# City Sanitation Plan

## Ahmedabad

June 2012

Prepared for

**Ahmedabad Municipal Corporation**

Prepared by

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## Ahmedabad Municipal Corporation

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**June 2012**

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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 |
| CSP | City Sanitation Plan |
| 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 National 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 | Millilitres |
| MoEF | Ministry of Environment & Forests |
| MOU | Memorandum of Understanding |
| MoUD | Ministry of Urban Development |
| MSL | Mean Sea Level |
| MSW | Municipal Solid Waste |
| 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 |
| NOC | No Objection Certificate |
| NRCP | National River Conservation Plan |
| 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 Benchmarks |
| 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 |

| | |
|---|---|
| STP | Sewage Treatment Plant |
| SWD | Storm Water Drainage |
| SWM | Solid Waste Management |
| TPD | Tons Per Day |
| ULB | Urban Local Body |
| UMC | Urban Management Centre |
| USD | United States Dollar |
| USEPA | United States Environment Protection Agency |
| WDS | Water Distribution Station |
| WoW | Wealth out of Waste |

## Acknowledgements

Urban Management Centre appreciates the support received from Ahmedabad Municipal Corporation, in particular from Dr. Guruprasad Mohapatra, Municipal Commissioner, Mr. I K Patel, Deputy Municipal Commissioner; Mr. Tarun M. Lad, City Engineer; Mr. Naresh Rajput, Director, SWM Department; Mr. Prashant Pandya, Deputy Director, SWM Department; Mr. Anand Patel, Additional City Engineer, SNP Cell; and Ms. Triptiben and Ms. Bhartiben. We also extend our sincere thanks to all AMC departments for providing valuable inputs and inputs for preparation of this report.

In addition to AMC, UMC is also thankful to the following institutions for their contributions.

1. City Sanitation Task Force (CSTF) formed for the purposes of preparation of this CSP
2. Mahila Housing Trust
3. Gujarat Urban Informal Economy Board
4. Gujarat Pollution Control Board (GPCB)
5. Navsarjan, Sanand
6. Kamdar Swasthya Suraksha Mandal (KSSM)
7. Ahmedabad Women's Action Group (AWAG)
8. Abellon Clean Energy

Manvita Baradi
Director, Urban Management Centre

## Disclaimer

The scope of this report is to present the results of our detailed analysis and understanding of sanitation 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 sectoral issues contained in this document, they represent only one perspective of our understanding and our interactions with various stakeholders of the City. Further, these issues would be refined in subsequent stages during the course of the preparation of the City Sanitation Plan. 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 untrue or incorrect. 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 surveyed or independently verified by UMC. Some of the data provided/ derived by AMC is nearest estimate based on field knowledge and not based on any scientific surveys or studies.

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 fee for this assignment is not contingent upon the outcome of the City Sanitation Report. 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 sanitation 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 City Sanitation Plan for AMC jurisdiction in July 2011. UMC conducted numerous visits since July 2011 till 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 municipal 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 municipal sanitation services in the city.
- Public toilets, urinals and open defecation (OD) spots
- Areas facing problems of flooding, water logging, etc.
- 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.

In congruence with guidelines laid by NUSP, AMC conducted the City Sanitation Task Force's first Consultation Workshop on February 21, 2012. Based on the stakeholder's feedback, their vision for development of their city over the next 25 years, and their priorities, first draft of the proposals to fulfil any gaps at AMC's end in sanitation services were then prepared and a broad sector wise investment was estimated for the next 25 years. Based on the verification of collected data by AMC, UMC conducted further studies to summarise the findings and present proposals to fill any gaps in sanitation services.

This Draft City Sanitation Plan Report presents the a) sector wise assessment of AMC' sanitation services, b) stakeholder's feedback for improvement of sanitation in the city, c) proposals under this CSP for fulfilling the gaps, and e) a broad cost estimate for all the proposals.

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

| S. No. | Name of the Organisation |
|---|---|
| 1 | Gujarat Urban Informal Economy Board |
| 2 | Kamdar Swasthya Suraksha Mandal |
| 3 | AWAG |
| 4 | Navsarjan |
| 5 | Gujarat Pollution Control Board |
| 6 | Mahila Housing Trust |

# 1. Introduction to National Urban Sanitation Policy

The Government of India launched its National Urban Sanitation Policy in November 2008 with the goal of making India "community-driven, totally sanitized, healthy and liveable cities and towns". The policy advocates that all cities would become open defecation free, all human wastes and liquid wastes will be collected and safely treated and adequate resources will be available for the operation and maintenance of the sanitation facilities.

As sanitation is a state subject, states would be required to develop state sanitation strategy that articulates its vision for accomplishing the goals of the National Urban Sanitation Policy. Cities which are responsible for sanitation will be required to develop city sanitation plans, implement and maintain the infrastructure facilities.

***Sanitation is defined as safe management of human excreta, including its safe confinement treatment, disposal and associated hygiene-related practices.***

While this policy pertains to management of human excreta and associated public health and environmental impacts, it is recognized that integral solutions need to take account of other elements of environmental sanitation, i.e. solid waste management; generation of industrial and other specialized/ hazardous wastes; drainage; as also the management of drinking water supply.

The Millennium Development Goals (MDGs) enjoin upon the signatory nations to extend access to improved sanitation to at least half the urban population by 2015, and 100% access by 2025. This implies extending coverage to households without improved sanitation, and providing proper sanitation facilities in public places to make cities open defecation free.

**Vision**

The vision for Urban Sanitation in India is:

**All Indian cities and towns become totally sanitized, healthy and liveable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women.**

## 1.1. Concept of Totally Sanitized Cities

A totally sanitized city will be one that has achieved outputs or milestones specified in the National Urban Sanitation policy, the salient features of which are as follows:

- Cities must be open-defecation free and provide access to toilets for poor people.
- Must eliminate the practice of manual scavenging and provide adequate personnel protection equipment that addresses safety of sanitation workers.
- All wastewater should be safely collected, treated and disposed.
- Recycle/reuse of treated wastewater for non-potable purposes should be implemented wherever possible.

- Solid waste collected and disposed safely.
- Services to the poor and systems for sustaining results.
- Improved public health outcomes and environmental standards.

## 1.2. Need for City Sanitation Plans

The City Sanitation Plan (CSP) 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.

The principal components of city-wide approach include:

a) Collection and sanitary disposal of wastes, including solid wastes, liquid wastes, excreta, industrial wastes, clinical and other hazardous wastes;
b) Storm water drainage;
c) Cleansing of thoroughfares, markets and other public spaces;
d) Environmental sanitation education;
e) Inspection and enforcement of sanitary regulations;
f) Monitoring the observance of environmental standards.

The City Sanitation Plans will be prepared after assessing the situation analysis and with wide consultation with stakeholders. The Plan will be based on the following considerations:

- To adopt a demand-based strategy and community participation in planning, implementation and management of sanitation infrastructure.
- To adopt locally suitable methods, technology and materials, and provide necessary facilitation support to the Municipal Corporation/ Municipality.
- To encourage community and private participation and define their role in creation and maintenance of the sanitation infrastructure, and thereby ensure a sense of ownership.
- To ensure coordination between various departments working in the field of water supply and sanitation, such as health, education, public health and engineering department, industry, environment, transport, pollution control board, etc.
- To ensure an optimum use of funds allocated by the 12$^{th}$ and 13$^{th}$ Finance Commissions for solid waste management.
- To coordinate various externally aided projects for their optimum results.

In the City Sanitation Plan, it has taken several steps to improve the quality of life of its urban population, with the special focus on urban poor. It has taken several steps towards this endeavour and is continuing to do so. Provision of universal access to safe drinking water and sewerage facilities is a prime need to enhance quality of life in a community, especially of the urban poor.

# 2. Formation of City Sanitation Task Force (CSTF) & its Roles & Responsibilities

The Corporation formed a multi-stakeholder City Sanitation Task Force (CSTF) as envisaged under the NUSP. The City Sanitation Task Force (CSTF) has been formed with representatives from various walks of life. A list of the members of City Sanitation Task Force is as below:

**Table 1 List of Members of City Sanitation Task Force**

| | City Sanitation Task Force | |
|---|---|---|
| **Chairman** | Hon. Mayor of Ahmedabad | Mr. Asit Vora |
| **Convener** | Municipal Commissioner, AMC | Dr. Guruprasad Mohapatra |
| **Secretary** | City Engineer, AMC | Mr. Tarun Lad |
| **Members** | **Other Government Departments** | |
| | Chief Executive Authority, AUDA | Ms. Mamta Verma, IAS |
| | HOD of Sewerage Department, AMC | Mr. Falgun Mistry |
| | HOD of Solid Waste Department, AMC | Mr. Naresh R. Rajput |
| | HOD of Health Department, AMC | Dr. S. P. Kulkarni |
| | HOD of Storm Water Drainage Department, AMC | Mr. M. K. Shah |
| | Gujarat Urban Development Mission | B. J. Vyas |
| | Gujarat Urban Development Company Ltd. | Mr. P. G. Gadani |
| | Gujarat Pollution Control Board | Mr. A. A. Dolati |
| | Indian Railways | Mr. Praveen Kumar |
| | Gujarat Chamber of Commerce & Industries, | Mr. Shailesh Patwari |
| | Representatives of unions of *safai karamcharis*, sewerage sanitary workers, etc. | Mr. Harish Chawda |
| | **Academic Institutions** | |
| | Indian Institute of Management, Ahmedabad | Dr. Prem Pangotra |
| | CEPT University | Prof. Mona Iyer |
| | All India Institute of Local Self Governance | Mr. Nachiket Dhruv |
| | **NGOs** | |
| | Ahmedabad Women's Action Group | Ms. Ilaben Pathak |
| | Mahila Housing Trust | Ms. Bijal Bhatt |
| | SAATH | Mr. Rajendra Joshi |
| | Environmental Sanitation Institute | Mr. Jayesh Patel |
| | *Akhil Bhartiya Paryavaran*/ Gujarat Sanitation | Mr. A.K. Mishra |
| | **Slum Dwellers** | |
| | *Vikasini* (city based federation of CBO supported by Mahila Housing Trust) | Ms. Kokilaben Vora |
| | Resident of the Bavaji na Chhapra, Khokhra Ward, East Zone. | Mr. Ramlingan Achipan Nayyar |

CSTF members have been active in providing valuable feedback for preparation of this CSP. The key roles of the CSTF to be undertaken for implementation of the CSP as defined by NUSP have been listed below.

1. **Launching City Level 100% Sanitation Campaign** - Using IEC Campaigns as an effective tool for the following topics:
   - 500 NOC Scheme
   - Providing new sewerage connections
   - Solid Waste Management Activities (ongoing)
   - Improving interaction between citizens and AMC by improving Public Grievances Redressal System (PGRS)
   - Creating awareness about various central, state and local individual toilet schemes
   - Septage management
   - Sensitisation towards preventing pollution in water bodies and improvements in the environment through improved sanitation
   - General health related awareness campaigns

2. **Introducing a Report Card Mechanism at Ward/Area Sabha Level**

3. **Adopting Standards for Various Infrastructure Services & other performance indicators**

Services to include

- Environment outcomes
- Health Outcomes
- Processes
- Infrastructure
- Service Delivery

In addition to CSTF, AMC has also initiated parallel efforts to improve sanitation in the city. Some of these parallel efforts include preparation of SWM Master Plan 2031 towards achieving Zero Garbage city; and IEC campaign for creating awareness related to solid waste management in the city. Additionally, the CSTF should also ensure that the implementing agency (AMC) should create GIS database of all sanitation related services.

# 3. 1st City Sanitation Task Force Consultation

The 1st City Level Stakeholder Consultation was conducted for preparation of City Sanitation Plan (CSP), Ahmedabad at Ahmedabad Municipal Corporation (AMC) office on February 21, 2012 at 1700 hrs in the Standing Committee Meeting Room, 3rd Floor, AMC Building, Danapith, Ahmedabad.

Representatives from the following organisations were present for the consultation:

1. Ahmedabad Municipal Corporation
2. Gujarat Chamber of Commerce and Industry
3. Gujarat Urban Development Mission
4. Gujarat Urban Development Company Ltd.
5. Indian Railways
6. Gujarat Pollution Control Board
7. CEPT University
8. IIM Ahmedabad
9. SAATH
10. *Akhil Bhartiya Paryavaran Sansthan*
11. Mahila Housing Trust (MHT)

Complete list of participants has been provided in Annexure 1.

The meeting was initiated with a welcome note by Mr. Tarun Lad, City Engineer, AMC. Post the welcome note Urban Management Centre (UMC) made a presentation to the members present. The presentation included the

- Context of the NUSP
- Need for a CSP
- The CSP Preparation Process as per the NUSP
- Sanitation Situation Analysis and Gaps in Services in Ahmedabad in Waste Water, Sanitation, Storm Water Drainage, Solid Waste Management, Environmental and Public Health
- Way Forward

The key points discussed during the meeting have been summarised below.

**General**

- Dr. Guruprasad Mohapatra, IAS, Municipal Commissioner, AMC suggested addition to 2 representatives from slum areas to be included in the task force. The Municipal Commissioner (MC) requested Mahila Housing Trust (MHT) to suggest names for the same.
- Dr. Prem Pangotra, IIM Ahmedabad suggested creation of singular integrated MIS system for spatial and non-spatial data which can be used by all departments of AMC for various purposes.

**Sewerage**

- Prof. Mona Iyer, CEPT University suggested strengthening faecal sludge management (FSM) mechanisms to provide for shortfalls in underground drainage systems. FSM can be used as an intermediate arrangement as sewerage network is expanded and full coverage by connections is achieved gradually.

- Mr. Tarun Lad, City Engineer, AMC mentioned that the service procurement of contracting agencies for reuse of treated sewage is in progress and he informed that MOUs have been signed and work orders would be issued by December 2012.
- UMC presented data regarding quality testing of treated sewage. In response to this, Mr. Lad pointed out that Gujarat Industrial Development Corporation (GIDC) is responsible for providing sewerage services in GIDC industrial areas of Ahmedabad. Outfall point of AMC's and GIDC's treated sewage is common and GIDC has failed on many occasions to maintain the desired quality.

**Sanitation**

- Data regarding open defecation in Ahmedabad was presented by UMC. Mr. Anand Patel, Additional City Engineer, SNP Cell, AMC requested UMC to update the data regarding open defecation spots in the city based on a survey conducted by SNP Cell in 2011. Mr. Patel would provide the same to UMC.
- In continuation of discussion over open defecation, MC suggested inviting Trichy Municipal Corporation for making a presentation at AMC on OD Free city.
- Ms. Bijal Patel (MHT) expressed that NGOs are capable and willing to manage public toilets in the city. However, AMC expressed concerns over credibility of many NGOs they have scrutinised in the past for the same.

**Storm Water Drainage**

- AMC requested updating data presented with local office of Indian Meteorological Department for rainfall in Ahmedabad.
- Mr. Lad informed the members present that AMC has undertaken lake interlinking project which assists in rain water harvesting in Ahmedabad.

**Solid Waste Management**

- Dr. Pangotra suggested that AMC should facilitate smoothening forward market links for fuel pellets and other products generated by processing municipal solid waste.
- Ms. Patel (MHT) reported that many private contractors responsible for Door/Gate to Dump collection skip chawls and slum due to reasons such as narrow roads where vehicle have difficulty in entering.
- MC also informed the members present that AMC is planning to contract lifting, processing and disposal of waste generated from dead animals on BOT basis.

The meeting was concluded by a word of thanks and request for continued support from the MC.

# 4. Service Level Benchmarking

## 4.1. SLB of Ahmedabad Municipal Corporation

The Ministry of Urban Development (MoUD), Govt. of India in the year 2010 has initiated an exercise to define Service Level Benchmarks (SLBs) and constituted a 'Core Group for Service Level.

Service level performance parameters have been identified for four basic urban services:

- Water Supply;
- Sewage;
- Solid Waste Management (SWM); and
- Storm Water Drainage

These parameters have been defined primarily from a utility manager's/planner's perspective. In other words, the parameters highlight the performance as would be monitored by the leadership/ management of ULBs or other civic agencies. These performance measurements will need to be carried out by the service delivery agencies themselves, reported to higher levels of management and also disseminated widely.

The principle of accountability for service levels is now gaining broad based acceptance at all levels. The ULBs are at the forefront of this shift, based on the decentralization agenda articulated under the 74th Constitutional Amendment.

The principle of benchmarking has been further endorsed by the 13th Finance Commission which has included Service Level Benchmarking as one of the conditionalities for allocation of performance based grants to ULBs, which amount to approx. INR8000 crores over the period 2010-15.

As part of the SLB exercise, Ahmedabad Municipal Corporation was selected for the SLB pilot study. The pilot project was implemented in 28 urban local bodies spread across 14 States and 1 Union Territory in India for compiling data for the financial year 2008-09. AMC was also selected among 12 cities for receiving funding for improvements in data quality as per the information system improvement plan initiative under the SLB.

## 4.2. National Sanitation Ranking 2009, MoUD: Ranking of Ahmedabad Municipal Corporation

The Government of India announced a National Urban Sanitation Policy with a view towards making all Indian cities and towns to become healthy and liveable as well as ensure the health and well being of its citizens. The policy advocates that all cities would become open defecation free, all human wastes and liquid wastes will be collected and safely treated and adequate resources will be available for the operation and maintenance of the sanitation facilities.

In order to promote urban sanitation and recognize excellent performance in this area, the Government of India has instituted an annual award scheme for cities. The award is based on the

premise that improved public health and environmental standards are the two outcomes that cities must seek to ensure quality of life for urban citizens. The awards are not merely an assessment of hardware or expenditure incurred in urban sanitation but how these lead to achievements of milestones of 100 % safe disposal of wastes from the city on a sustainable basis.

For the assessment, The Ministry of Urban Development has identified a set of output, process and outcome indicators that have been used to assess the existing sanitation conditions in the city. The list of indicators pertain to the practice of open defecation, access to sanitation (individual, community and public), collection, treatment and disposal of solid and liquid wastes, proper upkeep and maintenance of the sanitation infrastructure, clear institutional roles and responsibilities and improvements in health and environment.

The survey was undertaken across 423 cities including Municipal Corporations and Class A cities across the country. In Gujarat, the survey included 26 cities including 7 Municipal Corporations and 19 Class 1 cities of Gujarat.

As per the national ranking, Ahmedabad was ranked 19$^{th}$ at the national level. Comparing with its peer mega cities, Ahmedabad ranked third with an overall aggregate mark of 50.286.

**Table 2 Ranking of Mega Cities in National Sanitation Ranking 2009, MoUD**

| National Ranking | Mega City | Score |
|---|---|---|
| 12 | Bangalore | 53.637 |
| 13 | Chennai | 53.630 |
| 19 | Ahmedabad | 50.286 |
| 25 | Kolkata | 48.965 |
| 45 | Mumbai (Municipal Corporation of Greater Mumbai) | 45.076 |
| 88 | Hyderabad | 40.600 |
| 168 | Delhi (Delhi Municipal corporation ) | 36.963 |

In Gujarat, Ahmedabad also was ranked third after Surat and Rajkot cities.

**Table 3 Ranking of Ahmedabad amongst cities in Gujarat in National Sanitation Ranking 2009, MoUD**

| National Ranking | Mega City | Score |
|---|---|---|
| 3 | Surat | 69.080 |
| 9 | Rajkot | 56.118 |
| 19 | Ahmedabad | 50.286 |

The predominant areas where AMC lost marks and which pertain to sanitation are discussed below:

| Indicator No. | Indicator | AMC Score | Out of | Reasons for scoring (as of March 2009) |
|---|---|---|---|---|
| 1.a.i | Access and use of toilets by urban poor and other un-served households by individual and community sanitation facilities | 0.00 | 4 | On-site observation and Respondent survey of 6 large slums selected in consultation with AMC.<br><br>Based on respondent surveys- 27% slum population of these slums practice open defecation.<br>As per the slabs in the marking scheme of MoUD; any city with more than 15% slum population practicing open defecation will receive no marks. |
| 1.a.ii | Access and use of toilets by floating and institutional populations | 2.50 | 4 | Based on onsite observations of functionality of public toilets at public areas (6 places-bus stand, railway station, market areas, office area, and recreational areas).<br><br>All toilets visited were found functional.<br>However, 3 cases of open urination/defecation were observed. Hence AMC loses ( 3*0.5) 1.5 marks)<br><br>Based on the marking scheme of MoUD- "Deduct 0.5 Marks for each instance of open urination or open defecation visible in each sample observation location up to a maximum of 2 points being deducted in such a manner" |
| 1.a.iii | No open defecation (OD) visible | 0.67 | 4 | Based on number of open defecation instances that were visible in slums, public places, near railway tracks.<br><br>Out of 12 places, OD instances were seen at 8 places.<br><br>As per the MoUD Marking Scheme, "deduct[(proportion of field visits where OD was visible/total no. of field visits) multiplied by2] |
| 1.b | Proportion of total human excreta generation that is safely collected | 5.00 | 6 | 96% of properties are either connected to a sewer connection or has a soak pit/septic tank.<br><br>As per the MoUD Marking Scheme; cities where 90-100% properties are connected to sewer/ soak pit/ septic tank; will receive 5 marks. |
| 1.c | Proportion of total black waste water generation that is treated and safely disposed off | 6.00 | 9 | 80% of waste water generated in city is treated to secondary treatment ( 592 MLD treated out of 740 MLD generated)<br><br>As per the MoUD Marking Scheme, cities with treatment capacity of 80-90% will receive 6 marks. |
| 1.d | Proportion of total grey waste water generation that is treated and safely disposed off | 0.00 | 3 | No separate grey water collection system in the city. |
| 1.e | Proportion of treated wastewater that is re-cycled and re-used | 0.00 | 3 | No recycling of water ( as on 31st Dec 2009) |

| Indicator No. | Indicator | AMC Score | Out of | Reasons for scoring (as of March 2009) |
|---|---|---|---|---|
| 1.f | Proportion of total storm-water and drainage that is efficiently and safely managed | 2.00 | 3 | 1557.92 kms of storm water drains vis-a-vis a total road length of 2400 kms= 65%.<br><br>As per the MoUD Marking Scheme, cities with 60-100% coverage of storm water drainage will receive 2 marks. |
| 1.g | Proportion of total solid waste generation that is regularly collected | 1.00 | 4 | 2683 Tons collected vis-a-vis generation of 3252 Tons= 83%<br><br>Cases of littering observed at 14 places out of 18 places visited. Hence AMC loses 2 marks.<br><br>As per the MoUD Marking Scheme, cities with 80-100% solid waste collection receives 3 marks. deduct 0.25 mark for every instance of solid waste observed to be visibly littered in the city with a maximum of 2 marks to be deducted |
| 1.h | Proportion of total solid waste generation that is treated and safely disposed off | 0.00 | 4 | AMC treats 1000 Tons per day and disposes 100 tons at a Sanitary landfill site; which is 34% of waste generated.<br><br>As per the MoUD Marking Scheme, cities with 0- 40% of safe disposal of waste generated receive 0 marks. |
| 1.i | City wastes causing no adverse impacts on surrounding areas outside city limits | 0.00 | 5 | At 3 sites, on periphery of the city was observed littered with solid waste and there were 2 instances of untreated grey water being discharged into drains/ water bodies.<br><br>As per the MoUD Marking Scheme, Award 5 marks for 100% treatment of all types of wastes before letting residues out to land and water bodies outside the city; deduct 2 marks each for any land or water body outside the city receiving any untreated human excreta or untreated solid waste (including leachate), deduct 1 mark for any land or water body outside city receiving untreated grey water (water flowing in drains) |
| 2.a | M & E systems in place tracking incidences of open defecation | 2.00 | 4 | AMC lost 2 marks since open defecation data although is being collected and monitored by the Municipal Corporation; the same is not reported on a regular basis in public forums nor are there any incentives given to discourage open defecation. |
| 2.c | All septage / sludge cleaned, safely transported and disposed of after treatment from on-site systems | 4.00 | 5 | AMC lost one mark since cleaning and disposal of sludge from tanks and pits is not monitored |
| 2.d | Functioning and maintenance of storm-water drainage systems | 3.00 | 4 | AMC lost 1 mark since AMC does not undertake cleaning, repairs and maintenance of drains at any one other season than pre-monsoon. |
| 2.e | Efficiency of solid waste management rules (collection & treatment) | 3.00 | 5 | AMC lost marks since there was 0% of waste that is processed or recycled (in a waste recycling facility operated by ULB/agents) and AMC had only 15% of cost recovery in the SWM services. |

| Indicator No. | Indicator | AMC Score | Out of | Reasons for scoring (as of March 2009) |
|---|---|---|---|---|
| 2.f | Documented operational system and clear institutional responsibility | 3.00 | 4 | AMC lost one mark since there AMC has no written manual and procedures existing in practice for Septage |
| 2.g | Deviance on part of polluters and institutions | 1.5 | 3 | AMC lost marks since the BPMC Act under which the AMC operates does not explicitly provide for punishing/fining offenders for littering or for Letting out untreated human excreta in the open |
| 3.a | Quality of drinking water in the city | 6.16 | 7 | 22 out of 25 samples taken (from HHs/slum HHs/ public areas/ hand pumps or public stand posts) passed all tests.<br><br>As per the MoUD Marking Scheme, Award 7 X (no of samples with acceptable water quality following GoI standards (failure in any one parameter implying overall "failure") divided by total no of samples tested |
| 3.b | Water quality in water bodies in and around the city | 2.80 | 7 | 2 out of 5 water bodies passed the required tests (Sabarmati, Kankaria Lake).<br>Tests from Nikole, Chandola, Vastrapur lakes failed the tests.<br><br>As per the MoUD Marking Scheme, "Award 7/5 marks for each of the five samples with acceptable water quality following GoI standards (failure in any one parameter implying "failure"). |
| 3.c | Reduction in water-borne diseases incidence amongst city-population | 0.00 | 6 | AMC lost marks since AMC data does not show a decrease in number of diarrhoea cases from 2006 to 2009.<br><br>As per the MoUD Marking Scheme, no decrease gets 0 marks. |

Some of the media coverage from the MoUD ranking has been appended in Annexure 7.

# 5. Introduction to Ahmedabad Municipal Corporation

## 5.1. History of Ahmedabad Municipal Corporation

Ahmedabad Municipality came into existence on January 19, 1857 and was recognized by the statute and named as City Municipality in 1873. With the newly formed municipality, Ahmedabad was given the right to elect half the representatives of municipal commission under the local self governance introduced by Lord Ripon, the then Viceroy of India in 1883 (Yagnik & Sheth, 2011).

During the early 20th century, Ahmedabad Municipality implemented the first TP Act in 1915 for managing growth of the city. The municipality was suspended for the first time in 1910 and was later resumed in 1924. Later in 1926, it became Borough Municipality. During 1930s, Ahmedabad Municipality raised loans to provide affordable housing to workers by using increased import taxes on cotton. In 1935, AMC started collected '*Halaalkhor Tax*' (Scavenger Tax) from residents in order to provide sanitation services to the city. Initial collections neared INR 3 lakhs (Ibid).

Post independence, Ahmedabad Municipal Corporation was established in 1950. Upon becoming a corporation, the income of AMC surpassed its expenditure until 1973-74. During this period, with formation of Gujarat and Maharashtra as separate states, Ahmedabad was declared the capital of Gujarat (Ibid).

In 1978, Ahmedabad Urban Development Authority (AUDA) was formed under the Gujarat Town Planning and Urban Development Act, 1976 to regulate additional 300 villages and 9 adjoining municipalities.

During 1980s, AMC entered into an agreement with The World Bank for institutional strengthening. During 1990s and 2000s, municipal tax evasion was a common practice leaving AMC severely impoverished. Improvement in income sources was initiated with strict enforcement of tax and octroi collection during 1990s coupled with initiation of computerisation in the year 1994. In 1995, AMC transformed itself to a surplus ULB and took up several project works.

Later in 1997, AMC got itself credit rating of A+ by CRISIL (a financial management firm). This was followed by issuing public bonds for Public Subscription of INR 1000 million becoming the first urban local body in India to do so. Continuing its efforts to improve governance and services to its citizens, AMC further introduced E-Governance (Ibid).

As of 2012, AMC area is spread over 466 sq km. Spatial distribution of this population within the city over the decades shows that up to 1981 most of the new population added to the city was concentrated within the old AMC limits itself, especially in the eastern part. Ahmedabad grew from 190 sqkm to 466 sqkm in 2006. Expansion of the peripheral areas began in the 1980s and has continued. Earlier only the eastern parts and particularly the eastern periphery registered faster growth rate, but since the 1980s even the western periphery has grown rapidly. The city is currently divided into 64 administrative wards from previously 43 wards. 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:

**Figure 1 Location map of Ahmedabad**


**Table 4 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 | Sq. Km. | 466.14 |
| Population | Number | 55,68,695 |
| Number of Residential Properties | Number | 12,54,175 |
| Number of Non Residential Properties | Number | 3,80,849 |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

Ahmedabad has been flourishing and advancing in its importance in various areas such as commerce, trade, industry, education with aspirations of being recognised as a UNESCO world heritage city owing to its rich cultural past.

The city is growing in tune with the modern science and technology development, contributing for the nation building activities because of enthusiastic entrepreneurship of the local people. This is exhibited by important notable and prestigious institutions established in and around Ahmedabad city, such as Ahmedabad Textile Industry's Research Association (ATIRA), Indian Space Research Organisation (ISRO), National Institute of Design (NID), Indian Institute of Management (IIM), Gandhi Labour Institute, Community Science Centre, Physical Research Laboratory (PRL), Nehru Foundation, Sardar Patel Economic Research Institute (SPERI), Sardar Patel Institute of Public Administration (SPIPA), Centre for Environmental Planning and Technology (CEPT), Entrepreneurship Development Institute (EDI), Self-Employed Women's Association (SEWA), etc.

**Location, Connectivity and Geography of Ahmedabad**

Ahmedabad – Mumbai Golden Corridor has long been recognized to be an important development axis in Western India. This city of Ahmedabad acts as terminal and has seven major roadways, one express way and five rail networks.

Situated on the banks of the river Sabarmati, the city is located at 22 55' and 23 08' North Latitude and 72 30' and 72 42' East Longitude, at an average altitude of 49 m above Mean Sea Level (MSL).

Sabarmati River originates from Aravalli Hills in Rajasthan and drains into the Gulf of Cambay. On upstream side of Ahmedabad, river Sabarmati is bunded by constructing a dam at Dharoi, which is situated at a distance of 120 km. Further, a barrage has been constructed down-stream of Ahmedabad for diverting river water for irrigation purposes. The barrage is situated at 5 km down-stream of Nehru Bridge of Ahmedabad. Sabarmati river enters AMC limits and flows for 14 km through city with the fall of 13 m in ground level along the river banks. The falling gradient is 1 in 1100 on eastern part of the city. The ground slopes towards the river at a gradient ranging from 1:1250 to 1:1050. On western side, ground level slopes towards river with a higher gradient ranging from1:500 to 1:1000.

The Sabarmati River runs practically dry throughout the year except a few days during good monsoon years. However, the stretch of Sabarmati River, passing through Ahmedabad city is now fed with Narmada Canal Water. The ambitious project of Sabarmati Riverfront Development aims to create avenues on the banks of the river and keeping the river free from any pollution (refer Section 6.2). The city is divided into 2 parts as east Ahmedabad and west Ahmedabad. The eastern part of the city comprises of old walled city and industrially developed area. The Western part mainly comprises of newly developed residential areas.

Ahmedabad has a tropical monsoon climate, which is hot and dry, except in the rainy season. Summer days are very hot with mean maximum temperature of 41.3$^{o}$ C, while nights are pleasant with mean minimum temperature of 26.3$^{o}$ C. The mean maximum and minimum temperatures in the winter are 30$^{o}$ C and 15.4$^{o}$ C respectively. The average annual rainfall of the area is 740 mm, although there are considerable variations from year to year. The rainfall occurs generally during the months of June to September. The average humidity is 60%, which ranges from 80% to 90% during rainy season.

## 5.2. Governance and Institutional Framework

### 5.2.1. AMC's regulatory framework – The Bombay Provincial Municipal Corporation Act, 1949

The governing structure of AMC consists of both-political and administrative wings. As part of the political wing, the corporation has three elected councillors from each of its 64 wards. One third of the councillors are women.

Under the BPMC Act, the powers are vested with four distinct statutory authorities of the elected wing, which are the General Body, Standing Committee, Transport Committee and School Board Committee. The General Board is the supreme body of the corporation and the mayor is the chairman of the General Board for conducting its proceedings.

The General Body appoints the mayor and the deputy mayor. It also elects the members for the three statutory committees and 14 other committees. All the policy decisions are taken by the Board. It approves the budget, sanctions appointments and expenditure estimates sent by various departments. The Board meets once every month. Each committee comprises of twelve members, ten from the ruling party and two from the opposition.

The administrative wing is headed by Municipal Commissioner (IAS) supported by 8 Deputy Municipal Commissioners, 6 Assistant Municipal Commissioners, City Engineer and Executive Engineers. With fast growing demand for efficient management, AMC has strengthened top management over the years.

### 5.2.2. 2006 expansion of AMC's jurisdiction and its impacts on Sanitation

Ahmedabad Municipal Corporation underwent expansion of its jurisdiction in 2006. 17 Nagar Palikas and 27 Gram Panchayats were added to AMC. Many of the erstwhile ULBs were providing services to their citizens but were coping with severe deficiencies. Upon expansion of AMC's jurisdiction, the city level services were being gradually augmented wherever necessary and the institutional restructuring was ensuring provision of services to the newly merged areas at par with remaining of the city (refer Section. A quick comparison of AMC's services in sanitation between pre 2006 and post expansion have been given below:

**Table 5 Comparison of Water Supply SLB Indicators - Pre and Post Expansion (2006) of AMC**

| Performance Indicators | Benchmark | Status (post 2006) | Status (pre 2006) | Reliability |
|---|---|---|---|---|
| **Water Supply** | | | | |
| Coverage (%) | 100 | 85 | 95 | B |
| Per capita supply of water | 135 | 121 | 158 | D |
| Extent of Metering (%) | 100 | 0 | 0 | |
| Extent of non-revenue water (%) | 15 | 30.9 | 21.1 | D |
| Continuity of water supply (Hrs) | 24x7 | 2.25 | 2.25 | B |
| Efficiency in redressal of customer complaints (%) | 80 | 99.2 | 99.2 | A |
| Quality of Water Supplied (%) | 100 | 94.8 | 95.3 | B |
| Cost Recovery (%) | 100 | 53.8 | 53.8 | A |
| Efficiency in Collection of Water Charges (%) | 90 | 60.3 | 60.3 | A |

Source: (AMC, SLB Results Workshop: Presentation by Ahmedabad Municipal Corporation to Ministry of Urban Development, 2009)

**Table 6 Comparison of Sewerage SLB Indicators - Pre and Post Expansion (2006) of AMC**

| Performance Indicators | Benchmark | Status (post 2006) | Status (pre 2006) | Reliability |
|---|---|---|---|---|
| **Sewerage** | | | | |
| Coverage of Toilets (%) | 100 | 81.7 | 98.3 | B |
| Coverage of Sewerage Network (%) | 100 | 65.8 | 95 | B |
| Collection Efficiency of Sewerage Network (%) | 100 | 64.9 | 93.7 | D |
| Adequacy of Sewage Treatment Capacity (%) | 100 | 94.5 | 93.7 | D |
| Quality of Sewage Treatment (%) | 100 | 75.0 | 75.0 | B |
| Extent of Reuse and Recycling of Sewage (%) | 20 | 0 | 0 | |
| Extent of Cost Recovery (%) | 80 | 98.5 | 98.5 | A |
| Efficiency in Redressal of Consumer Complaints (%) | 90 | 58.7 | 58.7 | A |

Source: (AMC, SLB Results Workshop: Presentation by Ahmedabad Municipal Corporation to Ministry of Urban Development, 2009)

**Table 7 Comparison of Storm Water Drainage SLB Indicators - Pre and Post Expansion (2006) of AMC**

| Performance Indicators | Benchmark | Status (post 2006) | Status (pre 2006) | Reliability |
|---|---|---|---|---|
| **Storm Water Drainage** | | | | |
| Coverage (%) | 100 | 69.6 | 97.6 | A |
| Incidence of Water Logging | 0 | 214 | 4 | A |

Source: (AMC, SLB Results Workshop: Presentation by Ahmedabad Municipal Corporation to Ministry of Urban Development, 2009)

**Table 8 Comparison of Solid Waste Management SLB Indicators - Pre and Post Expansion (2006) of AMC**

| Performance Indicators | Benchmark | Status (post 2006) | Status (pre 2006) | Reliability |
|---|---|---|---|---|
| **Solid Waste Management** | | | | |
| Household level coverage (%) | 100 | 75.6 | 96.4 | A |
| Efficiency in Collection of MSW (%) | 100 | 72.9 | - | A |
| Extent of Segregation of MSW (%) | 100 | 2.7 | - | B |
| Extent of MSW Recovered (%) | 80 | 17.5 | - | B |
| Extent of Scientific Disposal of MSW (%) | 100 | 0 | - | |
| Extent of Cost Recovery (%) | 100 | 26.2 | - | A |
| Efficiency in Collection of SWM Charges (%) | 80 | 58.6 | - | A |
| Efficiency in Redressal of Customer Complaints (%) | 90 | 99.9 | 99.9 | B |

Source: (AMC, SLB Results Workshop: Presentation by Ahmedabad Municipal Corporation to Ministry of Urban Development, 2009)

As evident from the tables above, service level of most of the services in pre 2006 AMC have gone down post AMC's jurisdiction expansion. As erstwhile ULBs and Panchayats were struggling in providing services, AMC has been fulfilling these gaps since the expansion. In addition to local bodies and Panchayats, Ahmedabad Urban Development Authority (AUDA) had been providing roads, water supply, storm water drainage and sewerage services to these areas. This infrastructure was transferred to AMC during the jurisdiction expansion.

There are rare instances where services in erstwhile Nagar Palikas have been downgraded or nature of service has been modified to adversely affect the service. One such example is in erstwhile Vejalpur Municipality where it was noted as a leading best practice for Urban Reforms through E-Governance. This system no longer exists in its efficient form anymore.

**Box 1 Best Practice for E-Governance - Vejalpur Municipality (erstwhile)**

**Urban Reforms through E-Governance- Vejalpur Municipality**

*(This leading practice dates pre-merger within Ahmedabad Municipal Corporation in 2006)*

Vejalpur is one of the urban conglomerates outside Ahmedabad Municipal Corporation (AMC) limit, and under Ahmedabad Urban Development Authority (AUDA) jurisdiction. However, prior to 2006, Vejalpur was a municipality and like most other ULB's faced issues with regard to the implementation of its role as an agency for service to citizens. In order to remedy the situation, the governing board took a far reaching decision in the early 2000s to computerize most of the roles of the municipality. This action was highly effective, with efficiency levels within the municipality improving, redressal systems functioning, citizens being more satisfied and basic costs of functioning being reduced.

**Situation before the Initiative**

- Because of manual intensity of tasks, the issues were:
- Misplacement of manual records
- Shortage of staff and low pay
- Poor MIS
- Inaccurate tax and interest calculation as well as absence of efficient collection system
- Lack of a complaint and redressal mechanism
- Poor interaction with citizens;
- No single point of service or information, both to management and citizens;
- Lack of transparency and accountability

**Strategies Adopted**

- Computerisation and E-Governance
- Complaints Redressal
- Payments of all municipal Dues
- Online Registration & Issuance of Birth and Death Certificates
- Issuance of Licenses for Shops and Establishments
- On-line information on Infrastructure Projects and Tenders

**Results Achieved**

- Online office administration, monitoring/control mechanisms and service provision introduced – led to better time-management and paperless office administration
- Three civic centres established for time-bound complaint redressal and service provision
- General Administration staff not increased
- Transparency, accountability, service delivery improved
- Tax collection increased from 15% to 65%,establishment cost reduced to 8% of the budget income surplus over expenditure achieved

**Sustainability**

Ahmedabad Municipal Corporation (AMC) is happy to have Vejalpur- a well managed municipality, as part of its jurisdiction, which has achieved services to a great extent.

**Lessons learnt**

While E-governance is an excellent tool for achieving good governance, mere computerisation of existing data cannot be taken as e-governance. Political will and dedication of elected wing is an absolute, indispensable necessity for taking significant decisions.

**Transferability**

Many municipalities in Gujarat, on the direction of the Government, are in the process of adapting the Vejalpur e-governance model.

Source: Refer Annexure 10

## 5.3. Demography and Population Growth

The population in Ahmedabad has increased to 55.68 lakhs in 2011 from 35.20 lakh in 2001 (AMC, 2011a). The increase has been fuelled by natural growth as well as increase in the jurisdiction from 190 sqkm to 466 sqkm during 2001-11. Historical population growth of Ahmedabad city has been shown in the table below.

**Table 9 Population of Ahmedabad since 1891**

| Year | 1901 | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Population (in lakhs) | 1.85 | 2.61 | 2.74 | 3.82 | 5.91 | 8.37 | 11.49 | 15.85 | 20.59 | 28.76 | 35.20 | 55.68 |

Source: (Census_of_India, 2001)

The key drivers of population growth have been growth in economic activities such as retail, industries, and tertiary services. Zone wise population details of Ahmedabad municipal area have been indicated in the table below.

**Table 10 Zone wise Demographic Details**

| S. No. | Zone | 2011 | |
|---|---|---|---|
| | | Total Population | Total Households |
| 1 | North | 1,012,760 | 2,31,224 |
| 2 | South | 988,356 | 2,25,652 |
| 3 | East | 979,362 | 2,23,599 |
| 4 | West | 844,661 | 1,92,845 |
| 5 | Central | 565,288 | 1,29,061 |
| 6 | New West | 1,178,268 | 2,69,011 |
| | **Total** | **5,568,695** | **12,71,392** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

From the above table it is evident that the newly added New West Zone has highest population amongst other zones and hence is the major contributor of the demographic growth of the city over the last few years.

Likewise, slum population has also witnessed a large growth, now constituting 14.3 percent of the total population in Ahmedabad. The slum population in Ahmedabad has been shown in the table below:

**Table 11 Slum Population in Ahmedabad**

| S. No. | Year | Total City Population | Total Population in Slums | Percentage of Slum Population | Total Slum Households |
|---|---|---|---|---|---|
| 1 | 2001 | 3,520,085 | 439,843 | 12.4% | 68,994 |
| 2 | 2011 (Provisional) | 5,568,695 | 798,206 | 14.3% | 182,239 |

Source: (Census_of_India, 2001); (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

**Population 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). The adopted figures are as below:

**Table 12 Projected Population of Ahmedabad till 2021**

| Year | Population |
|---|---|
| 2011 | 55,68,695 |
| 2016 | 64,94,177 |
| 2021 | 75,73,468 |

Source: (AUDA, Population Projections provided by Ahmedabad Urban Development Authority for Ahmedabad for DP 2021, 2011)

Based on the above population projects, demand for various infrastructure has been computed in the sector wise analysis.

## 5.4. Slum Profile of Ahmedabad

As of December 2012, around 1,82,000 households comprising of nearly 8,00,000 people live in 772 slums in Ahmedabad city. In addition to slums, there are settlements known as '*Chawls*' which used to be earlier considered as 'slum like' but are now excluded owing to clear land titles and/or tenures.

There have been numerous efforts in the past to provide housing and services in slum areas in Ahmedabad. Based on an amendment to the Bombay Municipal Corporation Act 1949 in 1970s, AMC is obligated to spend atleast 10 percent of its annual budget for improving basic services in slums. Some of the programmes/ schemes for slums in Ahmedabad implemented in the past and/or ongoing are listed below:

**Table 13 Slums Improvement Initiative in Ahmedabad in the past**

| S. No. | Name of the programme/ scheme | Implementing Agency | Remarks |
|---|---|---|---|
| 1 | Slum Clearance (unofficial name) | Gujarat Slum Clearance Board (GSCB) | implementing formal housing programmes for low-income groups and upgrading slum areas |
| 2 | Environmental Improvement of Urban Slums (EIUS) | AMC | - |
| 3 | Urban Community Development Programme (UCD) | AMC | - |
| 4 | Urban Basic Services for the Poor (UBSP) | AMC | - |
| 5 | Slum Improvement Partnership (SIP) | | Comprehensive upgradation through improved health, education, skills upgrading, access to financial mechanisms and physical infrastructure. |
| 6 | *Deen Dayal Upadhyay Antodyaya Yojana* (also known as Slum Networking Programme or *Parivartan*) | AMC | Upgrading/ improving infrastructure in slums in partnership with local residents, NGOs, private sector, etc. alongwith integration of the slums with the city's infrastructure within a finite period. |
| 7 | 500 NOC Scheme | AMC | |

Source: (Bhatt, 2003)

Despite various efforts in the past, the results achieved could not fully eliminate completely the municipal services issues in slums. As of December 2011, zone wise break-up of slums in Ahmedabad has been provided in the table below:

**Table 14 Zone wise slum population details in Ahmedabad**

| Zone Name | Total Zone Population | No. of Slums | Slum HHs | Slum Population | Slum % of Total |
|---|---|---|---|---|---|
| North | 1,012,760 | 94 | 17,496 | 76,632 | 7.57% |
| South | 988,356 | 191 | 45,341 | 1,98,594 | 20.09% |
| East | 979,362 | 54 | 10,943 | 47,930 | 4.89% |
| West | 844,661 | 137 | 45,554 | 1,99,527 | 23.62% |
| Central | 565,288 | 112 | 18,817 | 82,418 | 14.58% |
| New West | 1,178,268 | 184 | 44,088 | 1,93,105 | 16.39% |
| **Total** | **5,568,695** | **772** | **1,82,239** | **7,98,206** | |

Source: (CEPT_University, Slum Survey of Ahmedabad City, Unpublished Survey Results, 2011) and (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

Ahmedabad city consists of 772 slums in the city with maximum number of slums in the South Zone closely followed by New West Zone. Annexure 6 shows the locations of slums in Ahmedabad. It can be observed that South, West and New West zones constitute 74 percent of slum population. Service provisions to these slums are underway through various ongoing initiatives. As of 1998, 80 percent of slums were on private lands (Bhatt, 2003) as cited in (Mahadevia, 2002). Based on a focussed group discussion (FGD) with Mahila Housing Trust, their representatives provided a close estimate of 75 percent of slums on private lands. As per MHT's study, majority of this land has been sold by original land owners to existing residents on the land. Due to notification of majority of this land for various other uses (primarily green belt) under the development plans prepared by AUDA, none of the land transactions have been registered and hence do not provide clear legibility of titles of these lands. According to MHT, based on past evictions in Ahmedabad, slums on private land are safer (or under lesser fear of forced eviction) than those on government lands.

Apart from tenure issues, slums are plagued with poor infrastructure services. According to an estimate by MHT, 68 to 70 percent of slum households have individual toilets. Many of the households have constructed their toilets through *Nirmal Gujarat Shauchalay Yojana* (NGSY) by Gujarat Municipal Finance Board (GMFB). In the year 2009-10, AMC had targeted constructing 21,000 individual toilets and finished 18,223 at the end of the year, while another 2663 were under construction. AMC targeted constructing 18,772 individual toilets and as of November 2011, only 1,737 were built while the remaining 16,988 were not yet started (GMFB, 2011). While individual toilets are being built under the NGSY, sewerage connections are being provided by AMC under the 500 NOC Scheme. This multiplicity of authorities leads to delays and high inconvenience to slum HHs reducing the overall effectiveness of the efforts. Also, unlike the *Deen Dayal Upadhyay Antodyaya Yojana* (SNP), 500 NOC Scheme does not cater to integrated service provision in slums and is limited to water supply and sewerage connections only.

In addition to the above, inadequate, poor quality and irregularity of water supply have been sighted as other problems. General sanitation conditions in the slums are poor and Door to Door collection service is not practiced by AMC. Instead, AMC's vans come only on main roads (mostly on the edge

of the slum or in some cases a distance away from slums) to collect garbage. In the absence of mobilised equivalent of a resident's welfare association/ society, door to door collection is not undertaken and high volume of waste is deposited at community bins. As reported by MHT, many slums do not have paved roads and water retention is a common problem in many areas leading to unsanitary conditions.

**Box 2 Brief of 500 No Objection Certificate (NOC) Scheme, AMC**

**500 No Objection Scheme (NOC) Scheme**

**Provision of Individual Water and Drainage Connections to Slum Households** (where titled are unclear) **under 500 NOC Scheme – Ahmedabad Municipal Corporation; Case Study**

The scheme, previously known as 500 NOC scheme, was launched in 2002 by the Ahmedabad Municipal Corporation. As the name suggests, the scheme aims at providing slum residents with a No Objection Certificate (NOC) that allows them to apply for legal individual sewage and water connections for their house. "500" relates to the amount the applicant has to pay to get the NOC.

All the households have to fulfil the following criteria:

1) The applicant should be residing in a slum dwelling of no more than 40 sq m.
2) The applicant should have some type of residence proof, such as ration card, voter ID, or tax or electricity bill or 7/12 *utaro* (Any one)

The individual applies to the zonal office on a form available for INR 10. S/he has to submit a proof of residence along with the form. The zonal office issues an 'inward number' to the applicant. (Alternatively, the NGO delivers the application forms (collected from the office on behalf of the applicant) to the community, collects the INR 10 fee with the completed forms, and INR 1,500/500 for the NOC. The NGO then delivers the documents to the Zonal Office and also pays the form fee amount and receives inward numbers issued by the office to be handed over to the applicant. Meanwhile, the NGO gives the applicant a temporary receipt which gets replaced by the regular one received from the office.)

An officer from Estate Department visits the applicant's residence for verification of the plot size conforming to the eligibility criteria and also prepares a rough plan sketch. (Alternatively, an NGO representative accompanies the official and helps in measurement verification and sketch drawing).

Beneficiaries pay INR 1500/500 to tax department or city civic centre and get NOC receipt. (NGO co-ordinates with Estate Department; they collect a list of beneficiaries and directly pay INR1500/500 to tax department and get an NOC receipt.

After receiving the proof of the payment made, the office arranges to send a photo fig to take picture of the residence along with the applicant holding the 'Inward No.' written on a small slate. This photo fig is then pasted on the bottom of the pink NOC certificate which the applicant gets laminated to ensure its long life. The NOC is delivered to the applicant who can now apply for water-sewer connection, or use it while getting the existing illegal connection legalized.

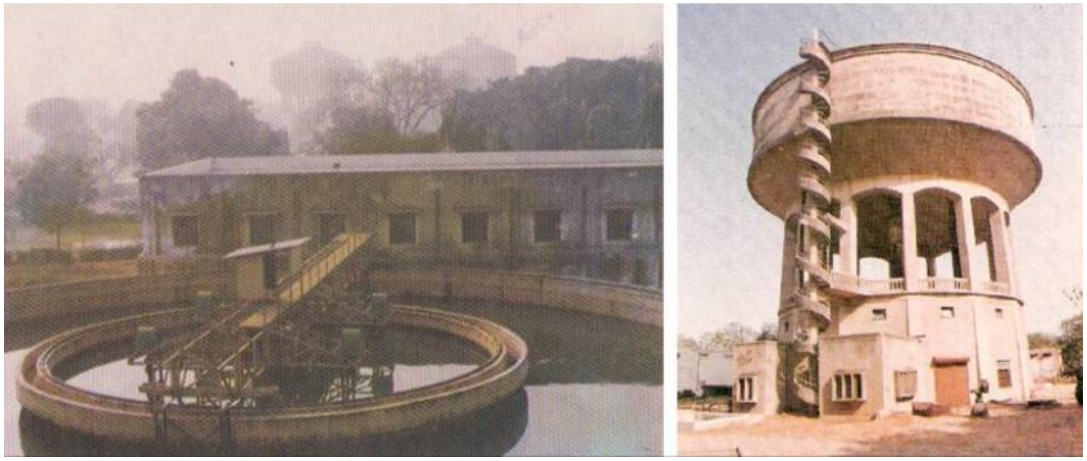
# 6. Sanitation Situation Analysis and Gaps in Services in Ahmedabad

## 6.1. Water Supply

Ahmedabad city is located on the bank of river Sabarmati, having a very old history of providing piped water supply since 1891. In 1950, Dudeshwar water works was constructed on the eastern bank of river Sabarmati sourcing water from the river. Since then, the main source of water supply for Ahmedabad city has been surface water. Dudeshwar water works has been augmented on several occasions. However, River Sabarmati being a non-perennial river resulted into inadequate water availability during dry months.

In late 1950s, the city shifted on ground water sources to cater the demand. During 1970-80, ground water constituted 87 percent of total water supplied by AMC (refer Figure 5). In addition to ease of extraction, compromised catchment of River Sabarmati also played an important role in this shift.

**Figure 2 Dudeshwar Water Works**



Source: (AMC, Water Supply Profile of Ahmedabad City, 2011)

To augment water supply with surface water sources, Kotarpur water works was constructed sourcing water from River Sabarmati released from Dharoi reservoir. Various augmentations could not keep pace with the increasing demand of the city and hence a gradual shift towards ground water was observed. Between 1975 and 2000, ground water table was reducing by 3 to 4 metres yearly. From the year 1999, release of water from Dharoi reservoir was stopped and Dudeshwar Water Works and 6 French wells in River Sabarmati became non-functional.

**Figure 3 Kotarpur Water Works**

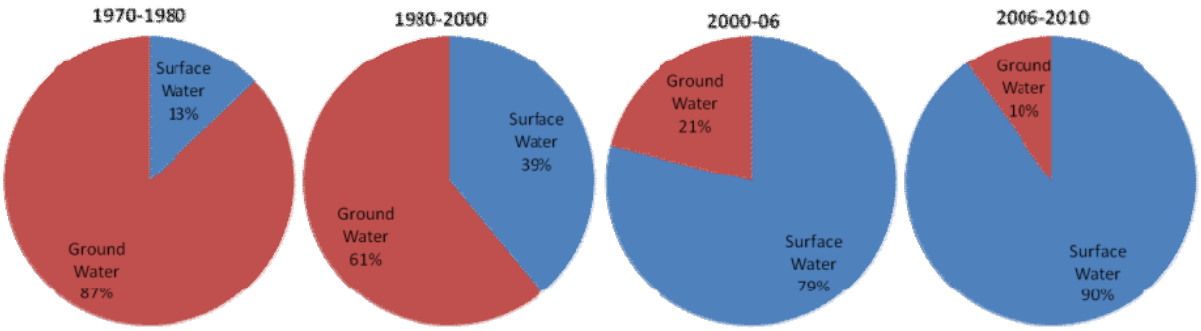

Source: (AMC, Water Supply Profile of Ahmedabad City, 2011)

By the year 2000, AMC started sourcing water from Shedhi Branch of Mahi Canal through Raska Wier Water Supply Project bringing water to Kotarpur water works. Additionally, water from Narmada Canal was channelized to River Sabarmati and Dholka Branch of Narmada Canal was used to source water for newer parts of western Ahmedabad. Jaspur Water Works was constructed by 2006-07 to treat water from Dholka Branch.

**Figure 4 Raska Water Works** (left & centre)**; Jaspur Water Works** (right)

Source: (AMC, Water Supply Profile of Ahmedabad City, 2011)

**Figure 5 Share of Ground and Surface Water in Ahmedabad**




Source: (AMC, Water Supply Profile of Ahmedabad City, 2011)

Due to increase in population as well as water demand, this Dudheshwar water works was upgraded by increasing the additional capacity of 45.4 MLD of water by providing six jack wells in the river bed. The city draws 330 MLD water from Narmada Canal commissioned in January 2007. To cater the demand of drinking water to new western part of AUDA, the Dholka branch of Narmada canal was also commissioned to draw 400 MLD. Raska water works has also been augmented with additional

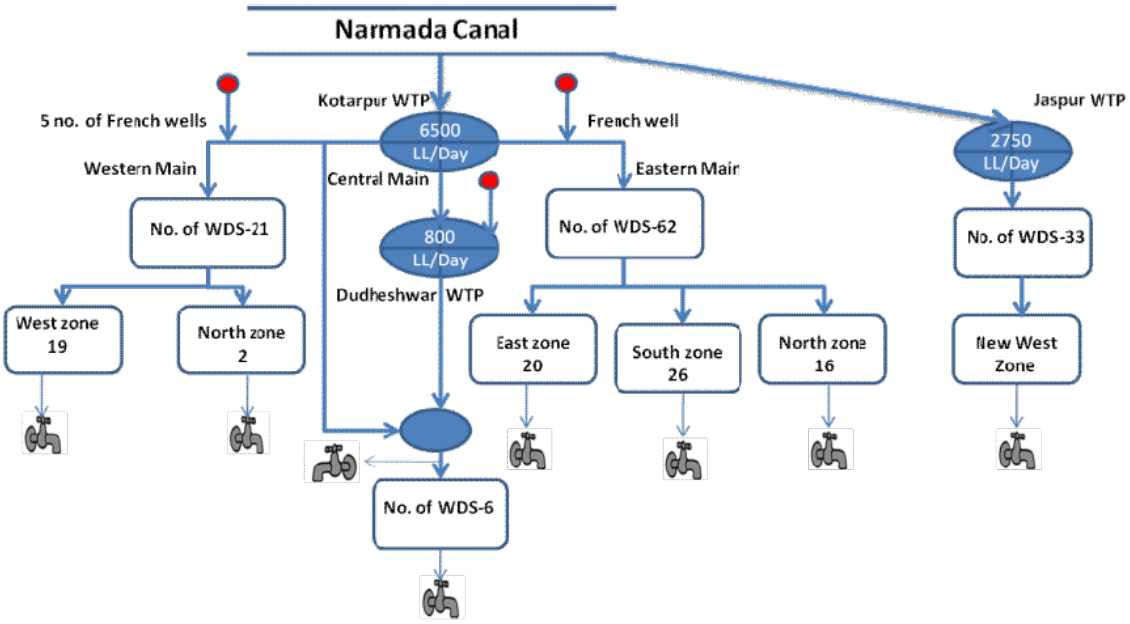
capacity of 200 MLD. Based on the water supply profile prepared by AMC, the future demand of water in Ahmedabad has been tabulated below:

**Table 15 Population and water demand of Ahmedabad city (Urban Agglomeration)**

| Year | Population (in Millions) | Demand (In MLD) |
|---|---|---|
| 1891 | 0.15 | 5.50 |
| 1901 | 0.19 | 18.20 |
| 1911 | 0.22 | 22.60 |
| 1921 | 0.27 | 32.00 |
| 1931 | 0.31 | 61.00 |
| 1941 | 0.59 | 88.50 |
| 1951 | 0.83 | 99.00 |
| 1961 | 1.15 | 209.10 |
| 1971 | 1.59 | 331.60 |
| 1981 | 2.38 | 397.50 |
| 1991 | 3.30 | 528.00 |
| 2001 | 4.42 | 708.30 |
| 2011 | 5.57 | 752.00 |
| Projected Population and water demand* | | |
| 2021 | 7.96 | 1273.30 |
| 2031 | 10.14 | 1623.00 |
| *Note: * Population projections as considered in DPR prepared for water supply.* | | |

Source: (AMC, Water Supply Profile of Ahmedabad City, 2011)

**Figure 6 Water Supply System of Ahmedabad Municipal Corporation**




Source: UMC.

A summary of various sources of water for Ahmedabad have been tabulated below:

**Table 16 Capacity of Sources of Water Supply (2011)**

| Source of water | 2011 (In MLD) |
|---|---|
| Raska | 200 |
| Narmada Canal | 330 |
| Intake well 1&2 | 495 |
| Dudheshwar water works | 70 |
| Jaspur water treatment plant | 275 |
| Frenchwell (7 No.) | 200 |
| Bore wells (532 No.) | 280 |
| **Total** | **1850** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

### Water Treatment Plants

AMC has existing four water treatment plants with the designed capacity of 1620 MLD. Currently 1220 MLD is sourced while 950 MLD is treated and supplied on regular basis against a demand of 835 MLD. The details of water treatment plants are as mentioned below.

**Table 17 Water Treatment Plant Capacities (2011)**

| Water Treatment Plant | Capacity (In MLD) | Actually treated (In MLD) |
|---|---|---|
| Kotarpur WTP | 715 | 550 |
| French Wells | 75 | 75 |
| Dudheshwar WTP | 70 | 25 |
| Jaspur WTP | 275 | 190 |
| Raska WTP | 200 | 110 |
| **TOTAL** | **1620** | **950** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

### Water Distribution System (WDS)

Ahmedabad Municipal Corporation has 139 water distribution stations across the city. There are six distribution zones, overlapping with the administrative zones. The distribution network of 3500 km covers entire city. The length of trunk main line is about 230 km. The average daily supply of water is around 1030 MLD. The average litre per capita per day (lpcd) is estimated around 148 LPCD. The coverage of water supply connection is reported to be 88.3 percent[1]. The daily supply of water at consumer end is 2.25 Hrs on fixed time.

[1] As reported by AMC, there are 11,22,160 residential water connection against 12,71,392.

### Quality of Water Supply

During the year 2011-12 (till Dec) numerous water quality tests were conducted at various locations of water supply chain. The table below gives details of number of samples taken from various locations for different types of tests.

**Table 18 Water Quality Tests for Municipal Water Supply, Ahmedabad**

| | WTP | Intermediate Points | Consumer End | Total Samples Tested | Passed | Percentage |
|---|---|---|---|---|---|---|
| Residual Chlorine - No. of Samples | 6,975 | - | 44,340 | 51,315 | 49,262 | 96.0% |
| Physical/Chemical - No. of Samples | - | - | - | - | - | - |
| Bacteriological - No. of Samples | 6,975 | - | 44,340 | 51,315 | 50,397 | 98.2% |
| Total Number of Samples for all types of tests | | | | 1,02,630 | 98,633 | 96.1% |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

### Service Level Benchmarking (SLB)

There are 9 key performance indicators developed for water supply system under SLB initiative. The details of indicators for AMC in Dec-2011 are given below in comparison with 2010-11.

**Table 19 Performance Indicators and its comparison with Benchmarks**

| S. No. | Performance Indicator | Benchmark * | 2010-11 | 2011-12 (till Dec) |
|---|---|---|---|---|
| 1 | Coverage of water supply connections | 100% | 90% | 92% |
| 2 | Per capita supply of water | 135 lpcd | 140 lpcd | 147 lpcd |
| 3 | Extent of metering of water connection | 100% | 0 % | NA |
| 4 | Extent of Non Revenue Water (NRW) | 20% | 26% | 20% |
| 5 | Continuity of water supply | 24*7 | 2.25 Hrs Daily | 2.25 Hrs Daily |
| 6 | Quality of water supplied | 100% | 99% | 99.5% |
| 7 | Efficiency in redressal of customer complaints | 80% | 99% | 99% |
| 8 | Cost recovery in water supply services | 100% | 78% | 82% |
| 9 | Efficiency in collection of water supply related charges | 90% | 81% | 82% |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012); Comparison done by UMC.

## 6.2. Waste Water

Efforts to provide an underground sewer system in Ahmedabad city, dates back to 1890, by Rao Bahadur Ranchhodlal Chhotalal[2] - the then President of the Municipality. Gradually, by the end of the year 1930, the entire walled city was covered by sewerage network and by the year 1958, complete area under AMC was equipped with an underground sewerage system (AMC, Sewerage Profile of Ahmedabad City, 2011). Annexure 2 shows the growth of sewerage network in Ahmedabad city since 1890.

Most of the sewage generated on the eastern part of the city was conveyed to 4 major terminal sewage pumping stations viz. Jamalpur, New Suburban, Maninagar and new Behrampura. From all these 4 terminal sewage pumping stations, the sewage was conveyed to the stabilization ponds at Pirana, for primary treatment. A major portion of untreated sewage was discharged either on land or directly into river Sabarmati until the year 1952. AMC took the cognizance of this problem and subsequently, commissioned Pirana Sewage Treatment Plant of 324 MLD capacity in the year 1975.

In the Western part of city, the sewage system was completed in the year 1955. The sewage was drained to the old Vasana sewage pumping station; from where, it was taken to 280 hectares of area of Vasana Sewage Farm. A part of the sewage remained untreated and was discharged directly into the river. Vasana Sewage Treatment Plant with a capacity of 54 MLD was subsequently commissioned in the year 1980 to treat all sewage collected from west Ahmedabad.

The remainder of this section analyses the sewerage system in Ahmedabad based on the various stages with specific issues as well gaps projected till 2021. This is followed by proposals under this CSP to fulfil any existing gaps as well as provide basic minimum services in sewerage to the city for the future. This section is structured as below:

i. Sewage Generation
ii. Sewage Collection (Slums and other areas)
iii. Sewage Treatment
iv. Reuse and Recycle of Treated Water
v. Staffing and Management
vi. Existing and Projected Gaps, and Issues
vii. Ongoing initiatives and Proposals under this CSP for improving Sewerage Services

### 6.2.1. Sewage Generation

Waste water generation in Ahmedabad as of December 2011 has been computed in Table 20. According to the estimate, a total of 1220 MLD water is supplied from the various facilities in Ahmedabad, out of which around 20 percent is lost as Non Revenue Water (NRW). Hence, effective supply of water reaching the consumers is estimated to be 950 MLD. Approximately, 80 percent of actual water received at the consumer end comes back as sewage. Hence the sewerage generation in Ahmedabad is estimated to be 802 MLD.

[2] Ranchhodlal Chhotalal was a well known mill owner in Ahmedabad who became the President of Ahmedabad Municipality in 1885. He was responsible for design and implementation of underground sewerage system in Ahmedabad.

**Table 20 Volume of Drinking Water Consumed and Sewage Generated (Mar-12)**

| S. No. | Type of Connected Property | Unit | Drinking Water Consumed | | | Sewage Generated |
|---|---|---|---|---|---|---|
| | | | ULB Water Supply | Other Sources | Total | |
| 1 | Residential | MLD | 1,073.60 | NA | 836.00 | 705.76 |
| 2 | Public taps | MLD | 109.80 | NA | 85.50 | 72.18 |
| 3 | Commercial | MLD | 36.60 | NA | 28.50 | 24.06 |
| 4 | Industrial | MLD | - | NA | - | - |
| 5 | Institutional | MLD | - | NA | - | - |
| 6 | Bulk Supply | MLD | - | NA | - | - |
| 7 | Other | MLD | - | NA | - | - |
| | **Total** | **MLD** | **1,220** | **-** | **950** | **802** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

In the above computation of sewage generation, water sourced from sources other than municipal supply (such as water used from private bores) have not been estimated since no such survey has been conducted[3]. Nevertheless, as AMC has a total sewage treatment capacity at of 1075 MLD (153 percent of existing sewage generation) at various installations, and any additional sewage generated can be treated. As of March 2012, only 720 MLD was effectively operational.

### 6.2.2. Sewage Collection Network

Ahmedabad was amongst the first few cities to have planned and implemented underground sewerage collection system during 1880s after careful study of sanitation systems in Calcutta, Lahore, Glasgow and London[4] (Yagnik & Sheth, 2011).

As of December 2011, 85% of the city's area (around 396 sqkm) is covered by sewerage network, whereas 90% of the residential properties in AMC have access to the city's sewer network. The table below provides a summary of the sewerage network in Ahmedabad municipal area. At present, there is 2172 km of sewage network in the city. As of March 2012, around 233 km of network has been recently installed in East Zone while, another 407 km length of network has been implemented in New West Zone. Work is ongoing for another 74 km of network in New West Zone.

**Table 21 Sewerage Network Coverage in AMC**

| Sewerage Network | Unit | Dec-2011 |
|---|---|---|
| Existing Length of sewerage network pipes | Kilometres | 2172 |
| Proposed/Ongoing Network | Kilometres | 74 |
| **Total area covered by sewerage network** | **Sqkm** | **396** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

Overall, Ahmedabad city has 81 percent of all properties connected to sewer network, while remaining are either disposing their sewage through septic tanks, soak pits open drains or resort to

[3] As water supply network in newly expanded AMC jurisdiction is being laid, alternate source of water like bore wells would be eliminated eventually.

[4] Meticulous studies were conducted including analysis of household habits, quantities of urine and solid waste per head, volume studies, kitchen and bathing waste water, waste from cattle and other human waste.

open defecation. The table below provides a break of all properties based on their sewage disposal methods.

**Table 22 Total Sanitation Coverage at the city level, 2011**

| Type of Property | Unit | Number of Properties with access to Toilets | | | | | | No access to toilets | Total Number of Properties |
|---|---|---|---|---|---|---|---|---|---|
| | | Toilets connected to | | | | In Private Layouts | Community Toilets | | |
| | | Sewers | Soak pits | Septic tanks | Drains | | | | |
| Residential | No. | 11,63,779 | - | 90,700 | - | - | - | - | 12,54,479 |
| Commercial | No. | 93,165 | - | - | 9,045 | - | - | 678 | 3,01,506 |
| Industrial | No. | Not in purview of AMC. Industrial areas have a separate CETP system. | | | | | | | |
| Institutional | No. | 14,661 | - | - | - | - | - | - | 14,661 |
| Other | No. | Not available. | | | | | | | 3,414 |
| **Total** | **No.** | **12,71,606** | **-** | **90,700** | **9,045** | **-** | **-** | **678** | **16,40,316** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

According to AMC, all government institutions are connected to sewer (as per the table below).

**Table 23 Zone wise Sanitation Arrangement of Government Institutions**

| Zone Name | Connected to Sewer | Septic tank | Soak away Pits - two-pit | Soak away Pits - single pit | Pits - draining into Nala/ water body | Service Latrines (Manually Cleaned) | No access to toilets | Total Number of Institutional Properties |
|---|---|---|---|---|---|---|---|---|
| North | 73 | - | - | - | - | - | - | 73 |
| South | 70 | - | - | - | - | - | - | 70 |
| East | 69 | - | - | - | - | - | - | 69 |
| West | 335 | - | - | - | - | - | - | 335 |
| Central | 475 | - | - | - | - | - | - | 475 |
| New West | 197 | - | - | - | - | - | - | 197 |
| **Total** | **1,219** | **-** | **-** | **-** | **-** | **-** | **-** | **1,219** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

According to AMC, all municipal schools are connected to sewers. However, when a quick visit to some of the schools was undertaken, toilets in the municipal schools were found to be in unusable state due to lack of maintenance, choked connections to sewer lines, unfriendly design for use by children and irregular water supply. The sanitation in municipal schools has been of some concern and requires attention. The taps and other fixtures from the schools, have been stolen leading to unusable toilets. In situations where it is used, it causes inconvenience to users and makes cleaning and maintenance difficult.

**Table 24 Sanitation Arrangement of Educational Institutions in Ahmedabad**

| Type of school | No. | Sanitation arrangements | | | | | | Disposal ** |
|---|---|---|---|---|---|---|---|---|
| | | Boys | | Girls | | Staff | | |
| | | Toilets | Urinals | Toilets | Urinals | Toilets | Urinals | |
| Municipal Schools ** | 225 | 557 | - | 593 | - | NA | NA | **All connected to sewer ** ** |
| All other colleges * | 170 | 100% | | | | | | |

Source: * (Gujarat_University, 2012); and ** (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

As of 2011, 100 percent of registered residential properties in Ahmedabad have an individual toilet and 93 percent are connected to sewer network. In Central and West zone, the network coverage is 100 percent for residential properties. As peripheral areas are being urbanised, the network is being expanded in these areas. Annexure 4 shows a map of the existing sewerage network in Ahmedabad. A zone wise sewage disposal of residential properties in Ahmedabad has been shown in the table below:

**Table 25 Zone wise Sanitation Arrangement of Residential Properties in Ahmedabad**

| Zone Name | Connected to Sewer | Septic tank | Soak away Pits - two-pit | Soak away Pits - single pit | Pits draining into Nala/ water body | Service Latrines (Manually Cleaned) | No Access to Toilets | Total |
|---|---|---|---|---|---|---|---|---|
| North | 1,94,396 | 21,600 | - | - | - | - | - | **2,15,995** |
| South | 1,83,351 | 20,372 | - | - | - | - | - | **2,03,723** |
| East | 1,80,110 | 20,012 | - | - | - | - | - | **2,00,122** |
| West | 2,13,759 | - | - | - | - | - | - | **2,13,759** |
| Central | 1,33,723 | - | - | - | - | - | - | **1,33,723** |
| New West | 2,58,441 | 28,716 | - | - | - | - | - | **2,87,157** |
| **Total** | **11,63,779** | **90,700** | **-** | **-** | **-** | **-** | **-** | **12,54,479** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

## Sewage Collection Network in Slums

Out of a total of 1,82,239 households in slum areas, around 71.5 percent of HHs have individual toilet. Of the slum HHs with individual toilets, around 90 percent are connected directly to sewers while the remaining dispose sewage in septic tanks, soak pits and nalas/water bodies. Around 17 percent or 31,000 slum households are dependent of public and/or pay & use toilets in the city.

AMC has recently conducted a biometric survey across the slums in the city. However, data is unavailable for New West Zone. Survey for this zone is underway, wherein out of an estimated 150 slums; survey has been completed for 101. Based on this survey, access of slum households to sewerage network have been shown in the table below:

**Table 26 Access to Sewage Collection Network in Slum Areas**

| Zone | Total no. of HHs * | Estimated number of Slum Households with sanitation arrangements | | | | | Community & Pay & Use Toilets | Number of HHs with access to individual or public toilet |
|---|---|---|---|---|---|---|---|---|
| | | *Connection to Sewer* | *Septic tank* | *Soak away Pits* | *Pits - draining into Nala/ water body* | Sub Total | | |
| North | 17,496 | 11,985 | 200 | 266 | 866 | 13,317 | 2,415 | 15,732 |
| South | 45,341 | 26,921 | 449 | 598 | 1,944 | 29,912 | 6,950 | 36,862 |
| East | 10,943 | 7,106 | 118 | 158 | 513 | 7,896 | 3,967 | 11,863 |
| West | 45,554 | 26,465 | 441 | 588 | 1,911 | 29,405 | 5,692 | 35,097 |
| Central | 18,817 | 10,385 | 173 | 231 | 750 | 11,539 | 3,525 | 15,064 |
| New West | 44,088 | 34,401 | 573 | 764 | 2,485 | 38,224 | 8,519 | 46,743 |
| **Total** | **1,82,239** | **1,17,264** | **1,954** | **2,606** | **8,469** | **1,30,293** | **31,068** | **1,61,361** |

Source: (CEPT_University, Slum Survey of Ahmedabad City, Unpublished Survey Results, 2011); and (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

**Figure 7 Individual Toilets and Water Connection in Slums of Ahmedabad**

Source: UMC.

**Sewage Collection Network Maintenance**

The sewage collection system was designed to cater to most parts of the walled city. The original system designed to be adequately ventilated and carry only sewage, had provisions for vent shafts at every 4 metres. Over the years, more than 80 percent of these vent shafts have disappeared (KSSM, 2006). This leaves the system ill-ventilated and causes potential hazard for cleaning staff. Despite the orders by the Gujarat High Court's order in 2006 against manhole workers entering the sewers, manual cleaning of sewers is undertaken due to ineffectiveness and inaccessibility of large super sucker machines in narrow lanes, especially in the walled city (KSSM, 2006). A total of 53 rickshaw mounted grab bucket machines in the city are highly insufficient for cleaning narrow lanes which are inaccessible by large vehicles. Zone wise details of the rickshaws have been provided in Table 28.

Over the years, due to increase in population, irregular maintenance, uncontrolled disposal of other waste in the sewerage network and wearing of the network, the capacity has been severely affected. To add to it, unofficial and unscientific cross connections between the sewer network and storm water drainage were made at various locations based on local complaints received by AMC (Tam, 2011).

AMC maintains a fleet of vehicles for cleaning of sewage collection network including the following:

**Table 27 Sewerage Machines and Equipments with AMC**

| Type of Machine | No. of Machines |
|---|---|
| Super Sucker | 4 |
| Combined Machine | 18 |
| Jetting Machine | 3 |
| Gulley Emptier | 4 |
| High Flow Jetting | 2 |
| Gulley Emptier on Hire | 10 |
| Rickshaw Mounted Grab Bucket Machine | 53 |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

Although the number of machines for maintenance of sewers seems sufficient, accessibility of narrow lanes and streets, especially in the walled city have been a problem and hence, manual cleaning was observed earlier. With a ban enforced on manual cleaning of manholes, AMC provided rickshaw mounted grab bucket machines to workers who were earlier engaged in manual manhole cleaning, most of them belonging to *Valmiki* community. A break-up of rickshaw mounted machines by ownership has been provided in the table below:

**Table 28 Details of Rickshaw Mounted Grab Bucket Machines used for Sewer Management in Ahmedabad**

| Zone | No. of Rickshaw Mounted Grab Bucket Machines | |
|---|---|---|
| | With AMC | Provided by AMC to manhole workers[5] |
| NWZ | 2 | 10 |
| CZ | 3 | 8 |
| NZ | 3 | 6 |
| WZ | 3 | 1 |
| SZ | 2 | 4 |
| EZ | 5 | 6 |
| **Total** | **18** | **35** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

[5] Rickshaw mounted grab bucket machines have been provided to Valmiki Samaaj to retain their employment.

### 6.2.3. Sewage Treatment

As indicated earlier, Ahmedabad generates about 802 MLD of sewage out of which around 720 MLD is collected through piped sewer network amounting to 90 percent collection. The entire sewage collected gets treated at the various STPs. While sewer network takes up 720 MLD, 92,654 septic tanks and 2,606 soak pits take up an estimated 50 MLD leaving the remaining 32 MLD which is disposed untreated in the city.

**Table 29 Waste Water disposal in Ahmedabad**

| Description | Dec-11 | Unit |
|---|---|---|
| Waste Water Generated | 802 | MLD |
| Waste Water Collected by Sewer Network | 720 | MLD |
| Waste Water Collected by Septic Tanks & Soak Pits | 50 | MLD |
| Waste Water Disposed untreated | 32 | MLD |

Source:

The table below shows the installed and operating capacities of various STP installations in Ahmedabad.

**Table 30 Volume of Wastewater Collection** (As of Dec-11)

| S. No. | Name of STP | Unit | Installed Capacity | Sewage Volume Treated | |
|---|---|---|---|---|---|
| | | | | Secondary Treatment | Proposed Tertiary Treatment* |
| 1 | Pirana STP - UASB Based | MLD | 106.00 | 106.00 | Enviro Associate |
| 2 | Pirana STP - Lagoon Based | MLD | 182.00 | 45.00 | Upgradation under NRCP Ph-II |
| 3 | Pirana STP - ASP Based | MLD | 180.00 | 180.00 | Doshion Veolia |
| 4 | Pirana STP - ASP Based | MLD | 60.00 | 60.00 | Enviro Associate |
| 5 | Vasna STP - UASB Based | MLD | 126.00 | 126.00 | Essel Infra |
| 6 | Vasna STP - Lagoon Based | MLD | 76.00 | 58.00 | Upgradation under NRCP Ph-II |
| 7 | Vasna STP - ASP Based | MLD | 35.00 | 35.00 | - |
| 8 | Vasna STP - ASP Based | MLD | 240.00 | 45.00 | No treatment |
| 9 | Vinzol STP | MLD | 70.00 | 40.00 | JITF |
| | **Total **** | **MLD** | **1,075.00** | **720.00** | |
| *10* | *Kamon STP (proposed)* | *MLD* | *As required* | *0.00* | *-* |
| *11* | *Vanzar STP (proposed)* | *MLD* | *As required* | *0.00* | *-* |

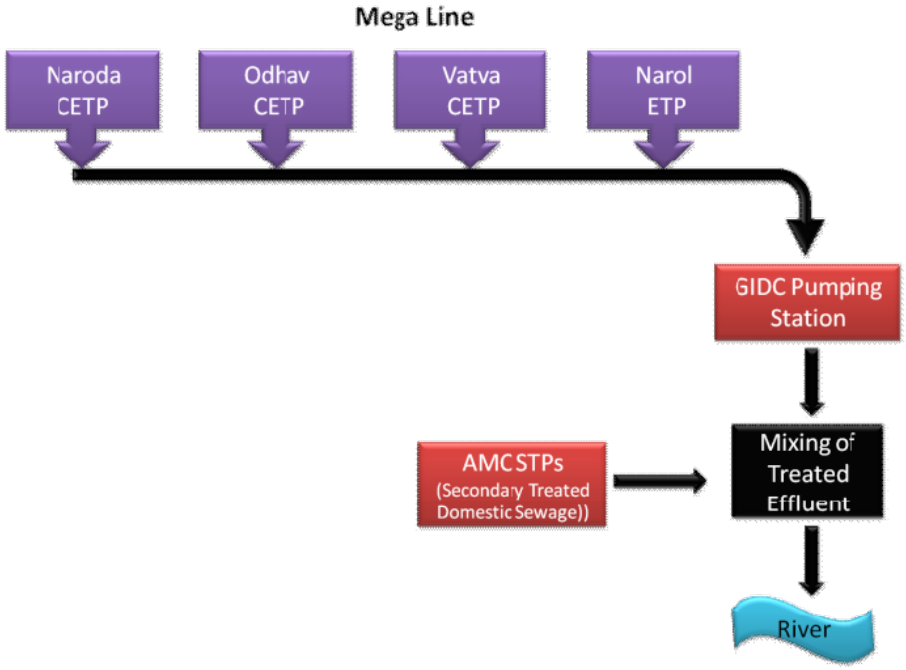
*Note: * MOUs have been signed by AMC with private consultants to conduct tertiary treatment at various STPs.*
*** Current operational capacity reported by AMC is 720 MLD* **(AMC, Sabarmati River Cleaning Project, 2012)**

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

AMC has nine existing sewage treatment plants with a total installed capacity of 1075 MLD at Pirana, Vasana and a new STP at Vinzol. Another 2 are under planning at Kamon and Vanzar. Common effluent treatment plants (CETP) have been installed by the highly polluting industries in Odhav, Naroda, Vatva and Narol GIDC estates. The treated effluent from CETP is carried by a 'Mega Line' and is mixed with the treated sewage from STP at Pirana so as to lower the concentration of S.S. and then discharged into river Sabarmati. A 27 km long mega pipe line has been laid from Naroda to

Pirana conveying this treated effluent of CETPs located at Naroda, Odhav, Vatva & industries of Narol-Shahwadi. The figure below shows a diagram of the mega line and industrial estates connected with it for effluent treatment facilities for industries in Ahmedabad.

**Figure 8 Dedicated Industrial Effluent Treatment System in Ahmedabad**




Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012); Diagram developed by UMC.

Presently, AMC conducts secondary treatment of sewage. AMC has signed MOUs under the Vibrant Gujarat Summit with various private consultants for conducting tertiary treatment of sewage prior to reuse and recycling of sewage.

### Sewage Quality

AMC regularly conducts testing of the waste water effluents. In 2010-11, 85% of the samples tested passed the tests as per CPHEEO norms. As per the latest data from March to December 2011, around 49 samples out of 251 failed the tests. Improvements from secondary to tertiary treatment of sewage would ensure 100 percent achievement of quality tests.

**Table 31 Quality of Waste Water Treatment**

| Discharge compliance after secondary treatment | | Tested | Passed | % Passed |
|---|---|---|---|---|
| Treated effluent samples, 2008-09 | Number/year | 504 | 378 | 75 % |
| Treated effluent samples, 2010-11 | Number/year | 283 | 241 | 85 % |
| Treated effluent samples, till Mar-2011 to Dec-11 | Number/year | 251 | 225 | 90 % |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

Overall, the number of samples tested has reduced significantly from over 500 samples in 2008-09 to less than 300 samples in 2010-11. As per AMC, outlet of treated waste water in Ahmedabad is integrated with waste water outlet of GIDC (covering 4 industrial estates of Naroda, Narol, Odhav and Vatva). Any lapses in treatment reflect on poor quality of treated waste water of AMC. This was

cited as the primary reason for failure of around 10 percent of tests conducted since March 2011 (Refer ).

Effectiveness of industrial CETPs is a serious concern as raised by the CAG Report for Gujarat, March 2012. A news article cites the CAG report saying that all four CETPs of Ahmedabad are not complying with norms. The table below shows the quality of treatment undertaken by various CEPTs in Ahmedabad.

**Table 32 Testing of Effluent Treatment Effectiveness of CETPs in Ahmedabad**

| CETPs | BOD | COD | $NH_3$ | Oil | TDS |
|---|---|---|---|---|---|
| **GPCB Norms** | **30** | **250** | **50** | **10** | **2100** |
| Narol | 195 | 414 | 15 | 1 | 3566 |
| Naroda | 490 | 1493 | 246 | 14.2 | 15614 |
| Odhav | 775 | 1408 | 900 | 12.4 | 5616 |
| Vatva | 570 | 1036 | 128 | 11.4 | 18528 |
| *BD – Biological oxygen demand; COD – Chemical oxygen demand; TDS – Total dissolved salts; $NH_3$ – Ammonia.* | | | | | |

Source: (TNN, You are living in toxic Ahmedabad, 2012)

Similarly, tests conducted by GPCB reveal failure of samples taken from River Sabarmati at entry and exit points namely Hansol Bridge and Maroli Pumping respectively. The table below shows the results of test conducted by GPCB and cited by CAG Report, 2012.

**Table 33 Results of tests conducted by GPCB at entry and exit points of River Sabarmati in Ahmedabad**

| BOD | 30 | 5 | 87 |
|---|---|---|---|
| Fecal Coliform | 500 | 23 | 4300 |
| Total Coliform | 5000 | 93 | 24000 |
| *BD – Biological oxygen demand.* | | | |

Source: (TNN, You are living in toxic Ahmedabad, 2012)

**Figure 9 Polluted River Sabarmati near Vishala Bridge**


Source: (TNN, CAG Diagnosis: 'Bimaru' Gujarat, 2012)

**Septage Management**

AUDA has prepared detailed project report (DPR) for expansion of sewerage network in western and eastern extensions of Ahmedabad city. The sewerage DPR has been prepared keeping in mind the needs of the city till 2040 AD. Most of the areas in the newly merged areas of AMC did not have underground sewerage network and hence there was enormous dependence on septic tanks. With implementation of the DPR, existing septic tanks can be connected to the sewerage network and gradually septage management could be phased out. However, until successful completion and achieving 100 percent coverage by sewerage network, septage management for the following need to be done.

**Table 34 Number of septic tanks, soak-away pits and pits draining into nalas/ water-bodies**

| Description | No. of Septic Tanks | No. of soak-away pits | No. of pits training into nalas/ water bodies | Total |
|---|---|---|---|---|
| Residential Properties | 90,700 | 0 | 0 | **90,700** |
| Commercial Properties | 0 | 0 | 9,045 | **9,045** |
| Slum households | 1,954 | 2,606 | 8,469 | **13,029** |
| **Total** | **92,654** | **2,606** | **17,514** | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

AMC is equipped with 53 septage handling machines and can hire around 10 more from private contractors on need basis. All dry sludge collected from the septic tanks is transported to Gyaspur scientific landfill site while wet waste is taken for treatment to STPs. AMC charges INR 225/- per trip for cleaning of septic tanks within their limits. It also seen that, AMC often has a backlog of requests due to which private operators charge more and supply this to nearby farms as nutrient manure. A summary of septic tank cleaning requests has been provided in the table below:

**Table 35 Average Number of requests received by AMC for Septic Tanks Cleaning**

| Zone | Number of requests per month |
|---|---|
| North | 30 |
| South | 30 |
| East | 140 |
| West | 0 |
| Central | 0 |
| New West | 200 |
| **Total** | **400** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

With a total of 92,654 septic tanks in the city, CPHEEO manual recommends cleaning of a domestic septic tank atleast once in 2 years. However, in practice many septic tanks are cleaned at an interval of 2 to 5 years. Recognising the importance of septage management as an intermediate solution, a quick assessment reveals that 46,327 tanks would need to be cleaned in the next one year (by 2012-13), by which complete sewerage network would be implemented. With 39 septage sucking machines owned by AMC, each machine can attend 4 calls daily. Hence, in a year Ahmedabad need

32 septage sucking machines to clean around 46,000 tanks. Since AMC owns 39 machines, there is no infrastructural gap for septage management in the city.

### 6.2.4. Reuse, Recycling and Disposal of Treated Sewage

AMC has recently initiated reuse of treated sewage to support an urban forestry initiative. About 0.63 ML of water (0.1% of sewage treated) is used for watering the gardens and urban forests.

Also, under the auspices of Vibrant Gujarat 2011, AMC had requested proposals from organisations to set up a sewage reuse and recycling units. Four organisations have displayed their interest and the Municipal Corporation is currently in a discussion to finalise. The proposed projects are as follows:

- Essel Infra Projects Ltd. for 126 & 35 MLD STP at Vasana site
- JITF water Infrastructure Ltd. (Jindal) for 75 MLD STP at Vinzol site
- Doshion Ltd. for 180 MLD at Pirana site
- Enviro Associate Pvt. Ltd. for 106 MLD and 60 MLD STP at Pirana

The Corporation has also received proposals for waste-energy project for generating gas from sewage at Pirana.

### 6.2.5. Staff and Management

AMC has a total staff of around 15,000. Details staff exclusive of sewerage department is not available as sharing of resources is a common practice for inter sectoral management of services. The table below shows the class wise staff composition of AMC.

**Table 36 Staff and Management of AMC, 2011**

| S. No. | Type of Staff | Unit | Technical | Non-technical |
|---|---|---|---|---|
| 1 | Class I | Number | 212 | 38 |
| 2 | Class II | Number | 637 | 110 |
| 3 | Class III | Number | 4,028 | 1,166 |
| 4 | Class IV | Number | 4,600 | 13,770 |
| 5 | Other | Number | NA | NA |
| 6 | Contracted Staff | Number | NA | NA |
| | **Total** | **Number** | **9,477** | **15,084** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

### 6.2.6. Service Level Benchmarking (SLB) and Gaps in Sewerage Services

There are 8 key performance indicators developed for sewerage system under SLB initiative. The details of indicators for AMC in Dec-2011 are given below.

**Table 37 Performance Indicators and its comparison with Benchmarks**

| Performance Indicator | Benchmark | 2011-12 |
|---|---|---|
| Coverage of individual toilets | 100 % | 82 % |
| Sewage Coverage by Connections | 100% | 82 % |
| Sewage Collection by network | 100% | 95 % |
| Sewage Treatment Capacity | 100% | 134.0 % |
| Extent of Reuse & Recycle of Sewage ** | 20% | 0.10 % |
| Quality of Sewage Treatment | 100% | 90 % |
| Efficiency in Redressal of Consumer Complaints | 80% | 99 % |
| Extent of Cost Recovery in Sewage Management | 90% | 83 % |
| Efficiency in collection of sewage charges | 90% | 83 % |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

Based on the infrastructural provisions and service delivery records maintained by AMC, existing and proposed absolute gaps in the same for sewerage services have been summarised below:

**Projected Gaps**

Based on the projected population, a proportionate increase in demand can be computed as below:

**Table 38 Existing and Projected Incremental Gaps in Sewerage Services**

| Waste Water | | | 2011 | 2016 | 2021 | Unit |
|---|---|---|---|---|---|---|
| | Existing Demand | Existing Delivery | Gap | Gap | Gap | |
| Sewerage Network Length | 2,976 | 2,246 | 730 | 1,225 | 1,802 | Km |
| Sewage Connections (total) | 15,74,060 | 12,71,606 | 3,02,454 | 5,64,053 | 8,69,128 | No. of Connections |
| Sewage Connections (slum)* | 1,82,239 | 1,17,264 | 64,975 | 64,975 | 64,975 | No. of Connections |
| Sewage Collection | 802 | 682 | 120 | 236 | 389 | MLD |
| Sewage Treatment Capacity | 802 | 577 | 225 | 341 | 494 | MLD |
| Extent of Reuse & Recycle of Sewage | 160 | 0.58 | 160 | 183 | 214 | MLD |
| Vehicles for Septage Management | 32 | 39 | - | - | - | No. |

*Note: Population projections done by AMC (at 2016 and 2021 are 64.94 lakh and 75.73 lakh) have been adopted for projected gaps assessment.*
** Gap projected for 2016 and 2021 is the same as 2011 as no increments in slums would occur as planned by various slum improvement schemes.*

Source: UMC.

Ahmedabad generates around 802 MLD of sewerage daily. Around 32 MLD of sewage is drained untreated into natural drains, storm water drains, lakes, agricultural fields and other open areas. Of the remaining, 720 MLD of sewage is collected and treated by AMC at various STPs prior to discharge in River Sabarmati. Another 50 MLD is collected and disposed using septic tanks and soak pits. A quality test revealed failure of 10 percent of samples tested for quality between April and March 2011 at the discharge points from STPs.

Ahmedabad city has a total of 15.74 lakh registered properties (excluding industries), while the number of sewer connections is 12.71 lakh. Around 3 lakh properties of various uses are not connected to piped sewerage network. Residential coverage of sewer connections by number of residential connections was found to be 92.8 percent with 11.64 lakh connections against 12.55 lakh registered residential properties. AMC reports coverage of sewer network by connections in slum areas to be 64.3 percent enumerating to 1.17 lakh sewerage connections in slum areas out of a total of 1.82 lakh households. Industrial estates have a separate Mega Line for collection and treatment of sewage generated in the industries through an exclusive CETP installation (refer ).

Recycling and reuse of treated water should be improved to by 213.5 MLD till 2021 to achieve 20 percent target set by MoUD. In addition to recycling and reuse, qualitative issues have been identified in the following section.

### 6.2.7. Issues in Sewerage Services

The key issues identified in sewerage services are as follows:

- All residential properties in Ahmedabad are equipped with individual toilets as per AMC's database but coverage of individual toilets in slums is 71.5 percent.
- While all residential properties with individual toilets are connected to sewer network, number of connections to sewer network in slum areas is only 64.35 percent of the total slum households.
- In residential properties, 7.2 percent of properties are still using septic tanks for disposing sewage.
- Recycle and reuse of treated sewage is restricted to urban forestry in the vicinity of STPs without wider use of the treated water. However, AMC has planned reuse of 550 MLD of industrial grade treated water reducing fresh water demand in industries.
- Despite excess capacity to treat sewage, only 90 percent of total sewage is being treated. Around 32 MLD is being discharged untreated
- Around 10 percent of samples of treated sewage failed the quality tests. As per AMC, GIDC's treated sewage is mixed with AMC's treated water prior to discharge in River Sabarmati (Refer Table 31). Any deficiencies in treating done by GIDC results in failure of quality test for combined discharge point.
- Due to unofficial and unscientific cross linkages between SWD and sewerage, sewage is getting channelized into water bodies including River Sabarmati (Tam, 2011).
- Despite various efforts taken by AMC to conserve River Sabarmati under the NRCP, the CAG Report of Gujarat published in March 2012 reports the efforts as a failure[6]. Industrial effluents are also being disposed untreated in River Sabarmati due to non compliance of CETPs with GPCB norms[7]. As per AMC, the final disposal of treated sewage is mixed with industrial effluents from GIDC which do not match GPCB norms resulting in failure of quality tests for samples taken from the combined discharge point.
- Domestic sewage is reportedly being discharged through cross connections in storm water drainage apart from illegal pipelines draining sewage directly into the river (Ibid).

[6] (TNN, CAG Smells a Rat, 2012)
[7] (TNN, You are living in toxic Ahmedabad, 2012)

### 6.2.8. Proposals of City Sanitation Plan for Sewerage Services

**Ongoing Initiatives**

AUDA prepared a detailed project report (DPR) for expansion of sewerage network in western and eastern extensions of Ahmedabad city. The sewerage DPR has been prepared keeping in mind the needs of the city till 2040 AD. Hence, subject to complete implementation of the works proposed in the DPR, the city would not face infrastructural gaps in sewerage treatment capacity. The proposals are under implementation by AMC including provision of collection network and augmentation of sewage treatment capacity of AMC.

**Table 39 Ongoing improvements in Sewerage System**

| S. No. | Proposed Augmentation | Number | Unit | Completion by (Year) |
|---|---|---|---|---|
| 1 | Sewage Collection Network | 714 | Km | December 2012 |
| 2 | Sewage Treatment Capacity | 700 | MLD | After approval of NRCP Ph-II |

Source: (AUDA, Detailed Project Report on Sewerage Network of East & West AUDA Areas of Ahmedabad (Gujarat) under JN-NURM Programme, n.d.)

**Recommendations of City Sanitation Plan**

While augmentation of sewer network would ensure coverage of all inhabited areas in the city, drives would be required to provide connections to households currently dependent on septic tanks. Sewerage network augmentation is estimated to be completed by 2012-13. Considering potential delays in achieving 100 percent connections, septage management should be strengthened as an intermediate measure to ensure sanitation in the city.

Around 8.69 lakh new connections need to be provided as the city grows adding 389 ML sewage daily. In addition of residential coverage, efforts would be required to provide connections in slum areas where septic tanks and soak pits are being used as alternative disposal mechanisms. The table below summarises the recommendations by CSP for improving sewerage services:

**Table 40 Infrastructure Works Proposed under CSP for Sewerage Services until 2021**

| S. No. | Description | Proposed Improvement | | Unit | Block Cost (INR in lakhs) |
|---|---|---|---|---|---|
| | | 2016 | 2021 | | |
| 1 | Refurbishment of existing sewerage network (@ 15% of existing network) | 337 | - | Km | 12,516 |
| 2 | Provision of sewerage connections | 5,64,053 | 3,05,075 | No. of Connections | Cost to be borne by user |
| 3 | Provision of sewerage connections in slums | 64,975 | - | No. of Connections | Cost to be borne by user |
| | | | | **Total** | **INR 12,516 lakhs** |

In addition to infrastructural improvements shown above, the city needs other initiatives to improve sewerage services in the city as listed below:

**Table 41 Studies and Programmes Proposed under CSP for Sewerage Services until 2021**

| Component | Description | Quantity | Unit | Block Cost (INR in lakhs) |
|---|---|---|---|---|
| **DPR Preparation** | Preparation of DPR for refurbishment of sewerage network proposed under this CSP | 1 | No. | 50.0 |
| **GIS Database preparation** | Preparation of GIS Database for Sewerage services under this CSP | 1 | No. | 50.0 |
| **IEC Campaign** | Sewerage related IEC campaign for promotion of individual connections and overall sensitisation towards environmental conservation through sewerage management | Yearly activity for 9 years @ INR 70 lakhs per year | | 630.0 |
| **Training & Capacity Building** | TCB programme for waste water department | Yearly activity for 9 years @ INR 70 lakhs per year | | 630.0 |
| | | **Total** | | **INR 1,360 lakhs** |

## 6.3. Sanitation

This section analyses existing sanitation services in Ahmedabad with specific issues as well as gaps projected till 2021. This is followed by proposals under this CSP to fulfil any existing gaps as well as provide basic minimum services in sanitation to the city for the future. This section is structured as below:

i. Access of households to toilets
ii. Coverage of Public Conveniences
iii. Open Defecation
iv. Existing and Projected Gaps, and Issues
v. Ongoing Initiatives and Proposals under this CSP for improving Sanitation Services

### 6.3.1. Access of households to toilets in Ahmedabad

Overall, Ahmedabad city has a fairly good coverage by access to individual toilets of all households. Out of a total of 12,71,392 households in the city around 96 percent of households have access to individual toilets. Out of 12.71 lakh households, around 1.82 lakh households are staying in slums. Of these 1.82 lakh households, around 52,000 households (28.5 percent) do not have access to individual toilets. As reported by AMC, all non slum households have individual toilets.

### 6.3.2. Coverage of Public Conveniences

**Status of Community/Public Toilets**

Ahmedabad city has around 1,840 community toilet blocks with 7,211 seats out of which 84 blocks (or 329 seats) are non functional. In addition to community toilets, there are around 590 toilet blocks with 2,354 pay and use toilet seats. Many of the pay and use toilets have bathing facilities with a total of 807 bathing units in the city. While community toilets do not charge any user fee, pay and use toilets charge a nominal fee of INR 2/- per use for defecation and bathing, each. Urinal provisions in pay and use toilets are free of charge for men. In addition to toilets, independent 1,182 urinals seats for men are installed in various parts of the city.

No survey has been conducted to assess the exact number of users of these facilities. As per AMC, 25 persons have been assumed per seat to assess the coverage. Hence, around 2.4 lakh users of community as well as pay and use toilets are estimated in Ahmedabad.

With a total of nearly 9,500 functional community and pay & use toilet seats, community toilets cater to around 1.8 lakh users while pay & use toilets cater to around 60,000 users as mentioned in Table 43 and Table 45 estimating the number of users to be 2.4 lakh in the entire city. Hence, number of regular users (households without individual toilets) per seat of public convenience is 9.5. Statistically, the number of toilet seats provided by AMC for public convenience is sufficient. However, regular maintenance and cleanliness of the public conveniences was found to be poor in many cases. The timings of public conveniences is also an issue as they remain locked between 2300 hrs and 0600 hrs in some localities. Locations of these toilets are unknown and there are no maps available with AMC which shows under or over served areas with public toilets.

Details of community as well as pay and use toilets have been provided in the tables below.

**Table 42 Number of Community Toilets in Ahmedabad**

| S. No | Zone Name | No of Toilet Seats | | | No of Toilet Blocks | | | Non Functional Toilet Blocks |
|---|---|---|---|---|---|---|---|---|
| | | Men | Women | Total | Men | Women | Total | |
| 1 | North | 883 | 840 | 1,723 | 176 | 177 | 353 | NA |
| 2 | South | 888 | 698 | 1,586 | 292 | 297 | 589 | NA |
| 3 | East | 986 | 906 | 1,892 | 208 | 213 | 421 | NA |
| 4 | West | 263 | 233 | 496 | 64 | 60 | 124 | NA |
| 5 | Central | 781 | 678 | 1,459 | 184 | 155 | 339 | NA |
| 6 | New West | 29 | 26 | 55 | NA | NA | 14 | NA |
| | **Total** | **3,830** | **3,381** | **7,211** | **924** | **902** | **1,840** | **48** |

Source: (CEPT_University, Slum Survey of Ahmedabad City, Unpublished Survey Results, 2011); (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

**Table 43 Operational Details of Community Toilets in Ahmedabad**

| S. No. | Zone Name | Estimated No. of Users Per day | Whether Use and Pay (Y/N) | Price Per Use (Urinal) | Price Per Use (Defecation) | Price Per Use (Bathing) |
|---|---|---|---|---|---|---|
| 1 | North | 43,075 | N | NA | NA | NA |
| 2 | South | 39,650 | N | | | |
| 3 | East | 47,300 | N | | | |
| 4 | West | 12,400 | N | | | |
| 5 | Central | 36,475 | N | | | |
| 6 | New West | 1,372 | NA | | | |
| | **Total** | **1,80,272** | | | | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

**Table 44 Number of Pay & Use Toilets in Ahmedabad**

| S. No. | Zone Name | No of Toilets Seats | | | No of Toilets Blocks | | |
|---|---|---|---|---|---|---|---|
| | | Men | Women | **Total** | Men | Women | **Total** |
| 1 | North | 279 | 213 | 492 | 70 | 53 | 123 |
| 2 | South | 144 | 119 | 263 | 36 | 30 | 66 |
| 3 | East | 365 | 277 | 642 | 91 | 69 | 161 |
| 4 | West | - | - | - | - | - | - |
| 5 | Central | 355 | 314 | 669 | 89 | 79 | 167 |
| 6 | New West | 152 | 136 | 288 | 38 | 34 | 72 |
| | **Total** | **1,295** | **1,059** | **2,354** | **324** | **265** | **589** |

Source: (CEPT_University, Slum Survey of Ahmedabad City, Unpublished Survey Results, 2011); (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

**Table 45 Operational Details of Pay & Use Toilets in Ahmedabad**

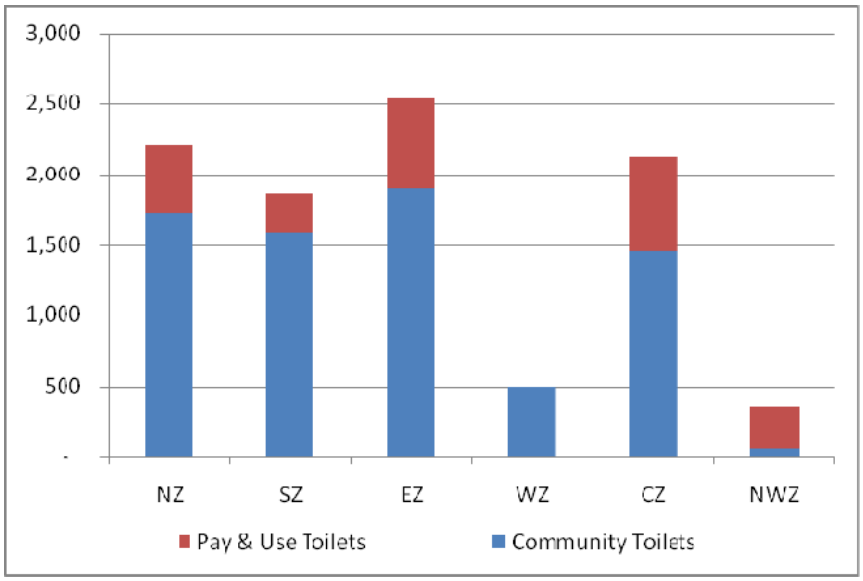
| S. No. | Zone Name | Estimated No. of Users Per day | Whether Use and Pay (Y/N) | Price Per Use (Urinal) | Price Per Use (Defecation) | Price Per Use (Bathing) |
|---|---|---|---|---|---|---|
| 1 | North | 12,300 | Y | Free | 2 | 2 |
| 2 | South | 6,575 | Y | Free | 2 | 2 |
| 3 | East | 16,050 | Y | Free | 2 | 2 |
| 4 | West | - | Y | Free | 2 | 2 |
| 5 | Central | 16,725 | Y | Free | 2 | 2 |
| 6 | New West* | 7,200 | Y | Free | 2 | 2 |
| | **Total** | **58,850** | | | | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

**Figure 10 Pay & Use Toilets in Ghatlodia *(left & centre)*; Urinal without water connection *(right)***

Source: UMC.

**Figure 11 Zone wise status of Public Conveniences in Ahmedabad**




Source: (CEPT_University, Slum Survey of Ahmedabad City, Unpublished Survey Results, 2011); (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

In addition to the toilet and urinal seats, AMC has provided bathing units for both men and women. A break-up of the same has been provided below:

**Table 46 Number of Public Bathing Units and Urinals in Ahmedabad**

| Zone | Bathing Units | | | Urinals | | |
|---|---|---|---|---|---|---|
| | Men | Women | Total | Men | Women | Total |
| North | 101 | 93 | **194** | 211 | - | **211** |
| South | 43 | 34 | **77** | 99 | - | **99** |
| East | 130 | 95 | **225** | 196 | - | **196** |
| West | - | - | **-** | - | - | **-** |
| Central | 99 | 89 | **188** | 206 | - | **206** |
| New West | 59 | 64 | **123** | 167 | - | **167** |
| **Total** | **432** | **375** | **807** | **1,182** | - | **1,182** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

As evident from the table, no separate urinals are available for women, especially at transit areas such as bus stands, interchanges, etc. Such facilities are available at these locations for men. Further, there are 685 additional public and pay & use seats for men as compared to women. An equitable distribution of such facilities based on gender is needed in the city.

Based on the data available for various public conveniences in the city, a summary the same categorised for men, women and differently-abled have been provided in the table below:

**Table 47 Summary of Existing Public Conveniences in Ahmedabad**

| Public Convenience | Existing Delivery | Unit |
|---|---|---|
| Toilet seats (Men) | 5,125 | No. |
| Toilet Seats (Women) | 4,440 | No. |
| Toilet Seats (Differently-Abled) | - | No. |
| **Total Toilet Seats** | **9,565** | **No.** |
| | | |
| Urinals (Men) | 1,182 | No. |
| Urinals (Women) | - | No. |
| **Total Toilet Seats** | **1,182** | **No.** |
| | | |
| Bathing Units (Men) | 432 | No. |
| Bathing Units (Women) | 375 | No. |
| Bathing Units (Differently-Abled) | - | No. |
| **Total Bathing Units** | **807** | **No.** |

Source: (CEPT_University, Slum Survey of Ahmedabad City, Unpublished Survey Results, 2011); (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

There are no child friendly public toilets in Ahmedabad giving very little choice to children but to defecate in the open. The construction techniques, materials and design standards are in dire need for revision as the current public toilets lack natural or artificial light and ventilation while providing very cramped space to its users. Men's urinals in many places were found to be without any water connections, further deteriorating their sanitary condition. There are no provisions of public conveniences for differently-abled and assisted users in the city.

### 6.3.3. Open Defecation (OD)

According to newspaper reports, more than 64,000 sanitation workers are still engaged in manual scavenging in Gujarat (TNN, HC directive to Gujarat Govt. on manual scavenging, 2011). The Gujarat high court had earlier issued directions for total abolition of manual scavenging in the state.

According to AMC, manual scavenging is not practised in the city anymore, though despite sufficient provision of public convenience seats, open defecation occurs at a few sites. Street sweepers cleaning the roads are subject to a form of manual scavenging while they clean the OD spots. In the absence of AMC conducted a city-wide survey in 2010 to assess the extent of open defecation in the city.

**Table 48 Zone wise number of open defecation spots**

| Zones | Major OD Sites | Minor OD Sites | Total OD Sites |
|---|---|---|---|
| Central | 40 | 32 | **72** |
| South | 16 | 24 | **40** |
| East | 1 | 60 | **61** |
| North | 46 | 26 | **72** |
| West | 90 | 46 | **136** |
| New West | 88 | 22 | **110** |
| **TOTAL** | **281** | **210** | **491** |

Source: (AMC, A Scientific Study for Identification of Open Defecation Spots, Reasons for the same & Suggestions to Eradicate &/or Minimise it in Ahmedabad City Area, 2010)

As per the survey, there are 491 open defecation spots in the city Around 281 are classified as major open defecation spots (more than 50 persons defecating in the open in a day) while 210 as minor defecating spots (less than 50 persons defecating in the open in a day). The table below shows the number of persons resorting to open defecation in each zone. Considering 4 zones only (south, west, central and new west), around 7.69 percent of slum population resorts to open defecation. At city level, around 1.72 percent of persons (considering only 4 zones) resort to open defecation.

**Table 49 Number of Persons Resorting to Open Defecation**

| Zone Name | Total Households | Individual Toilet | Public Toilet | Pay & Use Toilet | Number of persons resorting to OD |
|---|---|---|---|---|---|
| North | 17496 | 13,317 | 2,064 | 351 | NA |
| South | 45341 | 29,912 | 5,941 | 1,009 | 1,047 |
| East | 10943 | 7,896 | 3,502 | 465 | NA |
| West | 45554 | 29,405 | 5,408 | 284 | 30,426 |
| Central | 18817 | 11,539 | 2,909 | 616 | 4,649 |
| New West | 44088 | 38,224 | 7,427 | 1,091 | 25,287 |
| **TOTAL** | **182239** | **1,30,293** | **27,251** | **3,816** | **61,409** |

Source: (AMC, A Scientific Study for Identification of Open Defecation Spots, Reasons for the same & Suggestions to Eradicate &/or Minimise it in Ahmedabad City Area, 2010)

**Figure 12 Open Defecation at Ramapir no Tekro**

Source: UMC.

### 6.3.4. Gaps in Sanitation Services

As directed by the Government of Gujarat, all slum households should be provided with individual toilets in congruence with the objectives of the *Nirmal Gujarat* (UD&HD, 2008). Hence, public toilets are to be provided at public places for floating population and other city users.

In order to achieve complete sanitation, some existing public conveniences need to be refurbished while some additional need to constructed. No mapping of existing public conveniences exists. Hence, certain assumptions have been adopted as defined below:

**Table 50 Assumptions for estimating public conveniences demands**

| Assumptions | Remarks |
|---|---|
| Assumption 01 | Floating population of the city – 5 percent of total population |
| Assumption 02 | Local city dwellers using public toilets – 1 percent of total population |
| Assumption 03 | Around 50 percent of existing toilet seats in need of repairs and refurbishment |
| Assumption 04 | New toilet seats needed – 1 percent of existing seats (to ensure access in public areas) |
| Assumption 05 | Total number of toilet seats would be shared equally for men, women and differently-abled |
| Assumption 06 | Male and female urinals to be computed @ 1 for every 200 users, no separate urinals for differently-abled. All existing men's urinals would be refurbished to ensure water connections, drainage, meeting other design standards, etc. |
| Assumption 07 | Number of bathing units needed has been assumed to be 1/3rd of total toilet seats in the city for men and women and 1/6th of total toilet seats for differently-abled. The bathing units are to be placed at transit locations. |

Based on the above assumptions, the current and projected demand till 2021 for public conveniences has been calculated below:

**Table 51 Current & Projected Demand for Total Toilet and Urinal Seats**

| Description | Dec-2011 | 2016 | 2021 |
|---|---|---|---|
| City Population | 55,68,695 | 64,94,177 | 75,73,468 |
| Floating population (@ 5%) | 2,78,435 | 3,24,709 | 3,78,673 |
| Local city users (@ 1%) | 55,687 | 64,942 | 75,735 |
| **Total Users for Public Conveniences** | **3,34,122** | **3,89,651** | **4,54,408** |
| | | | |
| **Existing and Projected Demand for Public Conveniences** | | | |
| No. of toilet seats needed for floating population and city users (@ 1 for 100 users) & additional 50% for differently-abled | 5,013 | 5,847 | 6,819 |
| No. of urinals needed (@ 1 for 200 users) | 1,672 | 1,950 | 2,274 |
| No. of bathing units needed (1/3 of total toilet seats for men & women, 1/6$^{th}$ of total seats for differently-abled) | 1,393 | 1,625 | 1,895 |
| *Note: Population projections done by AMC have been adopted for projected gaps assessment. The projections for 2016 and 2021 are 64.94 lakh and 75.73 lakh respectively.* | | | |

Source: UMC.

As computed in the table above, the existing supply of aggregate toilet seats is more than the demand. However, equitable distribution for men, women and differently-abled persons needs to be ensured by repairing and refurbishing the existing seats to suit the users' requirements. Also many areas are unserved or underserved by such public convenience seats (especially transit areas and high density commercial areas) and hence despite more than sufficient existing seats, 950 additional seats (10 percent of total existing seats) have been proposed.

Similarly, urinals and bathing units too need to be distributed in an equitable manner based on usage patterns for men, women and differently-abled. In order to do so, a detailed demand based on type of user (men, women and differently-abled) have been calculated below for toilet seats, urinals and bathing units.

**Table 52 Current & Projected Gaps for Public Conveniences for Men, Women & Differently-abled**

| Public Convenience | Existing Delivery | 2011 | | 2016 | | 2021 | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | Demand | Gap | Demand | Gap | Demand | Gap | |
| Toilet seats (Men) | 5,125 | 1,671 | - | 1,949 | - | 2,273 | - | No. |
| Toilet Seats (Women) | 4,440 | 1,671 | - | 1,949 | - | 2,273 | - | No. |
| Toilet Seats (Differently-Abled) | - | 1,671 | 1,671 | 1,949 | 1,949 | 2,273 | 2,273 | No. |
| **Total Toilet Seats** | **9,565** | **5,013** | **1,671** | **5,847** | **1,949** | **6,819** | **2,273** | **No.** |
| | | | | | | | | |
| Urinals (Men) | 1,182 | 836 | - | 975 | - | 1,137 | - | No. |
| Urinals (Women) | - | 836 | 836 | 975 | 975 | 1,137 | 1137 | No. |
| **Total Toilet Seats** | **1,182** | **1,672** | **836** | **1,950** | **975** | **2,274** | **1,137** | **No.** |
| | | | | | | | | |
| Bathing Units (Men) | 432 | 557 | 125 | 650 | 218 | 758 | 326 | No. |
| Bathing Units (Women) | 375 | 557 | 192 | 650 | 275 | 758 | 383 | No. |
| Bathing Units (Differently-Abled) | - | 279 | 279 | 325 | 325 | 379 | 379 | No. |
| **Total Bathing Units** | **807** | **1,393** | **596** | **1,625** | **818** | **1,895** | **1,088** | **No.** |

Source: UMC.

In case of toilet seats, the existing seats (5,125 for men and 4,440 for women) exceed the total demand of seats in the year 2021. As mentioned earlier, reconfiguration of toilet seats to ensure equitable distribution for men, women and differently-abled is needed.

Based on the demand, a total of 1,137 urinals for women need to be provided by the year 2021 in addition to a total of 1,088 bathing units – 326, 383 and 379 units for men, women and differently-abled respectively.

**Table 53 Desired configuration of Toilet Seats, Urinals and Bathing Units by 2021 for Men, Women & Differently-abled**

| Public Convenience | Good | Refurbished | New | Total |
|---|---|---|---|---|
| Toilet seats (Men) | 2,563 | 603 | 317 | **3,483** |
| Toilet Seats (Women) | 2,220 | 946 | 317 | **3,483** |
| Toilet Seats (Differently-Abled) | - | 3,167 | 317 | **3,484** |
| **Total Toilet Seats** | **4,783** | **4,716** | **951** | **10,450** |
| | | | | |
| Urinals (Men) | - | 1,182 | - | **1,182** |
| Urinals (Women) | - | - | 1,137 | **1,137** |
| **Total Toilet Seats** | **-** | **1,182** | **1,137** | **2,319** |
| | | | | |
| Bathing Units (Men) | 216 | 216 | 326 | **758** |
| Bathing Units (Women) | 188 | 188 | 382 | **758** |
| Bathing Units (Differently-Abled) | - | - | 758 | **758** |
| **Total Bathing Units** | **404** | **404** | **1,466** | **2,274** |

Source: UMC.

Additional 950 toilet seats have been proposed keeping in mind the absence of these facilities at appropriate locations in public areas. Likewise, number of urinals needed is 836 for men and women each. However, 1182 urinals for men exist and hence, in order to retain these, all are proposed to be refurbished. In addition to 1182 urinals for men, 836 urinals for women should be planned all across the city.

### 6.3.5. Issues in Sanitation Services

The key issues identified in service delivery of sanitation services are as follows:

- Delays in provision of sewerage network in slum areas (by AMC) leading to NGSY's disapproval of requests by slum households to obtain individual toilets.
- There are no public conveniences for either the differently-abled users or for assisted users. Toilets have been designed insensitively ignoring the need for barrier free access to all.
- Absence of community toilets in the proximity to households without access to individual toilets
- Non-functional public toilets in slum areas
- Timings of pay-&-use toilets. Not all are open 24x7
- Ill-ma intained community toilets

- Uneven spread of community toilets and inadequate toilet seats for local requirements in many areas
- In some Public Toilets, there is acute shortage of water supply due to which Safai Kamdars are not able to clean the toilets regularly.
- Irregular water supply was observed in many toilets
- Many taps and other fitting are either broken or stolen
- Poor light conditions inside the toilet block also discourages its use, hence encouraging open defecation
- Design flaws in toilets lead to inadequate ventilation, odour and hence unusable conditions
- Toilets are unfriendly for use by children, old, differently-abled and assisted users. There is no provision for access for wheelchair users or person with walking sticks/ crutches.
- Insect and flies are a common feature in many toilets
- Drainage line of many public toilets was found chocked with *pan masala* and *gutka* packets due to absence of civic awareness (AMC, A Scientific Study for Identification of Open Defecation Spots, Reasons for the same & Suggestions to Eradicate &/or Minimise it in Ahmedabad City Area, 2010).
- In some areas it is not locals, but labourers, who defecate in open due lack of facilities for them
- Girls shy away attending schools where toilets are not available. Alternatively, they have to go home to use toilet facilities.
- Safai Karmacharis in some wards do not receive proper equipments, and in many cases where the equipments are provided, the Safai karmacharis do not use it. A weak mechanism of monitoring increases the problem.
- Lack of awareness of public health and hygiene is single most important factor of open defecation. One example is either absence of wash basins or non functional wash basins, soaps, etc.

### 6.3.6. Proposals of City Sanitation Plan for Sanitation Services

**Ongoing Initiatives**

There are various ongoing initiatives in Ahmedabad for provision of sanitation infrastructure. Some of them include provision of individual toilets to households, provision of community and pay & use toilets in the city, measures for cleaning and removal of open defecation spots and preventing their resurfacing. There are schemes such as SNP, 500 NOC Scheme, etc. which provide basic infrastructure to the slums and hence contribute directly and indirectly to improving sanitation.

As mentioned earlier, all households should be provided individual toilets, hence a total of 51,946 households need to be provided with individual toilets at the earliest. Henceforth, it has to be ensured that all new tenements are equipped with an individual toilet which is connected to the sewerage system of the city.

In order to fulfil the gaps in individual toilets and provision of public conveniences for floating population as well as city users, the investment requirements have been presented below:

**Table 54 Infrastructure Works Proposed under CSP for improving Sanitation Services until 2021**

| S. No. | Description | Proposed Improvement | | Unit | Block Cost |
|---|---|---|---|---|---|
| | | 2016 | 2021 | | |
| **Provision of Individual Toilets** | | | | | |
| 1 | Construction of individual toilets | 51,946 | - | Number | INR 2,078 lakhs[8] |
| **Provision of Public Conveniences** | | | | | |
| **Toilet Seats** | | | | | |
| 2 | Refurbishment of existing public/ pay & use toilet seats | 4,750 | - | Number | INR 2,969 lakhs |
| 3 | Construction of new toilet seats | 1,784 | 972 | Number | INR 3,445 lakhs |
| 4 | Refurbishment of existing men's urinals | 1,182 | - | Number | INR 369 lakhs |
| 5 | New Urinals (for women) | 975 | 162 | Number | INR 711 lakhs |
| 6 | Construction of bathing units | 1,222 | 270 | Number | INR 1,865 lakhs |
| | **Total** | | | | **INR 11,437 lakhs** |
| *Note: * Govt. Contribution: INR 2,182 lakhs;* | | | | | |

In addition to infrastructural improvements shown above, the city needs various studies and programmes to improve sanitation services in the city as listed below:

**Table 55 Studies and Programmes Proposed under CSP for improving Sanitation Services until 2021**

| Component | Description | Quantity | Unit | Block Cost |
|---|---|---|---|---|
| **DPR Preparation** | Preparation of DPR for undertaking sanitation works proposed under this CSP | 1 | No. | INR 50 lakhs |
| **GIS Database preparation** | Preparation of GIS Database for Sanitation services under this CSP | 1 | No. | INR 50 lakhs |
| **IEC Campaign** | Sanitation and eliminating OD related IEC campaign | Yearly activity for 9 years @ INR 70 lakhs per year | | INR 630 lakhs |
| **Training & Capacity Building** | TCB programme for Sanitation Department | Yearly activity for 9 years @ INR 70 lakhs per year | | INR 630 lakhs |
| | | **Total** | | **INR 1,360 lakhs** |

In addition to the above physical infrastructure, open defecation needs to be addressed separately through special programmes for creating OD free city. Some of the suggestions for reducing open defecation in the city are as follows:

- Prepare **design guidelines** to be followed which could include but not be limited to
  - **design considerations to make children-friendly toilet seats** in the toilet complexes. Open defecation is majorly seen among children of slums.
  - Overall sensitively designed complexes with adequate light, ventilation
  - Follow design standards for differently-abled and assisted persons
  - Improved design and quality of sanitary and electrical fixtures
  - Facilities such as mirrors, hooks for hanging clothes, belongings, etc.

[8] As per NGSY, government subsidy for building individual toilets is INR 4,000/- only. Hence, for investment plan under this CSP, only government share has been provided.

- Small counters for keeping bags, purses, etc.
- Fully equipped janitor's room

- **Staffing and Management**:
  - Arrange for visits of the sanitation workers to areas where the toilets are well maintained to share best practices
  - Implement MIS based staffing
- **Maintenance Schedule**:
  - Ensure regular cleaning of the community toilets as well as the drainage lines
  - Inventory of consumables including cleaners, soaps, etc. to ensure adequate stocks
  - Implement MIS based reporting and inspection mechanism
  - Monitor regular water supply

## 6.4. Storm Water Drainage

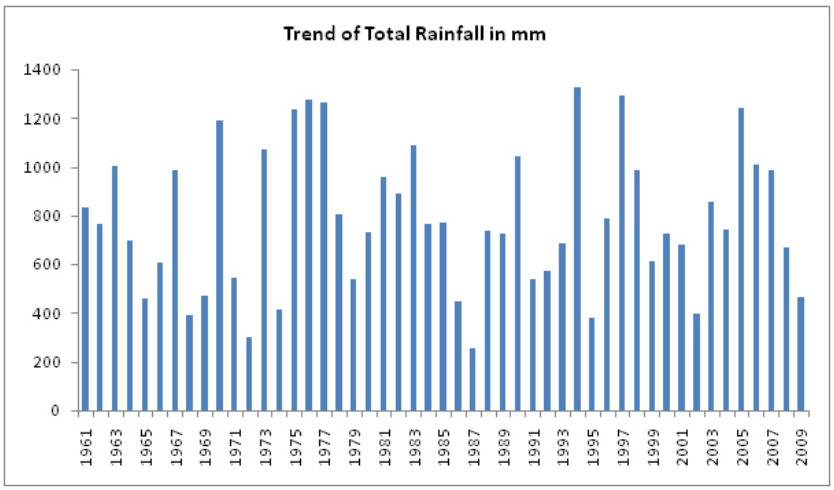
Ahmedabad has a separate system for sanitary sewers as well as storm water drains in AMC Area. Ahmedabad had built a total of 113 km of storm water drains by 1961 compared to a road length of 803 km which was later augmented at various stages. AMC added a mere 45 km of drains during 1961-71 which was further augmented by 71 km length of drains by 1981 amounting to a total of 229. At the turn of the century, AMC had a total of 290 km of drain length while the road length was 1,272 km. As of December 2011, the total length of storm water drains is reported by AMC as 731 km against road length of nearly 3000 kms.

**Rainfall Pattern in Ahmedabad**

The average annual rainfall is of the order of 740 mm. Most of the rain is in the months of June, July, August and September. The graph below shows the trend of rainfall in Ahmedabad since 1961.

With changes in climatic conditions, the number of days of rainfall has reduced, thereby increasing the load on existing storm water drainage system. Owing to this changing attribute, AMC's approach towards management of storm water is not based on coverage in proportion to road length. Instead, due to the topography of the city, it is based on number of flooding incidents and locations of frequent flooding spots. Based on the analysis of 25 years of flooding data, storm water drainage has been designed in accordance to handle local flooding.

**Figure 13 Rainfall trend in Ahmedabad since 1961**




Source: (CEPT_University, City Development Plan, Ahmedabad 2006-2012, 2006)

This remainder of this section analyses existing storm water drainage (SWD) services in Ahmedabad with specific issues as well gaps projected till 2021. This is followed by proposals under this CSP to fulfil any existing gaps as well as provide basic minimum services in SWD to the city for the future. This section is structure as below:

i. Existing SWD Network
ii. SWD Service in Slum Areas
iii. Water Logging
iv. Ongoing Initiatives and Past Initiatives taken by AMC
v. Existing and Projected Gaps, and Issues
vi. Proposals under this CSP for improving SWD Services

### 6.4.1. Existing Storm Water Drainage Network

The AMC has planned and implemented storm water collection and disposal system dividing into 6 zones. Total length of roads in AMC is 2976 km with 1484 km classified as major roads (30 feet and wider), while the length of storm water drains is 731.71 km. According to the SLB standards, storm water drains cover only 25 percent of the roads in the city. The deficiency in drain lengths increases the volume of storm water flow on roads surfaces. This eventually affects roads surfaces leading to increased maintenance. The storm water drains discharge the collected rain water into Sabarmati River at different locations. The details of storm water drains in AMC are as below:

**Figure 14 Lakes - Crucial for Storm Water Drainage**

Source: UMC

**Table 56 Details of Drainage Network in Ahmedabad**

| Zone Name | Drain Length in Km |
|---|---|
| North | 132.6 |
| South | 151.2 |
| East | 132.0 |
| West | 148.9 |
| Central | 48.8 |
| New west | 118.2 |
| **Total** | **731.7** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

### 6.4.2. Storm Water Drainage Service in Slum Areas

According to the bio metric slum survey conducted by AMC, about 60 percent of the households are covered by storm water drainage services. The table below gives a zone wise break up of coverage of slums by storm water drainage.

**Figure 15 Coverage of Storm Water Drainage Services in Slums**

| Zone | Number of HHs | Total HHs | HHs Covered | % of HHs Covered |
|---|---|---|---|---|
| North | Number | 17496 | 13,317 | 76% |
| South | Number | 45341 | 13,896 | 31% |
| East | Number | 10943 | 7,896 | 72% |
| West | Number | 45554 | 29,405 | 65% |
| Central | Number | 18817 | 11,539 | 61% |
| New west | Number | 44088 | 30,224 | 69% |
| **Total** | **Number** | **1,82,239** | **1,06,278** | **58%** |

Source: (AMC, Results of Bio metric survey of slums of Ahmedabad, 2011)

Most of the settlements that have been merged within the AMC limits had a natural lake. This was maintained by the village and which was fed by natural drains in the catchment areas. However, with rapid pace of urbanization and land development, this natural system has been disturbed leading to inundation of many areas during rainy season, while the lakes were deprived of their share of runoff water. AMC has undertaken lakes interlinking project in order to revive the lakes and integrated them in rain water management system. Details about the project have been provided in
.

### 6.4.3. Water Logging Problems

During last 2 decades, AMC is experiencing flooding during heavy rains, causing disturbance in normal civic life activities. With increased hard surfaces in the city, storm water percolation in the ground has reduced and has resulted in higher runoff putting additional strain on the storm water drainage system and causing localised water logging in various parts of the city. AMC has taken up provision of comprehensive network of SWD to prevent flooding. The incidents of water logging have been recorded and are presented in the table below:

**Table 57 Incidence of water logging in Ahmedabad, 2010-11**

| Zone Name | Unit | Incidents of flooding/ water logging |
|---|---|---|
| North | Number | 9 |
| South | Number | 5 |
| East | Number | 4 |
| West | Number | 3 |
| Central | Number | - |
| New west | Number | 15 |
| **Total** | **Number** | **36** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

### 6.4.4. Ongoing Initiatives and Works undertaken by AMC in the past

Storm water network has been provided along all the major roads as well as areas prone to water logging. As mentioned earlier, the approach of AMC is to eliminate flooding and hence, AMC manages storm water through effective management of water logging spots.

The network design of storm water drains in Ahmedabad has been carried out using automated softwares as the per the norms and standards for Storm Water Networks proposed by the CPHEEO, Ministry of Urban Development, Govt of India.

RCC Pipelines from 300 mm to 2000 mm diameter have been proposed as per detailed design requirements. For larger size above 2000 mm, RCC slab drains of different size were proposed.

Appurtenances such as, catch pits, curb inlet with catch basin, manholes are being implemented to effectively channelize the runoff into the storm network. Disposal of storm water is in River Sabarmati and in Kharicut Canal through gravity. The table below shows the lengths and cost of SWD under implementation (approved under JnNURM):

**Table 58 SWD Projects Implemented in Various Zones under JnNURM**

| Name of Zone | Cost (INR in crores) | Length (in km) |
|---|---|---|
| North Zone | 77.77 | 110.6 |
| East Zone | 45.06 | 76.5 |
| Central Zone | 3.51 | 2.0 |
| South Zone | 117.37 | 139.0 |
| West Zone | 59.14 | 79.3 |
| **Grand Total** | **302.85** | **407.4** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

**Figure 16 New Pipelines Laying**

Source: (AMC, 2011)

For the newly added New West Zone, 102 km of SWD work is under progress at a cost of INR 72 crore. As per AMC, the entire urbanised area of AMC has been covered by storm water drains effectively.

**Figure 17 Canal in New West Zone, Ahmedabad**

Source: UMC.

AMC has used the existing lakes in the city as intermediate storages which result in recharge of the ground aquifers and prevent further depletion of water table. A separate project for development of the lakes for beautification including increasing the capacity of the lakes for better Watershed Management is also under preparation by AMC.

### 6.4.5. Service Level Benchmarking and Gaps in Storm Water Drainage Services

Based on the infrastructural provisions and service delivery records maintained by AMC, the gaps in the same for storm water drainage services has been summarised below:

**Table 59 Service Level Benchmarking in Sewerage and Gaps in Service Delivery**

| Performance Indicator | Benchmark | 2011-12 (till Dec) |
|---|---|---|
| Road Length Covered by Drains | 100% | 24% |
| Incidents of water logging/ flooding | 0 | 36 |

Source: UMC.

Based on the SLB benchmark, Ahmedabad city needs to augment its storm water drainage network by 2,244 km. However, as AMC's approach is towards management of water logging spots, AMC needs to manage water logging at 36 locations in the city. Hence, as claimed by AMC, 100 percent of areas are covered by storm water drains, no augmentation of drain length is required.

**Projected Gaps**

In the coming years, as the city grows and new areas develop, AMC would need to provide storm water drains to these areas. AMC is observing incidents of water logging in the newly developed areas and would plan storm water drainage network in these areas to eliminate these spots. Hence, for the purpose of this CSP, projected gaps in of SWM in length cannot be quantified. Therefore, Based on the above methodology, quantitative gaps have not been computed in the table below:

**Table 60 Existing and Projected Incremental Gaps in Sewerage Services**

| Storm Water Drainage | | | 2011 | 2016 | 2021 | Unit |
|---|---|---|---|---|---|---|
| | Existing Demand | Existing Delivery | Gap | Gap | Gap | |
| SWD Network Length | 2,976 | 731 | -* | Projected gap for SWD can be quantified in the future based on water logging spots in areas as they develop | | Km |

*Note: * As per AMC, despite shortfalls in SWD network in comparison to road length, 100 percentage coverage has been provided in urbanised areas of AMC. Hence, the existing system is sufficient.*
*Population projections done by AMC (at 2016 and 2021 are 64.94 lakh and 75.73 lakh) have been adopted for projected gaps assessment.*

Source: UMC.

### 6.4.6. Issues in Storm Water Drainage Services

As storm water drainage is crucial in mitigating health hazards related to stagnation of water and other associated risks such as malaria, gastroenteritis, cholera, etc., AMC has been working towards improving the drainage system in Ahmedabad. AMC has collated data of the last 25 years data of water logging spots and accordingly the SWD improvements have been designed. Based on the analysis of the SWD system, the key issues identified in service delivery of storm water drainage are as follows:

- With climate change, the number of days of rainfall in Ahmedabad has reduced, thereby increasing the pressure on existing storm water drainage. Based on CPHEEO norms, the existing system is designed for rains upto 1 inch per hour.
- Slums coverage of storm water drainage services is only 58 percent.
- In some cases, water collection along the roads and railway tracks has been observed
- AMC claims, DPR has been prepared with the objective of managing local water logging and is sufficient for the city. However, drain lengths as per SLB and other benchmarks is highly inadequate.
- Although mandatory, enforcement of rain water harvesting is weak and building owners construct it for permission purposes only.
- It is reported that in many cases, due to unofficial linkages between sewerage and SWD, sewage is discharged through SWD in River Sabarmati (Tam, 2011).

**Figure 18 Water logged road in Ahmedabad, 2011**

Source: *Left:* (TNN, When it rains, it floods, 2011); *Centre & Right:* UMC

### 6.4.7. Proposals of City Sanitation Plan for Storm Water Drainage Services

AMC claims 100 percent city would be covered by SWD service in existing urbanised area upon completion of ongoing works. AMC's approach to SWD service for existing urbanised area is to eliminate local flooding and as per AMC, SLB benchmarks (and other benchmarks such as CPHEEO) do not apply for Ahmedabad owing to its unique system.

However, for new developments in the future, additional 1,071 km of road length would be required by the year 2021. As per CPHEEO guidelines, SWD drain length should be 130 percent of road length. Based on these norms, gaps in SWD network for 2021 have been computed in the table below:

**Table 61 Infrastructure Works Proposed under CSP for Improving Storm Water Drainage Services until 2021**

| S. No. | Description | Proposed Improvement | | Unit | Block Cost (INR in lakhs) |
|---|---|---|---|---|---|
| | | 2016 | 2021 | | |
| 1 | Construction of new SWD in future developments | Projected gap for SWD can be quantified in the future based on water logging spots in areas as they develop. Hence, future investment cannot be estimated as of today. | | | |
| | | | | **Total** | **-** |

In addition to infrastructural improvements shown above, the city needs other initiatives to improve SWD services in the city as listed below:

**Table 62 Studies and Programmes Proposed under CSP for Improving Storm Water Drainage Services until 2021**

| Component | Description | Quantity | Unit | Block Cost (INR in lakhs) |
|---|---|---|---|---|
| **DPR Preparation** | Preparation of DPR for implementation of SWD works proposed under this CSP | 1 | No. | 50.0 |
| **GIS Database preparation** | Preparation of GIS Database for SWD services under this CSP | 1 | No. | 50.0 |
| **IEC Campaign** | Storm Water Drainage and rain water harvesting related IEC campaign | Yearly activity for 9 years @ INR 70 lakhs per year | | 630.0 |
| **Training & Capacity Building** | TCB programme for Sanitation Department | Yearly activity for 9 years @ INR 70 lakhs per year | | 630.0 |
| | | **Total** | | **INR 1,360 lakhs** |

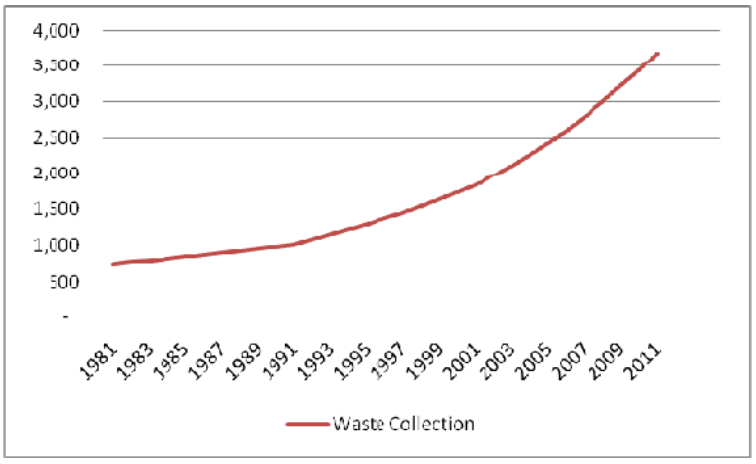
## 6.5. Solid Waste Management

This section conducts analysis of existing SWM services in Ahmedabad with specific issues as well gaps projected till 2021. This is followed by proposals under this CSP to fulfil any existing gaps as well as provide basic minimum services in sanitation to the city for the future. This section is structured as below:

i. MSW Generation
ii. MSW Collection & Segregation in the city
iii. MSW Transportation
iv. MSW Processing
v. MSW Disposal
vi. Staffing and Management
vii. New Initiatives of AMC in SWM Services
viii. Existing and Projected Gaps, and Issues
ix. Ongoing Initiatives and Proposals under this CSP for improving Sanitation Services

Over the years, municipal solid waste (MSW) has been increasing exponentially. AMC has been providing services to collect, transport, treat and dispose the same. Daily MSW collection in AMC has increased from a 750 MT to nearly 4000 MT in 2011. The graph below shows this growth:

**Figure 19 Daily MSW Collection in Ahmedabad since 1981**




Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

### 6.5.1. MSW Generation

A detailed break up of MSW generated by various categories of use is as follows:

**Table 63 Estimated Waste Generation in Ahmedabad**

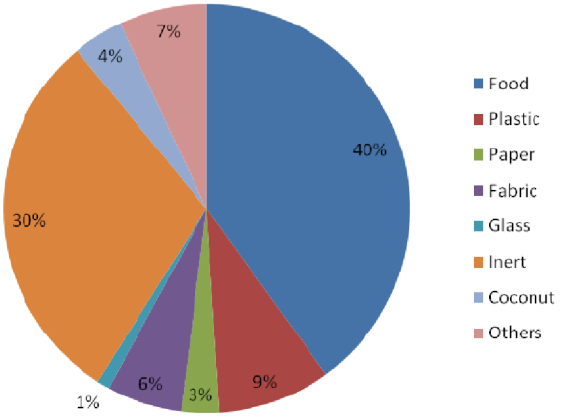
| Category | Unit | Waste Generated | Percentage* |
|---|---|---|---|
| Residential | Tons/ Month | 63,080 | 57 % |
| Street Sweeping | Tons/ Month | 26,561 | 24 % |
| Hotels' and restaurants' kitchen | Tons/ Month | 2,213 | 2 % |
| Special markets (e.g. veg. & non veg. markets, mandis) | Tons/ Month | NA | NA |
| Commercial establishments (incl. offices, institutions) | Tons/ Month | NA | NA |
| Other (C&D waste, etc.) | Tons/ Month | 18,814 | 17 % |
| **Total** | **Tons/ Month** | **110,667** | |
| *Note: * This percentage is based on percentage allocation to categories of waste prepared by AMC in 2009 for SLB data.* | | | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to May 2012, 2012)

Majority of waste is generated from households (57%), followed by 24% from street sweeping, while only 2 percent waste is generated by kitchens of hotels and restaurants. Details of waste generated by commercial establishments and special markets are not available. However, since household collection covers commercial establishments as well, it is assumed that the two categories are included in residential.

Samples tested at Pirana dumping site revealed high content of food waste – around 40 percent. As seen from domestic waste characterisation and samples from Pirana dump site, it presents a strong case for promoting segregation of wet waste at source and hence designing MSWM system for Ahmedabad to cater to segregated waste.

**Figure 20 Composition of Waste Reaching Pirana Dump Site (Feb 2010)**




Source: (Abellon, 2012)

### 6.5.2. Segregation of Waste

**Current Situation of MSW Segregation in Ahmedabad**

Two bins system has not been adopted by AMC and hence there is no segregation at source. AMC estimates that daily around 100 metric tons (MT) of dry recyclable valuable MSW is picked up by rag pickers in the city. MSW processing facilities have automated mechanical waste segregation process. In addition to this, AMC collects and transports waste from hotels' and restaurants' kitchens (1,495 MT), C&D waste (12,694 MT), dead animals & waste from slaughter house (216 MT) separately. Hence, considering the above wastes, around 13.4 percent of waste is collected and transported in segregated manner.

Once collected through Door/Gate to Dump system, MSW is transported to treatment plants or disposal sites directly without any manual handling and mixing of any other MSW.

**Table 64 Segregation of MSW**

| | | 2011 |
|---|---|---|
| Are two bins provided for MSW segregation (Yes/No) | | **No** |
| If Yes, Households provided two bins | Numbers | |
| Commercial establishment provided with two bins | Numbers | None |
| Is MSW collected in segregated form through D-T-D service (Yes/No) | | No |
| If yes, Quantity of segregated biodegradable waste collected from D-T-D service | Tons/ Month | |
| Is MSW transported in segregated form to Processing/Disposal facility (Yes/ No) | | No |
| If yes, Quantity of segregated MSW arriving at Processing/ Disposal facility | Tons/ Month | - |
| Quantity of MSW taken away by recyclers from intermediate points * | Tons/ Month | 100 |
| Is bulk MSW generated in the ULB is collected separately (Yes/ No) | | Yes |
| If yes, Quantity of bulk MSW collected separately | Tons/ Month | 14,405 |
| If data from above are not available, then | | |
| Quantity of MSW segregated as estimated by ULB | Tons/ Month | 13% |
| **Total MSW segregated in the ULB** | **Tons/ Month** | **14,505** |
| Note: * Estimated by SWM Department, AMC. MSW picked up waste pickers is usually for valuable dry recyclable. | | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

**Figure 21 Mixed H&K Waste Collection & Disposal is Open Dump**

*Note: (Left) Mixed MSW being dumped H&K waste; (Centre) Mixed waste being collected by H&K Van; (Right) H&K Waste being dumped in open and garbage (plastic) bags being manually scavenged by waste pickers.*

Source: UMC

### Informal & Unauthorised MSW Segregation

It has been observed on numerous instances where municipal/ contracted staff resorts to manual segregation of waste from container bins as well as municipal vehicles as illustrated in the figure below:

**Figure 22 Manual segregation from AMC vehicle and improvised storage for segregated waste**

Source: UMC

In addition to municipal/ contracted workers, waste pickers also manually segregate waste at various stages of transportation and processing in the municipal stream. Manual segregation in apartments and societies has been observed by societies' own staff to extract dry recyclable for selling to recyclers.

**Table 65 Stages of MSWM at which manual segregation takes place**

| Stage of MSWM | Segregation done by |
|---|---|
| Door step collection | Societies' own staff |
| Handing over to municipal van | Door/Gate to Dump collection staff |
| Transportation from Gate to Compactor (refer **Figure 22**) | Door/Gate to Dump collection staff |
| Secondary collection bins | Independent waste pickers |
| Open dumping site at Pirana | Independent waste pickers |

Source: UMC

As evident, manual segregation is prevalent at all stages of MSW management by societies' staff, municipal workers as well as independent waste pickers. The CPHEEO manual on municipal solid waste management recognises importance of segregation and hazardous nature of this practice. It further recommends formalising waste pickers into municipal stream with appropriate technology to incorporate them at any mechanised sorting facility being setup by the ULB or its contracted out agency.

> "In India, centralised sorting is not adopted. However, some intermediate sorting does occur after household wastes reach kerbside collection bins (*dhalaos*) through rag pickers. There is a need to formalise this intermediate sorting system or develop a centralised sorting facility to minimise recyclable materials reaching a waste processing facility or a landfill."
>
> (CPHEEO, 2000), *p 20*

### 6.5.3. Collection of Waste

Entire MSW generated in Ahmedabad is collected using various means including Door/Gate to Dump, street sweeping, direct collection of MSW from slaughter house, fish and meat markets, lifting of dead animals, hotels' and restaurants' kitchen MSW, construction waste and debris, etc.

**Figure 23 Various streams of collection of MSW in Ahmedabad**


Source: UMC

A breakup of MSW collected monthly from various zones under these categories has been provided below. As per the records maintained by AMC, total MSW collection peaks during December and hence December 2011 has been considered as the peak value for all related calculations.

**Table 66 Actual Waste Collected in Ahmedabad, December 2011**

| Category | Unit | Waste Collected | Percentage |
|---|---|---|---|
| Residential/D to D* | Tons/ Month | 26,622 | *24.5%* |
| From Municipal Bins (incl. Street Sweeping) | Tons/ Month | 56,018 | *51.7%* |
| Hotels' and restaurants' kitchen | Tons/ Month | 1,495 | *1.4%* |
| Dead Animals & Special markets (meat & fish markets) | Tons/ Month | 216 | *0.2%* |
| Commercial establishments* (incl. offices, institutions) | Tons/ Month | 11,409 | *10.5%* |
| Other (C&D, etc.) | Tons/ Month | 12,694 | *11.7%* |
| **Total** | **Tons/ Month** | **1,08,454** | |
| *Note: * Door to Door and Gate to Gate collection includes both residential as well as commercial establishments, it is assumed based on inputs from SWM department of AMC that 70 percent of this waste is residential while remaining is commercial.* | | | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

From the above table, it can be seen that nearly 52 percent of waste is being collected from municipal bins, which include street sweeping. Although, 100 percent of the city is covered by Door to Door or Gate to Gate collection, many households/ apartments/ associations/ commercial units are dumping waste in the municipal bins and not handing it over to the Door to Door/Gate to Gate collection vehicles. It has been observed that as the Door/Gate to Dump collection system is strengthening, the percentage of waste collected through street sweeping and municipal bins has been gradually reducing. The collection of MSW collected from municipal bins has reduced from 61 percent in March 2011 to 52 percent in December 2011.

**Table 67 Zone wise Type of MSW collected during December 2011**

| | CZ | WZ | NZ | EZ | SZ | NWZ | Total |
|---|---|---|---|---|---|---|---|
| Door/Gate to Dump | 7,458 | 5,480 | 7,370 | 5,591 | 5,632 | 6,469 | **37,999** |
| H&K MSW | 126 | 744 | 171 | 375 | 80 | 0 | **1,495** |
| C&D | 3,789 | 1,066 | 1,883 | 1,790 | 897 | 3,268 | **12,694** |
| MSW from Sec. Bins | 13,473 | 10,569 | 6,868 | 6,557 | 9,322 | 9,477 | **56,266** |
| **Total MSW Collected** | **24,846** | **17,859** | **16,293** | **14,313** | **15,931** | **19,213** | **108,454** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

The central and new west zones produce maximum MSW with a notably high construction and debris MSW collection. The reason for such high volume could be the minimal localised reuse of C&D waste in Central Zone and extensive construction activity in New West Zone resulting in increased collected by AMC as compared to other zones. During reconnaissance visits made by the team construction debris was found lying along roads or on vacant plots.

Under the present system of MSW collection from various streams, Door/Gate to Dump collection from residential areas is conducted during morning hours while collection from commercial establishments is done during morning and evening hours. The figure below shows the collection mechanism of residential, commercial and street sweeping streams.

**Figure 24 Collection mechanism of waste for residential, commercial establishments and street sweeping**


Source: UMC

Collection of H&K waste is conducted throughout the day with nearly 70 percent of such waste collected during the late night trip. Collection of C&D waste is based on calls by waste generators or as reported by field municipal staff.

## Door/Gate to Dump Collection in Residential Areas

Previous System

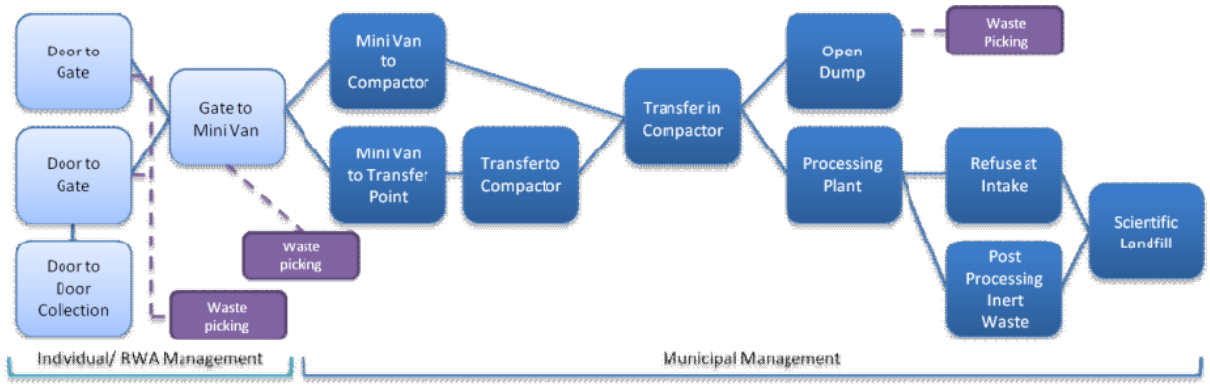
Until July 2010, AMC provided daily **Door to Door** collection of MSW on Public Private Partnership (PPP) through 1075 resident's welfare associations. Under this scheme, one part-time sweeper with a tricycle was employed by RWAs and AMC would pay INR 10 per household per month from where MSW was collected. The waste collected was then transported and deposited at the nearest secondary collection bins placed across the city.

Current System

Since July 2010, **Door/Gate to Dump** system was initiated by AMC whereby a private contractor appointed by AMC would collect waste from gates/ main entry point of societies using a closed body container mounted Euro III vehicles. During morning hours, waste from households (largely bio-degradable in nature) is used for composting. During evening hours, waste from commercial

establishments (largely dry waste) is used for producing eco-fuel. GPS enabled fleet was initially planned however, use of GPS has not been implemented.

**Figure 25 Existing Door/Gate to Dump Collection System Diagram for Residential Areas**




Source: UMC

In this new Door/Gate to Dump system, AMC vehicles collect MSW only from gates of societies and/or apartments, or at entry points (or last point accessible by mini-van) in case of slums and chawls. Therefore, in case of societies and apartments, it becomes the responsibility of the owners/ societies to collect waste from individual households and bring it to the society gate for collection by AMC vehicles. In case of slums, areas without residential societies/ associations or with defunct residential societies/ associations, it becomes the responsibility of individual households to carry the waste to the pre-defined collection point daily.

With these limitations, effectiveness of Door/Gate to Dump system has been in question and in many areas citizens are devoid of regular and timely collection of MSW. Residential areas where societies have employed workers for door to door collection, they have done so at their own expense which was earlier borne by AMC prior to this transfer of household level collection.

Since implementation of Door/Gate to Dump collection system, many residential societies and apartments have encroached over footpaths and road space outside their properties for storing garbage bins for collection. The same has been illustrated in the figure below.

**Figure 26 Storage of MSW on public footpaths and roads by residential societies and apartments**

Source: UMC

**Figure 27 Poorly designed bins and primary collection fleet creating operational difficulties for workers**

Source: UMC

## Door/Gate to Dump Collection in Slums

AMC provides solid waste management services in all slum areas of Ahmedabad as well. Most of the MSW generated in slums which is not collected through door/gate to dump system ends up on roads or at secondary collection points. As per AMC's Door/Gate to Dump collection system, AMC's vehicle collects waste from pre-defined location on the periphery or an easily accessible location within the slum at a fixed time. Households are expected to carry their MSW to the vehicle upon its arrival.

During field visits, it has been reported in many slums that collection vehicles skip visiting slums often. As many slums are spread over a large area, many slum dwellers do not come to know of the vehicle's arrival. Moreover, the timing of vehicle's arrival also varies significantly making it further difficult for slum households forcing them to deposit waste at secondary bins.

As per the records maintained by SWM department, all slum households are covered through the Door/Gate to Dump service. The table below shows a break up of zone-wise slum households served by AMC for MSW collection:

**Table 68 Coverage of SWM services in Slum areas of Ahmedabad (As per SWM Dept.)**

| Zone | Number of HHs | Total Slum HHs | Slum HHs Covered | % of Slum HHs Covered |
|---|---|---|---|---|
| North | Number | 17,496 | 17,496 | 100% |
| South | Number | 45,341 | 45,341 | 100% |
| East | Number | 10,943 | 10,943 | 100% |
| West | Number | 45,554 | 45,554 | 100% |
| Central | Number | 18,817 | 18,817 | 100% |
| New west | Number | 44,088 | 44,088 | - |
| | **Total** | **1,82,239** | **1,82,239** | |

Source: (AMC, Door to Door Waste Collection System, 2011)

Despite claims of 100 percent coverage, the effectiveness of Door/Gate to Dump collection system in slums of Ahmedabad is poor. During field visits to slums in various parts of the city, secondary collection points were found to be overflowing with garbage strewn around the bins attracting stray animals. Moreover, areas around public toilets were also found to be informal MSW collection points. The figure below shows the some such examples.

**Figure 28 MSW Collection Service in Slums - Secondary Bins & Public Toilets Strewn with Garbage**


Source: UMC

## Door/Gate to Dump Collection – Commercial Establishments

With introduction of Door/Gate to Dump system in 2010, AMC claims to cover 3,37,000 commercial establishments for collecting MSW. However, on ground many shop owners have complained of irregular collection of MSW. Many commercial areas are covered during morning hours prior to opening of shops. This forces the shop owners to deposit waste along the street and footpaths to be collected later. During a field visit to Relief Road, it was observed that many shops and complexes dumped waste on footpaths and roads as Door/Gate to Dump collection vans cover that particular stretch of road prior to opening of shops. In some cases, waste from shops is stored overnight outside the shops attracting stray animals.

As of December 2011, AMC manages waste collection from residential and commercial establishments in Ahmedabad using the Door/Gate to Dump process. A detailed breakup of waste collection in Ahmedabad by categories has been provided in the table below:

**Table 69 MSW Collection from Residential & Commercial Establishments through Door/Gate to Dump Collection System in December 2011**

| Category | No. of Units Covered | Waste Collected (Tons/ Month) | Percentage of Total |
|---|---|---|---|
| Residential Establishments | 12,50,000 | 26,622 | *24.5%* |
| Commercial Establishments (incl. offices, institutions) | 3,37,000 | 11,409 | *10.5%* |
| **Total MSW Collected by Door/Gate to Dump System** | **15,87,000** | **38,031** | ***35.1%*** |
| **Total Waste Collected by AMC** | | **1,08,454** | |
| *Note: Based on records maintained by AMC, total waste collection peaks in December; hence December has been used to compare generation vs. collection.* | | | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

Against a total generation of around 63,000 MT/month of MSW by residential and commercial establishments, only 38,031 MT/month (around 60 percent) is being collected through Door/Gate to Dump system. The remaining is either dumped at secondary collection bins or is deposited on street and footpaths and hence is picked up through street sweeping.

**Figure 29 Deposition of Waste by Commercial Establishments on footpaths and roads**

Source: UMC

## MSW Collection by Street Sweeping

Ahmedabad city has a total road length of around 3000 km as of 2011 and as the city grows, it is expected to increase to 5,500 km. AMC undertakes sweeping of all roads daily using a combination of road vacuum sweeping machines and more than 9,000 manual sweepers. The number of sweepers working with respect to the road length being swept is sufficient. Presently, road sweeping is undertaken in two time slots of 0630 hrs to 1130 hrs, and 1500 hrs to 1800 hrs.

**Table 70 Street Sweeping, 2011**

| Item | Unit | |
|---|---|---|
| Total road length covered by street sweeping | Kilometres | 2,976 |
| Number of sweepers' working shifts (Dec 2011) | Number | 9,672[9] |
| Frequency of street sweeping | No. times/day | 1 |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

In addition to road vacuum sweeping machines, AMC has M. S. Handcarts with provision to store 6 bins for manually collecting waste swept from the streets and public areas. The manual street sweeping staff is given the handcarts, brooms, uniform and other protective gear. However, during field visits it was observed that most of the sweepers do not use the protective gear provided to them complaining due to various reasons including poor design and quality of the gear, hindrance in performing their duties efficiently, unsuitable for a hot climate like Ahmedabad, etc.

**Figure 30 MSW Collection by Street Sweeping**

Source: *Left* – (SWM_Department-AMC, 2011); *Centre & Right* – UMC.

[9] A total of 7,751 permanent and 3841 part time sweepers work for street sweeping amounting to a total of 9,672 person days of work being undertaken.

In addition to sweeping roads and public areas, AMC also cleans around 1000 litter bins provided at various locations in the city (AMC, Door to Door Waste Collection System, 2011). However, many litter bins were found to be missing, broken or overfilled with litter. Moreover, due to absence of practice to putting garbage bags in litter bins, nearly all the litter bins were found to be extremely dirty as no regular cleaning or washing of these bins takes place.

**Table 71 Details of Litter Bins in Ahmedabad**

| Litter Bin related details | |
|---|---|
| Number of street bins installed | 1,000 |
| Areas served with street bins | Not available |
| Garbage bags placed inside street bins | No |
| Repair, maintenance cleaning/ washing schedule of bins | Not available |
| Adequacy of capacities of street bins at respective locations | Not Assessed |
| System of reporting of vandalised/ missing bins for replacement | Not available |
| Fine/Penalty for littering on streets/ public places | Yes |

**Figure 31 Litter bins placed at Kankaria** (left)**; Broken litter bin at Ashram Road** (right)

Source: UMC

MSW collected by street sweeping and from litter bins is deposited at secondary collection bins. The secondary collection bins are then transported using dumper placers to open dumping site at Pirana. During field visits, it was observed that the design of secondary collection bins makes it inconvenient for the sweepers to empty the small bins from the handcarts. Usually, the waste gets spilled over the workers.

The secondary collection sites usually become nuisance spots with garbage strewn around the bins attracting stray animals. The situation is worsened during monsoons as many secondary collection sites do not have hard paving or proper drainage outlet for rain water, or both. To counter hygiene issues, many cities usually disperse a mixture of lime and gammexane powder as a disinfectant without recognising the toxic effects of the same. Ms. Almitra Patel, Supreme Court Committee for Solid Waste Management has criticised this practice in an article, excerpt of which has been referred below:

> "There is now a Supreme Court order (in 1997 in WP 888/96) banning the use of all pesticides on urban garbage, either within the city or at the dumping-grounds. The material currently supplied as "lime" to cities, under the quality-suppressing pressures of the tender-system, is actually gypsum produced in factory effluent treatment plants while neutralizing their acid or alkaline wastes, and thus can contain traces of toxic chemicals or heavy metals, depending on the source."
>
> (Patel, 2003)

This practice has been stopped in Ahmedabad by AMC. Instead 'maltheon' which can be used without posing unreasonable risks to human health or the environment (EPA, 2008) is being used in Ahmedabad.

**Figure 32 Transfer of MSW from Street Sweeping into Compactor & Secondary Collection Bin**

Source: (AMC, Door to Door Waste Collection System, 2011)

AMC has a total of over 1,100 nuisance spots (AMC, Solid Waste Management & Conservancy Services, Presentation, 2011) while another document listing the secondary collection sites states a total of 900 spots. As per the higher estimate, out of 1,103 spots, only 866 sites have a secondary collection bins placed while the remaining 237 spots are open dumping nuisance spots. AMC has placed order to procure more bins in order to remove this deficiency.

**Table 72 Statement of Containers and Collection Sites**

| Total MSW Collection Sites | Existing No. of Containers | No. of Containers (Procurement order placed) | | Existing Container Collection Sites |
|---|---|---|---|---|
| | | 5 cu.m. | 7 cu.m. | |
| 1103 | 866 | 50 | 1716 | 597 |

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

As per detailed zone wise records, there are 900 nuisance spots with the newly merged New West Zone have more than half of such spots. The service provision in SWM was highly deficient in the erstwhile Nagar Palikas and Gram Panchayats of this zone and hence the high number of such spots.

**Table 73 Zone wise number of Nuisance Spots in Ahmedabad**

| Zone Name | Number of Nuisance Spots | % of total |
|---|---|---|
| Central | 46 | 10% |
| East | 79 | 18% |
| West | 57 | 13% |
| South | 88 | 20% |
| North | 40 | 9% |
| New West | 132 | 30% |
| **Total** | **442** | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

## Hotels' and Restaurants' Kitchen MSW Collection

Since 2007-08, AMC engaged private agencies for collection of hotels' and restaurants' kitchen MSW in Ahmedabad. A 5 year contract was finalised by AMC for 2 agencies to collect waste from 6 zones. As of December 2011, this system covered around 1,017 units out of a total of 2,300 units. The table below shows zone wise number of units present and covered under this system.

**Table 74 Zone wise number of Hotels & Restaurants covered by H&K Collection**

| | Central | East | North | South | West | New West | Total |
|---|---|---|---|---|---|---|---|
| Units Covered | 57 | 75 | 79 | 159 | 279 | 368 | 1017 |
| **Total Units** | **462** | **247** | **258** | **349** | **517** | **468** | **2301** |
| Coverage (%) | 12% | 30% | 31% | 46% | 54% | 79% | 44% |
| **Units Uncovered** | **405** | **172** | **179** | **190** | **238** | **100** | **1284** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

Central zone has minimum coverage of only 11 percent while having one of the highest numbers of hotels and restaurants. Coverage in New West Zones is highest as compared to the rest at near 80 percent. Apart from formal hotels and restaurants, there are numerous informal food stalls and hawkers which are not covered under this system.

In addition to the food stalls and hawkers, a lot of food waste is being generated at retail fruits and vegetables stores – both formal and informal. Such fruits and vegetable vendors are not covered under this system of collection.

**Figure 33 Collection by H&K Vans from Hotels & Restaurants**


Source: UMC

As per the contract, the agency responsible for collection approaches the hotels and restaurants and offers collection service based on rates fixed on the basis of average weight of H&K waste generated by the unit. It is the duty of hotels and restaurants to ensure only food waste to be deposited to H&K collection service while segregating dry waste for collection by Door/Gate to Dump system. Many hotels and restaurants choose not to avail services of this collection system, thereby disposing food waste in secondary collection bins or in Door/Gate to Dump system. There is no regulatory provision to ensure that a hotel or restaurant disposes food waste in a municipal or private recycle stream. As a result, around 40 percent of total waste dumped at Pirana contains food waste (refer Figure 20) generated by residences, fruit & vegetable vendors, food stalls, hawkers and hotels/ restaurants which do not avail H&K collection service.

The private agencies use a total of 4 vehicles for collecting waste from the units. The containerised fleet is used to avoid spillage of waste while transporting. On an average, around 3 persons including the driver undertake collection. Collection is undertaken mostly in 2 trips – one in the morning and one late at night. It was reported that by the ground staff that around 70 percent of H&K waste is collected during the evening shift as most of the waste is generated towards evening. Also, lesser traffic makes it easier to collect waste at late evening/ night.

Upon collection, the H&K MSW is transported to one of the processing plants for conversion of organic waste into compost.

### Construction and Demolition MSW Collection

Ahmedabad is a fast expanding city with significant construction activity taking place in all areas. As a result, the city generates around 19,000 MT of C&D waste every month constituting around 17 percent of total waste generation in Ahmedabad.

Of this 19,000 MT, only 12,600 MT of waste is collected by AMC while the remaining is either reused for local filling in and around construction sites or is illegally dumped along the roads, open areas and low lying areas. Collection of C&D waste is based on request calls from the waste generators. Apart from that, a few fixed locations in each zone have been designated at C&D waste secondary collection points from where AMC's C&D waste collection fleet collects the waste.

As per AMC's records, AMC runs a fleet of 117 vehicles with a total capacity of 366 MT per trip for collection and transportation of C&D waste. Out of these 117 vehicles, 40 are lorries/ trucks, 65 tractor trailers and 12 tipper trucks. Collection of C&D waste is done either in response to a request by generator of the waste or collection from pre-defined points in each zone.

In addition to AMC, private contractors are also providing collection services for C&D waste, especially in peripheral areas. Such waste collected by private contractors is used locally in as construction material for land filling.

**Table 75 Zone wise C&D MSW Collection (December 2011)**

| | CZ | WZ | NZ | EZ | SZ | NWZ | Total C&D MSW Collection | Unit |
|---|---|---|---|---|---|---|---|---|
| **Dec-11** | 3,789 | 1,066 | 1,883 | 1,790 | 897 | 3,268 | **12,694** | MT/Month |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

Maximum C&D MSW is collected from Central Zone closely followed by New West Zone. In New West Zone, a boom in the construction activity is the cause of high generation of C&D waste. Local consumption of C&D waste in construction/ landfilling is common in New West Zone while in Central Zone, local recycling of C&D waste in Landfilling or other construction activity is limited. Hence, there is little option for C&D waste generator other than requesting AMC to collect the same. In other zones, there is moderate construction activity and local consumption of C&D waste is common.

## MSW Collection from Slaughter House, Meat, Fish and Special Markets

Ahmedabad generates around 500 MT/month of waste from slaughter house, meat, fish and special markets. Ahmedabad has only one authorised slaughter house run by AMC in Central Zone. All meat is supplied in the city from this slaughter house. However, there are many other smaller unauthorised slaughter locations generating such MSW in and around the city.

AMC provides waste collection services from the only authorised slaughter house and from other AMC's meat markets only through a secondary collection point at such markets. There are many non-AMC meat and fish markets which are not covered by this service. The waste generated at such markets is disposed in either Door/Gate to Dump system or into secondary collection bins.

There is no dedicated service provided for collection of waste from fruits, vegetable and grains markets. Waste from these sources also finds way into the secondary collection bins.

For collection of waste from slaughter house, meat and fish markets, AMC has a fleet of 2 vehicles only. One van is used for collecting waste from fish market, while the other is used for collecting waste from mutton and beef market.

**Figure 34 Collection and Transportation of MSW from Fish Market**

Source: (SWM_Department-AMC, 2011)

During the field tracking of one of such vans starting from Teen Darwaza, it was revealed that the van did not have a closed body container for collection of waste. As a result, liquid waste (including blood) was found dripping from the vehicle while it was on the move. The staff used a tarpaulin cover over the van once it was fully loaded. The staff however was not using any appropriate protective gear while manually handling the waste and loading it into the van.

As many fish products come in thermocol boxes, large volume of such boxes were found at secondary collection point at fish market which were not picked up by the van and were burnt there itself. It was reported by the field staff that composting plant does not accept such boxes in the waste delivered to them, and hence the collection staff burns them at secondary collection points.

## Lifting of dead animals

Lifting of dead animals in Ahmadabad City area is done by AMC. Lifting of dead animals is undertaken against reports received about dead animals and from fixed locations in each zone on a daily basis. Mostly, dead animals are lifted manually and loaded into the vehicles but many times, street sweeping staff has to lift dead animals and place their bodies next to (and in many cases inside) the secondary collection bins.

In order to provide this service, the corporation has two dedicated vehicles working for 16 hours a day (2 shifts) managed by a team of 10 persons per vehicle. An order for 3 additional vehicles has been placed by AMC. AMC takes request at its control room based at Behrampura office and through AMC's website which has a section for 'Pale Depo' under complaints (refer Figure 60).

**Figure 35 Van for transporting dead animals**


Source: (SWM_Department-AMC, 2011)

### 6.5.4. Transportation of Waste

**Transportation of MSW Collected by Door/Gate to Dump System**

As discussed in the previous sections, AMC has contracted out Door/Gate collection of MSW to private agencies. Once the waste is collected from Door/ Gate using mini-vans, it is then transferred to compactors (10 and 12 MT) at depots, transfer station or along roads. The compactors then transport the waste to either open dump site at Pirana or to one of the processing plants.

In order to do so, the fleet maintained by various private agencies to carry out their services has been shown in the table below:

**Table 76 Zone wise Vehicular Fleet for Door/Gate to Dump Collection undertaken by Private Contractors**

| Zone | Mini Vans | | Compactor | | Zone wise Total |
|---|---|---|---|---|---|
| | Present | Spare | Present | Spare | |
| Central | 85 | 5 | 9 | 2 | 101 |
| North | 110 | 10 | 11 | 2 | 133 |
| West | 90 | 9 | 8 | 2 | 109 |
| New West | 109 | 10 | 10 | 2 | 131 |
| East | 80 | 10 | 7 | 3 | 100 |
| South | 80 | 9 | 7 | 6 | 102 |
| **Sub Total** | **554** | **53** | **52** | **17** | |
| **TOTAL** | | **607** | | **69** | **676** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

**Figure 36 Compactors in Line to dump MSW at open dumping site at Pirana**

Source: UMC.

**Transportation of MSW Collected Street Sweeping**

Once MSW is collected through street sweeping and from litter bins, the same is deposited in secondary collection bins. AMC has contracted out secondary collection bin lifting and transportation of the same to open dump site at Pirana partially. In addition to the bins, waste transportations from secondary collection sites without bins is also shared between AMC and private agencies. The fleet used by both AMC and private agencies for lifting and transportation of containers has been provided in the Table 77:

**Figure 37 Fleet for Transportation of MSW from Secondary Collection Bins**

Source: UMC

**Table 77 Responsibility for Zone wise Secondary Collection Sites & Containers lifting by Spot to Dump System**

| Zone | AMC | | Private Agency 01 | | Private Agency 02 | | Zone wise Total | |
|---|---|---|---|---|---|---|---|---|
| | Sites | Containers | Sites | Containers | Sites | Containers | **Sites** | **Containers** |
| Central | 10 | 16 | 64 | 109 | 0 | 0 | 74 | 125 |
| East | 101 | 112 | 52 | 69 | 0 | 0 | 153 | 181 |
| South | 91 | 108 | 48 | 71 | 0 | 0 | 139 | 179 |
| West | 23 | 24 | 0 | 0 | 121 | 159 | 144 | 183 |
| North | 65 | 79 | 0 | 0 | 43 | 59 | 108 | 138 |
| New West | 35 | 35 | 0 | 0 | 25 | 25 | 60 | 60 |
| **Total** | **325** | **374** | **164** | **249** | **189** | **243** | **678** | **866** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

## Transportation of Hotels' & Restaurants' Kitchen MSW

As the system of H&K MSW collection includes its transportation to processing plants, transportation details have already been covered for the same in previous sections.

## Transportation of Construction and Demolition MSW

As the system of C&D MSW collection includes its transportation to open dumping site at Pirana, transportation details have already been covered for the same in previous sections.

**Figure 38 Mechanised Fleet for Collection of C&D Waste**

Source: (SWM_Department-AMC, 2011)

## Transportation of MSW Collected from Slaughter House, Meat and Fish Markets

As the system of collection of waste from slaughter house, meat and fish markets includes transportation to processing plant, transportation details have already been covered for the same in previous sections.

## Transportation of MSW Collected by Lifting of Dead Animals

As the system of lifting dead animals includes its transportation to carcass dumping site near Gyaspur, transportation details have already been covered for the same in previous sections.

A summary of the total fleet maintained by AMC for carrying out the above functions has been provided in the table below:

**Table 78 Fleet and Capacity for Transportation of MSW, March 31, 2012**

| Type of Vehicle | No. of Vehicles |
|---|---|
| Tipper Truck | 40 |
| Dumper Placer | 105 |
| Skip Lifter | 11 |
| Refuse Compactor | 4 |
| Dead Animal Collection Van | 2 |
| JCB Machine | 17 |
| Bobcat Type Machine | 18 |
| Bull Dozer | 5 |
| Wheel Dozer Machine | 3 |
| Heavy Duty Loader | 3 |
| Excavator Machine | 4 |
| Truck Mounted Road Sweeping Machine | 2 |
| Tractor Mounted Road Sweeper Machine | 8 |
| Door/Gate to Dump Mini Van | 15 |

Source: (Central_Workshop-AMC, 2012)

## Transfer Stations

Six transfer stations are under planning in AMC with the objectives of savings in transportation cost, reduction in pollution and reducing contribution to traffic in the city. Transfer stations are being planned in five zones for handling 400 MT of MSW each. Eventually 12 stationary compactors, 60 containers (20 to 25 cu.m. capacity each) and 40 large hook loader vehicles would be required to transfer MSW from these stations to disposal site or treatment plants.

At present, one transfer station is functional but would be upgraded in the proposed scheme of zonal transfer stations. Work orders have been issued for five such transfer stations while one is in its tender stage. Operation and Maintenance (O&M) orders have been issued for 3 transfer stations.

**Figure 39 The only functional transfer station**

Source: UMC

Although the transfer stations are under various stages of planning and implementation, for the purposes of this master plan, they have been accounted as existing/ upcoming while computing future demand for the same.

**Figure 40 Equipment at Transfer Station - Stationary Compactor and Large Hook Loader Vehicle for Transfer Stations**

Source: (SWM_Department-AMC, 2011)

### 6.5.5. Processing of Waste

Ahmedabad has 2 operational MSW processing plants contracted out to private agencies. One of them converts MSW to compost while the other produces eco-fuel in the form of refuse derived fuel (RDF). Details of waste processed in Ahmedabad have been provided in this section below:

**Table 79 Summary of quantity of MSW processed**

| Details of MSW received at Processing/ Disposal Facilities | Unit | 2011 |
|---|---|---|
| Quantity of MSW received - Processing & Recycling Facilities | Tons/ Month | 10,763 |
| Direct disposal at dumping site | Tons/ Month | 97,591 |
| Quantity of MSW taken away by recyclers from intermediate points | Tons/ Month | 100 |
| **Total MSW received at Processing/ Disposal Facility & Recycled** | **Tons/ Month** | **1,08,454** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

Ahmedabad city processes 10,763 MT of MSW monthly through private agencies contracted for processing in the December 2011. An estimated 100 MT of MSW is picked up daily by rag pickers from secondary collection points and from open dumping site at Pirana. The table below provides details of existing and under construction processing facilities for MSW in Ahmedabad:

**Table 80 MSW Processing Installed Capacities and Actual MSW Received for Processing**

| | Unit | 2011 | |
|---|---|---|---|
| Does the ULB have any MSW processing facility | Yes/No | Yes | |
| Are daily logs of MSW intake at processing facilities available | Yes/No | Yes | |
| **Provide MSW processing facility details as under** | | **Installed Capacity** | **Current Operation** |
| Excel Industries | Tons/ Month | 15,000 | 4,875 |
| UPL Djai Power Ltd. | Tons/ Month | 7,500 | 5,888 |
| Creative Ecorecycle Port Pvt. Ltd. (I) * | Tons/ Month | 24,000 | - |
| Hanjer Biotech Energies Pvt. Ltd.* | Tons/ Month | 15,000 | - |
| **Total** | **Tons/ Month** | **61,500** | **10,763** |
| MSW collected by rag pickers for processing | Tons/ Month | | 100 |
| **Total MSW Processed in the ULB** | **Tons/ Month** | | **10,863** |
| Quantity of MSW rejected by processing facilities at intake point | Tons/ Month | | 2,166 |
| Quantity of post-processing rejects sent to dumpsite/ landfills | Tons/ Month | | |
| *Note: * Under construction, Creative Company's plant to be operational by January 2012 and Hanjer by March 2012.* | | | |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)

Details of existing and proposed MSW processing plants has been provided below:

i. **500 MT per day of Municipal Solid Waste is converted into bio manure by Excel Industries:** AMC has tied up with Excel Industries, Mumbai since 2000 for processing of 500 TPD of MSW daily to promote derivation of organic manure from MSW, reduce the quantity of MSW going to landfill site and to help agricultural production. For an input of 400 MT the plant recovers 75 MT of Compost per day by Microbial Composting. AMC has provided 25 acres of land for 15 years on a yearly rent of INR 1 per sqm. Currently, this processing plant is operating at 1/3$^{rd}$ of its installed capacity.

ii. **500 MT per day of MSW converted into RDF by UPL Djai Power Ltd. started since July, 2009:** The Corporation had awarded contract for setting up MSW to RDF Plant of 500 MT per day capacity on a 30 acre land given by the corporation to a private partner UPL DJAI Power Ltd. on a token lease rent for 25 years. This RDF is used in boilers as a substitute for coal, lignite, wood, oil etc. in industries. The plant has been operating since July 09, 2009. In March 2012, AMC revised the contract and with a reduction in capacity to 250 MT per day taking back 15 acres of land.

**Figure 41 MSW Processing Facilities at Excel Industries (left) and UPL Djai Power Ltd. (right)**

Source: (SWM_Department-AMC, 2011)

iii. **800 MT per day of MSW converted into Energy by Creative Ecorecycle Port Pvt. Ltd. (I) *(under implementation)*:** The plant is being set up on Financing, Building, Operating & Maintaining basis for production of Fuel Pellets / RPPWF and converts other organic MSW into Bio-organic Soil Enricher/ Organic Fertilizer from 800 MT per day of MSW. AMC has provided land of 25 acres on a token lease rent of INR 1/- per sqm for 30 years. This plant is expected to be operational in 2012-13.

iv. **Integrated Multi Product MSW Processing Plant by Hanjer Biotech Energies Pvt. Ltd. *(under implementation)*:** The Integrated Solid Waste Management Plant is being set up on Financing, Building, Operating & Maintaining for the Production of Integrated Multi Products like Organic Fertilizer, Fuel Pellets, RDF etc. from 500 MT per day of MSW. Land of 50,000 sqm on a token lease rent of INR 1/- per sqm for 30 years has been delineated. The company will treat all inert/ post process MSW coming out of Excel Ind. and UPL Djai Power Ltd., hence minimization of land filling further. This plant is expected to be operational by 2012-13.

v. **15 MT per day Proposed Processing Plant for Waste from Dead Animals**: In addition to the above, AMC has invited EOI for setting up of a plant for processing of capacity 15 MT per day of waste from dead animals. Details of the tender have been provided in Annexure 15.

vi. **Decentralised Bio-degradable Waste Processing**: AMC started this pilot in September 2011whereby daily garden, H&K waste and other green waste is converted into organic manure with the help of Organic Waste Converter (OWC) machines on a PPP mode. Each OWC machine of a capacity of 200 kg was installed for 60 days to test the idea. Registration of members was initiated with a credit point system whereby 30 percent of the waste deposited by members would be converted to organic manure and provided free of cost.

**Figure 42 Organic Waste Converter (50 kg Batch Size)**


Source: (AMC, 10 Initiatives taken by AMC for Solid Waste Management in Ahmedabad, 2012)

vii. **Augmentation of processing capacity by 1,500 to 2,500 MT per day by AMC**: AMC is planning augmentation of its processing capacity through private service providers. AMC is in the process of evaluating offers received for the same. After further negotiation, one or more service providers would be finalised out of the three shortlisted service providers.

viii. **500 MT per day Under Consideration Plant for Converting C&D Waste into Tiles and other Construction Material**: AMC has floated EOI inviting private agencies to setup a processing plant which can convert C&D waste into useful construction material like paver tiles.

Upon implementation of all of the above, combined installed capacity of all processing plants would be as follows:

**Table 81 MSW Processing Capacity - Existing, Under Implementation and Under Consideration**

| Processing Plant | Processing Type | Capacity (MT/Month) |
|---|---|---|
| **Existing** | | |
| Excel Industries Pvt. Ltd. | Organic Composting | 15,000 |
| UPL Djai Power Ltd. | Conversion to RDF | 7,500 |
| **Under Implementation** | | |
| **Creative Ecorecycle Port Pvt. Ltd. (I)** | Organic Composting & Fuel Pellets | 24,000 |
| Hanjer Biotech Energies Pvt. Ltd. | Organic Composting, Fuel Pellets, RDF | 15,000 |
| **Proposed/ Under Consideration** | | |
| For MSW from Dead Animals | - | 450 |
| Decentralised Bio-degradable Waste Processing | Organic Manure Conversion | 360 |
| Augmentation of Processing Capacity by AMC | Various | 45,000 to 75,000 |
| For C&D Waste | Conversion to paver tiles | 15,000 |
| **TOTAL** | | **120,000 to 150,000** |

Source: (AMC, Data provided by Ahmedabad Municipal Corporation during various meetings and discussions between Oct. 2011 to Feb 2012, 2012)