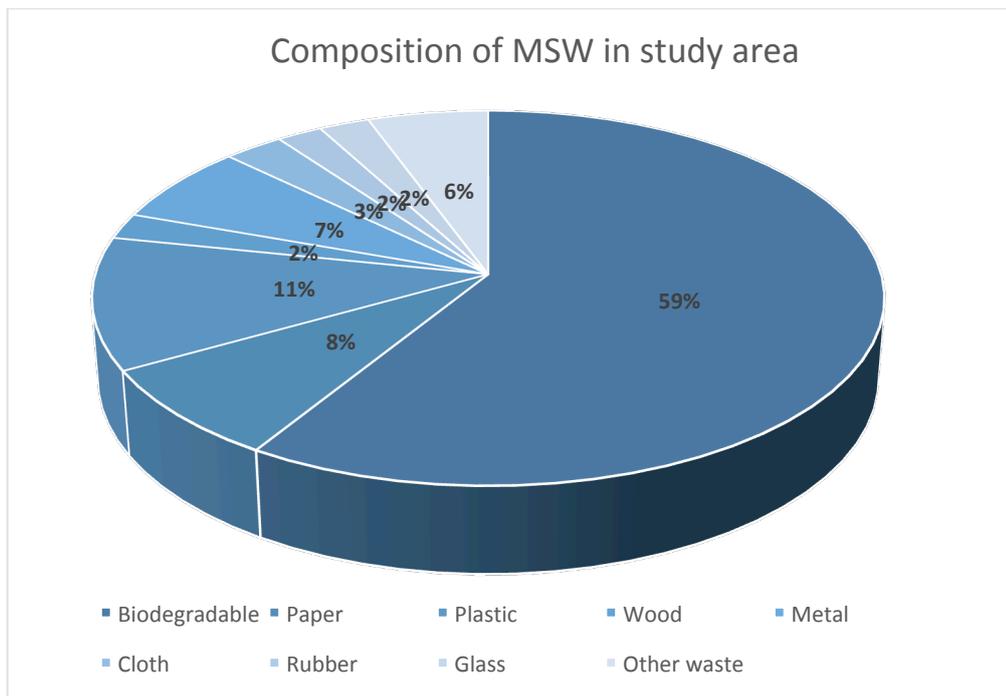


Figure 9: Composition of MSW in the study area

- About 59% MSW comprised of wet waste. The wet waste majorly consisted of food residues, vegetable and fruit peels and waste food items.
- Plastic waste was another type of waste, which was found in large volume. Plastic waste included plastic glass, plates, wrappers, polythene bags, pen, broken jars and showpieces.
- Materials like newspaper, magazine paper, cartons, and paper bags formed part of the paper waste.
- Metal waste comprised of wires, bottle caps and small tins.
- Among rubber waste, pieces of cycle tyre were found.
- Glass waste comprised mainly of glass bottles of medicine.
- Cloth waste consisted of rags of cloth.
- Other waste consisted of sanitary waste (materials like diapers and sanitary pads), minimum medical waste like syringes and e-waste materials like batteries.

About 59% of the waste obtained is compostable and waste material like paper, plastic, glass, metal which forms about 28% of the waste can be recycled.

This indicates a significant potential for resource recovery from MSW generated in the study area. Food waste may also be used as animal feed to some extent. Other alternatives of recovery from organic waste may be in the form of compost or energy and such recovery would reduce collection and transportation costs and landfilling. Recyclable waste can be sent to waste dealers for recycling. Community initiatives can also be taken for imparting knowledge and awareness about upcycling of better quality dry waste.

7.3 MSW collection

The elevation of the study area was found to increase as one proceeds from Zone 1 to Zone 8. The vehicles assigned to an area were dependent on the accessibility of the area, terrain and width of the roads.

In zones 1, 2, 3 and 4, pushcart (Fig. 10) was used as the primary vehicle of waste collection, while in the upper zones, i.e., zones 5, 6, 7 and 8 primary waste collection was done using trolley dustbins (Fig. 11).



Figure 10: Pushcarts used for collection of MSW

For street sweeping, a broomstick (Fig. 11) was available with the workers. Also, plastic tubs and mats were used for collecting bulk waste from open dumps. Secondary waste collection from the upper zone is done using the auto-tipper (Fig. 12), which further loads the waste into the compactor (Fig.13).



Figure 11: Trolley dustbins



Figure 12: Broomstick used for street sweeping



Figure 13: Auto-tipper



Figure 14: Compactor

Fig. 15 below shows the details of present solid waste collection system

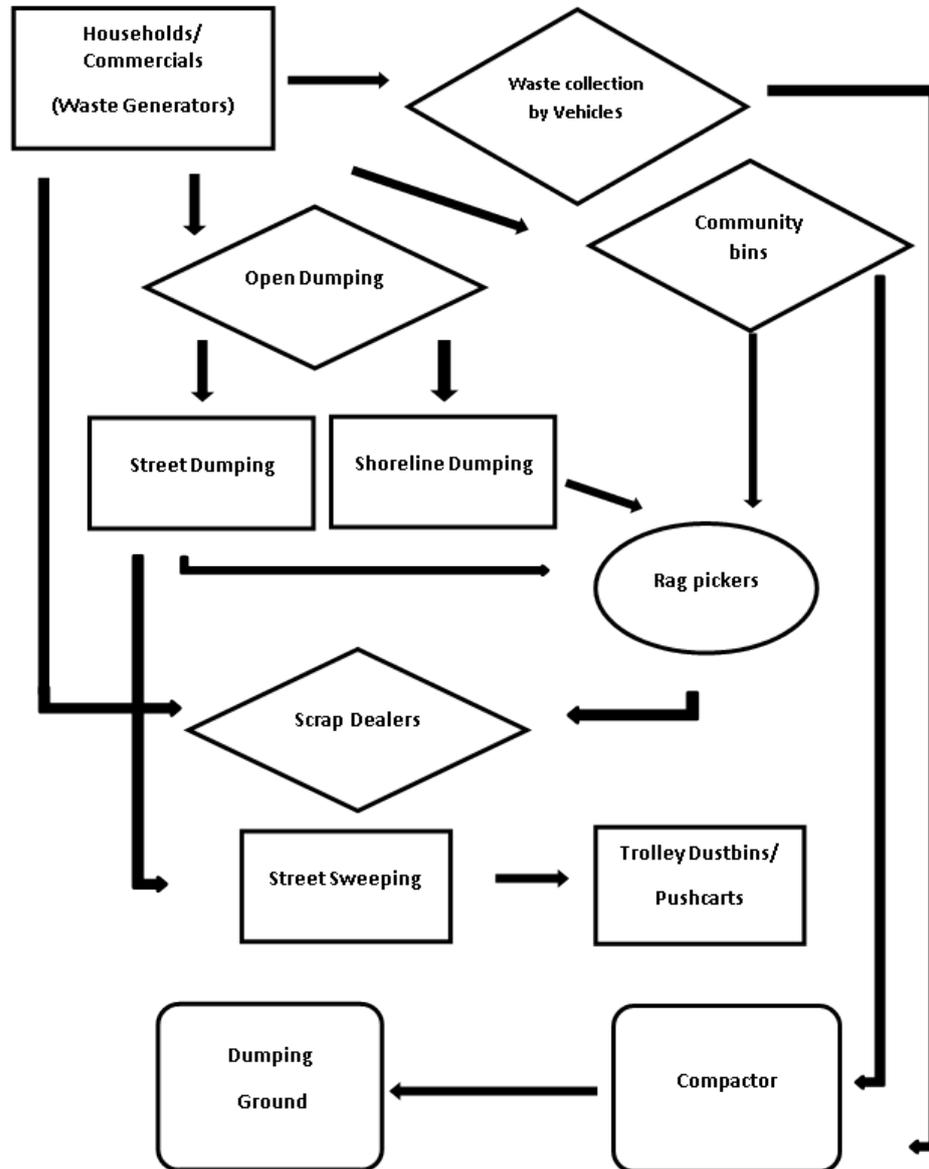


Figure 15: Flowchart of Waste management System in Study Area

7.3.1 MSW collection from households (existing MSW management cycle)

Waste collection from households started early in the morning at 7:30am and continued till 10am.

In Zones 1, 2, 3 and 4, primary collection of MSW from households and establishments were carried out using pushcarts and trolley dustbins. The waste collection from households were not door-to-door. The pushcarts in Zones 1, 2, 3 and 4 moved in the lane and stopped at various points along the lane, where people came and disposed of their waste.

The waste collected was further taken to the community bin located near Coast Guard office where secondary collection took place. For secondary collection of waste, a compactor was used. In parts of Zone 1, i.e., Heeraseth Chawl and Waras Lane, no waste was collected from the households and people used community bin for disposal of waste.

Fig. 16 presents the waste collection process in Zones 1, 2, 3 and 4

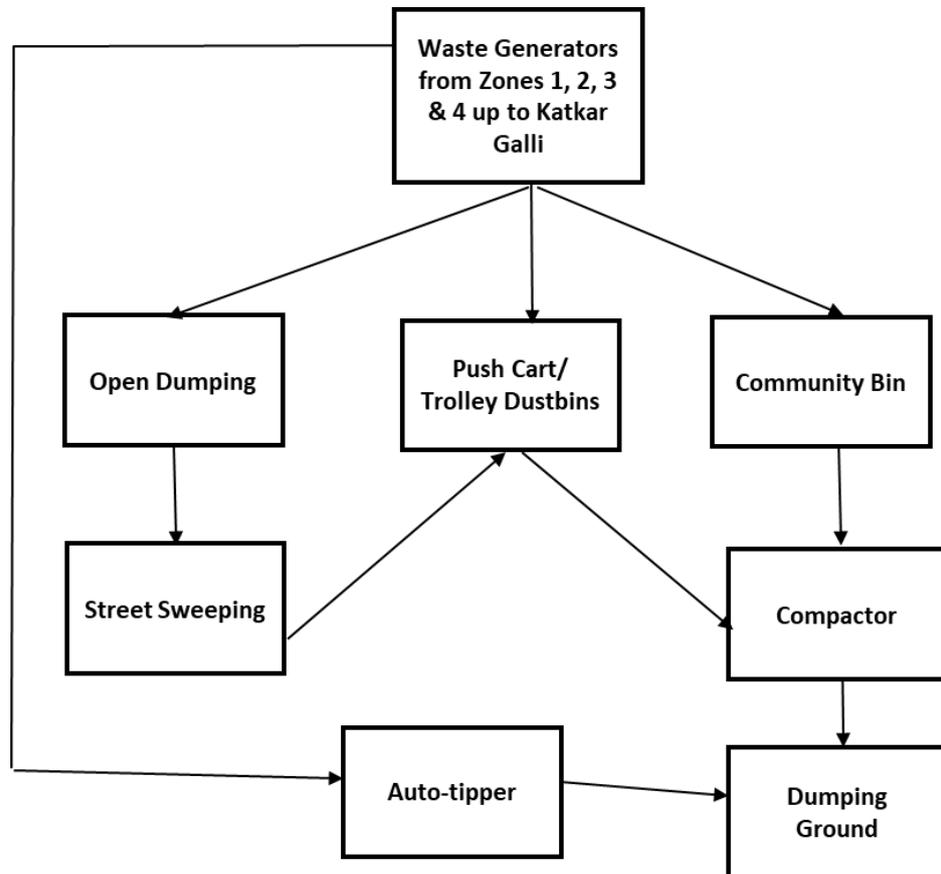


Figure 16: Flowchart of MSW collection by MCGM at Zones 1, 2, 3 and 4 (upto Katkar Galli)

In zones 5, 6, 7 and 8, where access to area was difficult due to narrow lanes and relative elevation (the area was accessible by footpath), the use of pushcart was restricted. Hence, primary collection was done using trolley dustbins. The dustbins further carried waste to an auto-tipper placed near Katkar Galli where secondary collection of the waste took place, which was further taken to the compactor present near the Coast Guard office for tertiary collection. The compactor was found to be present near the Coast Guard office from 7am to 4pm.

Fig. 17 below presents the waste collection process in Zone 5, 6, 7 and 8

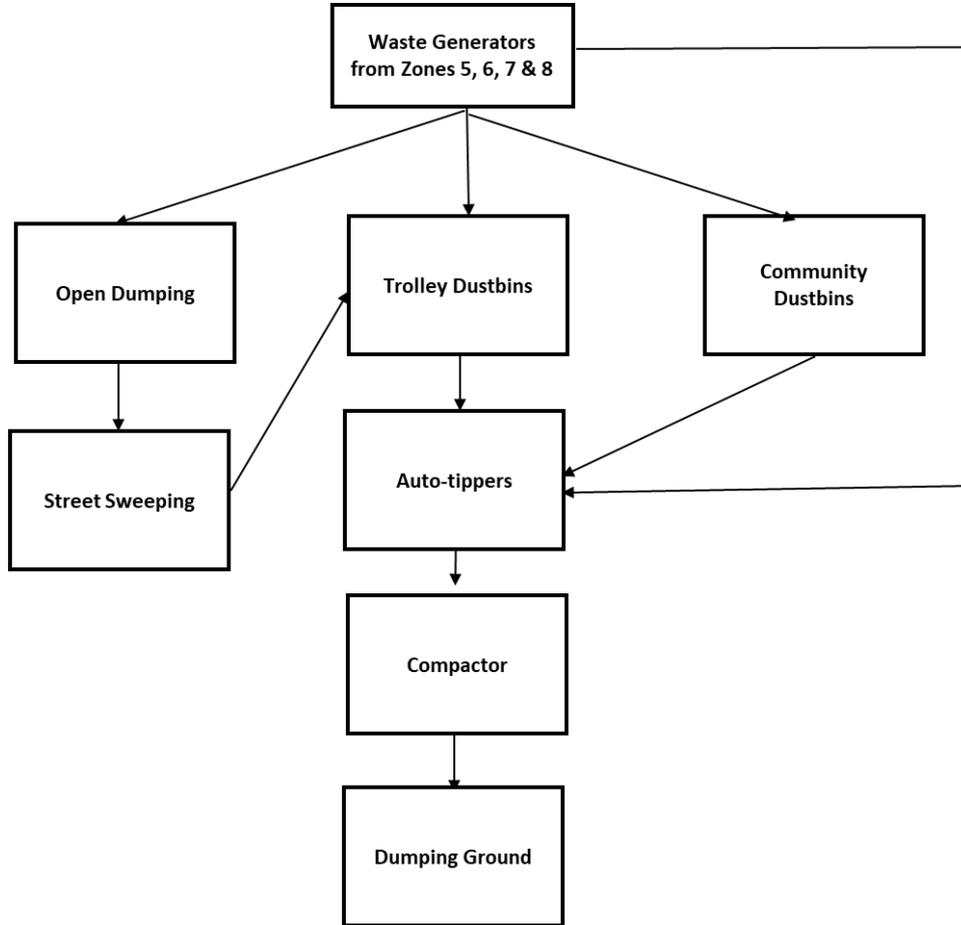


Figure 17: Flowchart of MSW Collection by MCGM at Zones 5,6,7 & 8 (beyond Katkar Galli)

During night, waste collection was not done by MCGM workers, but Aarna Foundation (NGO) was found to be carrying out the collection. An auto-tipper was used for collection of waste. The auto-tipper was observed in the area from 10:30pm to 11:15pm. The waste collection by auto-tipper was done up to Katkar Galli only. Waste was collected from households and commercial places. However, it was seen that no cleaning of community bin was done at night.

The waste collected by the compactor was taken to the dumping ground located in Deonar.

Waste collection in the upper zone, i.e., in Zones 7 and 8 was poor. The primary reasons for the same were ascertained as narrow lanes, lack of accessibility and no contribution from the people in MSW management. According to us, the time for which the waste collector stopped at the junction points should be for a longer time such that it is sufficient and adequate for people to reach the trolley dust bins and dispose off their waste.

7.3.2 Waste collection from non-residential set-ups

Waste collection from non-residential (including commercial set-ups) started early in the morning at about 7:30am and continued till 10am. In the lower zones, i.e, Zones 1, 2, 3, and 4, primary collection of waste from commercial establishments was done using trolley dustbins, which was later loaded into the compactor. The waste generated later in the shops were dumped in the dustbins at night as mentioned in Para 7.3.1 *ibid*.

In zones 5, 6, 7 and 8, where access to area was difficult and trolley dustbins were used, very few commercial establishments were observed in the area. The few commercial establishments carted their waste in trolley dustbins.

Market waste near Heeraseth Chawl was collected during day time, while majority of the commercial sectors dumped their waste at night in the auto-tipper provided by “Aarna Foundation”.

7.4. Community bins

In the entire study area, only three community bins were provided: Near Coast Guard area, Near Gonta Galli and near Achanak Krida Mandal. Images in figs 17-20 below show those community bins.

The community bin located near Coast Guard area was the most commonly used one. The bin was being utilized by people staying in Zones 1 and 2, majorly by the people from Heeraseth Chawl, Waras Lane, Bhandarwada and Pakhari Galli (area shown in map in Fig 21). The waste dumped in the bin contained waste mainly from commercial establishments. Other community bins were utilized by fewer people as dumping by them was carried out at the shoreline which was a major activity in the locality. Through interaction with locals it was found that majority of waste disposal was during night and early morning.



Figure 18: Community bin near Gonta Galli



Figure 19: Community bin near Achanak Krida Mandal



Figure 20: Community bin near Coast Guard office – during day

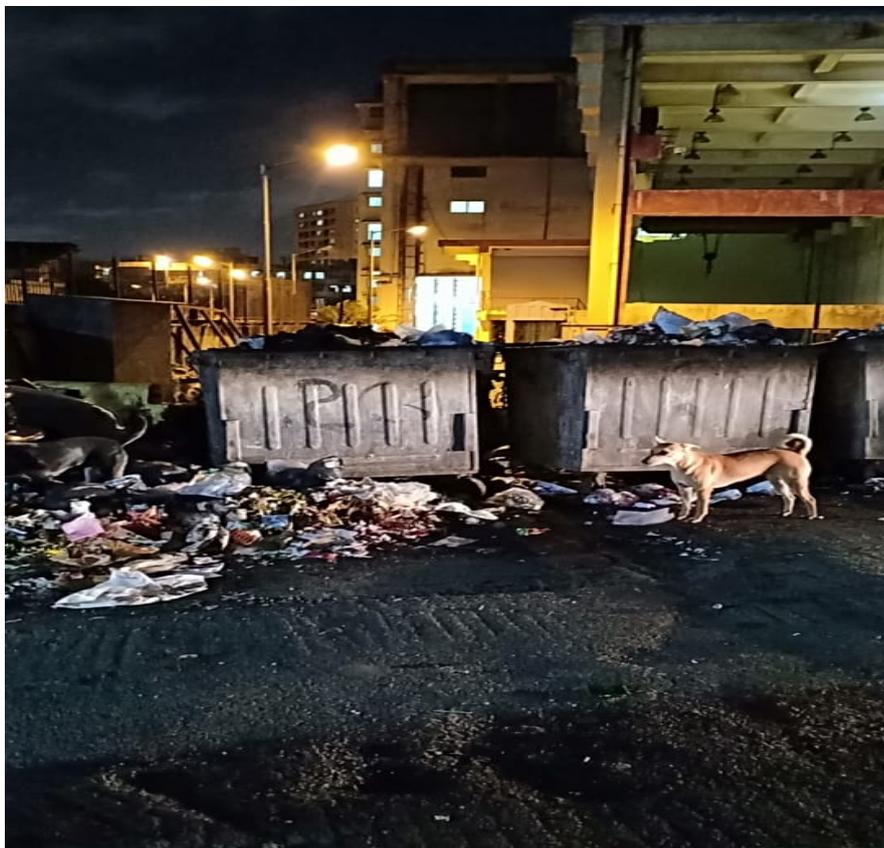


Figure 21: Community bin near Coast Guard office– during night



Figure 22:Chawls using Coast Guard community bin

The disposal of waste in all the community bins took place in a shabby manner. During the observation it was found that the waste put in the community bins spilled out, the reason for which was understood to be lesser number of community bins.

The quantity of waste disposed is also impacted by eating habits of the inhabitants. Upon interacting with the MCGM workers and locals it was understood that the people eat more non-vegetarian food on Wednesday and Sunday. Hence, the amount of waste, especially wet waste collected from community bins in morning was more on Thursday and Monday respectively.

The community bin was the main area of activity for the ragpickers. During day time many ragpickers were found to be segregating and collecting waste from the community bins. Animals also flocked around the community bins adding to the menace.

Community bins were cleared usually between 7:30am and 10:00am. Despite the waste collection at night by the NGO Aarna Foundation, the volume of waste generated post collection was large leading to spill over of waste around the dustbins.

Waste having high resale value in scrap market was also being separated and removed by an MCGM labourer. He sold those further to scrap dealers. About 7-8 kg of waste was found to be collected on a daily basis.

7.5. Street sweeping

Street cleaning is a fundamental service ensuring clean and hygienic urban conditions. Generally, households, commercial entities, and transport operators should be made responsible for garbage minimization on the streets. Street waste includes paper, plastic, dirt, leaves, and other vegetative matters. Manual sweeping was carried out in the area using broomsticks. Street sweeping was seen to commence simultaneously with waste collection activity. A dedicated person was deployed for sweeping activity in each lane. The waste collected during street sweeping was transferred to or collected by the pushcarts during waste collection from commercial establishments and households. In Zones 7 and 8, street sweeping was not observed.

7.6. Shoreline dumping

The study area is surrounded by sea on all three sides and shoreline dumping is rampant here. Shoreline dumping was seen at all three sides of the study area. People from all the zones dumped their waste along the shoreline. The reason mentioned by the locals for the same was improper waste collection. They also mentioned that they were not in the favor of storing waste for a long time in the house and hence, preferred throwing it along the shoreline.

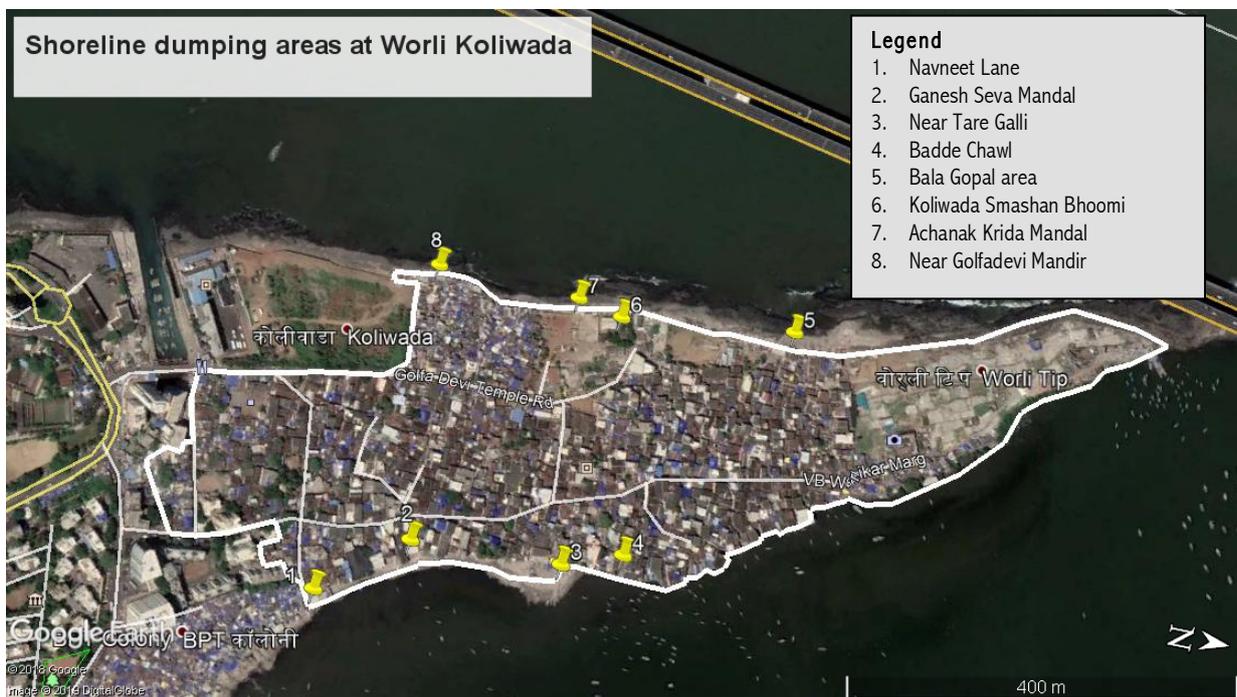


Figure 23: Shoreline dumping areas in Worli Koliwada

Locations like Ganesh Seva Mandal, shoreline of Golfadevi temple and Navneet Lane were more prone to dumping of waste. Other locations such as Tare Galli, Badde Chawl, Koliwada Smashan Bhoomi and

Siddivinayak Mandal were also found to be prone to dumping of waste. In upper zones, waste was found to be dumped mainly in the sea. Shore cleaning activity in the area is shown in Figs. 24 & 25



Figure 24: Shoreline cleaning by MCGM workers



Figure 25: Cleaning only on landward area

A group 'Beach Warriors' formed by the NGO, Aarna Foundation, was found to carry out cleaning of waste along the beach only on Saturdays. The group collected waste from seaward side and later piled it up on the land. However, the waste was rarely collected from landside. As the area is influenced by tide, at times the piled up waste again got dispersed in the sea water.



Figure 26: Near Bala Gopal Area (Shoreline Dumping)



Figure 27: Near Ganesh Seva Mandal (Shoreline Dumping)

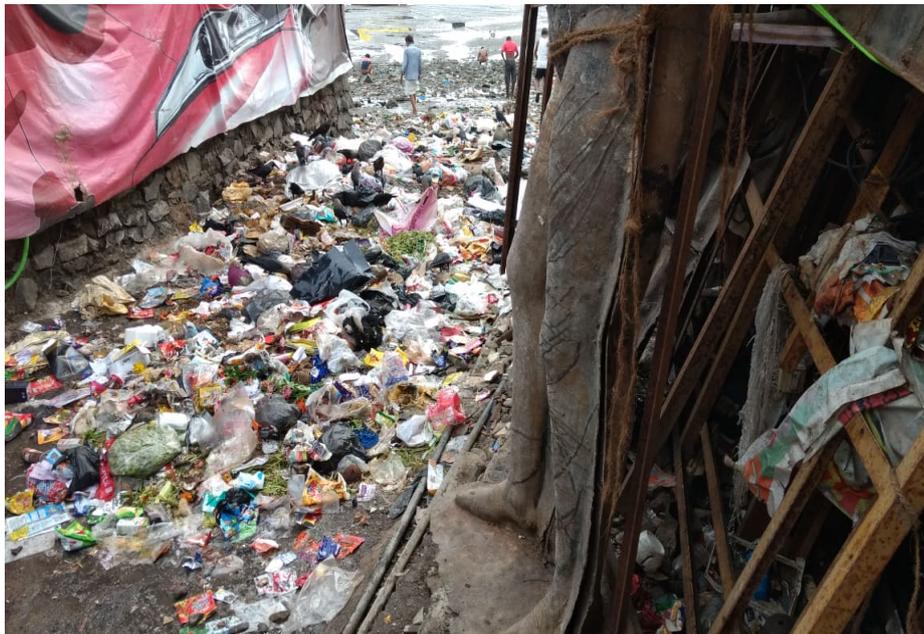


Figure 28: Navneet Lane (Shoreline dumping)

The study area being covered by sea on all three sides has tidal influence leading to accumulation of waste on the shoreline during high tide. Also, the shoreline is additionally impacted not only because of waste disposal but also due to open defecation. Shoreline cleaning done was partial targeting only on the landward sides of the sea (Fig. 25) and retaining the waste on seaward side influenced by open defecation. The frequency of cleaning varied in all the zones.

In Zones 1 and 2, cleaning was done everyday whereas in Zones 3, 4, 5 and 6, cleaning was done twice a week. The cleaning activity started from the upper zone and proceeded downwards. In Zones 7 & 8, cleaning was done only on occasions like Ganpati Visarjan and Navratri. A JCB was observed near shoreline of Bala Patil Chawl for cleaning of waste dumped on shoreline. On interacting with locals it was found that the work was done only for two days.

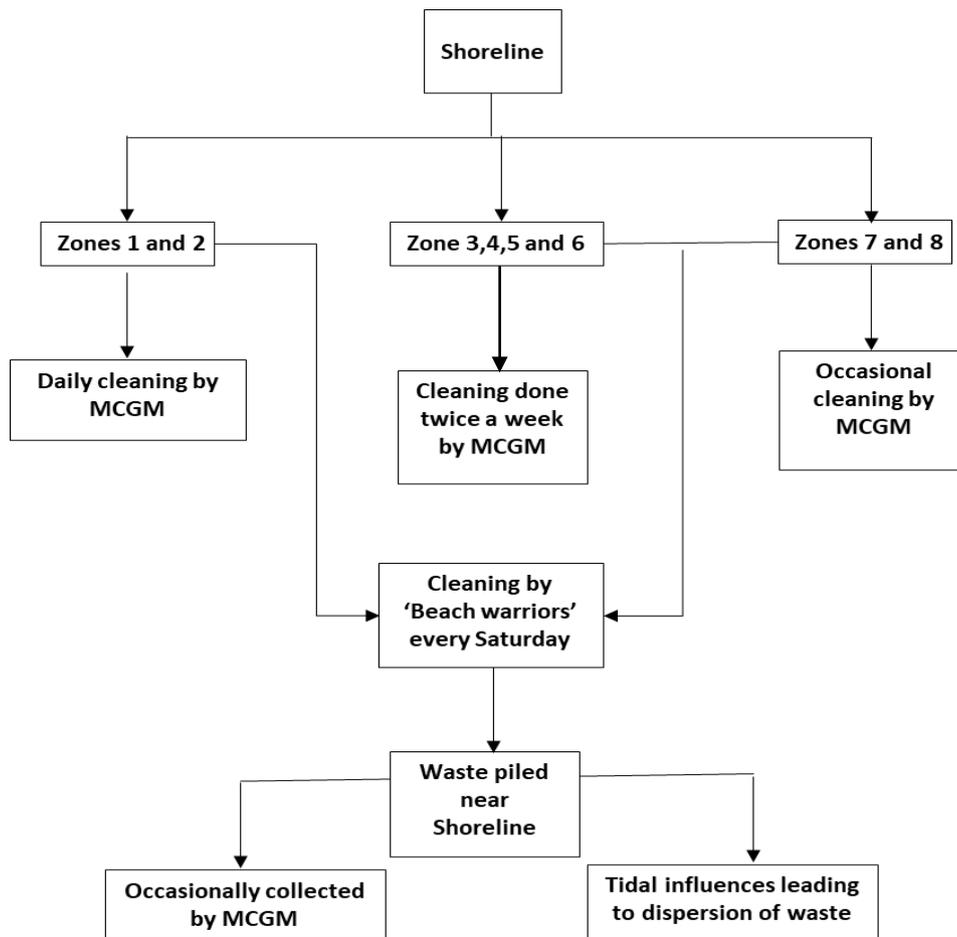


Figure 29: Flowchart presenting shoreline cleaning activity

7.7. Garbage vulnerable areas – open dumping

In all the locations, the waste was dumped in small portions all over the lanes. Main open dumping vulnerable locations in the study area were found near Datta Mandir, Pakhari Galli and Achanak Krida Mandal, Kashibai Cottage. The reason mentioned by people was lesser number of community bins in the area. Other major dumping issue was related to demolition waste, which was dumped along Golfadevi shoreline, Tare Galli and

Achanak Krida Mandal. The locals mentioned that the waste was not cleaned by MCGM. Tare Galli locals mentioned that they themselves were willing to help if MCGM initiates the cleaning of the demolition waste.

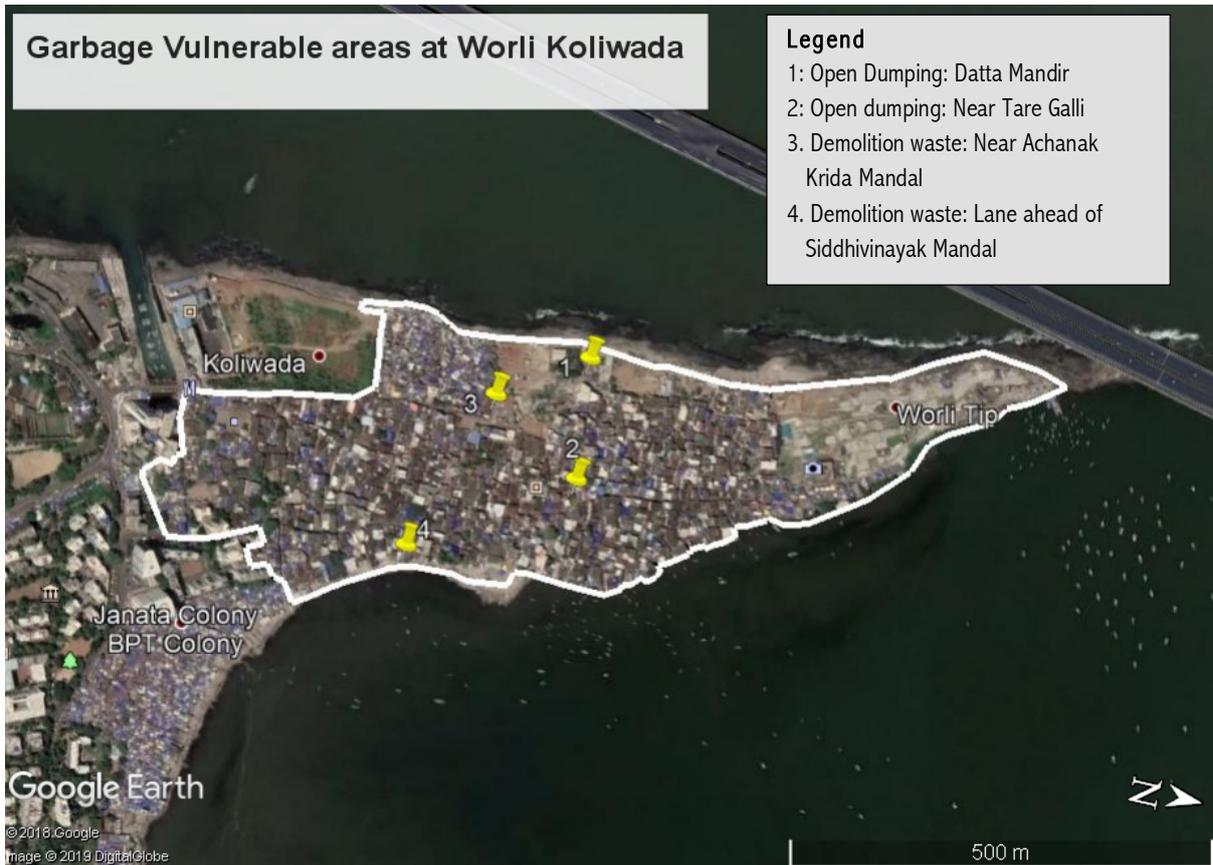


Figure 30: Garbage vulnerable areas



Figure 31: Datta Mandir (Open dumping)



Figure 32: Achanak Krida Mandal (Open dumping)



Figure 33: Pakhari Galli (Open dumping)



Figure 34: Achanak Maidan (Open dumping)

7.8. Scrap dealers and informal waste collectors

The informal sector in any city includes the 'kabadiwalas' or scrap dealers (the 'kabadi system') and the waste pickers. The 'kabadi system' network forms an important link in the overall waste recycling system prevalent in the country. The kabadi system or scrap dealers can be compared to micro-entrepreneurs who buy reusable and recyclable material like newspapers, metal, glass, cardboards, plastics, etc and sell it further to bigger aggregators or recyclers depending on the quantity bought/ accumulated by them.

During the audit, interaction was carried out with scrap dealers and ragpickers.

Details such as type of waste collected, cost of waste and personal details of the vendors were obtained during this interaction. A list of scrap dealers is given in Table 2. Also, a list of waste collected and their cost is mentioned in Table 3. The cost provided may vary as per demand.

Table 2: List of scrap dealers in the area

Sr. No.	Name	Area	Contact Details
1	Bharat Bhai (Laxmi Metal and Paper Mart)	Waras Lane	+91-9820577793
2	Sandeep Yadav (Patil Scrap Mart)	Near Golfadevi temple	+91- 8898568492
3	Raju Khan	Near Tare Galli	+91- 9769171457
4	Chetan Jain (Saraswati Metal & Paper Mart)	Gonta Galli	+91-7506414185

Table 3: Cost of Waste

Sr. No.	Type of Waste	Particulars	Cost (In INR)
1	Paper	Newspaper	8/ kg
2	Paper	Books	8/ kg
3	Paper	Magazine	8/ kg
4	Paper	Cartons	6- 8/ kg
5	Plastic	Bottle	10-12/ kg
6	Plastic	Milk bag	10-12/ kg
7	Plastic	Broken plastic	10-12/ kg
8	Metal	Iron	9-11/ kg
9	Metal	Aluminum	60-70/ kg
10	Metal	Steel	25-30/ kg

The scrap dealers do not collect waste like wood and clothes.

The ragpickers in the area collected waste mainly from community bins and shoreline areas. Waste such as plastic bottles, broken plastic, materials made from metal, cartons were collected by the ragpickers. The ragpickers were interacted with and asked for their interest in waste collection and segregation and about ten ragpickers showed interest in segregation and waste collection activity.

The ragpickers had no cellphone and Mr. Nikesh Kumar (Contact no.: 9879552348) is the single point of contact for all the ragpickers.

8. Other civic amenities

8.1. Water supply

In the study area, there were no issues of availability of water. The water was found to be sourced from MCGM in all the zones. However, continuous water supply was not available in the area, rather only from 6:30pm to 10:30pm. The water provided in this time was understood to suffice the requirement of the population without causing any shortage. People stored water in plastic tanks, plastic drums, buckets and metal containers.



Figure 35: Medium of water supply



Figure 36: Water storage containers

8.2. Sanitation

Sanitation is a major aspect when considering management of MSW. Where sanitation facilities are lacking and a large animal population freely move on the streets, street refuse contains a lot of fecal matter and manure. The audit brought out a major issue of lack of sanitation and rampant open defecation in the region.

Areas near Amar Prem Lane (Zone 2), Golfadevi Mandir (Zone 3) and Tare Galli (Zone 4) have less issues of toilets compared to the other parts of the study area. In rest of the entire study area, number of personal toilets were less than 20%. Public toilets were available in the study area, a list of which is given in Table 4. The water supply to these toilets was found to be provided by MGCM. Through interaction with the locals it was found that there was no issue of water supply and cleaning in the area, except that the cleaning was not done regularly in the toilet near Sanjay Krida Mandal.

Sr. No.	Area	Total number of toilets
1	Near Heeraseth Chawl	9
2	Waras Lane	16
3	Navneet Lane	14
4	Sanjay Krida Mandal	1 toilet for 7 houses
5	Near Golfadevi Mandir	10 toilets for ladies
6	Achanak Krida Mandal	Mobile toilet
7	Toilet near Sahakar Mandir	4 ladies, 4 gents
8	Bajar Galli Toilet	14 ladies, 10 gents

Table 4: List of toilets in the study area



Figure 37: Toilets in Worli Koliwada

The major issue faced by people in Zones 7 and 8 was lack of availability of proper toilets and hence, the shoreline surrounding these zones was more prone to open defecation. In zones where toilets are available, they are fewer in number than required. As per the Swachh Bharat Mission (Urban) Guidelines, one community toilet seat for every 35 men and one community toilet seat for every 25 women has been outlined. Accessibility to toilets decreases due to longer waiting time. This was one of the reasons put forth by people when asked about open defecation. Other reasons mentioned by people with respect to open defecation was their habit of using shoreline for open defecation since years.



Figure 38: Bajar Galli Toilet



Figure 39: Navneet Lane Toilet



Figure 40: Mobile toilets near Achanak Krida Mandal

9. Conclusion and Recommendations

9.1. Conclusion

On conducting the Solid Waste Audit in Worli Koliwada area, it could be concluded that much needs to be done here to ensure proper solid waste management. The major reason was found to be lack of contribution from the locals, which may further be attributed to lack of awareness, low education levels, low income levels and lack of pro-cleanliness social norms. Also, the study area is densely populated wherein constructions have come up haphazardly in many places leaving insufficient space to move waste collection vehicles, stow public dustbins or kerbside composting units or carry out kerbside segregation.

The study area is like a small peninsular tip, surrounded by sea on three sides and hence, it was vulnerable to dumping at shoreline. The waste in upper zones, i.e., 5, 6, 7 and 8, was largely dumped along the shoreline. Also, the frequency of dumping waste in the area was high, given the tendency of residents of avoid waste storage in home and throwing it out soon after generation.

The facilities provided by MCGM may not be sufficient. Waste collection was not regular and efficient making people lose interest in disposing their waste into the dustbins. The community bins provided were found to be less in number. The bins were placed in open without any lid, creating unhygienic and unsanitary conditions. Major activities like shore cleaning, demolition waste cleaning was not a part of regular activities of the workers. The area lacked proper planning with respect to collection of waste.

The waste generated in the region majorly consisted of wet waste, followed by plastic and paper. The lifestyle of people was found to be simple and this may be one of the reasons for less dry waste generation.

To develop an efficient waste management system various factors such as behavioural change in people with respect to waste management, efficient waste collection by MCGM workers, timely cleaning of major garbage prone areas and proper planning of infrastructure relating to waste collection and disposal need to be worked upon. Active participation from the residents of the study area would add to the effectiveness of a robust waste management system.

9.2. Recommendation

Any plan or new operation, which involves contribution of a large community can be optimally applied in a group only with adequate awareness about the concerned issue. Several times although there are adequate facilities and proper planning, the implementation of a solid waste management fails due to lack of awareness among residents. It will be nearly impossible for the civic body to provide better surroundings if residents do not make an effort to deposit waste into the bins and stop the practice of throwing garbage onto the road.

The study area was majorly influenced by improper waste handling practices and the major reason was found to be lack of awareness about the issues of improper solid waste management and also about the effects of a proper solid waste management. Even if someone was segregating MSW into wet and dry waste, no one was really found to be aware of the importance of proper disposal of waste in the dustbins. Awareness activity in the region should cover not only about segregation of waste but should also explain the necessity of disposal of waste in dustbins and finally handing over to the waste handlers. A holistic approach needs to be taken where people are introduced to various aspects of waste from cradle to grave, covering the impact on aesthetic value of the place, health of the people, hygiene and pollution.

Working towards developing a streamlined solid waste management system

The present solid waste management system is partly responsible for improper waste disposal in the region. The people in the region complained about the irregularity of the waste collectors, inefficient cleaning of dustbins, lesser number and capacity of dust bins and a hurried pick up/ door-to-door collection of waste.

Awareness about importance of segregation of waste and proper disposal

The local community can be made aware about importance of segregation of waste into wet and dry waste at primary level and also about importance of proper disposal of waste in the dustbins. This could lead to a behavioural change in the community and help introduce, implement and streamline a solid waste management system in the region.

Sufficient number of community bins at strategically planned locations

The area had less number of community bins as the garbage was seen to be spilling out of the bins and the situation was worse on days like Thursday and Monday. A proper estimation of waste that is generated on daily basis and other exceptional days needs to be considered and capacity of and number of bins should be increased accordingly. The collection bins must be appropriately designed with features like containers with lids. They should also have a large enough capacity to accommodate 20% more than the expected waste generation in the area. Also, 2 separate community bins for wet and dry waste should be placed strategically in all zones, making it easily accessible to people.

Personal Protective Equipment

Waste being heterogeneous in nature also contains hazardous substances. The waste handlers were found to handle waste without any safety gears. All the waste handlers should be given proper training in waste collection and should be made aware of utilization of safety gears.

The MCGM workers can be an active part of shoreline cleaning. The waste piled up during cleaning by “Beach Warriors” was irregularly collected by the workers. The MCGM workers can contribute in collecting waste from the shoreline and dispose it appropriately and correctly. Demolition waste was also an issue in few parts of the study area. This waste would be recommended to be cleared on timely basis by MCGM workers.

Sustainable Waste Disposal Techniques

During the audit it was found that, at the level of waste generation and collection, there was no source segregation of compostable waste from the other non-biodegradable and recyclable waste. Proper segregation at source of waste generation would lead to better resource recovery and options for scientific disposal of waste.

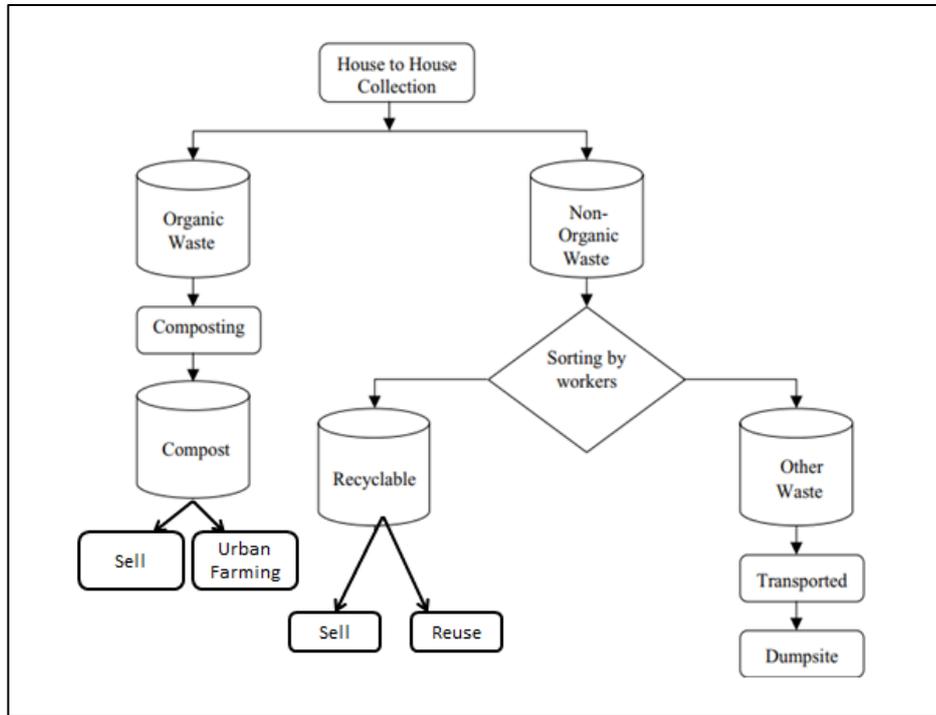


Figure 41: Optimal MSW management strategy

Activities such as door-to-door collection would lead to efficient management of MSW. MSW should be segregated at source and the wet waste generated can be used for composting. Community participation in MSW management should be initiated in the study area. This should be based on the principle of cooperation and partnership amongst Community Based Organizations (CBOs), Non-Governmental Organizations (NGOs) and the MCGM for managing civic services at the local level. A local committee can be established which will look after the smooth functioning of the system with respect to planning, implementation and monitoring. Ragpickers may be organized and trained and they can collect MSW and sort them out further - process biodegradable waste and sell the recyclable material. The MCGM may be approached for technical help in construction of composting system in these areas and give priority attention to such areas for other civic services. In this scheme, NGOs play a very important role by organising ragpickers and giving them necessary training for collecting and composting waste (Rathi S., 2007).

For minimum quantity of hazardous waste

If any waste (majorly hazardous waste) is disposed into landfill, sanitary landfills with liners can be used. Basically, a sanitary landfill is an open dump in which each day's waste is covered with a few inches of soil. When the landfill has reached its uppermost capacity, a foot or more of soil is placed on top as a cover. Frequently, the cover can be seeded with grasses and other vegetation. If operated properly, the sanitary

landfill greatly reduces the odors, vermin, or many of the other obnoxious characteristics of the open municipal dump. (Lee G. F et al, 1991).

Upliftment of ragpicker

Ragpickers sustain themselves by collecting, segregating, sorting MSW and then trading it. In doing so, they help clean up a significant proportion of the 1,43,000 metric tonnes per day (MTPD) of waste generated in India where the approximate quantity of solid waste generated in Mumbai is over 7,600 MTPD. A lot of garbage clearing is thus done informally by ragpickers who work without any job security, salary or dignity. Further, they are regularly exposed to injuries, infections and respiratory diseases apart from poverty, humiliation, harassment and sexual abuse on the streets. Hence, introducing ragpickers in MSW management is a boon for the MSW management system as well as for the ragpickers, who can uplift their standard of living.

10. Glossary: For terms and definitions

Auto-tipper: A four wheeled vehicle used to facilitate collection of garbage and its proper disposal

Biodegradable waste: Biodegradable waste includes any organic matter in waste which can be broken down into carbon dioxide, water, methane or simple organic molecules by micro-organisms and other living things.

Coastal Regulation Zone – III: CRZ-III areas are those areas that are relatively undisturbed and also include rural and urban areas that are not substantially developed.

Community bins: They are large bins, which are shared by all the residents in a particular backlane. They replace the separate domestic bins currently used by each household.

Composition of solid waste: The composition of solid waste means the different types of waste material that it consists of

Hazardous chemical pollutants: They are pollutants that are dangerous or potentially harmful to our health or the environment

Heterogeneous waste: It is composed of many different substances

Non-biodegradable waste: Non-Biodegradable wastes are those that cannot break down or degrade for many years. These are waste that cannot change into manure and they pile up causing pollution.

Landfills: A landfill site is a site for the disposal of waste materials by burial

MCGM: Municipal Corporation of Greater Mumbai

Personal Protective Equipment: Personal Protective Equipment refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection.

Ragpickers: It is a term for someone who makes a living by rummaging through refuse in the streets to collect material for salvage

Random sampling method: Random sampling is the basic sampling technique where a group of subjects (a sample) for study is selected from a larger group (a population). Each individual is chosen entirely by chance and each member of the population has an equal chance of being included in the sample.

Sanitary landfill: Sanitary landfills are sites where waste is isolated from the environment until it is safe

Sanitary workers: A person employed to collect, haul away, and dispose of garbage.

Scrap dealers: A scrap dealer is a person who buys waste scrap and then sells it on for profit

Self Help Group (SHG): A Self-Help Group is a financial intermediary committee usually composed of 10–20 local women or men

Solid Waste Audit: A systematic and independent examination of any organization or area to understand its waste production and disposal

Slum Redevelopment Authority (SRA): It is a government authority launched to process comprehensive slum rehabilitation scheme by introducing an innovative concept of using land as a resource and allowing incentive floor space index (FSI) in the form of tenements for sale in the open market, for cross-subsidization of the slum rehabilitation tenements which are to be provided free to the slum-dwellers.

Waste generators: A person whose act or process produces waste

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12. Annexure

SOLID WASTE AUDIT FORM

Zone:

Date:

Lane/ Area (names of the places covered):

TGIPL Auditor Name:

Sr. No.	Particulars	Descriptions	Auditor's Observation (s)	People's Comment (s)
1	Community bins	Location		
		Utility		
		Emptying time	Day:	Day:
			Night:	Night:
2.	Solid waste collection by MCGM	Area		
		Manpower involved in waste collection		
		Vehicle used for waste collection		
		MCGM amenities provided for solid waste collection		
			Frequency	Time
		Households:		
		Shoreline:		
		Public and Open Spaces:		

		Commercial Establishments:		
		Is waste collected from all households? (Yes/ No)		
		If no (Reason)		
3	Shoreline Dumping	Location(s)		
		Reason(s)		
4	Open dumps	Location(s)		
		Reason(s)		
5	Sanitation	Area		
		Personal / Public		
		Utilization of public toilets		
		If Yes, how is the water supply and who maintains that?		
		If No, why?		

		Open defecation		
6	Water facility	Area		
		Source		
		Availability		
		Time		
7	Waste collectors/ Scrap dealers	Name		
		Name of the shop		
		Area		
		Contact details		
		Willingness to deal with dry waste from the region after segregation		
8	Informal waste collector(s)	Name		
		Area		
		Time		
		Contact details		
		Willingness to deal with dry waste from the region after segregation		
9	Other details			



SWACHH

W O R L I K O L I W A D A



Design Courtesy

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