

Municipal Solid Waste Management

Ahmedabad Municipal Corporation

(As on 30.01.2015)

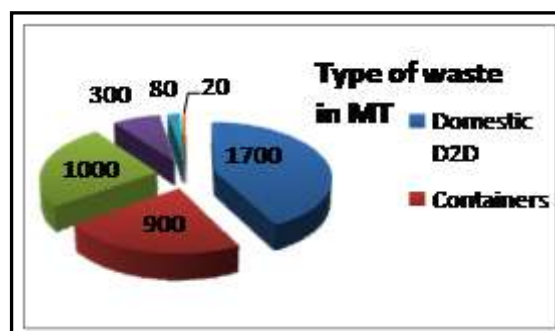
Introduction

Ahmedabad is the 7th largest city of the India and largest city of Gujarat with above 6 million population and 26.61% decadal growth rate. Total area of the city increased from 192 Sq. Km. to 466 Sq. Km. in 2006 with density of 11,948 /sq. km. City plays a strong and significant role in providing commercial resources and market access for the economies of neighboring cities. Times of India survey ranks city as the Best City to Live in terms of infrastructure. Overall, the city offers a good quality of life and living standards.

The city is witnessing a major construction / infrastructure boom as well as a steady population increase. It is a growing hub of education, information technology and scientific Industries. The Ahmedabad Municipal Corporation (AMC) provides all basic services to citizens of Ahmedabad Water supply, collection of sewage, solid waste management building roads and transportation, street lighting, providing medical and educational facilities are some of the key services. For effective service provision and smooth administration to all citizens, AMC has divided its activities in 6 Zones and 64 Wards. AMC has undertaken the mission towards achieving a Clean and Green Ahmedabad through the Solid Waste Management (SWM) Department which is in charge of all functions concerned with municipal waste collection, transportation, treatment and disposal of waste. AMC has allocated a funding of Rs. 350.38 Crore in its annual budget 2014-15 towards the development of SWM.

An Overview Solid Waste Management

Population of City is 60 lacs plus and city generates more than 4000 TPD waste including 300 MT of construction & demolition debris Waste. All waste is collected, transported, treated and disposed according to the MSW Rules.



(A) Present Solid Waste Management System of City

1. Sweeping of roads by AMC's own street sweepers
2. Night scrubbing through Road Sweeping Machines
3. Domestic Waste Collection by Door / Gate to Dump System
4. Waste collection from open spots
5. Lifting of Community bins / Containers
6. Segregated collection of kitchen waste from Hotels and Restaurants
7. Municipal Bio-Medical Waste
8. Carcass / Animal Waste
9. Flower / Holistic Material Waste

Deployment of Machineries & Equipments:-

AMC has deployed 89 Tipper Trucks, 40 JCB Machines, 33 Bobcat type machines, 120 Hydraulic Dumper Placers, 11 Skip Lifters, 54 Compactors, 4 Dead Animal Vans, 14 Nuisance Tankers, 1 Mobile Court, 60 Tractors, 3 Excavators, 5 Bull dozers, 3 Wheel dozers, 30 Truck / Tractor mounted Road Vacuum Sweepers, 15 self ride on road vacuum sweepers, 12 manure lifting vehicles (for cleaning of open defecation spots), 24 mini vans and other contactors' 700 vehicles in all 6 zones. AMC deploys more than 1173 Total vehicles / Equipments on daily basis for efficient handling of waste cleaning of the city.

In order to maintain cleanliness and public health, Ahmedabad Municipal Corporation recently purchased various vehicles–equipments like hook lifter vehicles, litter bins, refuse compactor vehicles as well as hot dip galvanized trolley for the same, self ride on type of sweeping machine etc. and has put them to use through operation and maintenance contracts. Owing to these vehicles, cleaning activity in various areas of the city has been carried out more rapidly and in a better way as well as there has been a reduction in the number of nuisance spots. To increase the scope of this work and to remove nuisance spots in other areas of the city as well as to meet the increasing needs, 1100 litres trolleys (silver colour) and other vehicles like refuse compactor vehicles will be procured. While for the narrow areas in the walled city, cleaning activity will be carried out using small hydraulic vehicles.



About 1250 litterbins have been installed in this year at various public roads, main roads, public places, footpaths, as well as traffic locations, where citizens can dispose their waste easily, and it has been planned to install even more number of litterbins in the forthcoming year.

For the collection and appropriate transportation of waste accumulated at open spots in various areas of the city and for small spots (where lesser quantity of waste) in year 2014-15, 660 liters and 1100 liters capacity galvanized trolleys numbering 550 and for its effective management, 30 refuse compactor vehicles whose operation has been commenced and in the forthcoming financial year 2015-16, further it is planned to purchase 500 galvanized trolleys and 30 refuse compactor vehicles and put to use.

(1) Sweeping of Roads by AMC's own street sweepers

1484 km roads are swept by more than 13000 AMC's own street sweepers on a daily basis. Street sweepers are provided a lorry and 6 bins for cleaning activity. The cleaning activity is carried out daily 365 days in a year from morning 6:30 am to 11:30 am and 3 pm to 6 pm on all roads of the city.



(2) Night scrubbing through Road Sweeping Machines

- All major public roads, BRTS roads and Model roads are covered under this system.
- 30 truck/tractor mounted road vacuum sweepers & 15 self ride on road vacuum sweepers are used
- Working time: 10 pm to 6 am
- These machines are helping AMC to keep city as a dust free city.



(3) Domestic Waste Collection by Door / Gate to Dump System:-

AMC introduced a new concept of Door / Gate to Dump since July 2009, in which the AMC appointed contractor to collect waste from residential units in the morning hours and from commercial units in the evening in closed Hydraulic Euro III vehicles. The waste from these vehicles is transferred to Refuse Transfer Stations (RTS) or local transfer stations from each ward and thereafter to the treatment plants / disposal site. The project is successfully covering 100% of all residential & commercial units, on all 365 days of the year. More than 600 Vehicles have been deployed that start the collection process from 7 am onwards. Currently, more than 1700 metric tons of waste is collected in this manner daily and transported to the processing plants. Collection of domestic waste from more than 14.50 lacs residential and 3 lacs commercial units are covered under Door / Gate to Dump project.



(4) Waste Collection from Open Spots:-

- AMC collect more than 1000 TPD waste from various spots in six zones by 130 tractors, trucks, JCB, etc, equipments & machineries.

(5) Lifting of Community Bins / Containers

- More than 941 locations are defined as waste collection points where 1054 closed body 7 cubic meter M.S. Community storage bins have been provided. AMC ensures that these containers are lifted at least once in a day and more than 900 TPD waste is collected under this system.
- AMC ensures that these containers are lifted at least once daily. AMC has developed a fully mechanized transportation system that ensures handling of waste only once. Further AMC has also outsourced the secondary waste transportation system & ensure timely & efficient removal of waste from its collection point.



(6) Segregated collection of kitchen waste from Hotels and Restaurants

- AMC has contracted with three agencies, which collect food waste from such units and charge from hotel / restaurant units on monthly basis so there is no cost to AMC in this system (as per polluters pay principle). Approximately 80 TPD food waste is collected from more than 1000 units of hotels and restaurants. It is delivered to compost plant for treatment. AMC is in a process of planning to utilize food waste for Gas / Electricity generation by bio-methanation.

(7) Municipal Bio Medical Waste

- AMC has contracted 2 agencies approved by Gujarat Pollution Control Board for daily collection, transportation and disposal of bio-medical waste from 4 municipal hospitals, 2 referral hospitals and 64 urban health centers and dispose it in their incineration plants.

(8) Carcass / Animal Waste

- AMC has deployed 4 hydraulic based vehicles and staffs to collect carcass of dead animal like cow, camel, buffalo, donkey, dog, rat, etc. AMC has deployed 2 vehicles to collect fish market, meat market and slaughter house waste from market. The facility is available from 7 am to 11 pm on all 365 days round the year. (Telephone No 079-32984152 & 079-25352911). Around 8 TPD animal waste is collected from the city under this system.

(9) Flower / Holistic material Waste

- Ahmedabad city has a historical Sabarmati river. To reduce pollution and maintain cleanliness of the river, citizens are motivated to deliver flower waste and such holistic materials in the "KALASH" instead of throwing into the river. AMC has deployed 16 "KALASH" on the 8 bridges of Sabarmati River. Such waste is delivered to compost plant for treatment.

(B) Transfer Stations for Secondary Transportation of Waste:-

- AMC has decided to construct one transfer station with capacity of 400 TPD in five Zones. Out of which 3 are operational and 3 are under construction. Civil & Mechanical cost of each transfer station is above to Rs. 5.5 crore.
- Each transfer station has 2 Stationary Compactors, 9 Large Hook Loader Vehicles and 11 Large Containers with 20-25 CMT Capacity and carry 10 to 12 MT waste.
- Compaction & Transportation of waste on each transfer station is about 350 TPD.
- Transfer station helps AMC to save on transportation cost, reduce pollution and ease traffic congestion, and effective & speedily collection of waste.



(C) Waste Treatment / Processing:-

(1) Existing Plants / Facilities:-

Name of Company	Daily Treatment	MSW converting into	Land Given (Acres)	Agreement Period	Technology Used
Bharuch Enviro Infrastructure Ltd	250 Tons	Compost and RDF / Pellets & Fluff	15	25 Years	Windrow Method
Creative Eco-Recycle Port Pvt. Ltd.	800 Tons	Compost and RDF / Pellets & Fluff	12.5	25 Years	Multi Product Integrated Technology
Hanjer Biotech Energies Pvt. Ltd	500 Tons	Compost and RDF / Pellets & Fluff	12.5	30 Years	Multi Product Integrated Technology

MSW Treatment / Processing

Name of Company	Daily Treatment	MSW converting into	Land Given (Acres)	Agreement Period	Technology Used
Excel Industries Ltd.	300 Tons	Composting	25	15 Years	Windrow Method

(2) C & D Waste Treatment / Processing :-

- Ahmedabad Enviro Projects Pvt. Ltd. has commenced the plant phase wise from December 2013 and the plant is fully operational since June 2014.
- AMC has designated 16 spots around the city where citizens will have to bring the C&D waste at their own cost. Also, the C&D waste generated by AMC civil works will be collected at these spots. The agency then collects C&D waste from these spots by their own vehicles. AMC is paying Rs. 155 per ton (with an escalation clause of 5% yearly increase).
- Citizens can register their complaints for collection of construction debris by phone call on AMC operated Comprehensive Complaint Redressal System (CCRS) phone no 155303.
- After the successful resolution of the complaint, the citizen and the concerned municipal authority shall be informed by agency through CCRS.
- As per Mapping and Scheduling for C&D waste below 1 ton, 4 to 5 spots can be covered per trip for which citizens shall be charged a minimum flat charge of Rs 200 per trip.

Weight	Per Metric Ton Rate	Per Trip (Minimum Rate)
Less than 1 MT waste	-	Rs. 200/-
For 1-5 MT waste (Minimum quantity)	Rs. 225/-	Rs. 675/-
More than 5 MT waste (Large quantity)	Rs. 212.5/-	Rs. 1700/-

- The collected waste will be weighed at AMC Weigh Bridge and also at weigh bridge of Company's plant which will be offloaded at municipal plant.



Recycled concrete aggregates are also commonly used in precast concrete products such as Precast RCC Benches, Precast RCC Drains, RCC Precast Concrete Manholes, Precast RCC Slabs, Precast RCC Sleeper, Louvers Fins, Pavers Rubber Mould, Precast Walls, Precast RCC Drain Covers, RCC Pipes & Cement Articles , Precast Concrete Box Culverts, Precast Concrete Manhole, RCC Fencing Pole, RCC Door Frame, RCC Grill, Kerb Stone & Ferro Cover, Kerb Stone, Road Edge Stone, Paving Stone, Kerb stone, Granite, Paving Blocks Mortar less For Concrete And Interlock Pathways. Recycled clay is used to make various types of brick, Hollow Block, Light weight blocks and Architectural Clay Products.

(3) Additional Two Companies are assigned processing Work:-

- For the remaining untreated waste, AMC has assigned work to two companies for setting up Treatment / Processing of waste Plants which are expected to start from 2016.

Name of Company	Daily Treatment	MSW converting into	Land Given (Acres)	Agreement Period	Technology Used
Abellon Clean Energy Ltd.	1000 Tons	Electricity	13	29 Years	Use European technology and follow European Emission Standards.
A2Z Infrastructure Limited	1000 Tons	Compost and RDF/ Pellets & Fluff	25	29 Years	Multi Product Integrated Technology

(D) Disposal of Inert Waste: -

AMC has secured engineered landfill site in operation and made provision for another five scientific landfill sites for Disposal of Inert / Post Process Solid Waste at Gyaspur.

Area: 12.88 hectares (32.82 acres)

Capacity: 11.50 Lakh Metric Tons (i.e. 1.15 million tons)

Total construction cost of the site: Rs. 13 Crore (i.e. Rs.130 million)



(E) Initiatives in Solid Waste Management:-

(1) Decentralized Model for Effective Utilization of Garden / Green Biodegradable waste:

- AMC started a Pilot Project in a Garden, Hotel Kitchen and other Green waste is converted into Organic Manure on PPP mode. A machine with the capacity of converting 200 kg of bio-degradable waste into compost has been put on experimental basis for 60 days to observe the process and effectiveness of the machine. Such small plant to convert biodegradable waste to compost is also useful for residential societies, big hotels, canteens, etc.
- With the experience of decentralized treatment / processing compost on plant of Pilot Project AMC has awarded work for design, build, operate and transfer of 2 bio-degradable waste convertor machines, each has a capacity of 1 metric ton, at Zoo and at Victoria Garden. Both Plants are in operation
- AMC is planning to set up more such bio-degradable waste convertor machine / bio-gas plant at fruit/vegetable market for converting 5 to 10 TPD for effective utilization of Green Waste



(2) Mobile Court Initiative for Littering & Nuisance

AMC launched country's first Sanitation Mobile Court on 4th June, 2009 dedicated to contain littering. 1,63,808 cases have been registered and Rs. 7.52 crore penalty levied from such offenders.



Year	Cases	Penalty (Rs)
Jun 09-Dec 09	14939	1592470
2010	27358	5176150
2011	30276	4822165
2012	38111	27952402
2013	29234	23702120
2014	43547	17339999
Jan -2015	2897	1937550

Year	Seizure of Plastic below 40 micron (kg)	Notices	Penalty (Rs)
2011	16093	3608	564910
2012	5135	7527	630850
2013	8748	22037	4261441
2014	7408	15588	2244081
Jan- 2015	161	816	71500

(3) Preparation of Public Health Byelaws

AMC has prepared Public Health Bye-laws for effective enforcement and maintaining discipline.

- Classification of waste in 25 categories
- Generators of waste based on their type, 21 categories
- Segregation of waste
- Storage of waste
- Delivery & collection of waste
- Processing & disposal of waste
- Liquid Waste Management

- Prevention of Waterborne, Vector borne and Food borne diseases
- Offences under the bye-laws
- General offenses which is applicable to all the citizens within city limit, (23 in number)
- Enforcement of the provisions
- Schedule of Fines

The main objectives of preparing the Public Health Bye Laws are

- to develop a tool for Municipal authorities to regulate the implementation of Municipal Solid Waste Management (MSWM) which will help improve the services to protect public Health, the environment and natural resources (water, land, air).
- to promote the ecological management of solid waste in compliance with the principle of the 4Rs: Reduce, Reuse, Recycle, Recover and safe disposal.
- an effective MSWM service can be achieved only by improving the efficiency of MSWM activities, thereby leading to the reduction of waste generation, separation of MSW and recycling and recovery of materials, and generation of compost and energy.

After reviewing following documents of various cities, PHBL -2012 for Ahmedabad city is prepared

- Cleanliness and Sanitation Byelaws, 2009 of Delhi city
- Cleanliness and Sanitation Byelaws, 2006 of Mumbai city
- SWM Bye-laws of Nagpur city
- Compiled document of circulars, Rules and Acts regarding Sanitation and cleanliness –Madhya Pradesh
- Comparison of the fines imposed by different cities

The PHBL covers:

- 1) Segregation, storage, delivery & collection, processing and disposal of solid waste
- 2) Liquid waste management
- 3) Prevention of waterborne, vector borne and food borne diseases
- 4) General Offenses
- 5) Enforcement
- 6) Obligatory Duties of Municipal Corporation
- 7) Schedule of fines

The PHBL classifies waste as:

- 1) Generator wise categorization
- 2) Categories of waste -30
- 3) Stage wise implementation of segregation starting with the basic categories:

- 1) Wet waste
- 2) Dry waste, and
- 3) Other waste
- 4) Powers to Municipal Commissioner to make necessary amendments in PHBL

The PHBL classifies Generators into 20 categories and separate provisions for each generator Penalty mentioned in PHBL as:

- 1) Penalty for 20 general offenses and 38 specific offenses
[breach of bye-laws from 33-71(2)]
- 2) Compromise fees and administrative charges ranging from Rs. 100 to Rs. 50,000
- 3) Powers to attach the property for the defaulters in major offences
- 4) Penalty varies for repeated offense
- 5) Penalty varies across generators

Specific provision is mentioned for formation of Nuisance Detection Squad (NDS) in PHBL. If the offender does not produce an identity proof, the Authorized Officer of Ahmedabad Municipal Corporation or the officer of Nuisance Detection Squad (NDS), shall exercise the powers under section 42 of the Criminal Procedure Code, in pursuance of the powers of the additional officers, as conferred on him under section 22 of the Gujarat Police Act.

Same has been approved by the General Board of AMC and it is sent to Urban Development Department of Government of Gujarat for approval.

(4) Compliance to Manual Scavenging Act, 2013

Department of Social Justice & Empowerment, Ministry of Social Justice & Empowerment, Government of India published the “Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013” on October 1, 2013

For compliance with Section 37 of the Act, AMC vide circular no 85, formed a system of effective monitoring of zone level activities by Addnl. City Engineer/Dy. Health Officer of each zone

Urban Management Consulting Pvt Ltd (UMC) was awarded the project work for Audit of Public Toilets, Community Toilets, Pay & Use, Public Urinals. AMC has initiated implementing the recommendations of the Audit Report.

UMC has also been awarded the project to frame an Action Plan in order to meet the conditions of Section 37 in the Act.

AMC has also purchased 20 Manual Lifting Machine (6-trolley mounted, 14 auto rickshaw mounted) at a cost of Rs 83 lacs to clean the Open Defecation Spots in the city.

(5) Information Education Communication (IEC) Project for Awareness to citizens:-

Major objective of conducting IEC activities was to inform, educate and communicate people about solid waste management and to make people aware about the importance of waste segregation, collection and health issues due to improper waste management.

AMC, along with CEPT came up with a unique proposal for conducting IEC activities in the city. CEPT is appointed as an advisory agency to provide technical advisory services to AMC for IEC activities. The scope of work for advisory services of CEPT included;

- To prepare IEC strategy
- To finalize tender process and tender documents
- To formulate tender evaluation criteria, and
- To evaluate tender and recommend agencies for engagement of component

CEPT helped AMC in preparation of tendering specifications, carrying out the bidding process and finalization of agency. IEC activities designed to include three components of IEC activities. Three agencies specialized in different aspects of IEC, were engaged by AMC.

Component Details		Role
Component 1	Design and content development for mass communication and Management of IEC process (overseeing component 2 & 3)	Design of all distribution material
Component 2	Mass production of IEC material and dissemination	Mass production & Dissemination
Component 3	Training, Education & Public events	Execution and Dissemination

(6) GPS / RFID based Monitoring System:-

In 2013, AMC invited bids for installation of GPS and RFID technology based solution for the vehicles deployed for collection & transportation of solid waste management of Ahmedabad city for 5 years on two bid system with a technical demo as a part of bidding process. AMC has engaged (n) Code Solutions (A Division of GNFC) as a consultant for this project and assigned this work to Infinium Solutionz Private Limited, Ahmedabad.

Scope of work of project:

AMC follows two methods for waste collection. (1) Door to door waste collection (2) Bins placed at fixed locations.

(a) Door to Door Collection:

AMC has 6 Zones and 64 Wards. In each ward, there are fixed number of routes for waste collection covering all the societies, apartments and areas of the Ward. A vehicles traverses through the route, collects garbage from pre-defined points (POI) in the route. One can just imagine the volume of work and complexity in solid waste management by following figures:

Total Routes	:	600 plus
Total Door to Door vehicles	:	700 plus
Total POIs (Point Of Interest)	:	25,000 plus

Current status is:

- Ward wise route details and POIs are provided to the computer system.
- GPS device is installed in each vehicle.
- Pilot Run for 2 Wards in live environment was carried out and results were satisfactory.
- Presently trial run for all routes is going on.

(b) Bins:

Bins are placed at fixed locations. Bin Lifter vehicles lift the Bins, travel to transfer station / dump site, and transfer garbage to big truck or dispose off at dump site.

The volume of work is:

Total Bins	:	1000 plus
Bin locations (Bin POIs)	:	1000
Total Bin Lifter Vehicles	:	200 plus (including hook loaders)

RFID Technology:

AMC is also using RFID technology for effective monitoring of solid waste management activities.

- RFID Technology comprises of two parts (a) RFID tag (b) RFID reader.
- RFID Tag contains a unique number which only RFID reader can read.
- RFID tag is mounted on each vehicle as well as on each Bin.
- RFID reader is placed at selected locations (i.e. Transfer station weighbridges, dump sites, Ward offices).

Current status of project:

- Zone wise Bin Lifter vehicle details and Bin locations is provided to the computer system.
- GPS device is installed in each Bin Lifter vehicle.
- RFID Tag is mounted on each Bin.

- RFID readers are installed at Transfer stations, dump site weighbridges and ward offices.
- All AMC concerned staff as well as collection and transportation agencies are monitoring the system on a daily basis.

Various outcomes / Learning of AMC during the pilot trial

- AMC found that routes and POI data is critical for the success of this system. All further reports and monitoring depend on the correct data of POI.
- AMC has verified Route/POI data before entering in the system and also in the system after entry is over.
- AMC team has physically verified the correctness of system generated reports.
- During pilot run, AMC has re worked on following to improve the system:
 - Geo-fence definition of POIs.
 - Educated drivers about locations of RFID readers, so that vehicle attendance can be recorded automatically.
 - Sometimes, it was difficult to determine whether POI is served or not.
 - (Number of minutes stay at specific POI varies, sometimes vehicle stops little far due to narrow road, but manually lifts the garbage from inside of the society, sometimes vehicle of some other route serves the POI, some Bins are not served for 2 – 3 days because people have parked vehicles around it.)
- Before starting this initiative, AMC has assured capacities, sustainability and robustness of the device for functioning in such environment, so technological hurdles were not faced.

Some of the realized benefits after installing VTS in AMC vehicles are:

- Efficient monitoring of Solid Waste Management process.
- Efficient utilization and tracking of vehicles.
- Citizen complaints can be handled with actual details.
- Analytical reports are available for operation monitoring and decision making.
- Bin movement can be tracked live.
- Vehicle movement can be tracked live.
- Fleet monitoring: Improvement in vehicle productivity and performance.
- Alerts for important information to take timely action.
- Route optimization: resulting in reduction in kilometers.
- Integration of dumpsite and weigh bridge data.

- Effective assessment and evaluation of Contractor Performance.
- Increase in service, accuracy and safety in solid waste management.
- Overall improvement in the solid waste collection resulting in improvement of cleanliness of the city.
- The technology will help in identifying the gaps in Solid Waste Management. Although this system is first version, AMC can improve by experience and by providing solutions to the system. Such modern technology provides solutions, but after all its the people who make any system successful. With the co-operation of citizens, civic body and technology, Ahmedabad will become 'Zero-Waste' city in coming years.

(7) Capacity Building of Employees:-

- Sweepers, supervisors and supervisory staff is given training by experts to develop skill, knowledge up gradation, capacity building and strengthen the activities.
- Seminars and Workshops are conducted periodically to update the knowledge.
- 1984 sweepers are allotted houses under Dr. Ambedkar Aawas Yojna. 512 more houses are under construction.
- Health Check up of sweepers is carried out regularly.
- Promotion given to 63 sweepers as Sanitary Sub Inspectors.

(8) City Sanitation Plan (CSP)

The City Sanitation Plan (CSP) of Ahmedabad was prepared in 2012. It is aimed at developing and maintaining a clean, safe and pleasant physical environment to promote social, economic and physical well-being of all sections of the population. It encompasses plan of action for achieving 100% sanitation in the city through demand generation and awareness campaign, sustainable technology selection, construction and maintenance of sanitary infrastructure, provision of services, O&M issues, institutional roles and responsibilities, public education, community and individual action, regulation and legislation. Same has been approved by the General Board of AMC.

(9) Technical Audit of all Public Conveniences

AMC appointed Urban Management Centre (UMC) to conduct a detailed technical audit of more than 1600 public conveniences in Ahmedabad. The main objectives of the technical audit were to assess the conditions of the public conveniences, identify issues and provide recommendations to the Ahmedabad Municipal Corporation to make improvements.

UMC would visit all public conveniences within AMC's jurisdiction (excluding autonomous zones like University, Airport, Railway stations etc.) and collect the following data:

1. Location of the toilet block, (and mark on the map if AMC will provide base map- to understand spatial distribution)
2. Photographic documentation including multiple exterior and interior photographs. The focus would be on capturing the building structure, cleanliness, accessibility, immediate surroundings of the unit, condition of sanitary fixtures, condition of plumbing fixtures, leakages (if any), cleanliness inside the block, etc.
3. Filling a survey form which could include the following:
 - a. Unique ID of the toilet block (based on a pre-defined nomenclature principle)
 - b. Type of facility (pay and use/ community/ urinal)
 - c. Location of the block (near slum, market, commercial area, transit points)
 - d. Number of toilet/ urinal/ bathing units within the block (by type – men, women, children, differently able, etc.)
 - e. Infrastructure Provisions
 - i. Building condition
 - ii. Condition of doors, windows and other civil elements within the block
 - iii. source of water supply
 - iv. Condition/ presence of sanitary and ancillary fixtures (including seats dustbins, hooks for hanging clothes, soap dish/ holder, handrails, etc.
 - v. Electric fixtures
 - vi. Method of waste water disposal and functionality
 - vii. Accessibility (ramps, steps, etc.)
 - f. Management/ Operations Assessment
 - i. Timings of the convenience
 - ii. Administrative arrangement (block run by which agency, staffing arrangements(gender))
 - iii. Pricing/ user charges (if applicable); monthly pass arrangements
 - iv. Cleaning schedule
 - v. Repairs and maintenance schedule
 - vi. Provision of consumables (soaps, sanitary cleaning material, brooms, mops, etc.)
 - vii. Some idea on daily user fees collected (in case of pay & use)- if available
 - g. Qualitative Assessment
 - i. Overall Cleanliness (outdoor and indoor)
 1. Stray animals in/ around the block
 2. Presence of SWM secondary collection bins near the block or open dump/nuisance spot
 - ii. Lighting/ illumination
 - iii. Ventilation and odour

- iv. Water spillage on floor
4. Preparation of a ward/zone wise-report with analysis of the condition of the toilet blocks.

(10) Plastic Waste

a) Using Plastic Waste for Construction of Roads

Taking cue from Chennai, where roads have been built using polymer bitumen in coastal areas of Chennai and to curb the increasing plastic waste in the city and enhance environmental protection, Hon. Municipal Commissioner instructed officials from Road and Building Department of AMC visited Chennai to review the quality of roads built with polymer bitumen.

Based on the conclusions from this visit, AMC's Solid Waste Management Department dispatched the plastics waste to the hot mix plant to prepare the polymer bitumen.

Accordingly, AMC started road resurfacing in Ahmedabad using polymer bitumen.

Under this pilot project, one km long stretch was constructed.

Main points of adopted methodology for the construction of Polymer Bitumen Road in Ahmedabad are as under:

1. Waste plastic of 40 micron to 90 micron thickness was used in the process.
2. Waste plastic was shredded up to 2.36 to 4.75 mm to achieve required thickness.
3. To decide the proportion of waste plastic in Hot Mix, an analytical study was carried out by Road Project Department of AMC.
4. After carefully execution of various experiments to decide the content of waste plastic and on the basis of its results, it was decided to add 8% of Bitumen content waste plastic.
5. Addition of waste plastic was done by placing on conveyer belt manually .
6. Hot Bitumen whose temperature is maintained between 150 C to 160 C is added thereafter.
7. Bitumen is bonded with the aggregate by means of plastic which acts as a binder .
8. The mix prepared by this method is called as waste plastics-aggregate-bitumen mix (Composite) which was laid at site by contemporary method at the temperature of 120 C to 130 C.
9. No extra machinery is necessary to construct the Polymer Bitumen Road.
10. Consumption of waste plastic per 1000 kg Bitumen is 80 kg i.e. 8% of Bitumen and in total 22 MT plastic waste was used.

There are a range of benefits by using plastic waste in road construction as below:

- Reduction in discarded plastics bags in the city
- Protecting the roads from washing out in monsoon
- Reduction in cracks in roads due to melting bitumen in summer
- Cost effectiveness in road construction
- Significant increase in the income of rag pickers

- Better protection against the rain water and thus better durability will be achieved

After examining the durability of this road, AMC is planning to resurface more roads in each zone of the city with polymer bitumen.

b) Recycling PET Bottles

The machine named 'My Pet' collects and crushes plastic (PET) bottles. The company, Arts Alive Ventures Pvt. Ltd has installed machines at Ahmedabad Railway Station, to crush the PET bottles and sell the shredded material to recycling companies as "PET flakes", which are then used as a raw material for a range of products like polyester sheets & fibers or back into PET bottles. In November 2014 as a Pilot project, AMC allocated 12 locations to this company to install machines to collect and recycle plastic waste. AMC will charge Rs 101 as token fees from the company. The company has signed a contract with AMC for one year.

(F) Future planning to strengthen the system

1. Collection, Transportation & Safe disposal of E – waste
2. Scientific and safe disposal of Carcass of Animals & Waste from Slaughter House, Fish Market, Meat Market etc.
3. SWM Master Plan up to 2031
4. Roadmap for Zero Waste Ahmedabad by 2031
5. EOI for 1000 TPD waste treatment
6. Decentralized bio-gas plants
7. Land Reclamation Project of Present Dump Site

(1) Collection, Transportation & Safe disposal of E - waste

For effective implementation of E-waste (Management and Handling) Rules, 2011 in city AMC has assigned a work to a consultant for co-ordinating with all stakeholders including GPCB, dealers, producers, etc to establish the collection centres for E-waste collection, safe transportation and safe storage / disposal. RFQ-RFP is invited and process is on to finalize the bidder.

(2) Scientific and safe disposal of Carcass of Animal & Waste from Slaughter House, Fish Market, Meat Market etc.

AMC has assigned work to a consultant for issuing a competitive Bid for Design, Construction, Operation & Maintenance of a daily 8-10 tons processing plant on Public Private Partnership mode for 30 years. AMC has initiated a pilot project in December 2014 for exploring best suitable technology.

(3) SWM Master Plan upto 2031

AMC prepared a SWM Master Plan which provides a detailed profile of Ahmedabad City, existing system in city, solid waste characteristics, current leading waste management practices, strategy and options for city, planning for 'Zero Waste' management system,

institutional strengthening and training, capital investment plan and need for monitoring & evaluation. Same has been approved by the General Board of AMC.

Process adopted

- Process tracking of all streams of SWM
- Numerous stakeholders' consultations
- Strategy development towards zero waste
- Infrastructure gap and management assessment
- Recommendations and capital investment

(4) Roadmap for Zero Waste Ahmedabad by 2031

AMC has participated at the Special Event of ISWA World Congress 2011 and agreed on the “Declaration for Zero Waste Ahmedabad” by 2031. AMC has signed a Memorandum of Understanding with UNCRD (United Nations Center for Regional Development, Japan) to get technical assistance for developing a “Roadmap for Zero Waste Ahmedabad by 2031”. AMC had a detailed Multi-stake holders' consultation meetings with the help and support from UNCRD Japan and Zero Waste South Australia.



The Zero Waste concept for Ahmedabad will serve as catalyst for policy changes at



National level in realizing resource efficient and zero waste societies in India.

34 strategic actions proposed under 10 focus areas

10 focus areas

1. Environmental Protection
2. Health and Safety standards
3. Dedicated Institutional Structures & Governance arrangements
4. Community awareness & ownership
5. Segregation of waste streams
6. Partnerships & Collaborations
7. Sustainable innovative Infrastructure & Technologies
8. Education & Awareness at all levels
9. Investment in 3R Infrastructure (Eco-Towns, Science Parks, Eco-Industrial Zones)
10. Implementation & Systematic Review Process

34 strategic actions

Strategic Action 1

Ban open dumping of waste and develop a comprehensive master plan for the Pirana dump with an aim to reduce the current and future environmental impacts. The master plan should cover areas such as:

- a site operation plan
- environmental clean-up, a site remediation plan
- separation / buffer distances
- security and access
- an environmental monitoring plan
- a post-closure plan and a long term vision for
- value added / beneficial use of the landfill site
- landfill gas extraction and use for energy

Strategic Action 2

Develop a comprehensive litter awareness and prevention plan for the City, backed up with stringent regulation and an enforcement mechanism. Work with key NGOs to promote better compliance.

Strategic Action 3

Introduce tighter regulation and enforcement to prevent illegal disposal and dumping of wastes. This regulation should cover all sections of the community (individuals, business, industry) and particularly target items such as plastics, food waste, paper, hazardous wastes and packaging material.

Strategic Action 4

Work with the Gujarat Pollution Control Board to introduce better environmental management practices for the private sector involved in waste management and recycling. Introduction of licensing and enforcement mechanisms to monitor adoption of good environmental practices has been successful in other parts of the world and can be considered for Ahmedabad.

Strategic Action 5

Develop appropriate policies and regulatory measures to formalize and systemize the informal waste management sector (rag pickers, scavengers, etc) to reduce the current high level of exposure to health, safety and environmental hazards.

Strategic Action 6

Develop a comprehensive health, safety and environment plan covering the entire waste management workforce.

Strategic Action 7

Introduce appropriate safety gear and provide regular training to the workforce to improve skill level.

Strategic Action 8

Introduce a system of regular audits and a health monitoring program for the workforce.

Strategic Action 9

Moving towards zero waste requires sustained focus and commitment of significant AMC resources. This can be facilitated by developing strong and dedicated institutional arrangements. AMC may consider either restructuring/redesigning the existing Solid Waste Management & Conservancy Services section, or consider establishing a dedicated entity (for example Zero Waste Ahmedabad) to raise the profile of the road map and to achieve greater efficiencies. The new entity should have a clear mandate to implement the road map with delineated authority, responsibility, staff and budget.

Strategic Action 10

Establish a regulatory framework with by-laws to support the new institutional arrangements.

Strategic Action 11

Undertake measures to build technical capacity within the new entity and within the waste sector generally in Ahmedabad.

Strategic Action 12

Liaise to establish political support from all political parties to ensure long term certainty for the new entity. The achievements will be gained over a long time frame and the institution will need to meet key performance indicators along the way.

Strategic Action 13

Foster broader community ownership and individual responsibility through education, regulation, stringent enforcement and appropriate pricing mechanisms to influence and bring about behaviour change.

Strategic Action 14

Systematically introduce improvements to waste collection systems to encourage individual responsibility, behavioural changes, waste segregation and discourage littering.

Strategic Action 15

Introduce means based pricing mechanisms such as 'pay as you throw' so that residents are charged for waste collection based on the amount of the household's waste.

Strategic Action 16

Introduce reasonable fines and penalties for littering and illegal dumping of wastes. The fines need to be severe enough to act as a deterrent and should be tightly enforced.

Strategic Action 17

Identify and implement strong policies that will enable better waste collection, transport and storage infrastructure to maximise collection and segregation of recyclables from the waste streams.

Strategic Action 18

Progressively introduce measures to modify the waste collection system with particular focus on collection bins and collection frequency. The current system of daily collection is not sustainable and does not encourage waste segregation at source or household.

Strategic Action 19

Progressively introduce regulation imposing bans on landfilling of recyclables (plastic, paper, metal, food, greens, construction and demolition waste, E-waste) as systems become better used and patronized. This ensures a supply of materials to the new recycling industries that will emerge to service Ahmedabad.

Strategic Action 20

Partner with research institutes and industry to develop practical solutions to deal with waste management issues, including development of local capacity to implement energy and resource efficient technologies in business and industry sectors. This would require public-private partnerships and co-investment opportunities to find solutions.

Strategic Action 21

Play a strong advocacy role in introducing product stewardship arrangements for a range of consumables such as electronic goods (TVs, computers, IT equipment), lead acid batteries, tyres, consumer packaging (including plastic bags), paint and mercury containing lamps.

Strategic Action 22

Work with other arms of the government and industry groups to promote business assistance programs for industry with a focus on lean manufacturing, cleaner production and waste recovery.

Strategic Action 23

Work with the manufacturing industry, business community and financial institutions to facilitate the creation of strong and sustainable markets for recyclables and green jobs

Strategic Action 24

Use a holistic Total Cost Assessment (TCA) approach to introducing technologies for waste collection, segregation and processing. A TCA approach helps in quantifying direct and indirect costs and encourages consideration of life-cycle impacts in decision making process.

Strategic Action 25

Encourage and support investment in innovative resource management technologies and infrastructure, for example recycling precincts with dedicated facilities for recycling plastics, aluminium, steel, paper, glass and other recyclables. This can be done through subsidy schemes, soft loans and other economic incentives.

Strategic Action 26

Deliver clear and targeted education and awareness programs to meet the needs of the community, businesses, industry and the waste management industry.

Strategic Action 27

Introduce a best practice waste management demonstration program at strategic locations in Ahmedabad to raise awareness of the community, including awareness raising programmes and activities related to health and safety aspects of e-waste.

Strategic Action 28

Develop measures to influence behaviour and build a 3R culture so that households and businesses are encouraged to take responsibility for minimizing their own waste and using resources effectively.

Strategic Action 29

Work with the education sector to introduce zero waste education in the school curriculum.

Strategic Action 30

Develop policies and programs favorable to promoting triangular cooperation between government, private/industry sector, and scientific and research institutions towards realizing eco-towns, science parks, eco-industrial zones.

Strategic Action 31

Establish a '3R Think Tank' with participation from experts and leaders in the private sector, research institutes and government.

Strategic Action 32

Prepare an implementation plan with a 3-5 year term. The plan should demonstrate adherence to the 3R waste hierarchy and strategic actions outlined in the Zero Waste Road Map. The plan should include targets and key performance indicators for review on a yearly basis.

The plan should cover:

- The projects to be undertaken each year listed under the strategy headings, including a brief description of the intended activities and outcomes and budget
- The positions and roles responsible for delivering the project.
- A 3-5 year sequential funding outlook for the project or project area.

Strategic Action 33

Introduce an independent, third party review process. The review will include an analysis of how AMC is meeting the overall objectives of the Zero Waste Road Map. The review will track progress made by AMC in delivering the implementation plan and measure achievements against the key performance indicators.

Strategic Action 34

Prepare a data collection matrix to include key data parameters for measuring progress against the key performance indicators. Continually improve the quality of data collection, management and reporting throughout the life of the Zero Waste Road Map.

Same has been approved by the General Board of AMC.

(5) EOI for 1000 TPD waste treatment

AMC has planned for 100 % Processing / Treatment of waste generated from City on daily basis. AMC published EOI in May 2014 for additional 1000 TPD waste treatment / Processing on PPP mode. 5 bidders responded to this EOI and out of which 4 companies were assessed to be technically qualified. As the project duration is of 30 years, a legal firm has been assigned the work of legal vetting and assist AMC in preparation of RFP and draft concession agreement.

(6) Decentralized bio-gas plants

AMC is in a processing of planning to set up decentralized bio-gas plant of 2 to 10 ton capacity to utilize vegetable, food waste, flower waste, green waste, night soil, to generate bio-gas and energy.

(7) Land Reclamation of existing Present Dump Site

- Legacy Solid Waste is being disposed & accumulated at Pirana dumping site having total area of about 84 acres for a long back.
- 65 acres of land is accumulated with heaps of garbage having 15-20 meter height.
- AMC has planned a project for Reclamation of the site on PPP mode.
- AMC received offers from 6 private companies to provide feasible solution of legacy waste. Out of these companies, 2 companies have submitted their techno commercial feasibility reports. AMC has initiated the process to evaluate these offers and also appointed a legal vetting firm.

- A draft Term Sheet prepared by the legal firm has been shared with AMC & 2 companies during the meeting held in January 2015 and preparation of final term sheet is under process.