Municipal Solid Waste Management Master Plan

'Towards Zero Waste'

Final Report prepared in 2012

Ahmedabad

March 2013

Submitted To:

Ahmedabad Municipal Corporation

Submitted By:

Urban Management Centre (UMC)

URBAN MANAGEMENT CENTRE
in collaboration with ICMA

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The Urban Management Centre is a not-for-profit organization based in Ahmedabad, Gujarat, working towards professionalizing urban management in India and South Asia. UMC provides technical assistance and support to Indian state local government associations and implements programs that work towards improvement in cities by partnering with city governments. UMC builds and enhances the capacity of city governments by providing much-needed expertise and ready access to innovations on good governance implemented in India and abroad. UMC is a legacy organization of International City/County Management Association (ICMA) and hence is also known as ICMA-South Asia.

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Abbreviations

ADB	Asian Development Bank
AMC	Ahmedabad Municipal Corporation
AMTS	Ahmedabad Municipal Transport Service
APWA	American Public Works Association
ATIRA	Ahmedabad Textile Industry's Research Institute
AUDA	Ahmedabad Urban Development Authority
AWAG	Ahmedabad Women's Action Group
BOO	Build Operate Own
BPMC Act	Bombay Provincial Municipal Corporations Act
BRTS	Bus Rapid Transit System
C&D	Construction & Demolition
CA	Chartered Accountant
CBO	Community Based Organisation
CEPT	Centre for Environmental Planning Technology
CETP	Common Effluent Treatment Plant
CPHEEO	The Central Public Health and Environmental Engineering Organisation
CSR	Corporate Social Responsibility
cu.m.	Cubic Metre
EDI	Entrepreneurship Development Institute
FGD	Focussed Group Discussion
GIDC	Gujarat Industrial Development Corporation
GIS	Geographical Information System
GLI	Gandhi Labour Institute
GMFB	Gujarat Municipal Finance Board
GoI	Government of India
GPCB	Gujarat Pollution Control Board
GPRS	General Packet Radio Service
GPS	Global Positioning System
H&K	Hotels' & Restaurants' Kitchen
ha	Hectare
HH	Household
IEC	Information, Education and Communication
IIM	Indian Institute of Management
INR	Indian Rupee
ISRO	Indian Space Research Organisation
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
km	Kilometre
KSSM	Kamdar Swasthya Suraksha Mandal
lpcd	litres per capita per day
MBA	Masters of Business Administration
MCD	Municipal Corporation of Delhi
MHT	Mahila Housing Trust
ML	Million Litres

MLD	Million Litres per Day
mm	Millimetres
MoEF	Ministry of Environment & Forests
MOU	Memorandum of Understanding
MoUD	Ministry of Urban Development
MSL	Mean Sea Level
MSWM	Municipal Solid Waste Management
MT	Metric Tons
NA	Not available
ND	Not defined
NGO	Non Government Organisation
NGSY	Nirmal Gujarat Shauchalay Yojana
NID	National Institute of Design
NRW	Non Revenue Water
NUSP	National Urban Sanitation Policy
O&M	Operation and Maintenance
OD	Open Defecation
OWC	Organic Waste Converter
PGR	Public Grievances Redressal
PHS	Public Health Supervisor
PPP	Public Private Partnership
PRL	Physical Research laboratory
RCC	Reinforced Cement Concrete
RDF	Refuse Derived Fuel
RWA	Residents' Welfare Association
SEWA	Self-Employed Women's Association
SI	Sanitary Inspector
SLB	Service Level Benchmarking
SMC	Sound Material Cycle
SOP	Standard Operating Procedures
SPERI	Sardar Patel Economic Research Institute
SPIPA	Sardar Patel Institute of Public Administration
SPV	Special Purpose Vehicle
sq.km.	square kilometre
sq.m.	square metre
SSI	Sanitary Sub Inspector
SWM	Solid Waste Management
TPD	Tons Per Day
ULB	Urban Local Body
UMC	Urban Management Centre
USEPA	United States Environment Protection Agency
WoW	Wealth out of Waste

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In addition to AMC, UMC is also thankful to the following institutions for their contributions. Mahila Housing Trust; Gujarat Urban Informal Economy Board; Gujarat Pollution Control Board (GPCB); Navsarjan, Sanand; Kamdar Swasthya Suraksha Mandal (KSSM); CEE, Ahmedabad Women's Action Group (AWAG); Excel Industries, SEWA and their member waste pickers, Abellon Clean Energy .

I would like to acknowledge UMC's Project Team who worked closely with AMC team, especially Meghna Malhotra and Anurag Anthony. Other UMC staff who worked on the process tracking of solid waste are Hemang, Shabana, Shivangi, Vinay, Ankita, Yatish and Usha.

Manvita Baradi
Director, Urban Management Centre

Disclaimer

The scope of this report is to present the results of our detailed analysis and understanding of municipal solid waste management situation in Ahmedabad Municipal Corporation (AMC) jurisdiction. Our conclusions are based upon information drawn from research of the relevant sectors, data collected from AMC, discussions with the respective departments and our own sector expertise. No representation or warranty, express or implied, is given by Urban Management Centre (UMC) or any of its respective partners, officers, employees, or agents as to the accuracy or completeness of the information, data or opinions provided to UMC by third parties.

In terms of identifying various issues related to municipal solid waste management (MSWM) contained in this document, they represent only one perspective of our understanding and our interactions with various stakeholders of the City. We have neither carried out an audit or due diligence of the City nor a viability assessment of the assets or claims made by the ULB.

In the course of our assignment, we were provided with both written and verbal information. Nothing has come to our attention to cause us to believe that the facts and the data provided by AMC are not true or correct. However, no responsibility is assumed for the authenticity of the information furnished by AMC, neither verbal nor written. It is believed to be reliable and has not been independently verified by UMC.

No investigation of the title of the tangible and intangible assets has been made and AMC's claim to the assets has been assumed to be valid. No consideration has been given to liens or encumbrances, which exist against the assets. Therefore, matters of a legal nature relating to the title of the assets have not been considered. The data considered for the master plan preparation is of FY 2011-12 as the cut-off date decided by Ahmedabad Municipal Corporation.

The fee for this assignment is not contingent upon the outcome of this MSWM Master Plan. Nothing contained herein, to the contrary and in no event shall UMC be liable for any loss of profit or revenues and any direct, incidental, consequential damages incurred by AMC or any user of this document.

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With this report, UMC intends to provide only professional advice to AMC on various municipal solid waste management and related issues identified herein. This report also presents recommendation on what UMC believes is the most suited solution for sanitation issues identified, amongst various other alternatives that may exist.

Preamble

Ahmedabad Municipal Corporation invited Urban Management Centre for preparation of Municipal Solid Waste Management Master Plan – 2031 for AMC jurisdiction in November 2011. UMC conducted numerous visits between November 2011 and April 2012 for the purposes of data collection, field visits, interaction with ULB officials, citizens, focussed groups, etc. In addition to data collection, detailed site visits were conducted at the following locations to assess the status of MSWM services:

- Waste collection points in residential, commercial, special (including meat & vegetable) market areas; formal and informal open dumping sites in and around the city, etc.
- Natural water bodies including *nalas*, river, lakes, ponds, etc. to assess the environmental degradation caused due to lack of MSWM services in the city.
- Public toilets, urinals and open defecation (OD) spots
- Special areas such as railway station, Gujarat University, other campuses of large institutional areas, GIDC estates in the city, etc.
- Some select outgrowths/ contiguous settlements to the city

Other site visits included areas such as the slums, residential areas, municipal civic centres, retail and wholesale markets, health and educational institutions, etc.

The purpose of these detailed field visits was to establish a qualitative relationship between the statistical details provided by the ULB with the actual ground realities, which in many cases, were found to be in conflict with each other. Based on the verification of collected data from AMC, UMC conducted further studies to summarise the findings and present proposals to fill any gaps in MSWM services. As UMC has been engaged in designing IEC campaign on behalf of AMC, the learning has been drawn from the understanding as well.

This report is the final deliverable of the master plan preparation which presents the existing situation analysis of municipal solid waste management in Ahmedabad followed by overall strategy and broad recommendations for improving services in solid waste till 2031. For the purposes of this master plan, municipal solid waste does not include hazardous industrial waste and bio-medical waste generated in the city. For both types of waste, respective sector has utilities for collection, transportation, treatment and disposal of their respective waste and is beyond the purview of Ahmedabad Municipal Corporation.

Quantity of solid waste generated follows is a sinusoidal pattern and historical records showed that it peaks in the month of December. Hence, for the purposes of this master plan, December 2011 (for the FY 2011-12) has been taken to compute all functions related to quantity of waste and make projections until 2031. Continued efforts are being undertaken by AMC to improve services by bringing process changes as well as augmenting existing infrastructure and equipments for solid waste. Status of existing equipments and vehicles has been revised (as requested by AMC) between April and June 2012, and all computations factor these additional equipments and vehicles.

In order to understand the qualitative issues, UMC also conducted meetings with various organisations during the course of preparation of this master plan as indicated in the list below:

S. No.	Name of the Organisation	Date of Meeting
1	Gujarat Urban Informal Economy Board	February 01, 2012
2	Kamdar Swasthya Suraksha Mandal	March 02, 2012
3	AWAG	March 02, 2012
4	Navsarjan	March 14, 2012
5	Gujarat Pollution Control Board	March 15, 2012
6	Mahila Housing Trust	March 20, 2012
7	Abellon Clean Energy	April 12, 2012

Over and above them, UMC team has done detailed process tracking of solid waste based on the origination point and conducted local consultations with numerous stakeholders in the city.

Executive Summary

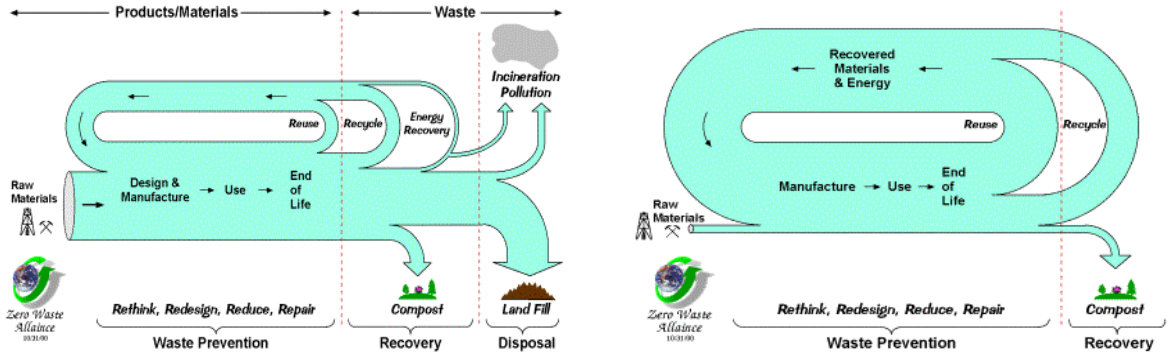
1. Concept of Zero Waste Cities

Increasingly the concept of sustainable cities has been gaining prominence in management of cities. Zero Waste Management is a key component of the sustainable management of cities.

As ***a lifestyle where no waste is generated, i.e. any object that has completed its life-cycle can be re-consumed locally in any natural and/or industrial process without generating any solid, liquid or gaseous waste***.

The figures below show current generic waste flow diagrams followed by an improved system with implementation of zero waste.

Current Generic & Zero Waste Waste Material Cycles



Source: http://www.zerowaste.org/case.htm#virtual_tour

2. Existing Situation of SWM in Ahmedabad

AMC area is spread over 466 sq km. The city is currently divided into 64 administrative wards and each ward has three elected municipal councillors with one seat reserved for a woman candidate. Ahmedabad has a completely decentralised model of urban governance and has been divided into six zones for ease and efficiency of administration. The location of Ahmedabad is shown in the map below:

Location map of Ahmedabad

Table 1 General Information about Ahmedabad

Item	Unit	Yr. 2011
Number of Wards/Zones	Number	64
Number of Zones	Number	6
Number of Slum Settlements	Number	739
Area	sqkm	466.14
Population (Provisional Census 2011)	Number	55,68,695
Number of Residential Properties	Number	12,54,175
Number of Non Residential Properties	Number	3,80,849

MSW Generation: Almost 110,667 MT of solid waste is generated from the city on a monthly basis.

MSW Collection: Around 106,484 MT (around 98 percent) of waste is collected monthly by AMC from various stream or sources of generation including:

i. Door/Gate to Dump System (includes residences, commercial establishments, institutes, offices, etc.)
ii. Street sweeping
iii. Hotels' & Restaurants' Kitchen Waste
iv. Construction & Demolition Waste
v. Waste from Special Markets (including slaughter house, meat/ fish/ vegetable markets)
vi. Lifting of Dead Animals

Primary & Secondary collection through Street Sweeping & Door/Gate to Dump, respectively

Source: (AMC, Solid Waste Management & Conservancy Services, Presentation, 2011) & UMC

Primary collection of H&K, Bio-Medical and Dead Animals/Meat Waste

Source: (AMC, Solid Waste Management & Conservancy Services, Presentation, 2011)

MSW Transportation: Upon collection, using mechanised fleet, AMC transfers waste using own/ private contractor's fleet and transports it to either processing plants or open dumping site at Pirana.

Transportation fleet for MSW; Proposed Transfer Station

Source: (AMC, Solid Waste Management & Conservancy Services, Presentation, 2011)

MSW Processing: AMC has 2 processing plants, one for converting waste into compost and another for producing refuse derived fuel (RDF). In addition to existing processing plants with a cumulative capacity of 1000 MT per day, another 1300 MT per day capacity of processing plants are being setup in the city. Total MSW processed in Ahmedabad is 10,000 MT monthly out of a total of 110,667 MT.

MSW Disposal: Presently, most of the waste (around 90 percent) is being dumped in the open at Pirana dump site. Of the remaining, around 8 percent of MSW is recovered while 2 percent of inert waste is disposed at scientific landfill site at Gyaspur. A total of 97,000 MT of MSW out of 110,667 MT monthly is disposed in the open dump site while 2,000 MT disposed at scientific landfill site.

Processing into Compost; Open Dumping Site at Pirana; Scientific Landfill at Gyaspur



Source: (AMC, Solid Waste Management & Conservancy Services, Presentation, 2011) & UMC

Summary of SWM Profile of Ahmedabad

Description	Quantity	Unit
Waste Generated	110,667	MT
Waste Collected	108,454	MT
Waste Processed by processing plants	10,663	MT
Waste picked by waste pickers	100	MT
Waste Dumped Open Dumping Site	97,591	MT
Waste Disposed at Scientific Landfill	2,166	MT

Source: (AMC, Data provided by AMC during meetings and discussions , 2012)

3. Population and MSW Generation Projections

The present population and its growth are the main elements upon which the structure of this city sanitation plan is based. For the purposes of this study, population projections have been used as defined in the Development Plan of Ahmedabad under preparation by Ahmedabad Urban Development Authority (AUDA). Based on historical data, Ahmedabad generated just 1000 MT in the year 2000 while it has increased to around 3500 in 2011 with a 350 percent decadal growth rate. It is envisaged that per capita waste generation growth rate would stabilise at 1.33 percent annually (Kurien, 2002). Based on this increase in per capita, growth in MSW generation with overall increase in population has been shown in the table below:

Projected Population of Ahmedabad till 2021

Year	Population	Daily Waste collected (MT)
2011	55,68,695	3,500
2016	64,94,177	4,596
2021	75,73,468	5,726
2031	1,02,99,972	8,887

Source: (AMC, Data provided by AMC during meetings and discussions , 2012); UMC

4. Strategy for Zero Waste Ahmedabad

Sound Material Cycle Society (SMC) provides zero waste solution in true sense. However, as SMC involves initiative at international, national and local levels, it is a long term goal and other approaches can be aligned to increase preparedness of cities to adopt SMC principles in the future. Other options include Reduce-Reuse-Recycle as an effective way to achieve zero waste cities and are implementable in our cities in the current circumstances.

The table below gives a comparative approach taken by various approaches for MSWM.

Approaches for Zero Waste Cities - Sound Material Cycle Society, Management of 3Rs & Combination of Both

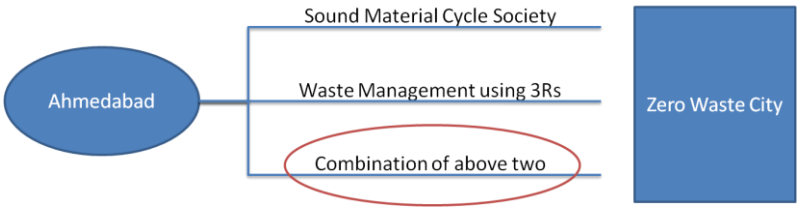
Parameter	Sound Material Cycle[1] (SMC)	Management of 3Rs [2]	Combination of both
Concept	Idealistic concept of no generation of waste at all. Everything is reusable and recyclable.	Use a combination of Reduce-Reuse-Recycle as a method to reduce waste and hence manage it better.	Implementing 3Rs can be immediate while SMC is seen as a long term plan. Hence, a combination of two – adopting 3Rs as an intermediate step while capacitating ULB to adopt SMC as and when implemented is the combined method.
Policy Framework	Requires very strict policies at international, national, state and local level.	Breaks down 'Zero Waste' to implementable actions with reduced dependency amongst national, state policies while laying a larger focus on local policies.	Immediate policy interventions at local levels can be done. Simultaneously, push for amendments in state and national policies. Enables local government to prepare for SMC
Technical Feasibility	Highly advanced industrial nations like Japan working towards making SMC feasible. At present, only packaging, automobiles and appliances sectors successfully covered by Japan.	Depends on efficient micro management of services covering collection, segregation, transportation, processing, treatment and disposal. Complex task, especially in under-capacitated local governments.	Management of 3Rs – immediate implementation possible. Long term strategy – preparing AMC to adopt SMC in the future as international, national and state policies for SMC mature.

Source: UMC

[1] Adopted by Japan.
[2] Adopted by South Korea, Australia, many EU nations.

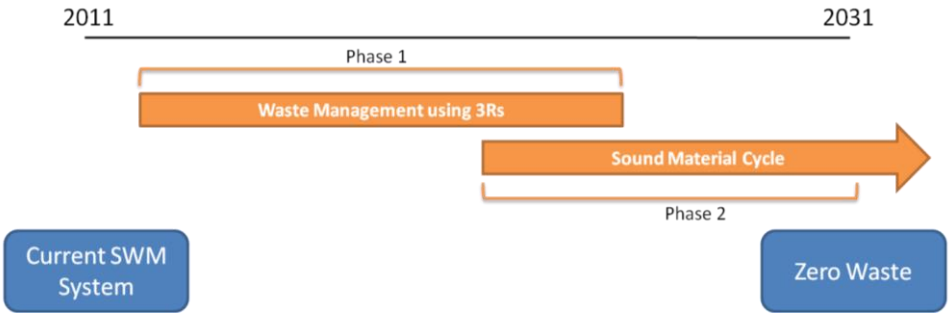
In case of Ahmedabad, based on the above analysis, a combination of SMC and 3Rs provides a viable solution as an intermediary stage to eventually achieving SMC. As per the timeline of this master plan, Phase 1, i.e. upto 2021 can be planned for incorporating principles of 3Rs, while during the next ten years, i.e. upto 2031, measures to improve AMC's preparedness to adopt SMC principles can be planned. Implementation of SMC however, involves much larger policy initiatives at national and state level which can be relooked at in a periodic manner.

Methods to achieve Zero Waste City



Source: UMC

Phasing Transition from 3Rs to SMC Principles for achieving Zero Waste



Source: UMC

With management of 3Rs, per capita waste generation could be controlled. Whether per capita generation can be reduced or not is dependent on consumption patterns, global economics and policies at international, national and local levels.

For preparation of MSWM Master Plan 2031 for AMC, various micro planning scenarios have been explored to achieve targets set in the previous section towards zero waste. Under the current circumstances, any scenario can be assessed with 2 pre-conditions

i. Mixed waste entering the municipal stream
ii. Segregated (at source) MSW entering municipal stream

The three scenarios which have been assessed for MSWM collection are

Scenario 01 : Bin Free City
Scenario 02 : Strengthened Secondary Collection System
Scenario 03 : Improved Door Step and Optimised Secondary Collection System (Minimized Bin City)

Scenario Comparison for Segregated (at source) MSW

	Scenario 1: Bin Free City	Scenario 2: Strengthened Secondary Collection System	Scenario 3: Minimized Bin City
Residential Collection	100% coverage of Door to Door/Gate to Dump collection (including slums, defunct RWAs,	Door to Door/Gate to Dump collection through **compartmentalised** GPS	100% coverage of Door to Door/Gate to Dump collection (including slums, defunct RWAs, non RWA areas, etc.)

	non RWA areas, etc.) through **compartmentalised** GPS managed fleet.	managed fleet. Non RWA/ defunct RWA areas/ slums can use secondary collection points with **multiple bins for segregated waste** to deposit waste.	through **compartmentalised** GPS managed fleet.
Street Sweeping (Swept Waste + Waste from Litter Bins)	All secondary collection points and nuisance spots removed. High surveillance and monitoring to curb re-establishment of these spots.	All nuisance spots covered by placing multiple containers 9for segregated waste at sites (atleast 5,500 x 2 bins by 2031)	Same as mixed waste model.
	Waste collected in garbage bags (separately for swept waste and waste from litter bins) and placed along the road. **Compartmentalised** GPS managed fleet collected these separate garbage bags.	Waste is deposited at secondary bins (atleast 2 bins at each site) placed at every km of road length	Minimal bins placed and hence emptied.
	Number of garbage bags required – double that of mixed waste situation	Total number of secondary bins required – **5500 x 2** approx. (for 5500 km road length by 2031)	Reduced number of garbage bags required (compared to Scenario 1) but double than that in case of mixed waste
	No provision for occasional large quantity of waste generated from homes/ shops/ offices.	Coloured secondary bins serve for segregated waste generated from homes/ shops/ offices.	Limited provision of secondary bins for occasional large quantity of segregated waste generated from homes/ shops/ offices.
Vegetable, Fruits, Meat Waste	Compartmentalised GPS managed fleet collects waste from individual shops/ door – special waste and other waste segregated.	In addition to door step collection, vegetable, Fruits, Meat vendors/ shops deposit waste at compliant secondary points with coloured bins.	Compartmentalised GPS managed fleet collects waste from individual shops/ door – special waste. For congested areas, special compartmentalised small non-motorised vehicles to be used for door to door collection.

Based on the comparative analysis of the three scenarios, 'Scenario 3: Improved Door Step and Optimised Secondary Collection System (Minimised Bin City)' has been selected as the preferred option. This option with 'Segregated (at source) MSW' should ideally be adopted in congruence with the scenario preferred for segregation in the previous section.

5. Final Scenario and the Preferred Options for Achieving Zero Waste

Based on AMC's preferences and vision for SWM services, the preferred scenario has been formulated by compiling selected alternatives of independent streams of MSWM. The table below provides a summary of the preferences expressed in the previous section.

Summary of Composite Preferred Scenario for MSWM Master Plan 2031

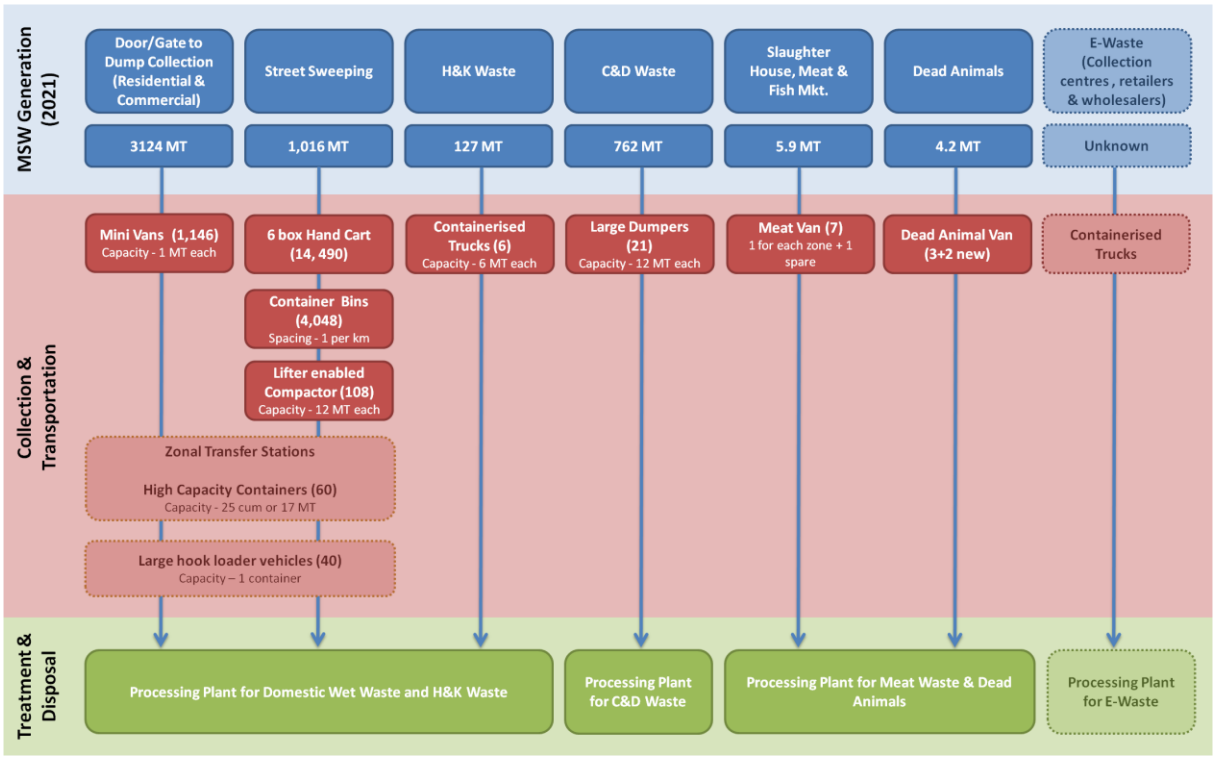
	Preferred Scenario	Remarks
Segregation		
	Segregation of domestic MSW into dry, wet & domestic hazardous waste.	Further segregation of dry waste into paper, plastic, fabric, glass, metal, wood, etc.
Collection		
Residential, commercial & institutional	100 percent Door step collection for all (including slums & chawls)	
H&K Waste	100 percent Door step collection	
C&D Waste	Call based collection. C&D waste	

	Preferred Scenario	Remarks
	reporting mechanism for street sweeping staff	
MSW from slaughter houses, meat/ fish/ vegetable markets	100 percent door step collection from special markets	
Dead Animals	Call based collection. C&D waste reporting mechanism for street sweeping staff	
Bio-medical waste	Independent system.	
Transportation		
Residential, commercial & institutional	Dedicated compartmentalised fleet for collecting dry & wet MSW	Level of segregation would decide the fleet compartmentalisation & any need for separate fleet for segregated waste in the future.
H&K Waste	Dedicated fleet	
C&D Waste	Dedicated fleet	
MSW from slaughter houses, meat/ fish/ vegetable markets	Dedicated fleet	
Dead Animals	Dedicated fleet	
Processing & Disposal		
Recovery	65.0%	
Composting	*35.0%*	
Sound Material Cycle	*10.0%*	
Recyclers (including waste pickers)	*20.0%*	
Waste to Energy (pelletisation)	20.0%	
Landfilling (inert waste only)	5.0%	
Incineration	10.0%	

Source: UMC

Based on analysis of existing system of MSWM in Ahmedabad, the existing mechanism (combination of door/gate collection and secondary collection) should be strengthened to integrate various ongoing initiatives by AMC. Details of ongoing initiatives have been listed on page 105. The proposed strengthening of the existing system has been mapped in the figure below which explains the collection chain from source to treatment/ disposal by 2031 while identifying various infrastructural requirements for the same.

Preferred Strategic Option for Strengthening Existing MSWM Mechanism



Source: UMC

As proposed above, collection and transportation of MSW should be improved through strengthening the current chains based on source. Subsequent sections further detail out each chain of MSW collection, transportation, processing and disposal of MSW based on the source of generation as per the preferred scenario for the master plan.

6. Ongoing Initiatives in SWM in Ahmedabad

There are various ongoing initiatives in Ahmedabad for provision of solid waste management infrastructure and for creating awareness. Some of them have been listed below.

Information, Education and Communication (IEC) Campaign for Solid Waste Management

In its endeavour to keep the city clean, AMC is of the view that in parallel to investments and regulations; IEC (Information, Education and Communication) campaign is an important element to improve city Solid Waste Management. AMC has initiated an IEC Campaign through various mediums including:

- Door to Door Awareness campaigns (handouts/ paper bags with messages/ stationary with messages);
- Public events (Environment day, Health day, Clean-up drives, Ward Sabha etc.);
- Competitions, awards for localities, public places, malls, innovative initiatives;
- Capacity building of staff and other informal stakeholders through onsite and offsite training and visit to best practices, and

Mass Communication tools like Rallies, Street Plays, Skits, Hoardings, Banners, Theatres, Radio Jingles, Local Cable Network, Telephone Ringtones/Jingles tie-up with Telecom Companies, Lectures at schools and colleges. Some samples of print content designed have been provided in Annexure 10.

Preparation of Public Health Bylaws

AMC has initiated preparation of SWM Guidelines as a road map towards creating standards and norms at the local level for various SWM processes. Guidelines would also deal with violations and fines, obligatory responsibilities of AMC, waste generators and service providers of solid waste management.

Plastic Ban

The guidelines by Union Ministry of Environment and Forests (MoEF) have clearly outlined the role of the local civic body. The guidelines mention that polythene bags below 40 microns should be completely banned while those above this thickness can only be sold at a rate which is to be fixed by the local body. AMC has stringently taken action to ban manufacture, trade use and sale of prohibited plastics bags.

Proposed Capping of Open Dump Site at Pirana

Over the years, AMC has been disposing MSW in open dumping site at Pirana. Out of 84 acres, around 65 acres of land has 20 to 25 metre high heaps of garbage stocked. There is potential to tap methane gas generated from these heaps and hence USEPA has undertaken a pilot project in the year 2007 for measuring the percentage level of methane concentrations found; estimated at about 950 cu.m. daily. On an average, landfill gas contains 45 to 55 percent of methane. The gas collected can then be sold off to nearby industries as raw fuel. Many industries have shown interest in using the recovered methane gas. Alternatively, captured methane gas can be processed, purified and converted into electricity. While capping the heaps of garbage for capturing methane gas, AMC plans to build nature park/ green park over the dump site.

Study for Eradicating Open Defecation (OD)

AMC recently conducted a study on open defecation through survey of OD sites. The study was undertaken over a period of 20 days. The suggestions of the study have emerged as follows:

- Creating awareness by IEC activities in communities
- AMC should construct adequate number of public and pay and use toilets for the people residing in areas susceptible to OD, especially along the railway line.
- After these facilities are provided, AMC should get in dialogues with Railway Authorities to make them aware about provision of such facilities and also to draw their attention towards taking adequate measures to restrict/prevent people trespassing for the purpose of OD along with the Railway Line.
- Awareness of children in schools (*Anganwadi's*) and community is very important as in spite of sanitation facilities available at home or community, they defecate in open.
- It is also suggested that OD needs to be controlled by enforcement where it is done in some private properties
- Adequate and regular water supply at pay and use toilets should be ensured.
- An immediate requirement of cleaning or construction of new drainage lines to avoid the problem of overflowing of chocked drainage.
- More vigilant supervision over Maintenance and regular day to day cleaning of Pay and Use and Public toilets.
- Requirement to increase no. of seats and urinals at pay and use toilets.

AMC has taken initial steps towards complete removal of OD in Ahmedabad through this detailed study outlining the actions to be taken to achieve the objectives of the study. With effective

infrastructural on-ground implementation, IEC programmes and strict enforcement, AMC hopes to make Ahmedabad an OD free city in the future.

Green Waste Processing

AMC has tied up with a private company to set up a demo/ pilot project for 60 days in Law Garden area to convert the garden waste, green waste coming from nearby hotels' & restaurants' kitchen MSW, waste given by the citizens at the site into the compost. The company operating the plant would give back the compost to the citizens free of cost in the proportion of conversion ratio from waste to compost. Regular supplier of green waste may become a member of this Eco Club and will grow this concept. AMC has its own 200 public gardens and if this concept turns to be successful, then the same can be replicated elsewhere.

Wealth Out of Waste (WoW) Initiative

The project aims at segregating solid dry recyclable waste at source including paper, plastic, metals, glass, etc. The scheme is based on private agencies collecting such segregated waste from households, shops, offices, etc. and paying a sum based on fixed rates to the waste provider. The collection agency would further provide the dry recyclable was to various recycling industries.

Paper Cups at Tea Stall

AMC is concerned about the use of non bio-degradable plastic cups being used at tea stalls in Ahmedabad as they choke the drains and are often consumed by stray animals. Hence, AMC has undertaken an initiative to introduce paper cups instead of plastic cups in all government offices, banks, educational institutions, etc. with the help of corporate sector as a part of Corporate Social Responsibility (CSR). Since August 12, 2011, AMC's main office has already started using paper cups. This can gradually be extended to roadside tea vendors.

E-Waste Management

For effective implementation of E-waste (Management and Handling) Rules, 2011 in Ahmedabad, AMC in coordination with GPCB and with the help of Corporate Sector, plans to establish points for e-waste collection, safe transportation and safe storage of the same. The authorized e-waste recycling company has expressed interest to transport the same to its plant at its own risk & cost.

7. Summary of Key Recommendations

	Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
Two/Multi-Bin System	Segregate Dry and wet waste by residential, commercial and institutions based on the two/multi-bin system to be suggested by Public Health Bye-laws being prepared by AMC.	✓		
	Introduce advanced dry waste segregation into paper, plastics, metals, glass, fabric, etc.		✓	
Food Waste	Initiate food waste recycling for generation of compost material or energy generation. Regulatory	✓		

	Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
	mechanisms should be introduced and enforced strictly.[3]			
E-Waste	Introduce deposition of e-waste at retailers and wholesalers of electricals and electronics	✓		
	Setup AMC's collection centres (1 per ward or 10 per zone) to be planned for segregated collection	✓		
	Formalise licensed e-waste recyclers	✓		
Waste Pickers	Register waste pickers and convert them to municipal waste collectors/ sorters/ sweepers through effective livelihood training.	✓		
	Conduct livelihood training programmes for waste pickers to increase their employability as municipal SWM or sanitation workers.	✓		

Recommendations for Door/Gate to Dump Collection in Residential, Slums and Commercial Areas

	Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
Residential Areas and Slums	Prepare a database of all residential societies/ associations and initiate a dialogue to ensure of regular service being provided to citizens.	✓		
	For areas not served by any residential society/ association, CBOs & NGOs to initiate door step collection **or** restore the older system where waste pickers were mainstreamed into the municipal stream as door step waste collection workers through NGOs/CBOs.	✓		
	Adopt the above system for slums and chawls to ensure door step collection.	✓		
	Designate slums as special zones where door to door collection and street sweeping may be undertaken by the same agency.	✓		
	Instruct residential societies/ associations to store bins inside their premises and not encroach on public footpaths and roads.	✓		
	Introduce provision for storing MSW bins within premises in the building plan approval process.	✓		
	Prepare standard operating procedures (SOP) and share them with residential societies/ associations and encourage them to follow the same. In addition to sharing, AMC should conduct comprehensive training and awareness for the same.	✓		
Commercial Establishmen	Increase awareness through regular dialogue with shop owners to store their waste in garbage bags	✓		

[3] In the absence of a strict regulation, Singapore is failing to achieve its target of 70 % food waste recycling by 2030, while South Korea succeeded in achieving 94 % with strict enforcement (Correspondent, 2009).

	Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
ts	within their premises during the day and place them outside their shops only at the end of the day.			
	Conduct late evening (post 2100 hrs) collection of waste from commercial areas	✓		
Other Recommendations	Immediately stop transfer of waste from one vehicle to another in the open along roads	✓		
	Install/ direct contractors to install GPS and use for route planning and monitoring	✓		
	Strict enforcement of compliance by municipal/ contracted staff should be ensured as per the proposed SOP (to be prepared by AMC) including use of safety kit and protective gear by workers.	✓		
	Conduct regular health checkups for all contracted staff (in addition to municipal) in addition to provision of medical and insurance against occupational hazards	✓	✓	
Design modifications	Compartmentalise vehicular fleet to collect segregated waste as per proposed segregation	✓		
	Easy transfer of waste from bins into collection vehicle (low height loading vehicles)	✓		

Recommendations for MSW Collection through Street Sweeping & Litter Bins

	Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
General Recommendations	Prepare a comprehensive MIS including maps of areas swept by each sweeper, placing of litter bins, cleaning schedule, human resource management, etc.		✓	
MSW Collection from Street Sweeping	Prepare SOP for street sweeping and collection of waste from litter bins.	✓		
	Conduct training and capacity building programmes for street sweeping staff	✓		
	Introduce grading of cleanliness (streets)		✓	
	Introduce night sweeping on arterial, sub-arterial and other major roads (without inconvenience to residents) using mechanised road vacuum sweeping machines	✓		
	Strict enforcement (including fines in case of violations) for use of proper gear and appropriate equipments.	✓		
	Undertake design improvements to protective gear and equipments	✓		
	Improve inter-departmental coordination should be done to ensure proper paving of unpaved areas/ areas prone to water collection, etc.	✓		

	Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
	Immediately stop open defecation and until achieving so, use mechanised equipment for sweeping such areas	✓		
	Strictly prevent any unauthorised sub-contracting of street sweeping activities by workers.	✓		
MSW Collection from Litter Bin	Prepare a detailed plan for litter bins in the city including design considerations, placement and management of the bins	✓	✓	
	Introduce a mechanism to report broken or missing litter bins and a maintenance schedule for bins	✓		
	Line up all litter bins with disposable garbage bags	✓		

Recommendation for H&K Hotels' & Restaurants' Kitchen MSW Collection

	Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
	Prepare a comprehensive MIS including maps with locations of units to be covered by collection vehicles should be prepared. Integrate the same with GPS-GPRS enabled tracking system for monitoring and management of the fleet.	✓	✓	
	Introduce regulatory mechanisms to ensure that all hotels, restaurants, food joints, hawkers and vendors of fruits/ vegetables use H&K collection service mandatorily.	✓		
	Link renewal of shop/ restaurants/ hawking licenses for hotels, restaurants, food joints, fruits/ vegetable vendors to compliance with H&K collection system.		✓	
	Negotiate customised fleet with vehicle/ body suppliers and included specifications in terms of reference for private contractors.	✓		
	Prepare SOP for carrying out H&K waste collection.	✓		

Recommendations for C&D MSW Collection

Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
Introduce inter-departmental reporting mechanism (Eg: street sweepers can report C&D waste dumped in an unauthorised manner to the concerned team)	✓		
Strengthen mechanism for requests for collection at central and zonal level, channelize information flow between levels.	✓		
Amend building completion certificate issued by AMC to include procuring a certificate indicating details of C&D disposal.	✓		
Introduce vehicle mounted cranes to the fleet for collection of C&D waste	✓		
Prepare SOP for carrying out collection of C&D waste	✓		

Recommendations for MSW Collection from Slaughter House, Meat, Fish and Special Markets

Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (10 yrs onwards)
Extend MSW collection through this stream to door step collection instead of secondary collection point only.	✓		
Cover non AMC meat and fish markets.	✓		
Cover all fruits, vegetables and grains markets (separate from meat and fish) with door step collection from each shop.	✓		
Adopt fully mechanised fleet in adequate numbers with appropriate technology for loading, unloading and transportation of such waste	✓		
Prepare SOP for carrying out collection of such waste.	✓		
Impose a ban on disposing waste other than classified as meat/ fish waste in secondary collection bins.	✓		
Initiate strict action against violators in case of burning of such waste and/ or packaging (including thermocol boxes).	✓		

Recommendations for Lifting of Dead Animals

Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (1 yrs onwards)
Introduce reporting mechanism whereby street sweeping staff should inform the dead animals collection team in case of any dead animal found in their respective beat.	✓		
Stop dumping of dead animals in or around secondary collection bins.	✓		
Prepare SOP for carrying out collection of such waste.	✓		
Regulate informal systems of dead animal collection and ensure compliance with SOP.	✓		

Recommendations for Transportation of MSW

Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (1 yrs onwards)
Ensure compliance to transportation plan with introduction of zonal transfer stations.		✓	
Prepare SOP for carrying out transportation of MSW.	✓		

Recommendations for MSW Processing & Disposal In Ahmedabad

Action Item	Short Term (< 5 yrs)	Medium Term (5-10 yrs)	Long Term (1 yrs onwards)
Emphasize processing MSW already collected in segregated manner such as C&D waste, H&K waste, waste from dead animals and meat waste.	✓		
Enforce immediate ban against burning of waste anywhere in the city including Pirana.	✓		
Immediate measures should be taken to correct the damage done by Pirana to its neighbouring areas.		✓	✓

Annexure 20 Life-cycle and Unit Costs of various Equipments & Machinery used for SWM

Equipment/ Machinery	Life-cycle of Equipment/ Machinery (Years)	Per Unit Cost in INR Lakh (2012-13 Rates)
Door/Gate to Dump Collection Van (1 MT)	5	5.00
Compactor (14 cum)	10	25.00
Compactor (6 cum)	8	18.00
Hand Cart (6 bin)	3	0.05
Litterbins	1	0.04
Protective Safety Kit for SWM Workers	0.5	0.03
1100/660 litre Plastic Bins	2	0.38
MS Container Bins (7 cum)	5	0.70
High Capacity Containers for Transfer Stations	5	7.00
Large Hook Loader Vehicles for Transfer Stations	8	38.00
Road Sweeping Machine (Truck Mounted)	8	70.00
Closed Body Container Truck (9 MT)	12	15.00
Skip Lifter	10	18.00
Container for Skip Lifter	5	0.55
Crane Mounted Truck for C&D Waste	8	40.00
Closed Body Truck for Dead Animals with Rear-lift	10	20.00
Mini Truck for Meat Waste Collection (TATA 407 or similar)	12	15.00
Closed Body Container Truck for E-Waste	12	20.00

Source: (AMC, Data provided by AMC during meetings and discussions , 2012)

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