What Works
in water & sanitation

Case studies from urban Gujarat

Urban Management Centre

The Urban Management Centre (UMC) 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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PAS, a five-year action research project, has been initiated by CEPT University with funding from the Bill and Melinda Gates Foundation. PAS aims to develop better information on water and sanitation performance at the local level to be used to improve the financial viability, quality and reliability of services. It will use performance indicators and benchmarks on water and sanitation services in all the 400-plus urban areas of Gujarat and Maharashtra. UMC and the All India Institute of Local Self Governance are CEPT's project partners in Gujarat and Maharashtra, respectively. More details are available on www.pas.org.in.

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Contents

Case studies from municipalities 78

Abbreviations

APFC	Automatic Power Factor Correction		STP	Sewerage Treatment Plant
BOO	Build, Own, Operate		SWM	Solid Waste Management
CASP	Conventional Activated Sludge Process		TDS	Total Dissolved Solids
CBO	Community-Based Organization		TOC	Total Organic Carbon
CCC	City Civic Centre		TPD	Tons per Day
CDM	Clean Development Mechanism		TPM	Time, Place and Movement
CER	Certified Emission Reduction		UASB	Up-Flow Anaerobic Sludge Blanket Reactor
CFL	Compact Fluorescent Lamp		ULB	Urban Local Body
CISF	Central Industrial Security Force		UNFCC	United Nations Framework Convention on Climate Change
CPCB	Central Pollution Control Board		WDS	Water Distribution System
GEB	Gujarat Electricity Board		WTP	Water Treatment Plant
GIDC	Gujarat Industrial Development Corporation			
GoI	Government of India			
GSFC	Gujarat State Financial Corporation			
GUDC	Gujarat Urban Development Corporation			
HBEPL	Hanjer Biotech Energies Pvt. Ltd.			
HGV	Heavy Goods Vehicle			
HRD	Human Resource Development			
ICT	Information Communication Technology			
IEC	Information Education Communication			
LDP	Low Density Polypropylene			
LGV	Large Goods Vehicle			
LIC	Life Insurance Corporation			
MGD	Million Gallons per Day			
MGV	Medium Goods Vehicle			
MIS	Management Information System			
MLD	Million Litres per Day			
MNES	Ministry of Non-Conventional Energy Sources			
MSL	Mean Sea Level			
MSW	Municipal Solid Waste			
MWe	Megawatt electrical			
NGO	Non-Government Organization			
NOC	No-Objection Certificate			
NRV	Non-Return Valves			
O&M	Operation and Maintenance			
OWC	Organic Waste Convertor			
PAC	Poly Aluminium Chloride			
PPP	Public-Private Partnership			
RDF	Refuse-Derived Fuel			
SCADA	Supervisory Control and Data Acquisition System			

Glossary of terms

7/12 utaro	Survey record document
Bhavai	Popular folk theatre from Gujarat
Falia	Cluster of houses along a narrow lane
Kalash	A metal pot with a large base and small mouth often used in Hindu rites
Khani-pini	Street food market
Mitra Mandal	Community-based-groups of men
Naala	Open drain
Puja	Religious ritual performed by Hindus as an offering to various gods and godesses
Safai Karmachari/ Kamdaar	Sanitation staff
Sakhi Mandal	Community-based-groups of women
Swachchhta Mitras	Members of *sakha mandals*
Talao	Lake
Valmiki Samaj	Hindu community that is commonly involved in the sanitation sector
Vaalu	Leftover food collected from households at night

Introduction

It is realized that due to the rapidly changing urban environment, information exchange and communication among urban managers and continuing education are critically important tools for improving urban governance. Our experience of working with urban local bodies has shown that documentation of best practices and its transfer between peers is an effective mechanism for sharing innovations and towards improving the quality of life in their communities.

As part of the efforts to improve water and sanitation services in cities of Gujarat, there is an immense need for building the capacity of urban local bodies and supporting the development of skilled, professional city managers.

Teams from the Urban Management Centre have been visiting all 166 urban local bodies for data collection pertaining to water supply, sanitation (toilets and sewerage), solid waste management (SWM) and storm water drainage services.

After the first round of data collection in year 2009-10 (data for year 2008-09 was collected), the UMC team compiled the data and summarized indicator values in a tabular form for each urban local body. During interaction with ULB staff, the teams came across leading practices and innovations that cities have undertaken. All these practices were documented in a standard format and have been brought to the reader as a catalogue of ideas.

The objective is to promote such ideas, processes and practices through a wider readership for knowledge up-gradation and learning. Hopefully, this will develop insights and encourage replication of such strategies that lead to improved performance indicators in water and sanitation sector in ULBs.

UMC has worked with the basic understanding of the criteria for categorizing a practice as a 'Leading Practice'. We are not trying to sit in judgment, but we hope this kind of compilation will provide a ready reference for any City Manager to undertake innovations in his/her community. That is why we call it a catalogue. It is an album to choose from.

The catalogue deals with leading practices in water and sanitation sector as discussed above, and in a detailed format, friendly enough for busy city practitioners in the field.

Since any initiative is a dynamic process and constantly evolving, the documentation of urban innovation is a continuous process. What we are presenting in a catalogue is, so to speak, dated. One would be required to re-visit practices and understand how differences are brought about in the community. Also, one would need to engage in discussion with the community from time to time regarding how they have perceived these innovations and whether they find them acceptable.

This is the fifth such catalogue compiled by us. We have been documenting leading Practices since 1999. Such practices are then supported for their transfer to other cities ready for change.
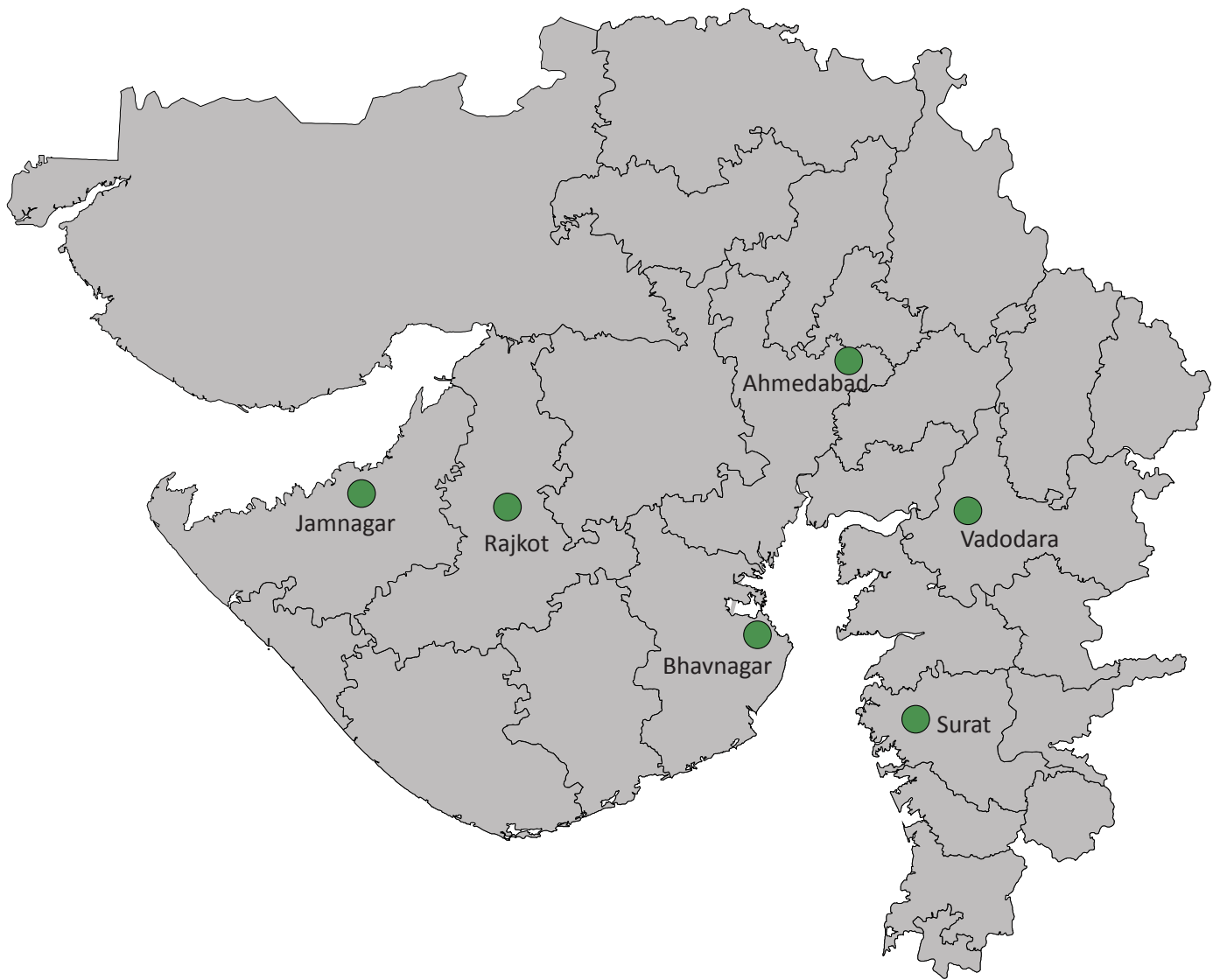
Case studies from

municipal corporations

Ahmedabad

Integrating waste-pickers into AMC's waste collection system
a pilot project by AMC with SEWA

Situation before the initiative

Waste-pickers play an important role in the waste recycling chain. The waste that is thrown around by citizens is picked and sorted by these waste-pickers. They sell this segregated waste to intermediate scrap-dealers who then transport waste to recycling units and industries.

Ramapir-no-Tekro, located in Vadaj area, is the largest slum in Ahmedabad. About 1.5 lakh families reside here who have migrated from neighbouring small towns of Gujarat like Patan, Mehsana, Kheda and neighbouring states of Rajasthan, Madhya Pradesh, etc. The slum comprises of numerous chawls and has very narrow lanes.

The narrow alleys and lanes created by the organic growth remained dirty as door-to-door collection service was not being provided by AMC. At present, most of the slums in Ahmedabad do not have any door-to-door collection system. Likewise, there were no waste collectors visiting the entire settlement of Ramapir-no-Tekro. The Municipal Corporation had assigned two persons to collect waste from all houses in a pedal rickshaw, but gradually it stopped. A few waste-pickers from the area used to collect waste from houses in order to get leftover (*vaalu*) food at night. But that was also not regular . There is a canal passing through the settlement which further drains into the Sabarmati River. This canal served as a receptacle of all the waste gathered by the slum, creating extremely filthy conditions. The clogging of the canal was a potential cause of flooding during monsoons. The entire settlement turned highly unhygienic and extremely filthy.

The organic settlement of Ramapir-no-Tekro is the largest slum in Ahmedabad housing 1.5 lakh families
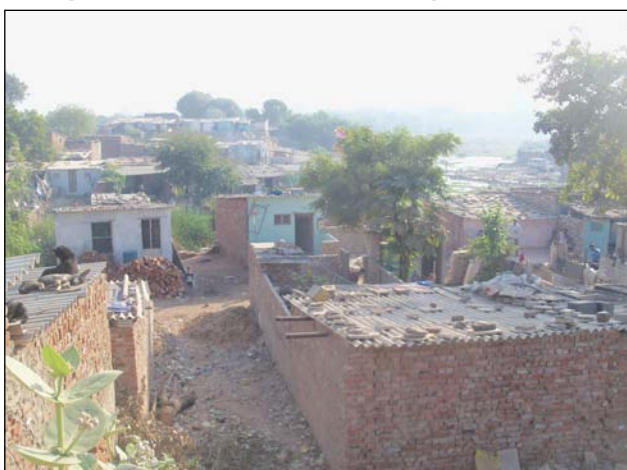
Initiative

Self Employed Women's Association (SEWA), a membership organization, supports and organizes women workers of informal sector within 12 states of India. After several rounds of meetings and constant discussion, the Ahmedabad Municipal Corporation (AMC) joined hands with SEWA to initiate a pilot for door-to-door waste collection work from slum settlements of Ramapir-no-Tekro in Vadaj area. Waste-picker members of SEWA from the area were assigned the task for the pilot project.

According to an estimate by SEWA, there are about 55,000 waste-pickers in Ahmedabad. SEWA has organized around 49,240 waste-pickers and cleaners in Ahmedabad. Waste-pickers are challenged by several issues, like:

- They have to work in unhealthy work conditions.

- They are prone to injuries and other health disorders.

- There is no fixed income.

- Women have to face discrimination and exploitation—even sexual exploitation.

- Children are also dragged into waste-picking which affects their health and education.

Inclusion of waste-pickers in the Urban Local Body's (ULB) waste collection system serves numerous benefits, such as:

- Providing dignity and fixed monthly income to waste-pickers.

- Assistance to the ULB in reaching out to households in narrow alleys and lanes through door-to-door system.

Prior to the inception, AMC asked SEWA to do a household survey in the slum settlement to find out total number of houses and the existing solid waste infrastructure in the settlements.

During the survey, the SEWA team also oriented the slum-dwellers to the new initiative. They also gave awareness messages of not throwing their waste in the open and to segregate wet and dry waste.

The SEWA survey revealed that there are 6,556 households in total in Ramapir-no-Tekro. SEWA divided the area into different "beats" and allotted work to 25 women waste-pickers with 2 supervisor women from the same slums. As the waste-picker women were not ready to leave their lanes and collect waste from other houses in the settlement, SEWA convinced and allotted them houses around their own houses.

SEWA imparted introductory training to these women members to maintain work hygiene and also provided aprons to the waste collection team. The waste collectors were trained to inculcate relationship with local households.

The waste collection is carried out between 8 am and 12 am. The women collect waste in the six container handcarts provided by AMC. If the lane is too narrow to enter with a handcart, two women go and collect waste in a plastic container. The slum area produces about 2.5 to 3 tons of waste everyday. The collected waste is later dumped into AMC's authorized contractor's waste container truck. The waste collection team of SEWA was made to understand the importance of imparting general awareness to residents about not throwing waste in the canal and to segregate and recycle waste.

These waste-picker women are organized under SEWA's Gitanjali Cooperative Society. Such grouping under a cooperative society provides them strength and confidence to carry out their work by eliminating the discrimination and exploitation they face as individuals. The women are paid Rs. 10 per household per month by the AMC for door-to-door collection of waste. Each member earns a minimum of about Rs. 2,500 per month through regular door-to-door waste collection. Besides, they segregate paper and plastic waste from the collected trash and sell it to scrap-dealers to fetch some extra money.

Results

After initial hesitation, the project received a good response from the slum-dwellers. Since the SEWA women visit the slum regularly, slum-dwellers have reduced throwing waste in the open to a substantial extent. The waste-picker women have asked slum households to collect a day's waste into a bin and give them the waste every morning. Now slum-dwellers wait for SEWA waste collectors to come and collect their waste. Some residents also want the government to initiate street-sweeping in the slum.

The initiative has also brought about positive changes in the lives of waste-picker women. These women now receive a fixed monthly income instead of living on a daily income from rag-picking. They also earn additional income from selling recyclables.

The project has made positive social, economic and environmental impacts with cleaner slum streets and a healthy environment.

Lessons learnt

Solid waste management practices can never be successful without people's participation. It is necessary to create general awareness among people as well as waste-pickers regarding cleanliness and importance of hygiene.

With increased privatization in the SWM sector, informal sector workers have been marginalized. Such initiatives will ensure that waste-pickers are brought into the mainstream and are formalized. It is important that these initiatives move beyond the pilot phase and are scaled up to achieve better systems at the city level.

Sustainability

Formalizing the involvement of waste-pickers in solid waste management in areas where it is difficult for ULBs to undertake door-to-door waste collection is not only environmentally sustainable, but has social and economical benefits. However, a proper operating and monitoring framework is required to link waste-pickers to the solid waste management system of a city to make such initiatives sustainable in the long run. Waste-pickers should be supported by a registered body to encourage them to stay in mainstream systems as well as to gain people's trust in them.

Transferability

This kind of project offers a good opportunity to mainstream waste-pickers into the solid waste management system. It can also provide door-to-door waste collection and street-sweeping services in slums which are neglected most of the times. An ULB can also allot street-sweeping work to waste-pickers along with door-to-door collection to provide efficient services.

AMC is planning to replicate the service in other parts of Ahmedabad.

The initiative has brought about positive changes in the lives of waste-picker women

Meenaben, residing in Ramapir-no-Tekro for the last 10 years, now does not have to walk to the *naala* daily to throw waste.

*"We polluted the naala, as there was no provision for our waste. We cannot keep the waste at our doorstep. Now our doorsteps and outside streets are clean, which really makes for a positive healthy environmen*t" she says. She is expecting these women to collect waste regularly.

Another resident, **Anitaben**, a sole earner in the family, is quite happy with this initiative as it saves her and her daughter time. Earlier, they used to go and throw waste into the canal two to three times a day. Now Anitaben can pay attention to her daughter's education and health. She hopes that now that her daughter does not have to engage in the daily chore, she will be able to pay attention to her studies.

Lalitaben, aged 30, a waste-picker, was merrily dancing when she got her salary of Rs. 4000/- at the end of one month. She stays in the Ramapir-no-Tekro slum and has been a 'paper picker' for the last 15 years. She used to earn up to Rs. 60-90 per day but waste picking did not ensure her a regular income. With the door-to-door collection work, she collects waste from 400 houses. She is really happy with this permanence. She says she has never in her life earned this amount of money at one go. She says, *"This work gives me the feeling of assurance, which we all want in our lives. The first thing I will do is to get monthly groceries, which is definitely cheaper then buying it every single day, in retail"*.

Premilaben is a widow and has 3 sons who all live separately. For the last 15 years she has been staying alone in the Ramapir-no-Tekro slum. She used to collect waste from houses and roads, with the sole intention of getting free meals at night from slum residents. With door-to-door collection work, she is now eating, working and living with dignity. She is also able to save some money for her old age. She earns around Rs. 2500/- per month. This work has given her the biggest security and a means to cover food and medical expenses.

Decentralized composting plant in Ahmedabad

a pilot project by AMC

Situation before the initiative

Every large city is challenged by the issue of efficient waste management. Although many cities have improved upon primary and secondary collection, waste treatment and disposal remains a hurdle. Over the years, many 'Waste to Energy' plants have failed due to high content of organic waste in Indian waste. In the absence of wet and dry waste segregation, a substantial amount of organic waste which could otherwise be recycled and composted goes to garbage dumping sites. Ahmedabad is no different. The city produces about 3,800 tons of solid waste everyday out of which almost 50 percent is organic/wet waste from households, hotels and kitchens, public places, etc., which is dumped at waste disposal sites. This includes food waste, animal waste, garden waste, bio-sludge, flowers from religious places, etc. Such waste is also often strewn on streets, around waste containers, in abandoned sites, or in drainage lines. This results in unhygienic and unsanitary conditions in the vicinity, foul odour and breeding of germs and insects.

Organic Waste Converter (OWC) machine

Initiative

Ahmedabad Municipal Corporation (AMC) has prepared a master plan for making Ahmedabad a 'Zero Waste City' by the year 2031. Responding to a proposal by Gujarat Consumer Industries (GCI) Ltd. AMC approved to install and run an Organic Waste Converter (OWC) machine (by Excel Industries Ltd.) to make organic compost out of wet waste on a pilot basis for two months in 2012.

AMC provided a site and three-phase electricity power connection at Law Garden to install a 200 kg/day capacity OWC machine with a shredder machine to make compost out of wet waste.

The pilot project was initiated on 29th September, 2011, and continued to operate till 20th April, 2012. AMC made arrangements to deliver green waste as well as hotel & kitchen waste generated from nearby areas to OWC's site at Law Garden. Sahara Public Health Organization, AMC's authorized contractor for the collection of hotel & kitchen waste, delivered about 200 kg food waste daily from nearby hotels and restaurants to this site, instead of transferring it to the garbage dumping site at Pirana. Garden waste generated from Law Garden was also brought here. The owners of fast-food joints from nearby '*Khani-Pini* Bazaar' (food stalls) who earlier dumped their food waste in a community bin every night now sent it to the OWC.

The OWC machine requires an area of 3 x 4 meter for installation. Besides, an open space of about 3.3 X 4.5m is needed to keep the raw compost in curing system racks. As the machine and the system are easy to operate, there is no requirement of specially skilled staff to run the system. Some basic training is given to AMC staff to operate the system and to follow the process to make mature compost out of organic waste.

Compost curing system racks

Process of 'Garbage to Garden'— the OWC system

- First of all, organic waste is put into the OWC machine with dry compost and an appropriate amount of bio-culum. Segregated organic waste is bio-mechanically treated in the OWC machine. It homogenizes organic waste with appropriate bio-culture/bio-culum and organic media to absorb moisture from the wet waste. Coarse waste such as garden pruning, bones, etc are shredded using a shredder machine prior to feeding into the OWC machine. The output from the OWC machine is raw compost with an uniform-coloured soil structured coarse powder that is free of bad odour. The leachate is controlled during homogenization process in OWC. The OWC operates in batch cycle of about 15-20 minutes to make raw compost out of organic waste. The waste treated in OWC machine accelerates the composting cycle.

- The raw compost generated from the OWC machine is then placed into a compost curing system in racks where moisture is controlled using a fogging system as per predetermined timing. The raw compost is converted into matured compost after about 10 to 15 days of curing.

- About 35- to 45 percent of manure is generated from total amount of wet waste.

- The matured compost can be utilized for decorative plants, backyard kitchen gardening or for 'green initiatives' such as eco-hotels, eco-housing, eco-townships etc., or for urban landscaping, social forestry, bio-energy plantation, etc., as part of Corporate Social Responsibility (CSR) initiatives. It can also be used as compost for field crops.

Eco Club Initiative

AMC's Health & Solid Waste Management Committee and Recreational, Cultural & Heritage Committee also decided to start an Eco Club at Law Garden to involve more citizens. The project was started in a Public-Private Partnership (PPP) mode in which they offered to convert daily garden, kitchen and other green waste into organic manure using an OWC machine.

Main features of the Eco Club:

- Timing of the Eco Club activities was from 8 to 10 in the morning and 4 to 6 in the evening (including Sunday).

- Registered members were required to bring their green waste to the site for which they were given credit points.

- The green waste received yielded about 30 percent organic manure.

- This organic manure was returned to members of the club free of cost in the proportion of green waste received by them. For example, they were provided 3 kg manure in return for 9 kg green waste.

- The green waste and manure weighing was done through an electronic weighing scale.

- The organic manure was given to members in 900-gram packs in biodegradable bags.

This initiative received good response from citizens and about 100 people joined the club. AMC also distributed information leaflets in the area around the garden.

Results

- The initiative proved to be a quick waste disposal solution for green waste.

- The OWC machine is easy to operate; the process is fast, taking very little space and is appropriate for households, industrial canteens, restaurants, temples, markets and large housing complexes.

- Decentralized composting reduces transportation cost of wet garbage to waste disposal sites.

- The system is a probable solution to unnecessary waste accumulation at waste dumping sites.

- The initiative helped maintain hygiene and a cleaner, greener and healthier environment.

- The cost of manure generation is very nominal, about one and a half rupees per kg for converting 200 kg of wet waste in a day (as per 2012 rates).

Banner informing about the Eco Club

Lessons learnt

The implementation of such a project in PPP mode requires better coordination and cooperation between associated departments and organizations. Such initiatives are more successful if awareness among local citizens to recycle their green and wet waste is generated and encouraged.

Sustainability

The initiative is economically and environmentally sustainable as it saves transportation cost and also contributes to a better environment. Better coordination and communication can lead to sustainable as well as successful implementation of the project. A waste cycle should be created for regular delivery of wet waste at OWC site for the long-term sustainability of the project.

Transferability

GCI and Excel Industries are in discussion with AMC to scale up the initiative in all major wards of Ahmedabad. The technology is also being used by Bhavnagar Municipal Corporation to process a large amount of organic waste generated from the main vegetable market. This initiative can be replicated in any ULB for the effective treatment of green waste.

Information, education and communication campaign for solid waste management

Situation before the initiative

The city of Ahmedabad generates approximately 3800 Metric Tons (MT) of solid waste per day. To keep the city clean, Ahmedabad Municipal Corporation's (AMC) Solid Waste Management (SWM) department has undertaken a variety of initiatives—improved waste collection methods, better organization of street-sweeping and garbage collection, modernization and the up-gradation of garbage processing plants, maintenance of public sanitary services, law enforcement through mobile courts, etc. Service Level Benchmark (SLB) indicators for Ahmedabad reflect a high degree of collection, proper transportation and moderate treatment facilities. With increasing population in the city, it is difficult for local governing bodies to communicate their message to citizens. Disseminating the message of solid-waste-management-related services is essential and creating awareness a necessity. To ensure the participation of citizens and to create awareness among citizens for solid waste management, AMC undertook an information, education and communication (IEC) campaign in the year 2012.

Initiative

AMC pioneered Information, Education and Communication (IEC) activities to aid the SWM department to create awareness among citizens about cleanliness, waste collection, treatment, disposal and sanitary measures. AMC's objectives in introducing IEC into its 'Clean and Green Ahmedabad' campaign was to create awareness and make all sections of society—individuals, citizen groups, associations, NGOs, industries, communities—feel responsible for the management of solid waste.

AMC collaborated with local organizations for the design, implementation and dissemination of communication activities like making short films, publicity of AMC's endeavours through advertisements in newspapers, information pamphlets, banners and hoardings, use of folk theatre to create awareness, training programs in schools and colleges and showing short films in movie theatres. All communication was designed using classification of the targeted audience. Procurement of IEC services was advised by CEPT University. The Urban Management Centre(UMC) and Theatre and Media Centre (TMC) designed all the communication material for various age groups and various localities of the city. Het Graphics printed the material and dissemination was done by Aayush Foundation.

Mascot
A special mascot was designed by the Urban Management Centre for AMC's IEC campaign to create a brand identity and facilitate the easy recollection of information and communication provided by AMC's SWM department. AMC chose the earthworm (in Gujarati "Alasiyalal") as a mascot to bind together IEC's various aspects. The mascot assumes new "avatars" for specific festivals or occasions.

School Trainings
AMC and UMC understands that children, the future of our cities, are the best source and means through whom we can communicate a message to a wider audience. Whatever children learn, they are likely to carry back to their homes, friends and society. The IEC initiative focused on making school children aware about solid waste and its disposal related issues.

AMC disseminates information about its cleanliness initiative among school children through training programs. For this, they have hired trained individuals who visit various schools with pre-designed training tools. Children are shown a short film (in Gujarati or English), engaged in interactive lectures on the importance of solid waste management and thereafter involved in games to reinforce messages conveyed during the program. Teachers are given training kits containing information about the objectives of the 'Information Education Communication' endeavour undertaken by AMC and the need to create awareness among children of age 10 years and above. Each kit contains a CD with an audio-video presentation on solid waste management, various games to help children recapitulate their learning, a list of do's and don'ts while disposing of garbage, and different project ideas that can be undertaken and completed by children of all ages.

Mascot for AMC's IEC campaign on SWM

The publicity van with awareness messages

Theatre Slides

AMC and UMC chose the concept of designing theatre slides to reach out to masses through cinema theatres. Amdavadis are movie lovers and theatres rarely go empty—to utilize this medium, theatre slides in three languages (English, Gujarati and Hindi) have been designed and developed for dissemination in movie theatres and multiplexes before or during movie intervals. The duration of each short film is approximately 10 seconds. The slides address issues like littering, reducing use of plastics especially as carrying bags for shopping, encouraging recycling and general information about solid waste management. The slide shows are also displayed on LEDs at traffic islands at prominent junctions in the city.

Films

Short films of about 3 minutes in duration in English, Gujarati and Hindi have been prepared by UMC-TMC for specifically targeted audiences, such as households, children, commercial and institutional establishments and slums. These films use popular Gujarati lyrics and song styles, and local celebrities to attract citizens' attention and heighten the film's recollection value.

Street Plays

Folk art is an important part of any society's cultural fabric and AMC has tapped this medium to create awareness in society. *Bhavai* and street plays have been scripted with special focus on sharing messages on the health impact of waste management, littering, storage of waste in dustbins at household and institutional premises, cooperation with AMC *safai karmacharis*, fines to be levied by AMC, etc. Folk artists regularly perform *bhavai* and street plays in select areas for their maximum impact.

Pamphlets

AMC has sanctioned the design and dissemination of pamphlets for distribution among common population. These pamphlets are designed with specifications as per type of waste, its disposal methods and related details.

School children at a training program on SWM

An awareness rally organized by students of Don Bosco English School

A Bhavai performance to create awareness

Publicity Van

AMC has organized a tableau designed by Het Graphics covered with posters of the 'Clean and Green Ahmedabad' campaign. The tableau, containing a battery-operated television set, was parked at prefixed spots in prominent areas in the city showing a short awareness film. The crowd that gathered was also given pamphlets about SWM and awareness talks by the campaigner and volunteers.

Monitoring and Evaluation

AMC and UMC also monitor IEC activities at regular intervals. Group discussions were conducted among selected citizen groups. AMC and UMC also monitor and evaluate the efficacy of street plays, *bhavais*, school training schedules, theatre slide shows and other IEC activities.

Results

- AMC's SWM IEC campaign initiative has helped in creating awareness among citizens and in their daily practice of solid waste disposal through the use of effective means of communication.

- Constant feedback and monitoring conducted by CEPT and UMC teams has helped AMC understand the satisfaction level of citizens, especially slum residents.

- The local body has understood the urgent need for segregation of waste disposal at its source and the need to disseminate awareness regarding such practice to citizens.

- AMC has been advised of the need for community waste bins with better design that allows for easy access and also prevents littering by animals.

- Need to understand and make arrangements for e-waste collection and disposal, a growing concern in the city of Ahmedabad given its large urban population.

- Monitoring and feedback survey after the campaign shows that citizens appreciate AMC's decision to use street theatre with songs to spread awareness about solid waste management. Training and awareness programs at schools have proven to be successful—several schools have taken up projects to create clean environments in the areas surrounding schools. Many schools were encouraged to conduct awareness rallies on their own.

Lessons learnt

Monitoring agencies developed feedback forms to capture the response and receptiveness of citizens to the IEC campaign. Citizens' interviews and surveys were conducted in several locations across the city—the interviews covered all targeted groups belonging to different sections of society.

Sustainability

Feedback and monitoring are the most important aspects of the IEC campaign. Constant evaluation and action is required to understand the receptiveness of the citizens and modify redesign and work accordingly on further programs for it to be more effective.

Transferability

The IEC campaign is a successful venture generating awareness and participation among citizens regarding the best method for their solid waste disposal in order to keep the city clean and green. This initiative can be undertaken by other cities if they follow a proper and organized structure.

Awareness drives are an essential component for ensuring success in any public service delivery program. Citizens have to be made aware of their roles and responsibilities in the area of waste management. Communication material generated has to be in a local language and as per local contexts.

Kalash bins for *puja* waste disposal

The city of Ahmedabad is built around the Sabarmati River, one of the biggest rivers in North Gujarat. As a part of its drive to make Ahmedabad a 'Clean and Green' city, the Ahmedabad Municipal Corporation undertook the responsibility of cleaning the river of pollutants and waste. Moreover, with the Sabarmati River Front Development Project in the heart of the city, it was essential to maintain the cleanliness of the river.

One of the main pollutants in the Sabarmati is the *puja* leftover. Citizens usually dump waste produced during puja and other religious rituals into the waters of river Sabarmati. Most Hindu rituals require the material used in various rituals to be disposed in a water body. Respecting the religious sentiments of people, AMC decided to set up specially designed bins exclusively for *puja* leftover.

Known as '*kalash*' bins, these waste bins are shaped like small pots used during religious ceremonies and are made of fibre. AMC placed two *kalash* bins on Sardar Bridge as part of a pilot project. AMC staff monitored the usage of these bins and noticed a large number of citizens used the bins instead of throwing the waste into the river. Following the positive feedback, AMC has placed 12 *kalash* bins on four bridges—Sardar Bridge, Nehru Bridge, Gandhi Bridge, and RTO Bridge. Each bridge has two to four bins each. The *kalash* bins are emptied four to five times a day; the waste is collected in mini tractors that take the waste to the composting unit set up by Excel Industries Ltd.

As per AMC reports, the *kalash* bins have served their purpose and the amount of religious waste thrown into the water area beneath these bridges has reduced to a great extent.

A *kalash* bin on one of the city bridges to dispose *puja* waste
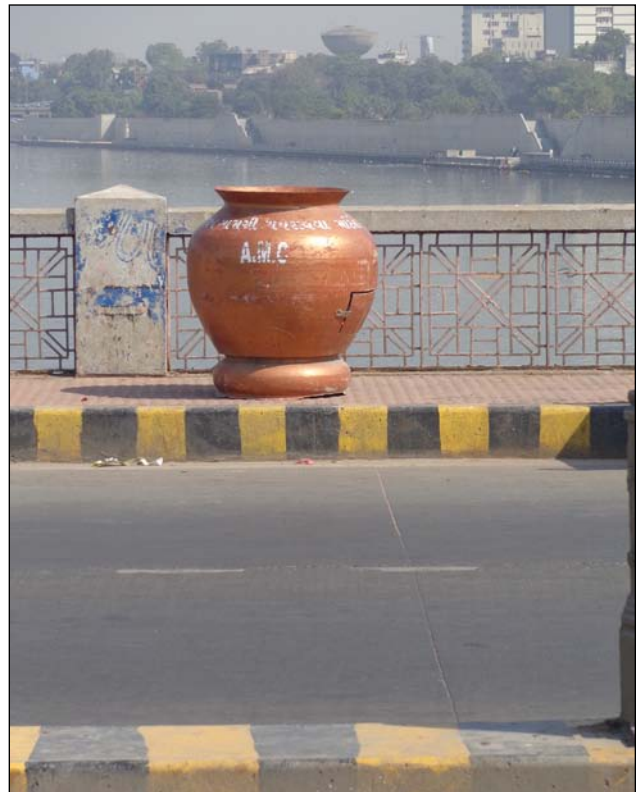
Conducting a tree census

Situation before the initiative

Adequate tree cover is an important indicator of any city's green health. Trees are like lungs that filter out the polluted air from our planet. To understand the amount of green cover of the city, a tree census can provide the vital details of city's green species, i.e., number of trees, increase or decrease in number of trees, area-wise density/proportion of trees, total biomass (a measurement of carbon storage in the city to know impacts of climate change) of the trees in the city, etc.

Earlier in 2005-06, the Forest Department of Gujarat had conducted a random tree-counting survey in Ahmedabad. This exercise provided ward-wise number of trees and species of trees in Ahmedabad. For the first time, Ahmedabad Municipal Corporation (AMC) decided to conduct a full-fledged tree census to measure the proportion of green cover in Ahmedabad.

Initiative

Generally tree census activity comes under the purview of the Forest Department, but due to inadequate workforce to cover large areas of Ahmedabad, it was not possible for the Department to carry out such a huge task single-handedly. Thus, with an aim to measure the city's green cover and to get an accurate idea of natural diversity in Ahmedabad, AMC took this initiative and joined hands with the State Forest Department to conduct a tree census in Ahmedabad in association with the Botany Department of Gujarat University and the Municipal School Board. The Army also agreed to facilitate carrying out a tree census in the Army Cantonment premises. While technical assistance was provided by the Forest Department, the Municipal School Board and Gujarat University's Botany Department provided human resources for data collection.

Volunteers marking trees during the tree census
(photo courtesy AMC)

A volunteer measuring a tree trunk during tree census
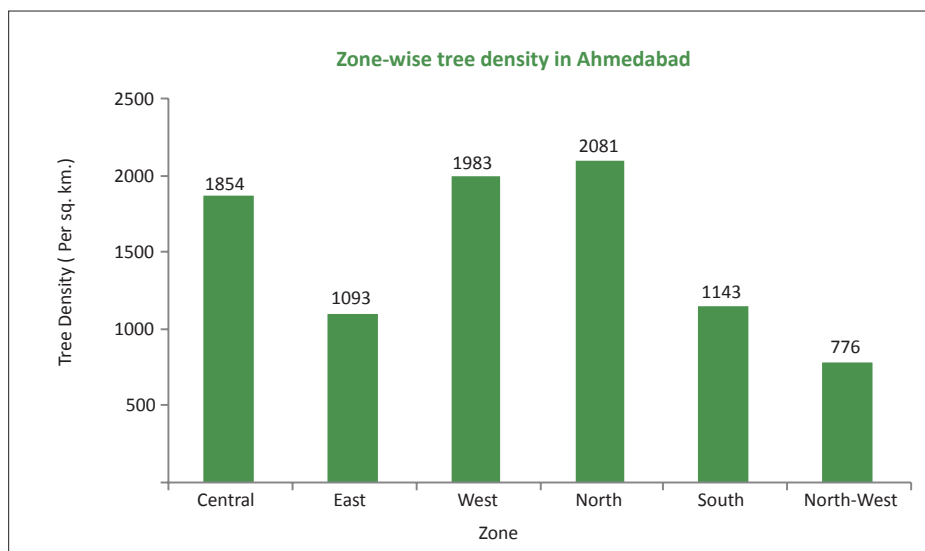(photo courtesy AMC)

Zone-wise tree density in Ahmedabad

Zone-wise tree density in Ahmedabad

Zone	Tree Density (Per sq. km.)
Central	1854
East	1093
West	1983
North	2081
South	1143
North-West	776

The task of data collection for conducting the tree census was carried out every Sunday in February 2012. To make the task easy, the city was divided into 153 blocks, 70 dense green patches and the Army cantonment area based on geographical area and their greenery. AMC also generated 64 ward-wise green images with the help of Bhaskaracharya Institute for Space Applications and Geo-informatics (BISAG) and Google imagery. To ease the process of data collection and analysis, the areas were further segregated into 4 categories—residential areas, industrial areas, educational institutions and open plots and areas under AMC.

A team consisting of one tree expert, one coordinator and four to six tree volunteers was formed for each block. Teachers and students of 8th grade of municipal schools worked as team coordinators and tree volunteers respectively, while graduate and post-graduate students of Gujarat University's Botany Department were assigned the responsibility as tree experts. The State Forest Department had formed 35 separate teams to carry out tree census in 70 dense green patches of the city. A total of 1710 persons were roped in for conducting this exercise. It is essential to correctly identify a tree while conducting a tree census and thus a pictorial guideline was prepared with names and pictures of the trees. These pictorial guidelines were given to the volunteers.

AMC also organized a one-day training programme for tree census volunteers. The volunteers were given training in how to identify various trees from their components. They were also trained to measure the diameter of tree trunks. A criterion was decided that, at the minimum, 4.5 ft height and more than 3.9 inches girth of trunk will be considered as 'trees' in the tree census. The volunteers were also provided with a kit consisting of a clipboard, stapler, measure tape, chalk sticks, pen, forms, block-wise maps etc.

The details of tree name, type and girth were noted in four category-wise formats prepared prior to the census. AMC had also decided to gather details of rare trees in Ahmedabad as a part of the tree census-2012. A separate format was prepared to document details and location of these rare (historic) trees with their photographs.

There was no monetary remuneration offered to volunteers due to a limited budget for the study, and thus only volunteers with motivation and interest to work in this task were signed up. AMC issued limited-period identity-cards to the volunteers permitting them to travel for free in AMTS buses while on duty to conduct the tree census. Teachers were compensated with 4 holidays in return for the Sundays they spent working for tree census.

Results

The tree census-2012 by AMC helped to measure the present status of trees of Ahmedabad along with their species-wise total number and their area-wise proportion in the city. It also provided indirect data to measure 'carbon storage' in the city from the total biomass of trees that are found; such data can help in measuring the effects of climate change.

According to the data provided by the AMC, there are 6,17,052 trees in Ahmedabad. The tree density in the city is 1,313.30 trees per sq km. The graph on the following page shows zone-wise tree density in Ahmedabad (excluding the Army cantonment area). The north zone of Ahmedabad has the highest tree density of 2081.40 trees per sq km, followed by the west zone (1,983.50 trees per sq km), central zone (1,853.58 trees per sq km), south zone (1,142.95 trees per sq km), east zone (1,093.45 trees per sq km) and lastly the new west zone (775.58 trees per sq km).

Lessons learnt

- All cities should undertake such an exercise to understand the extent of green cover that they have and how many more trees the city needs.

- Based on the data, further tree plantation initiatives should be linked in targeted areas. A calculation and analysis of the number of trees per person should be done to get a clearer picture of situation.

- The instruction guidelines and methodology for conducting the tree census should be prepared as simply as possible in the local language. They should be practical and clear with examples so that these are easy to absorb and can speed up the process.

Sustainability

Team-building is the most important aspect of the whole exercise. Coordination with different departments should be done effectively to sustain the effort before, during and after the work. Citizens' participation in tree plantation initiatives as well as incorporating tree-census data into future city development plans and strategies should be combined to make such initiatives really sustainable.

Transferability

The tree census initiative is 100 percent replicable in any city and it should be undertaken to figure out the current green biodiversity of the city; based on it, future development work can be planned. A tree census in association with a municipal corporation can yield more results.

'500 NOC Scheme' for provision of basic services to slums

Situation before the initiative

Ahmedabad city had around 60 textile mills until the late 1980s, most of which have now ceased from functioning. Employment opportunities in these textile mills attracted many people from other places to the city. These people preferred settling around mill complexes on open vacant land belonging to the state government, AMC, and even private holdings. The closure of the textile mills and the simultaneous rise of the industrial sector deterred them from abandoning the city, as they got engaged in alternative employment sectors including labour, services, self-employment, or employment in other industries. Consequently, their dwellings—a makeshift arrangement—came up on any open available land in a very irregular and unorganized manner, giving rise to slums. These settlements were devoid of basic services given by AMC as the residents were considered as encroachers with no ownership titles. This resulted in various issues faced by such people and also by the society at large including; the Municipal Corporation, Police Department, Traffic Department and Revenue Department. Lack of regular basic service resulted in severe unhygienic conditions within their settlements and led to grave and even complex issues. Ahmedabad has 13.54 percent such population residing in 772 slum pockets across the city (PAS data, 2011-12).

Initiative

AMC launched the '500 NOC Scheme' in 2002. It aims at providing slum residents with a 'No Objection Certificate' (NOC) that enables them to apply for legal individual sewerage and water connections for their dwellings. '500' relates to the amount the applicant has to pay to get the NOC. This enables them to receive basic amenities without creating conflict with the land title issues.

An Ahmedabad slum after provision of services
(photo courtesy AMC)

Provision of basic services in Jadibanagar slum
(photo courtesy AMC)

Process

An individual household is required to purchase an application form for Rs 10, and submit it with required information to AMC along with Rs 500 for obtaining the NOC. An NGO, Mahila Housing Sewa Trust, has been roped in to coordinate processes between AMC and slum-dwellers.

The households were required to fulfil the following eligibility criteria:

- The applicant should be residing in a slum dwelling of no more than 40 sq m area

- The applicant should have any one of the several types of residence proof, such as a government ration card, voter ID, or tax or electricity bill or

NOC Scheme

NGSP (GMFB) Toilet Scheme

Water & Drainage Connection
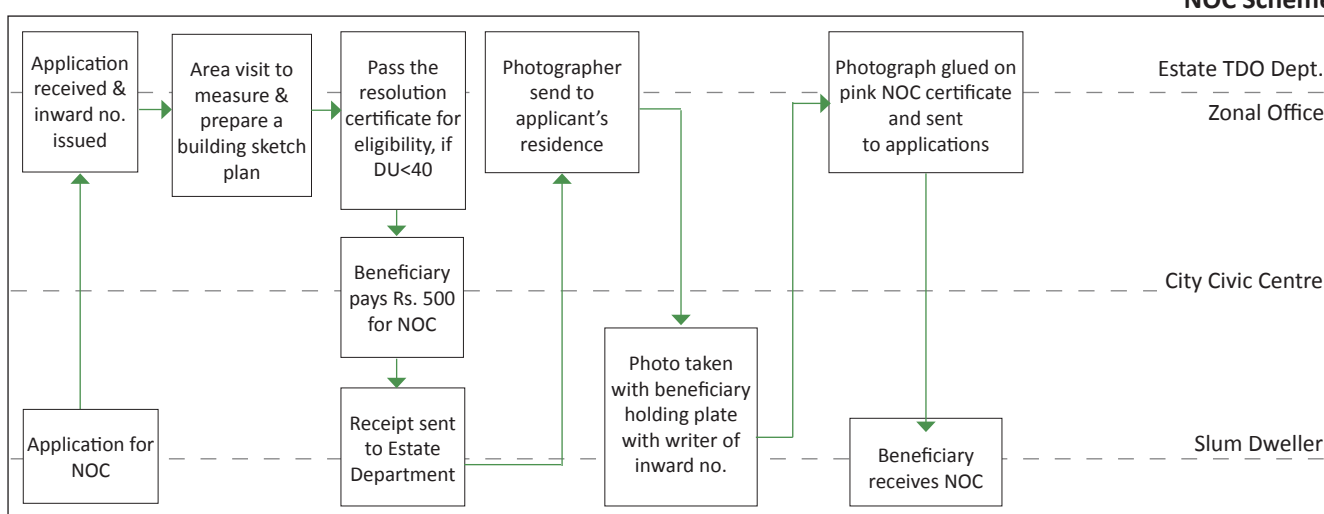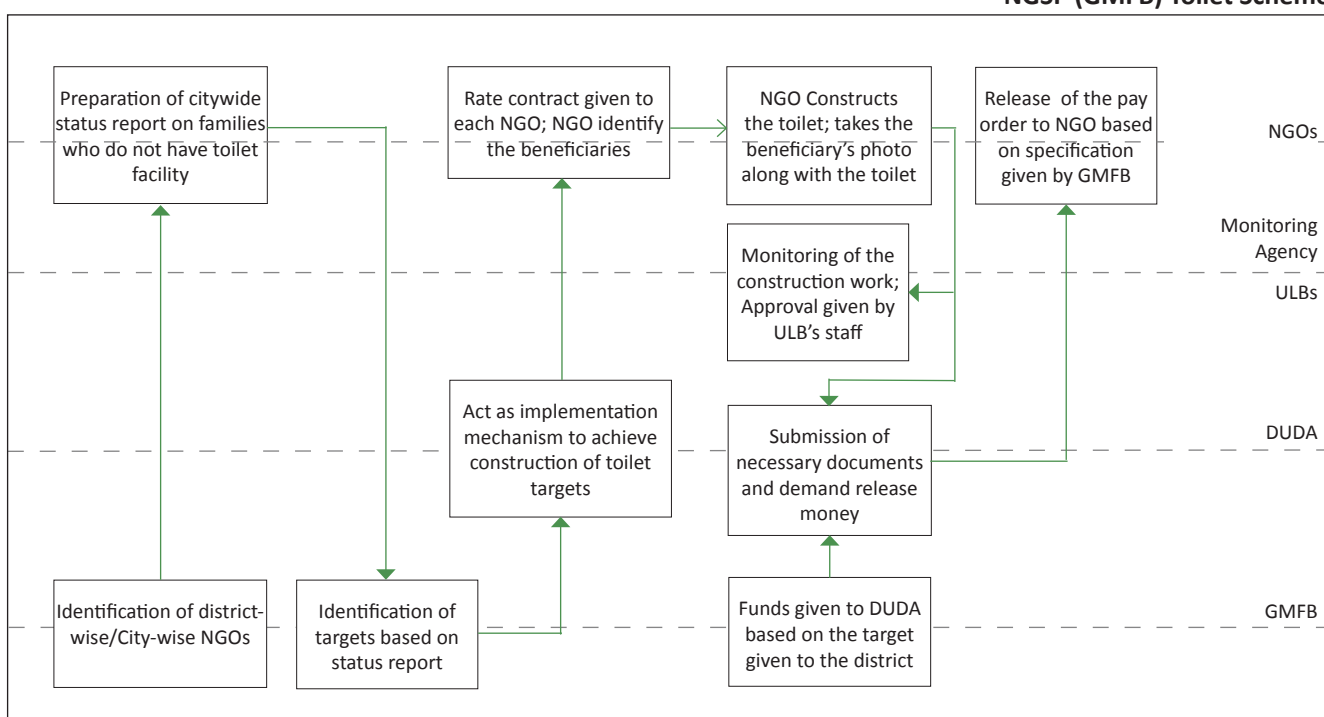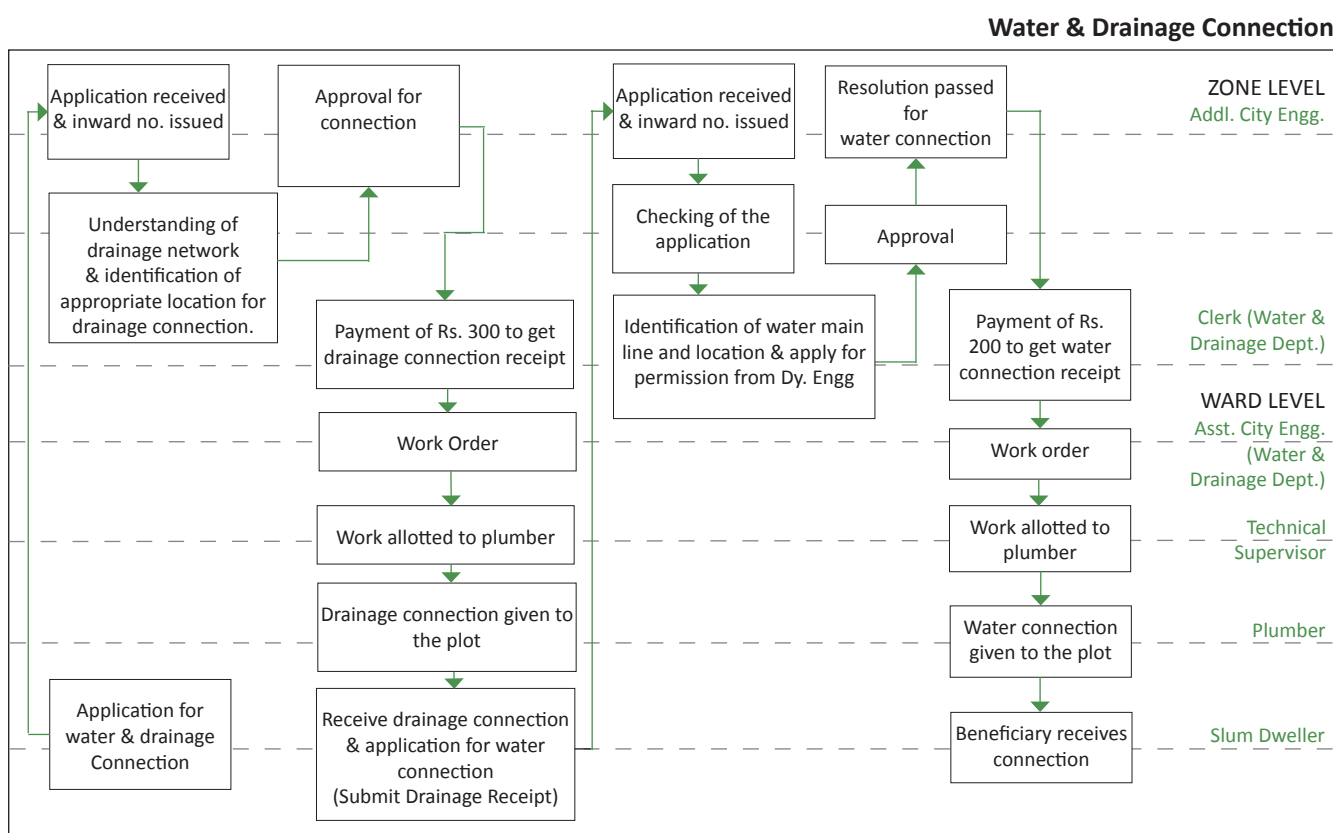
Implementation steps explained

- Any individual can apply for the scheme. (Alternatively, the NGO identifies potential target communities, raises awareness among residents and organizes the households willing to participate in the scheme. NGO can also co-ordinate between the beneficiaries and the corporation).

- The individual applies to the zonal office on the specific form available for Rs 10. She/he has to submit a proof of residence along with the filled form. The zonal office issues an 'inward number' to the applicant. Alternatively, the NGO delivers the application forms to the community, collects Rs 10 fee with completed forms, and the fee for the NOC. It then delivers the documents to the zonal office, pays the form fee and receives inward number 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, once received from the office.

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

- Once the dwelling unit is found to match the prescribed criteria laid down as eligibility conditions, the Estate Department of the zonal office issues a 'resolution' certificate to the City Civic Centre (CCC). (It is a time-consuming process because the resolution can be passed only when a group of 10-15 applicants applies for NOC.)

- Beneficiaries pay NOC fee to tax department or to the CCC and get the NOC receipt. (The NGO co-ordinates with Estate Department, collects a list of beneficiaries, directly pays fee to tax department and gets an NOC receipt.)

- After receiving the proof of the payment made, the municipal office arranges to send a photographer to take a picture of the residence along with the applicant holding a small slate with the 'Inward No' and his/ her name written on it. This photograph is pasted at the bottom of the pink NOC certificate, which is then laminated by the applicant to ensure protection from any possible damage. The NOC is delivered to the applicant who can now apply for water and sewer connection, or use it while getting the existing illegal connection legalized.

- In case the dwelling unit is found more than 40 sq mt while measuring, the applicant's other family member can apply on another form, and the procedure to be followed remains the same.

Individual Water & Drainage Connection:

1. Applicants are eligible for a water connection only if they possess a drainage connection. They are required to apply for a drainage connection and is only then eligible for water connection. This is done following the same procedure/steps explained above.

2. If the applicants do not have a drainage connection, they have to apply for the same to the sub-zonal office or CCC along with NOC receipt and latest tax bill.

3. This application is sent to the Deputy City Engineer.

4. The concerned civic official checks for the existing network availability, and if found feasible, sends the application back to the Assistant City Engineer along with the site map and location permission.

5. After getting permission from the Assistant City Engineer, the Deputy City engineer passes a resolution permitting the drainage connection for the applicant. In case of non-feasibility of a water connection, permission is not granted for drainage and, therefore, the water connection.

6. Once the resolution is passed and the permission is granted, the applicant is expected to pay Rs. 300 for the drainage connection and get the receipt.

7. The duplicate of the original receipt and the application are sent back to the Dy. City Engineer who then sends the documents to the concerned ward's technical supervisor.

8. The work is then allotted to a plumber and the applicant gets a drainage connection. This procedure takes a minimum of 10 days. The applicant gets the connection up to the plot-level at AMC's cost.

9. For procuring individual water connections, the procedure remains the same, except the applicant has to pay an additional Rs. 200. Here, the cost of puncturing the road till the settlement level is borne by AMC. Miscellaneous costs like road cutting and filling within the settlement, pipe cost etc. have to be borne by the applicant.

Cost for the services

- Application form for NOC: Rs. 10
- NOC fee: Rs. 500
- Drainage connection fee: Rs. 300
- Water connection fee: Rs. 200
- Miscellaneous charges: Rs. 500-550*

* Miscellaneous charges vary and are location-specific. They also vary across zones. They consist of the cost of pipeline, road cutting and filling. These charges depend on the kind of contract awarded to contractors.

Results

AMC's initiative shows an innovative way of providing services to all slum-dwellers irrespective of tenure of land with necessary legal riders, that do not make them eligible for any right of, or title to, ownership. The innovation comes in the wake of a High Court direction for providing slum-dwellers with basic services. The provision of civic utilities has brought about a sea change in the attitude of slum-dwellers, and consequent improvement in living conditions and self-esteem.

Till now a total of 84 slum settlements in five zones of Ahmedabad have been covered under the scheme. In total 4,646 drainage connections and 3,387 water connections have been provided to slum-dwellers in the year 2011.

Lessons learnt

Slum areas are not connected to the city's infrastructure networks. The major impediment of any ULB is in granting permission to the unauthorized dwellings that have come up on government or municipal, or private land. Consequently, slum-dwellers do not get safe drinking water, or have sewerage connection or individual toilets. AMC has taken a holistic view of the prevailing conditions in the slum areas and implemented innovative measures to provide slum-dwellers with basic amenities.

Sustainability

Any right-based approach that not only leads to environmental and social improvement but improve living standards of urban poor is a sustainable approach.

Transferability

Such a scheme of providing basic services to illegal dwellers can be well-replicated in other cities of the State and create a better environment not only for slum-dwellers but also for citizens at large.

Pipeline being laid in Sattadharnagar slums

Drainage work in progress in Hanspura slums

Impact of ' 500 NOC Scheme'

Kokilaben Bohra, a slum dweller of Rajivnagar in West Zone, Ahmedabad, and now a house owner, suffered a lot in the past 10 years mainly due to lack of civic utilities like water and sewer connection, and toilet. She was compelled to fetch water from the street bore that was polluted by a soak pit located nearby. In the absence of an individual or community toilet facility, she had to resort to open defecation at night or at dawn.

Under the '500 NOC Scheme', she and many others like her in the neighbourhood applied for NOC by paying Rs 500, as she was fully eligible under the prescribed criteria. It was a long wait for them and following vigorous representation, water tankers were offered on alternate days. The tankers often got diverted to more influential and powerful people who bribed tanker drivers. In the end, water and sewer connections were released and she was also able to get an individual toilet constructed on her premises. The scheme provided her easy access to clean water and the privacy of an individual toilet. This was made possible by the issue of the NOC certificate by AMC and the help rendered by the NGO MHT-SEWA. Kokilaben sums up, stating, "*I have struggled a lot for the past 10 years, and can now live in comfort.*"

Bhavnagar

Decentralized composting of organic waste

Situation before the initiative

The Gangajaliya-Talav market is the main vegetable market in Bhavnagar and it generates 15 tons of organic waste every day. Earlier, this waste was crudely dumped at a site in Kumbharwada, nearly 7 km from the city, where other solid waste of the city is also dumped by the Municipal Corporation. At this dump site, this organic waste was getting mixed with other municipal solid waste. Also, the Corporation incurred a lot of expenditure in collecting the waste and transporting it to this dump site. This market waste was the cause of unhygienic conditions and many health hazards.

Private-sector initiative

Excel Industries, a Bhavnagar-based manufacturer of Organic Waste Converters (OWC), a decentralized waste treatment technology proposed to install an OWC unit free-of-charge at the vegetable market. The machine was gifted by the company in 2008-09. Bhavnagar Municipal Corporation (BMC) set up the required infrastructure—land, electricity, water connections, and a shed to house the OWC machine behind the vegetable market. The converter can process approximately 300 kg organic waste per hour and it produces 7 tons of organic manure daily. The product is packed in bags of 50 kg. The final product is called 'soil enricher', and is sold to farmers for Rs 3 per kg. Initially, BMC operated the OWC. It later handed over the operating of the OWC to a trained women group (*Sakhi Mandal*—who are monitored by the Mahatma Gandhi Khadi Gram Udhyog Trust, Ahmedabad). The trust pays Rs 10,000 to BMC every month as revenue. The soil enricher is in demand by the farmers from nearby fields.

OWC machine

The compost wind-row that is left to dry for 21 days before it is packed

The Corporation has hired three sweepers to sweep the market, collect waste from shops and transport it to the OWC shed. Other godown owners in the market premises make private arrangements for the waste to be sent to the shed. Looking at the success, BMC has got permission to install a new, upgraded compost convertor at the same premises, also to be donated by Excel Industries. The new machine will have the capacity of processing 500 kg compost per hour (almost 12 tons per day).

The Process

The converter works in batches at regular interval of 10-15 minutes. Vegetable waste is shredded before adding it to the machine. After two to three minutes, this green waste is directly added into it. A stipulated amount of micro-organism culture is also added in with the waste to absorb moisture and generate raw compost. The output generated is a homogenous and odour-free mixture. This mixture is then sprayed with slurry of micro-organisms and kept aside in wind-rows for 21 days to mature. The product at the end of this period can be used as soil enricher or converted into fuel pellets.

Results

Earlier, BMC had to transport the waste from the market to its designated dumping site nearly 7 km away. This would require a total of 8-10 trips by two tractor trailers and one refuse compactor. At the rate of Rs 400 per trip, BMC incurred an expenditure of Rs 0.12 million per month for the transportation. With the installation of the OWC right behind the vegetable market, the transportation cost was reduced. The agency sells the soil-enricher to farmers and pays BMC Rs 10,000 monthly. Segregated organic waste is converted to compost which was earlier mixed with other city waste and dumped.

Lessons learnt

Spot-mechanization of composting process is a financially and environmentally viable proposition.

Sustainability

The set-up does not entail major operation and maintenance costs. It is environmentally, economically and socially sustainable. Requirement of manpower is also less. The revenue from the sale of manure is nearly 50 per cent higher than the expenditure costs indicating that it is a profitable venture for the agency. BMC earns Rs. 10,000 per month (Rs 0.12 million per annum) without being directly involved in the work.

Transferability

The success of BMC's initiative can provide inspiration to other cities. The organic waste converter costs approximately Rs 0.8 million to Rs 1 million, depending on the size. The process requires minimum labour attention. The machine can be installed in a small space of approximately 3m x 4m area.

Jamnagar

Setting up an efficient online complaints redressal system

Situation before the initiative

Prior to the current system of user-friendly complaint redressal, the citizens of Jamnagar were finding it difficult to report complaints related to their civic services. Earlier, citizens had to register their complaints either with the Public Relations Officer or in the old office of the Municipal Corporation, or in the respective departments in written or verbal form. There was no system for complaint registration and its monitoring. Citizens were also unaware of what kind of complaints should be registered and where. There was no proper registration of complaints leading to poor redressal. In order to ensure that each complaint reaches its designated place, the complaints received were transferred to respective ward offices. Thus, the process of redressal would take at least 4 to 5 days. There was no information management system in place if the complainant wished to track the status of his/her complaint. It was also difficult for the municipal staff to monitor and track the number of complaints being received and to redress them quickly.

Initiative

The Jamnagar Municipal Corporation (JMC) has its own Electronic Data Processing (EDP) department. Looking at the available resources and in order to improve the existing system of complaint redressal, JMC authorities decided to implement a system for online complaint redressal. The whole web-based system was set up in-house by the EDP department on the internet, and all the departments were configured on a Wide Area Network (WAN) for the project. The new system was introduced from 1st January, 2010.

Since the inception of the system, JMC has received total 1,10,271 complaints in various departments like property tax, electricity, solid waste, water, slum, town planning, etc., out of which 1,09,733 complaints have been solved till 17th July, 2012 and about 538 complaints are pending.

JMC solved a total of 42,819 complaints in the year 2010, 45,826 complaints in the year 2011 and 41,720 complaints in the year 2012.

The system offers two different modes for complaint registration: through online complaint registration on JMC's website (http://www.mcjamnagar.com/complain-new.asp), and on a toll-free number (18002330131) at the 24x7 functional call centre. Due to low internet penetration, most citizens prefer to use the toll-free number system for registering their complaints which is more user-friendly.

At the call centre, the municipal corporation has appointed 3 operators on contract basis for round-the-clock complaint registration. The complaint is registered in the special software with details like date of complaint, ward number, type of complaint, name and address, mobile number of the complainant, and subject of the complaint. The SMS-based complaint status alert system was also introduced from 26th January, 2010. This enables citizens to keep track of their complaint's status. An auto generated SMS is sent to the complainant on his/her mobile number with complaint number, so they don't have to remember their complaint number. The system also sends an SMS after the complaint is resolved by the civic body. There are about 30 branches and 7 types of subjects of municipal services for which complaints can be registered. All departments can track their complaints online and act on it.

The management information system sends all staff an auto-generated SMS of the last 24 hours' complaint information at 11:00 am every day. The Municipal Commissioner also receives a daily SMS summarizing each department's status of complaints. This enables him/her to review their work, give directions and make decisions. The system can also generate branch-wise, ward-wise and subject-wise summary reports of pending complaints. Various departments also analyze the received complaints in their own way and plan accordingly for future development works.

Since the citizen charter is not linked to the complaint redressal, there is no time frame or limit to resolve a complaint. Some complaints may take longer to get resolved than others. The overall response from the citizens have been encouraging. Now even if any citizen conveys his/ her complaint verbally at the municipal corporation office, it is registered in their online system and the Municipal Corporation can keep track of all the complaints.

At JMC's online complaint redressal office

The Municipal Corporation had organized an event for inauguration of the call centre. To further disseminate the information, the toll-free number of the call centre was also published in news scrolls of local news channels. Besides, this information was also displayed at each ward office. Information dissemination made a significant contribution in informing the citizens about using the new system. There has been a gradual increase in number of complaints registered through toll-free number since the initial phase of the system.

The increase in the number of complaints indicates improved recording and monitoring of complaints. This initiative has been cost-effective for JMC as it didn't require much investment and has minimal recurring operation & maintenance cost. The civic body already had required equipment, like computers and the server. Additionally, it needed to incur the salary of three call-centre operators who are hired on contract basis and the cost of SMSs for informing complainants and officers. SMS charges hardly cost more than Rs. 7,000 annually. The Municipal corporation plans to use a GIS based complaint redressal system to be able to do complaint mapping and more efficient problem-solving in the future.

The online complaint registration system

Results

The computerized system helped to achieve better results for the municipal corporation as well as for the citizens.

- All the departments can now see the details of ward-wise and subject-wise complaints, as well as received, solved and pending complaints.

- The system has encouraged citizens to come forward to complain not only for their grievances but also for civic problems affecting the public at large More and more people are now using JMC's toll-free complaint number to register complaints on a range of municipal-services-related issues.

- The system registers online complaints for 13 kinds of civic services, i.e., property tax, electricity, solid waste, civil works, water works, estate, fire, UCD, underground drainage, health, slum, garden and town planning. Electricity-related complaints are highest among all civic services, and hence it is easier for many of the citizens.

- It has facilitated better inter-departmental coordination and integration. Complaint tracking has also become easier and complaint can be transferred to the appropriate department .through WAN.

- This saves money, time, energy and manpower.

Lessons learnt

A better managed complaint redressal system is essential to gain the confidence of citizens. Linking the system to a citizens' charter to make complaint redressal more effective

Sustainability

The system is sustainable and it offers transparent, efficient and user-friendly system to their citizens.

Transferability

The model is fully replicable in any other large and medium scale cities having basic required infrastructure to set up the online complaint redressal and management system.

Rajkot

Facilitating efficient administration through m-governance system

Situation before the initiative

The Rajkot Municipal Corporation (RMC) faced problems with their grievance redressal system and tax payment facilities. Earlier, citizens had to stand in long queues for hours to obtain tax-related information, make payments and register complaints regarding civic services. The tedious methods irked citizens and resulted in low revenue for the ULB. RMC had set up call centres to aid the complaint redressal system but none of those numbers provided 24x7 availability. Of the 52 departments of RMC, 15 departments had their own complaint systems with separate phone numbers making complaint registration a tedious job.

Moreover, officials spent a majority of time answering queries and completing paperwork, leaving no time to focus on fieldwork and complaint-solving. These factors resulted in low recovery of property tax revenue, low rate in filing tax returns, delay in notices, mistakes in handwritten paperwork and delay in grievance response time. To provide citizen-friendly services, RMC set up an interactive website (www.rmc.gov.in) in 2008 to provide citizens with information related to property tax, water charges, profession tax, birth and death registration, etc. Internet penetration in interiors of Rajkot is only approximately 10 percent and hence RMC realized that the website alone was not adequate to reach out to all its citizens. To counter this, RMC developed its 24x7 call centre, transaction kiosks and the award-winning leading practice of m-governance services.

The Face Recognition Machine at RMC offices

Initiative

m-Governance is the method of extending government services available on the internet platform to the mobile platform to increase its accessibility. As per data provided by Rajkot Municipal Corporation (RMC), Rajkot has 88 percent mobile coverage which means more than 1 mobile phone per family. RMC decided to utilize this coverage as a tool to improve its service delivery system and took the decision to utilize mobile governance. The concept was initiated by Mr. Mahesh Gohel (Electronic Data Processing Manager) along with his team of engineers.

RMC's Electronic Data Processing (EDP) Department effectively integrated all aspects of services provided by RMC. With the use of a centralized server, RMC established an electronic system that provides complete information and access to all services—drainage system, theatre and vehicle tax, miscellaneous collection, professional tax, property tax, water charges, birth and death certificates, town planning, grievance management system, marriage registration, Right to Information, food and industrial license, financial accounting, personnel information system, estimation and costing, legal management system, etc. These services are tied up with other innovative online initiatives for effective and improved service delivery. RMC generated public awareness about their e-governance and m-governance campaigns through local media. Newspapers carried publicity advertisements, hoardings were put up, local news channels provided airtime, radio media was also used effectively, and brochures and pamphlets were distributed.

m-Governance System

In January 2011, RMC launched its m-governance system with the objective of effective use of technology to assist citizens and RMC. The motive was to facilitate RMC's service to areas with limited internet access; reach maximum mass through use of simple and effective technology; facilitate delivery of government services in a personalized manner; improve efficiency of operations; give cost-effective services to citizens; improve government-citizen interface.

The entire engineering system of m-Governance and e-Governance is taken care of by the RMC's IT department comprising 9 people. The call-centre staff works on a 3-year contract basis.

There are two main features of the m-governance system—the payment reminder system for municipal dues where registered mobile users are sent SMS alerts on dues and payment dates and a vaccination alert system in which parents who have registered birth of their child at RMC are given alerts about vaccination dates.

RMC's m-governance system has four distinguishing features

- **Alert Service** – Developed and implemented for the transaction of taxes, it gives information about dues, payment reminders and payment facilities. This service also provides information about property tax transactions, professional tax transactions, birth and death registrations, bill payments to vendors and contractors, Awas Yojna instalment transaction and 'cheque return' alert. Parents who have registered birth of their child at RMC are given alerts about vaccination dates under the vaccination alert system. Citizens can register themselves for these alert services depending on their requirement.

- **Interactive Services** – Provides citizens with information about dues and details about other services. These include getting information about registration of mobile numbers for property tax details and transactions, detailed information about the SMS alert system, outstanding dues in property tax and water charges, change in details of property name, and request for property tax assessment, etc. To use the interactive services, citizens have to send an SMS to 09624096241 as per specific formats for specific services. For example:

  - Light <Pole No>
  - Property Tax Due Bill <17 Digit Property No>
  - Water Charges Due Water <13 Digit Water Connection No>
  - Name Change Name <17 Digit Property No>
  - Assessment Request Assess <Name and Address of Property>
  - Complaint Status Status <complaint no>

- **Management Services** – Includes detailed 24x7 call centre and the process of intimating higher officials within RMC about the information and complaints received through the 24x7 call centre and SMS services; sending information about daily income and expenditures, daily grievance statistics to higher officials; sending cheque return details to higher officials, department heads and the Municipal Commissioner, and employee attendance details.

- **Payment Reminder Services** - Citizens registered on this service get reminders about property tax dues, water charges dues and Awas Yojna (Housing Scheme) instalment dues. As per data available, 45000 citizens additionally have paid their dues this year owing to the Payment Reminder Service and RMC has received additional revenues of Rs. 33 crore additional as compared to last year's revenue.

According to Mr. Gohel, the cost of setting up the infrastructure was Rs 2.5 lakh while monthly expenditures mount to Rs 10,000/-. Statistics provided by EDP say that till April 2012, 97000 SMS reminders had been sent out by the system. Currently, citizens can register complaints only for streetlights in their areas by entering the Unique Identification Number (UID) given to each lamppost.

Vaccination Alert System

Introduced by Rajkot Municipal Corporation in the *Nirogi Bal Varsh* (Healthy Child Year 2008-09), all registered births are sent vaccination alerts by RMC as per the vaccination camp dates. As per rules, all births are to be registered immediately by parents at the hospital. RMC has established a tie-up with hospitals across the city. Once a parent registers the child's birth and provides personal details, the hospital sends the child's details, along with the parent's contact numbers, to RMC. These contacts form the database for the alert numbers.

Based on the National Immunization Scheme, the alert is sent from the age of 7 days to 16 years. Vaccinations covered under this service include:

- Within 7 days of birth: BCG
- Within 14 days of birth: OPV-0
- At age of 1.5 month: DPT-1 & OPV-1
- At age of 2.5 month: DPT-2 & OPV-2
- At age of 3.5 month: DPT-2 & OPV-3
- At age of 9 months: Measles & Vitamin A (Dose 1)
- At age of 18 months: DPT Booster & OPV Booster
- At age of 5 years: DT-5
- At age of 10 years: TT-10
- At age of 16 years: TT-16
- At 9 Months to 5 year (each 6 months): Vitamin A (Dose 2 to 9)

SMS alert service for sending reminders about outstanding dues

24x7 Call Centre

Rajkot Municipal Corporation launched its 24x7 call centre service in 2008, establishing a one-point stop for complaint registration. An intricate software system developed by RMC's EDP manager, Mahesh Gohel, the initiative aims to be citizen friendly. Once a citizen registers a complaint at the call centre, the complaint is forwarded to the concerned department official through an SMS and the complainant is also informed similarly. Once the issue has been resolved, the system sends an SMS alert to the complainant. Citizens can also register complaints on RMC's website. Each complaint redressal has the time limit of 72 hours; if not resolved within the given time, the complaint escalates to the higher authority. The department heads and the Municipal Commissioner are sent summarized SMSs about the complaint and its status daily—meetings are conducted with the Municipal Commissioner every 15 days for updates on the complaint redressal system. The call centre also makes calls to complainants for feedback on the complaint redressal system. RMC covers 75 municipal services under the 24x7 call centre.

Details about registered complaints can be obtained under m-governance's management service:

- PND to know pending complaints
- PND <mobile no> to get pending complaint of other officer
- ID <Complaint No> to details of complaint
- EDP <Complaint No> to know complaint is sent to which officer

While the call centre's software has been developed and is sustained by RMC's EDP department, attending to calls at the centre is contracted to a company on a 3-year contractual basis. The company appoints a team leader who is trained by RMC's EDP officials. This individual in turn trains other individuals employed in the call centre. RMC coordinates with the team leader for updates regarding the program and further training. The call centre works in three shifts—7:00am to 3:00pm, 3:00pm to 11:00pm, 11:00pm to 7:00am—and employs 10 individuals to attend to calls.

The 24x7 call centre received 92448 phone calls in 2011-2012.

A call centre employee registers a complaint

The online complaint redressal form
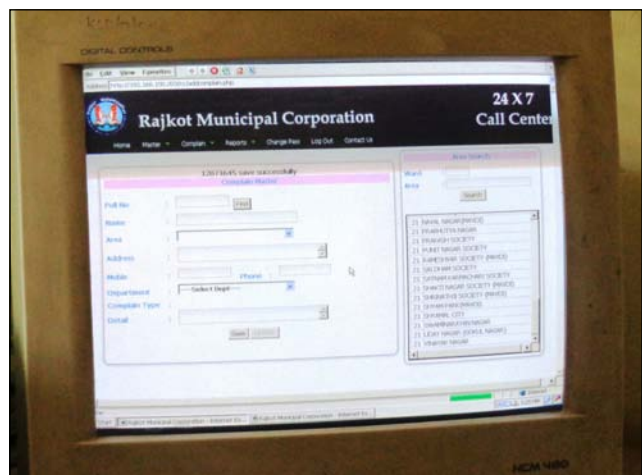
Other Services

The EDP department has developed other initiatives for better communication and smooth work flow within RMC.

- **Post Office Collection**
  RMC has tied up with Post Offices for better service delivery and increased accessibility to citizens for payments. Post offices now act as collection centres for property tax payments, water charges, Awas Yojna EMI and professional tax payments. All infrastructure is provided by the post office. RMC has provided computer facilities to 20 out of 23 post offices in the city. Now citizens can avail RMC's services within a periphery of 3 km. In the long run, this tie-up will provide huge savings as RMC would not be required to set up additional civic centres in the city.

- **Transaction Kiosks**
  RMC has set up transaction kiosks to provide payment facilities to individuals who cannot access m-governance or e-governance for various reasons. Till date, a total of three kiosks have been set up in three municipal zones. Built by EDP department, these kiosks accept property tax payments and water tax payments through cheques, cash and coins. The pilot kiosk was set up in July 2011 and after a positive response, two more kiosks were set up. As of April 2011, more than Rs 1 crore had been collected through these kiosks.

- **Cheque Update System**
  In April 2012, RMC discovered that the departments had to return cheques worth almost Rs 19 lakh due to a variety of reasons. This was a cause for concern as not only did it affect revenues, it also caused calculation discrepancies within departments. This inspired the EDP manager to develop a system wherein details of returnable cheques are circulated to respective departments monthly so that concerned officials can address these monetary issues immediately instead of waiting till the end of the financial year. Moreover, citizens whose cheques are returned are also informed through mobile alert services.

- **Building Plan Permission**
  RMC has recently implemented a new software which enables town planners to provide details and delivers building plan permits to citizens on the spot. The software has been customized to allow town planners to study data provided to them. The software has proven to be an effective and instant tool for verification and sanctioning of building plan permits.

- **Quick Response Code**
  RMC launched a unique initiative in September 2012 for easy validation of documents such as birth/death or marriage certificates issued by the RMC. These certificates have a unique code which can be validated by citizens and authorities with the use of a phone application called Quick Response (QR) code scanner.

- **Face detector system**
  Factors such as irregular attendance and officials reaching office late affected the productivity of RMC. To tackle this issue, EDP Department set up face-detecting machines (at a cost of Rs. 30,000 per unit) on every floor of the RMC office building. Built with a unique technology, this machine recognizes the faces of all employees working with RMC in different departments, marking their attendance and also the time of their entry in office premises. The EDP office estimates an average of 30 minutes early arrival of employees after setting up these units.

- **Internal Notes System**
  Field officers often require taking notes during surveys and visits and it is not always conducive to use paper and pens. Most officials prefer using their mobile phones. With this objective in mind, EDP department developed an application connecting an official's mobile to his/her computer system in RMC office. With this application, officials can take notes on their mobile phones and send them to a given number which is synced with their computer system. Officers can later access the same notes on their computers in office.

Results

According to the information provided by RMC, citizens have benefited massively with the implementation of m-governance and other e-governance initiatives.

- RMC has effectively integrated administration with citizen services.

- The system has helped improved the interface with citizens and also the internal management.

- There is a marked increase in the level of citizens using various e-governance initiatives.

- RMC's annual income from property tax in the year 2008-09 was Rs. 90 crore while in 2010-11 it increased to Rs. 140 crore.

- Following launch of the Payment Reminder Service, RMC received more than Rs. 20 crore in dues from 40,000 registered users.

- There is an increase in transparency of duties and officers' response since higher officials are given daily updates about complaints, their redressal and status.

- The automated system has increased efficiency and has decreased margin for error.

- M-governance has enabled crowd management in RMC offices, allowing officials to concentrate on their work rather than spending time dealing with registration processes.

- The number of people lining up at the RMC office everyday for complaint registration has reduced by 10 percent.

- Citizens with children within the age of 7 days to 16 years receive regular vaccination camp updates under the National Immunization Programme.

- Citizens can track the progress of work done on their complaints through SMS service.

- There is a reduction in operation costs as system is a one time investment.

- Citizens save time as grievance redressal and delivery of services is faster.

- Paper usage has decreased.

Number of users (e-governance)

M-Governance transactions
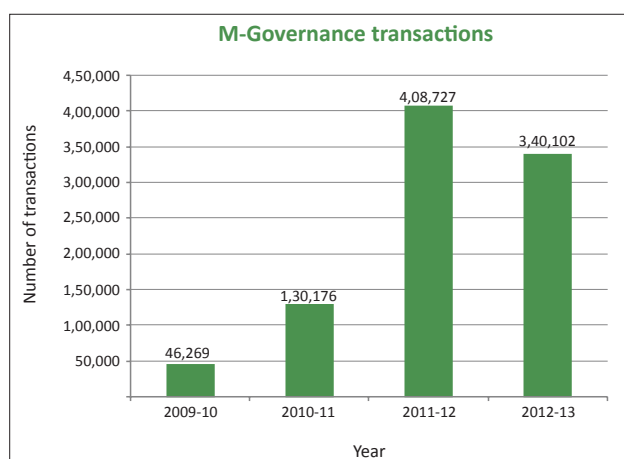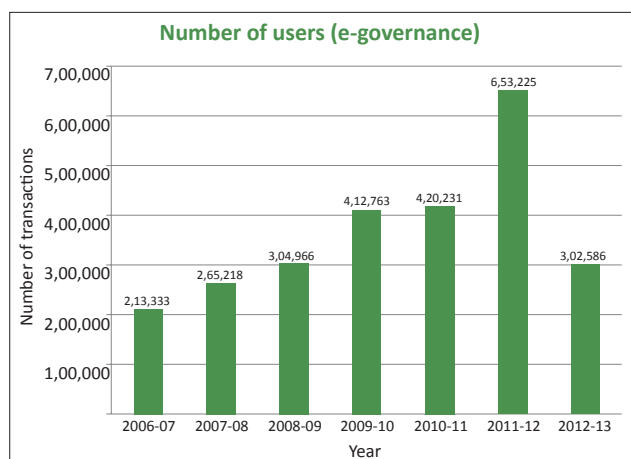
Awards received by RMC

- Nagar Ratna award for complaint redressal system

- Jury Choice award in mBillionth 2011 (South Asia)

- Bronze in National e-Governance Award 2010-11

- Second in Citizen's choice in eIndia 2010

- Finalist in Manthan 2010 (South Asia) Award

Lessons learnt

Effective implementation of m-Governance and e-Governance has facilitated better delivery of services by RMC and has highlighted the following lessons:

- m-Governance has helped develop RMC's interface with its citizens.

- Service delivery has become more effective and dynamic.

- Officials' productivity has increased due to transparency in the system.

- Payment reminder system has helped increase revenue generation. Citizens are willing to make payments if the proper follow-up is done.

- Vaccination alert program can potentially help reduce the occurrence of life-threatening diseases in future generations.

- Information is more accessible to citizens.

- Citizens get quality service irrespective of social and economic status.
- Transactions are cost effective.

- Service time is reduced.

- Interaction between citizens and administration is more result oriented.

- Automated systems have made administration relatively error free.

Sustainability

The entire software setup is developed by in-house experts at RMC and has a low maintenance cost, making it economically sustainable. As this was an in-house initiative, the EDP department had a direct interest in increasing efficiency of RMC staff. Such in-house interest ensures that the overall m/e governance initiative is sustained in the long run. With constant up-gradation and reviews, the software will remain cost-effective. Reduced paperwork has increased productivity levels of officials. The increasing use of technology has the potential to considerably improve the delivery of services in urban areas.

Transferability

The initiative can be replicated in other ULBs as it facilitates efficient organizational functioning and provides citizens a good interface with the Corporation. The Urban Management Centre facilitated a study tour of municipal officials from cities of Gujarat to Rajkot ,for them to experience and understand the system. Following the study tour, UMC is facilitating a technical transfer of this practice to Himmatnagar. RMC has in principle accepted to help the ULB set up a similar system at the Himmatnagar's Municipality's civic centre.

Tax Collection through EMI

Rajkot Municipal Corporation initiated a system of tax collection through EMI (Equated Monthly Instalments) under the e-governance system in July 2012 to aid citizens and officials in tax collection. RMC's decision to allow tax payment in instalments is helpful to citizens—it aids citizens who do not have the financial capacity to make full payment of taxes. RMC also benefits with the continuous cash flow and better financial management.

As per RMC rules, a citizen can register for this service through ECS (Electronic Clearing Service) mode—once a citizen has registered for the facility, after the first time, the monthly instalment is deducted from the citizen's account. RMC allows 10 EMIs and monthly instalments are deducted on the 15th day of every month after the first month. RMC currently covers property tax, water charges, conservancy tax, drainage tax and lighting tax under this scheme.

Till August 2012, only three citizens had registered themselves with this system; however RMC, has set a target of registering at least 200 tax payers till March 2013 before officials review the entire system including feasibility and sustainability.

Improvements to solid waste management value-chain

Situation before the Initiative

RMC collects a total of 370 TPD of municipal solid waste (MSW) from all wards of the city. Door-to-door waste collection in Rajkot was started in 2002. However, service delivery was not up to the mark. Waste collection was carried out by RMC's staff until 2008. At that time, the door-to-door collection coverage was 65 per cent. The establishment expense incurred by RMC for the year 2007-08 was Rs 210 million. Biomedical waste was also illegally being disposed off along with the municipal waste. Waste generated by construction activities was not being disposed properly. Roads were littered with garbage.

The MSW was transported to an open dump site at Manda Dungar, 8 km away from the city. The site was not designed as a scientifically-engineered, sanitary landfill as per MSW Rules 2000. It was a mixed waste collection—not segregated into recyclables, biodegradable and inert residual material. Some additional drawbacks of any such practice are foul odour, an increasing number of fire incidents, and ground-water contamination due to the open dumping.

The MSW Rules 2000 require establishing a waste treatment and processing plant, apart from the required landfill. This requires heavy capital investment; moreover, the experience of such plants across India is not encouraging—high initial investment, high operating and maintenance cost, and difficulties in establishing a market for by-products such as compost manure, pellets, etc., towards revenue generation.

Waste-pickers were organized in *sakhi mandals* and *mitra mandals*

Initiative

RMC initiated changes in all aspects across the value chain of waste management. For improving door-to-door collection of waste, waste-pickers were organized into *sakhi mandals*. Night sweeping was introduced as an additional shift. A mobile squad was formed to ensure that there is no littering on the roads and fines for littering were introduced.

RMC established the MSW processing plant on a BOO basis. The Corporation leased out its land to a private-sector company that was given the responsibility to establish and operate the plant. The company is also responsible for marketing and sale of recovered products, by-products and co-products.

Implementation Strategies

Door-to-door waste collection

The initiative to involve waste-pickers in garbage collection was introduced in the year 2008. RMC approached waste-pickers in the city. The rag-picker women were asked to form self-help groups. They were registered as *sakhi mandals* with the Corporation and were given training in door-to-door waste collection. The *sakhi mandals* were operationalized in March 2008.

Each *sakhi mandal* comprises nine *sakhis* and a leader. Currently, there are 54 such *sakhi mandals* which have been allotted the work of door-to-door garbage collection. As per the rules laid down, each *sakhi* can collect garbage from a maximum of 300 houses or shops. Each sakhi is paid Rs. 13 per month per household.

RMC has also recently approached a self-help group working in the city for door-to-door waste collection and street-sweeping. The members of the group have organized and registered themselves as *mitra mandals* with the corporation. Each *mitra mandal* comprises eight *mitras* and a leader. As per the rules by RMC, each *mitra* can collect garbage from a maximum of 120 households per month and sweep streets allotted to them. Every *mitra* is paid Rs. 35 per household, per month for household waste collection and street sweeping. *Sakhi mandals* cover 1.26 lakh households under the door-to-door waste collection, while *mitra mandals* cover 1.4 households.

Almost 2.1 lakh households have been covered under the door-to-door collection, indicating 98 percent coverage. This coverage does not include vacant or closed properties. According to RMC authorities, the rest of the areas are not easily accessible for door-to-door garbage collection.

RMC has out sourced the responsibility of training *sakhi mandals* and *mitra mandals* to the Mahatma Gandhi Trust, Ahmedabad. Monitoring and evaluation of their work is conducted by dedicated RMC officials.

RMC provides wheel barrows to the *sakhis* and *mitras*; route maps have been prepared by the ward supervisors. The beats have been charted out, and the mandals operate accordingly.

While collecting waste, the *sakhi mandals* and *mitra mandals* segregate recyclable matter such as plastic and paper, and later sell it. This way, while they earn extra money, the quantum of waste eventually going to the processing plant is reduced.

Door-to-dump collection

RMC has initiated a pilot project for door-to-dump waste collection. Earlier, *sakhi mandals* and *mitra mandals* used to collect garbage from households, carry them to community containers, from where the garbage was taken to transfer stations and then to the processing site. RMC has started the door-to-dump waste collection where, once a *sakhi* or *mitra* has collected garbage from selected households, the garbage is dumped in a mini-tipper instead of a community bin. Each mini-tipper is assigned a route for the day which it follows and takes the collected garbage directly to the transfer station. This removes the need for a community bin— RMC initiated this project to move towards its goal of a bin-free Rajkot.

Currently, six electoral wards out of 23 electoral wards are covered under the pilot project. RMC plans to study this pilot project till the first quarter of 2013 and then expand to other areas of Rajkot.

Street-sweeping

Rajkot wakes up to a clean city. This has been made possible by night sweeping carried out on 48 major roads, i.e., a total of 80 km road length. Roads are also swept in the mornings and afternoons. Vegetable markets are also properly cleaned at night through scraping and brushing. Now that the door-to-door waste collection is handled by the *sakhi* and *mitra mandals,* the Corporation's SWM staff has been given the task of street-sweeping.

RMC has also introduced mechanized sweeping—three machines have been purchased through capital grant given by the State government. These machines are deployed for eight hours, per shift every day.

Checking of littering on roads

The mobile squad was formed in June 2008 to ensure that there is no littering on the roads. The team comprises two sanitary sub-inspectors, a driver and 5 labourers per shift. They move around the city in a jeep with a tipper, and are accompanied by a lifter that lifts garbage dumped on the streets. Three mobile garbage collection vans, one for each zone, have been pushed into action to collect waste from problem areas. The person or group responsible for littering the area has to pay the applicable administrative charges.

The administrative charges are collected from the defaulters based on the expense incurred by RMC in collecting the waste from that point. By the end of April 2011, 18,585 cases had been registered and Rs 50 lakh collected as administrative charges.

6,000 dustbins have been distributed to shopkeepers in commercial areas so that they would not throw waste on the streets.

RMC has also installed 4,500 street bins at regular intervals at public places. 10,000 more such bins will be installed to cover 150 streets of Rajkot.

Construction debris collection

The debris squad was formed in June 2008 to collect construction waste from sites. The team comprises one sanitary sub-inspector, two drivers and two labourers per shift.

This team has one loader (JCB) and one tipper. It takes administrative charges from the responsible person at the site. The construction waste in turn is used to fill up low-lying and water-logged areas. Up until April 2011, administrative charges amounting to Rs. 2 lakh have been levied against lifting of construction waste.

Biomedical waste disposal

RMC has given the license for collection and scientific disposal of biomedical waste to a private agency. This agency arranges for waste to be collected from hospitals and clinics. RMC conducts regular drives to check if the hospitals and clinics are properly disposing off their waste. If any institution or individual is found guilty of mixing biomedical waste with municipal solid waste, administrative charge of Rs. 5,000 is levied on the offender.

Integrated MSW Processing in PPP Mode

To adhere to the MSW Rules 2000 and the guidelines therein, RMC placed an advertisement in local newspaper inviting interested parties to install an integrated solid waste management plant. After scrutinizing all proposals received, Hanjer Biotech Energies Pvt. Ltd. (HBEPL) was short-listed for further discussion. After a series of detailed technical discussions and presentations, the suitability of HBEPL was ascertained.

The Standing Committee of RMC passed a resolution in June 2003 to confirm the contract for the establishment of the waste processing plant. It was decided that RMC and HBEPL would establish the plant on a BOO basis. The plant became fully operational in April 2006. RMC acquired 100 acres of land for the purpose of developing a sanitary landfill and waste processing plant on a lease of 200 years. Being a wasteland, the land was appropriate to be utilized for the construction of a landfill site.

Of the 100 acres, 30 acres was given to HBEPL for establishing the waste processing plant on a lease of Rs. 1 per sq m per year. In other words, the land was leased to HBEPL for Rs. 4,048 per acre per year. The construction work for plant started on 7th June, 2005.

The Process

Collection and Transportation: Waste from the city is brought in dumpers and taken to the waste processing plant where it is weighed and taken for stages of processing as shown in the diagram below.

Segregation
The waste is then segregated into wet organic waste, dry organic waste, recyclable waste (plastic, metal, etc.) and inert materials.

Wet Organic Waste
The wet waste gets treated and is transformed into organic compost

Dry Organic Waste
Dry organic waste is utilized for making green coal or as it is commercially called fluff. It is used as a fuel for industrial processes.

Recyclable Waste
The fifth stage of the entire process is segregation of recyclable waste like rubber, metal, plastic which has economic importance in the recyclable junk market.

Inert Materials
HBEPL utilizes fine grit and inert material (almost 20-35 percent of total inert material) for making briquettes by mixing it with fly ash. 10-15 percent of total waste goes to sanitary landfill site.

Waste segregation and processing process
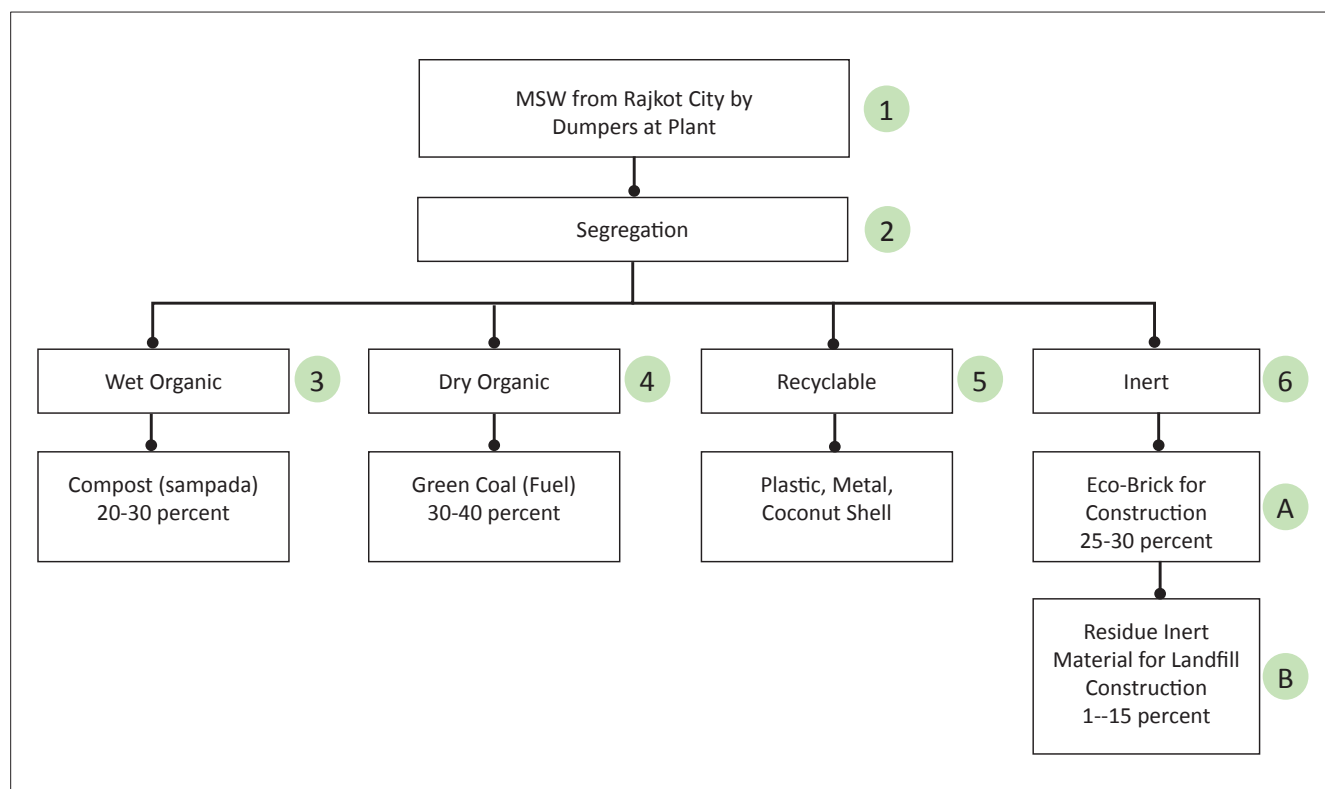
Salient features of BOO Agreement

Role of HBEPL	Role of RMC
Lease rental for land at the rate at Rs. 1 per sq m	To lease 30 acres of land for setting up the processing plant and warehouse facilities for an initial period of seven years
Installation and commissioning of waste conversion and processing plant. Penalty of Rs 1 million in case of failure to set up plant	No financial assistance from RMC to HBEPL
Liability of the equipment involved in waste conversion/processing to be with HBEPL	To deliver 300 metric tons of MSW per day to the plant
All products as output of the waste conversion and processing to be the assets of HBEPL	To provide utilities like access roads up to the entrance of premises of the plant, water supply of up to 0.2 million litres per day, electricity power line (user charges for such utilities to be borne by HBEPL)
HBEPL would be responsible for marketing and sale of recovered products, by-products, co-products and all the revenue generated would go to HBEPL	Proper disposal of mixed, heterogeneous rejected waste not required by the waste processing plant

The Integrated Waste Processing Plant of RMC, operated on BOO basis, is the first of its kind which utilizes nearly 85-90 percent of biodegradable waste and leaves behind only 10-15 percent of total waste as rejects that go to landfill. This way the landfill has a longer life.

The results have been very encouraging. The entire waste amounting to 300 MT of MSW is processed into:

- Bio Fertilizer : 60 MT/day
- Fluff (Green Coal) : 80 MT
- Eco-Bricks : 15,000
- Recyclable : plastic metals and others

Eco-bricks manufactured from inert waste
(photo courtesy RMC)

The production costs of by-products are compatible with their conventional counterparts. Initial results are very encouraging and there are many buyers for the by-products of the plant.

Fluff (Green Coal)

The dry organic waste is compressed into fuel fluff. Its calorific value is very high compared to other sources of fuel. The production cost of the fluff is also economical. It is just Rs 1.40 per kg and hence is a much cheaper option than other conventional fuels like coal or wood. The table below shows a comparative analysis between calorific values and costs of fluff and various conventional sources of fuel.

The fluff has high demand in the paper and cement industries due to its high calorific value and economical costing. The fluff could also be used in the combination of other sources of fuel like coal, wood, natural gas etc. Presently, the fluff is being sold to a cement factory at Kodinar and to paper mills at Vapi and Kuwadwa.

Bio-fertilizer

A sample container of 18,000 kg of bio-fertilizer was exported to Oman in October 2005. Now, the entire compost is being sold to corporate clients including Reliance Industries at Jamnagar (Gujarat) and Reliance Energy at Dahanu (Maharashtra). Compost is also being used as appropriate mix with chemical fertilizers. This application has been approved by the Gujarat State Fertilizer Corporation as having advantages of reducing the costs and increasing the crop output. It has been reported that the crop yield increases by approximately 1.5 times.

Eco-Bricks

The eco-bricks are utilized by HBEPL for construction work in their plant itself. The production cost of eco-brick is Rs. 1.10 per unit, while the cost for normal burnt brick is Rs. 1.40 per unit. The Integrated Waste Processing Plant has created a ripple in the region. It is reported by HBEPL that other municipal corporations like Bhavnagar Municipal Corporation and Jamnagar Municipal Corporation have also showed keen interest in constructing the Integrated Waste Processing Plant in a manner similar to RMC.

Results and Impact

- Prior to the *sakhi mandal* initiative, waste-pickers were an unorganized group. They did not have any fixed monthly income. After the formation of *sakhi mandals*, the women have got employment and get regular income every month. They can take advantage of government schemes aimed at social upliftment. This has given them financial as well as social security. The initiative has facilitated employment for 860 women. Each member gets Rs. 10 per house per month. So if she covers 300 houses, she earns Rs. 3,000. Besides, the women sell the recyclable waste from the waste collected and earn approximately Rs. 1,500 month additionally.

- Hiring *sakhi mandals* has been the most cost-effective solution for RMC. The corporation currently spends Rs. 27 lakh per month on sakhi mandal as compared to Rs. 1.19 Crore that it would have spent had it hired its own staff to work. Even the option of outsourcing the task to private contractors would have entailed an expenditure of Rs. 29 lakh.

- Door-to-dump waste collection's pilot project has proved to be a successful venture and has reduced the number of people handling the waste.

- The requirement of community bins has been reduced as there is daily collection and transportation of waste from secondary points to the processing plant.

- The RMC staff members who used to collect garbage earlier were handed the task of extended street sweeping and night sweeping. Newly-introduced mechanized street-sweeping is also facilitating better cleaning process. This has increased the sweeping efficiency.

Source	Calorific value kcal/kg	Cost per kg
Coal	3,600 − 4,080	Rs. 9
Wood	4,060 − 6,960	Rs. 7 to Rs. 10
Fluff (Green Coal)	3,700 − 4,200	Rs. 1.4

- Littering has been reduced as waste is collected from the doorstep every day.

- As recyclable waste is removed from the total waste, it reduces the tonnage to be transported to compost facilities.

- Because of the integrated municipal solid waste processing plant, the quantity of inert residue that has to be sent to the landfill site is only about 20 per cent. A number of products are manufactured at the processing site, including manure, eco-bricks, plastic products, etc. RMC also saves on the capital and operational expenditure on processing of waste.

- The presence of a mobile squad across the city has given a message to citizens that RMC is serious about the task of maintaining a clean city. Lessons Learnt

Often in large cities, macro-level institutional and management interventions are required, not only to improve services but to make the services environmentally, socially and financially viable. SWM projects with private-sector participation not only facilitate the inflow of private capital into civic services but also allow for sharing of risks. The ULB also benefits from the technical expertise of the private sector. The entry of a private-sector player in the area of waste management aptly demonstrates the power and potency of public-private collaborations to transform the ULB's civic services and organizes the entire cycle of solid waste management.

Revenue Chart
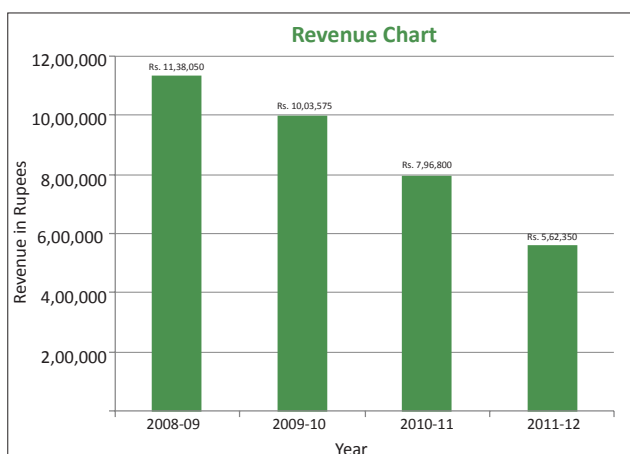
With the integration of waste-pickers into the entire process, RMC should initiate a socioeconomic study on the waste-pickers and how their lives are influenced by mainstreaming of their services. This study would also show benefits of the organized SWM sector beyond just monitory gains.

Sustainability

The door-to door collection initiative is a win-win situation for all the stakeholders—the *sakhi mandals*, the *mitra mandals*, RMC and the residents. The cost-effectiveness of the system makes this initiative sustainable for RMC. Other practices by RMC, including collection of waste and construction debris by mobile squad and debris squad respectively, privatization, and scientific disposal of biomedical waste, are environmentally and financially sustainable.

The contract between RMC and the private sector player is for a period of seven years. Till now, most solid waste treatment plants had not met with success owing to non-availability of a market. The private sector company, HPEBL, has successfully developed a market for its end-products and hence this initiative is financially as well as environmentally sustainable.

Treatment and processing of organic/wet garbage and production of alternative fuels from the inert substances left over after processing of MSW is an environmentally sustainable activity.

Transferability

Rajkot's initiatives in SWM are unique yet replicable. A certain basic investment has to be made, in terms of time, money and energy, for bringing together and training workers from the unorganized sector. Finding such manpower may also not be very difficult. Once the system is in place, the work is much easier, efficient and satisfying for the ULBs.

Forming separate squads may not be feasible for all the ULBs, most of which are already reeling under severe staff crunch. The least a ULB can do is to tighten its ropes and decide on action against offenders.

While RMC is a larger body and can initiate a number of practices simultaneously, smaller ULBs can replicate some of the processes or customize them according to their resources and requirements.

Surat

Effective public grievance redressal system

Situation before the Initiative

Every ULB understands that an effective grievance redressal system is essential for an efficient and transparent municipal body. A properly functioning complaint registration system, customized for citizens' needs and use, allows citizens to register complaints and provide feedback on urban services. A transparent system effectively bridges the gap between the citizen and the municipal body. Surat Municipal Corporation (SMC) is the 8th largest city in India. This organization realized early the importance of a functioning platform for complaint redressal. Earlier, citizens had to visit the nearest ward office (for sanitation-related complaints) or the zone office (complaints in other categories) to register their complaints. In these offices, citizens registered their complaints with officials who issued coloured cards as per the nature of complaint and the time allotted for redressal. This process required excessive manual labour and citizens' time was wasted standing in queues. Moreover, citizens were unaware of the status of their complaints and the identity of the official in-charge of their complaint and hence many times they had to register their complaint again.

Initiative

In order to develop an effective and sustained complaint registration system, SMC took feedback from citizens and bifurcated its complaint redressal system. SMC initially set up City Civic Centres in 2003; this was followed by setting up an online public redressal system and an integrated single number helpline in 2009 and 2010 respectively. Thus, SMC has three modes of receiving complaints:

1. Online public redressal system
2. Single number helpline
3. Civic centre/zone offices

SMC website

The complaints registered through either of these mediums are categorized on the basis of the time required to solve the issue—24 hours, 48 hours, 72 hours and 1 week, SMC ensures each complaint has a redressal window of 168 hours (7 days). The time frame is decided as per the complexity of the complaint; if the complaint is not solved within the given time frame, it is escalated to higher authorities. Department heads conduct weekly meetings with the Municipal Commissioner to discuss the complaints redressal issues.

Online Public Redressal System

SMC launched the web complaint system (http://www. suratmunicipal.gov.in/Complaint/mailcomplaint) in the year 2003 when the body realized the need of a technology to keep a record of complaints and actions taken to deal with them on a regular basis. Written complaints and their maintenance required excessive manual labour and citizens were reluctant to waste time queuing at offices to register their complaints. With these thoughts, SMC developed the online grievance redressal system which not only keeps records of the complaints that are registered and but also allow citizens to track their complaints.

The online grievance redressal system is monitored by SMC's Information System Department that ensures smooth functioning of the system and ensures regular updates. The development and maintenance of the system is contracted to IT professionals.

In order to register an online complaint, citizens have to visit the SMC website where they have to choose the complaint option.

The general format of the registration requires two categories of information—details about the complaint and personal details of the complainant. The top half of the online form is for information about the work that needs to be done as the citizen has to select a complaint code, specify the zone and ward, give specific location of the complaint area and describe the complaint in detail—this can be done in English or Gujarati.

The bottom half of the form gives space for personal information about the complainant so that SMC can immediately revert to the citizen and keep him updated about the officer in-charge of the complaint and get regular updates.

Personal Information

*First Name	
*Last Name	
*Address 1	
2	
Area	
Phone	
E-mail	
*Pl. notify me about steps taken by SMC through:	○ E-Mail ○ Don't notify

Submit   Reset

Top

Home | Search | Site map | Contact | Mail | Disclaimer

Complaints can be registered under the following categories:

Types of Complaints accepted under Comp. Mgmt. Sys. through Website Civic Center

Description	Duration (in hrs)	Description	Duration (in hrs)	Description	Duration (in hrs)
Garbage & Cleanliness		**Drainage & Storm Drain**		**Public Toilets**	
Cleaning/Scraping not carried out	48	Overflowing drainage	24	Public Toilets not cleaned	24
Cleaning/Scraping not proper	48	Missing/Broken Manhole cover	24	Seats not sufficient	168
Container/Dustbin not lifted	24	Leakage in drainage line	24	Improper management of public toilet	168
Container/Dustbin spot not cleaned properly	24	Request for emptying soakpits/septic tanks	48	Open Defecation in public places	168
Lifting of building materials	24	New Drainage line/connection requested	168	New toilet block requested	168
others	24	Overflowing soakpits/septic tanks	24	**24 hours**	
Mosquito and Insects		Choked drainage line	24	Adulteration of foods	48
Fogging not done	48	Other	24	Improper disposal of hotel/restaurant wastes	24
Fogging not proper	48	**Property Tax**		Food poisoning	24
Spraying not done	48	Wrong Assesment	72	Agency not registered	48
Spraying not proper	48	Others	72	Garbage and Cleanliness	24
No insecticide measures taken	48	**Water Supply**		others	24
Mosquito breeding site	48	Insufficient supply duration	24	**Hospitals & Dispensaries**	
Other	24	Insufficient supply pressure	24	Nuisance of biomedical waste	24
Roads & Footpath		Impure/Contaminated water	24	Hospital/Dispensary not registered	48
Damaged Road	168	Pipeline leakage	24	others	24
Damaged Footpath	168	Chlorine content not proper	24	**Complaints against SMC Staff**	
Damaged Road divider	168	Supply not received	24	Misbehaviour of Staff	168
Improper Traffic Signal/Rotary	168	Repairing of Standpost/Handpump	168	Corruption charges	168
New Road Requested	168	New connection/line requested	168	Complaints not attended properly	168
New Footpath requested	168	New Standpost/Handpump requested	168	others	168
New Road Divider Requested	168	Other	24	**Public Parks & Garden**	
New Traffic Signal/Rotary Requested	168	**Dead Animals**		Cleanliness in garden not proper	48
Other	24	Lifting of carcass of big animals	24	Trimming of Trees	48
Street Light		Lifting of carcass of small animals	24	Others	48
Insufficient lighting	72	Other	24	**Stray Animals**	
Street light not working	72	**Illegal Construction & Encroachment**		Catching stray cats	24
Street light pole collapsed	24	Encroachment of public roads	168	Catching stray cattle	24
New street lighting requested	168	Construction in Margins of plot	24	Catching stray pigs	24
Other	24	Construction without permission	24	Catching stray dogs	24
		Other	24	Other	24

Once the citizen has registered the complaint, the system auto-assigns the complaint to the concerned official and reverts to the citizen with details of the concerned authority, the time frame allotted for redressal of the complaint. Further on, citizens are informed through email if there is change in the authority in-charge of the complaint—the email includes the details of the officer.

Once the complaint has been resolved, the citizen receives another email where he/ she is intimated about the status of the complaint. At any point of time, the complainant can contact the official to get updates about the complaint.

An email informing registration of complaint

Surat Municipal Corporation
Complaint Lodged through www.suratmunicipal.gov.in
Date: Nov 20 2012 3:17PM

Complaint ID: 999/520124207
Duration for Compliance 24 hrs.

Complaint Category: Drainage and Storm Drain (ગટર અને વરસાદી ગટર)
Complaint Code: Missing/Broken Manhole cover (બિનહ્યાત/ટ્રુટેલ મેનહોલ કવર)
Description: gatar line tutel gandu pani ubhri,machhar thai che.
Zone: North Zone
Ward: 15-J, Gotalawadi
Location: gar ni same main gatar line tutel.

Lodged by: sunil kumar dalsukhlal
Address: 31-B,viram nagar society, next to akhand anand school,ved road ,surat
Area: ved road,viram nagar society
E-Mail: sunilkumarjariwala@yahoo.com
Phone:

Complaint Assignment/Transfer Details
Employee Name: RAJESHKUMAR C JARIWALA
Designation: Executive Engineer
Department: North Zone
Contact No: 09724345429

Complaint Status
Status: Complaint Assigned / Transferred
Remarks: Complain transfer to Executive Engineer - North Zone

Note: This email was sent to you from an automated system.
DO NOT reply to this message as the reply-to address is not monitored.

An email intimating status of complaint to citizen

Surat Municipal Corporation
Complaint Lodged through www.suratmunicipal.gov.in
Date: Nov 20 2012 3:16PM

Complaint ID: 999/520124193
Duration for Compliance 48 hrs.

Complaint Category: Garbage & Cleanliness (કચરો અને સફાઇ)
Complaint Code: Cleaning/Scraping not carried out (સાફ-સફાઇ થયેલ નથી)
Description: Disposal of Scrapped material
Zone: West Zone
Ward: 16- Rander Gam
Location: Near rander bus stand to qureshi street gali

Lodged by: Shabbir
Address: 6/20 babu gali, Rander town
Area: babu gali
E-Mail: shabbirwadiwala@yahoo.com
Phone:

Complaint Assignment/Transfer Details
Employee Name: DINESHCHANDRA M JARIWALA
Designation: Executive Engineer
Department: West Zone
Contact No: 09724345211

Complaint Status
Status: Complaint complied
Remarks: COMPLAINT IS COMPLIED

Complaint Feedback
Kindly click on the link below to give us the feedbak on the action taken by SMC on your complaint.

Give Your Feedback

Single Number Helpline
SMC launched a single number helpline (0261-2451913) to reach out to citizens without access to internet and who are unable to go to civic centres. Available from 6.00am to 10.00pm, the helpline number accepts complaints irrespective of the department. The helpline takes down details about the complainant and sends SMS updates to the complainant. A citizen can check the status of the complaint on the website too. The website and helpline integration was done in the year 2010 to improve redressal services. Complaint categories available on the helpline are given in the table on the following page.

Complain Status:

Enter your Ticket No. [   ]

[Check Status] [Clear]

Status of the complaint can be checked online

List of complaint categories

Description	Duration (in hrs)
Garbage & Cleanliness	
Cleaning/Scraping not carried out	48
Cleaning/Scraping not proper	48
Container/Dustbin not lifted	24
Container/Dustbin spot not cleaned properly	24
Lifting of building materials	24
Hawkers not maintaining cleanliness	48
Improper disposal of hotel/restaurant wastes	24
others	24
Mosquito and Insects	
Fogging not done	48
Fogging not proper	48
Spraying not done	48
Spraying not proper	48
No insecticide measures taken	48
Mosquito breeding site	48
Other	24
Roads & Footpath	
Damaged Road	168
Damaged Footpath	168
Damaged Road divider	168
Other	24
Street Light	
Insufficient lighting	72
Street light not working	72
Street light pole collapsed	24
Other	24
Dead Animals	
Lifting of carcass of big animals	24
Lifting of carcass of small animals	24
Other	24

Description	Duration (in hrs)
Drainage & Storm Drain	
Overflowing drainage	24
Missing/Broken Manhole cover	24
Leakage in drainage line	24
Choked drainage line	24
Other	24
Water Supply	
Insufficient supply duration	24
Insufficient supply pressure	24
Impure/Contaminated water	24
Pipeline leakage	24
Chlorine content not proper	24
Supply not received	24
Repairing of Standpost/Handpump	168
Other	24
Public Toilets	
Public Toilets not cleaned	24
Improper management of public toilet	168
Open Defecation in public places	168
Hospitals & Dispensaries	
Nuisance of biomedical waste	24
others	24
Public Parks & Garden	
Cleanliness in garden not proper	48
Trimming of Trees	48
Others	48
Door to Door Garbage Collection	
Door to Door Garbage not Collected	48
Door to Door Garbage Irregular	48
Others	48

Currently, the complaint categories on the website and the helpline are different. The SMC is working on integrating many more complaints together to create an exhaustive list applicable to all streams of complaint registrations. The single helpline 2451913 is connected to 3 direct lines connected to 3 computers with 1 operator each who work in two shifts (6.00am-2.00pm and 2.00pm-10.00pm). The SMC is planning to set up a new helpline number which will be easier to remember.

Results

- All complaints are registered efficiently and quickly solved.

- Efficiency of the employees has increased.

- A comprehensive database of the complaints has been generated.

Lessons learnt

- SMC can connect with citizens and proper redressal of grievances helps achieve better performance.

- Combination of 3 mediums makes for effective complaint registrations and reaches out to majority of citizens.

- Effective use of technology can assist in proper development of any governance system.

Sustainability

The system can be effectively sustained. However, currently there are some issues of all complaints not being taken on the helpline. Once SMC streamlines these efforts, the system will be robust.

Transferability

The system is effective and can be customized as per requirements of the ULB for effective complaint system.

Involving resident welfare associations for SWM

The 'Society Anudan Scheme'

Situation before the Initiative

After Surat was hit by a plague epidemic in 1994, the Surat Municipal Corporation (SMC) began a massive cleanliness drive. Gradually, the city gained the status of being among the cleanest of cities in the country. SMC planned and implemented many programs for cleanliness and solid waste management. Initially, SMC carried out street sweeping and garbage collection activities in selected areas of the city. However, with the increase in city limits and large-scale developments, SMC was falling short of staff and related infrastructure to provide 100 percent of waste/garbage collection from all areas of Surat. Unable to meet their goal, SMC decided to involve its citizens by introducing a public-private-partnership initiative called 'Society Anudan Scheme'.

Initiative

Surat Municipal Corporation's initiative of 'Society Anudan Scheme' has been developed with the objective of involving citizens to achieve overall hygiene and cleanliness of the city. Conceptualized in the year 1998, the Society Anudan Scheme was implemented around 2005. As part of this scheme, societies have to register themselves under the scheme through a set procedure. The scheme is to support societies' in the process of cleaning and sweeping within the SMc's area. Once the application is accepted, the society has to make arrangements for street sweeping within the residential area and ensure proper cleanliness. At the end of every month, a sanitary inspector from SMC visits the society for monitoring and evaluation—if the society meets the expected cleanliness standards set by the SMC, the sanitary inspector provides a certificate. Once the society gets the certificate, all cleaning and solid waste collection charges are paid by the SMC. Currently, over 600 societies are registered under this scheme.

SMC pays every registered society under the Society Anudan Scheme at the rate of Rs. 0.6-0.65 per sq m. with a minimum payment of Rs. 1200 per month.

A society that wishes to register with the Society Anudan Scheme has to approach the SMC ward office with a set of documents consisting of:

- Layout plan of the society.

- An official letter on the society's letter-head stating an interest to join the Society Anudan Scheme and an acceptance to follow it's rules/regulations.

- List of administrative committee members of the society.

After verification, the set of documents is forwarded by the ward office to the zonal office where the Deputy Medical Officer(MO) examines the documents. The Deputy MO then passes on the documents to the deputy engineer who visits the society to check measurements and fix the monthly payment. If the application is accepted by the zonal office, it is given a No Objection Certificate (NOC) and the application is forwarded to the Municipal Commissioner for final authorization. After a final validation by the municipal commissioner, the society has to deliver bank documents to the ward office to set up the payment procedure. SMC employs the Electronic Clearing Service (ECS) for monthly payments to the societies under the Society Anudan Scheme. For this the society has to submit the following documents:

- Application form with details about the society's bank accounts to facilitate ECS.

- Details of the society account operator on a society letter-head.

- Copy of Permanent Account Number (PAN) of the society.

After the final permission, the society has to arrange for sanitation and sweeping equipment like brooms, carts and other items. The society also has to employ individuals for sweeping the society. SMC provides the required amount of insecticide. Every month, a sanitary inspector or sub-sanitary inspector from the Public Health Department of the particular ward conducts a standard check of the society. If the society is found to be satisfactorily clean, the inspector gives a certificate which the society president has to submit to the SMC ward/zone office. After the certificate is submitted, SMC releases the payment which is directly deposited in the society's bank account monthly.

Societies have to make arrangements for disposal of garbage (collected during street sweeping) to the nearest SMC garbage container. Street sweeping in most societies is completed between 7.00am-11.00am daily.

Each society registered under the Society Anudan Scheme continuously for a period of 3 years, has to renew its registration under the scheme following the same procedure.

There have been very limited instances when any society has registered a complaint to the SMC regarding the scheme. Occasionally, the society has internal issues, for example there are disputes between administrative members and this affects the cleaning routine of the society. However, since it is an internal matter, SMC officials are not required to interfere in these issues. Till date, rarely has any society's registration under the Society Anudan Scheme been revoked due to unsatisfactory cleaning standards.

Due to an increasing number of apartments in the city, the SMC is now contemplating developing a similar Anudan Scheme for apartments—the process is under consideration as it will require specific framing with new sets of rules and regulations.

Lessons learnt

- Residents take responsibility for keeping their society clean.

- Surat Municipal Corporation's burden is greatly reduced.

Sustainability

Since SMC does not have enough staff to facilitate sweeping in every society, the PPP model in the Society Anudan Scheme effectively reduces the SMC's burden. The society sweeping is sustainable since it does not require major participation from SMC except for monitoring, monthly payment and providing the required amount of insecticide. The society has to arrange for and make payment to the sweepers and arrange for equipment--this monetary payment can be done from the money paid by the SMC as part of the scheme.

Transferability

The Society Anudan Scheme has been implemented by Surat Municipal Corporation on a PPP (Public-Private-Partnership) basis. Since the local authority is only responsible for providing the required amount of insecticide to the society and monitoring the cleanliness, it greatly reduces the burden on SMC. Thus, this scheme can be adopted by various municipalities as it is economically feasible, generates employment and creates better relations between the citizens and authorities. The end-result is a hygienic and clean city.

Outsourced door-to-door garbage collection

Situation before the initiative

Before the implementation of door-to-door garbage collection system in Surat city, it was a normal practice for householders to throw waste on to the streets from where it was collected by sweepers in handcarts for its disposal in nearby containers. This created an overall filthy and unaesthetic appearance on the streets as well as around the container point.

Containers and dustbins were placed in various locations to collect the waste being generated. Ward-wise nuisance spots were identified from where MSW was collected for its transportation and disposed at the final disposal site. The main drawback of this collection system was nuisance of stray animal at each dustbin and nuisance spot; even waste-pickers were found segregating recyclable waste at spots creating an unhealthy appearance.

Door-to-door collection system was earlier implemented as a pilot project through tractors which did not have closed bodies i.e. the transportation was not being done as per prescribed norms in MSW Rules 2000.

Initiative

The new initiative has been developed for garbage collection from the doorstep of each household. The objective was also to develop a habit among householders to store their garbage in separate bins to collect dry and wet waste until the vehicle for door-to-door collection arrives.

In 2008-09, 7.8 lakh households out of the total 8.6 households, as well as 1.45 lakh out of 2.62 lakh nonresidential properties were covered under door-to-door collection.

SMC data states that in the year 2012 (till November 2012), a total of 10.26 lakh units are covered under the door-to-door garbage collection service.

Collection truck

Door-to-door Collection

Implementation Strategies

The main objective of the door-to-door system was to implement MSW Rules-2000. Other objectives were:

- to improve overall health and hygiene environment by timely collection of waste from every house/shop on everyday basis.

- reducing the number of container spots.

- reducing the number of stray animals around container spots.

- reducing the nuisance of foul smell associated with container spots.

Before the implementation of this system, a feasibility study with reference to the size of ward, its population, and a network of roads with existing road width was carried out for fixation of Time, Place and Movement (TPM) Schedule. The door-to-door collection system was first started as a pilot project in one ward of each zone. This activity was initially carried out in open tractor. After the successful implementation of the pilot project of the door-to-door collection, it was extended to three of seven zones through a tender process. Three agencies to whom the work was entrusted for the period up to February 2011, deployed brand-new close fabricated vehicles of various categories, i.e., Heavy goods vehicles (HGV)/medium goods vehicles (MGV)/large goods vehicles (LGV), painted in green. In June 2011, SMC contracted door-to-door garbage collection for 7 zones to 7 agencies which deploy a total of 308 vehicles across the city.

Process
1. Usually, the vehicles reach the concerned ward office early in the morning every day to get confirmation regarding route monitoring.

2. Complaint redressal system is developed at each ward office where a householder can register a complaint regarding any non-coverage.

3. Phone numbers of the supervisory staff are provided to residents of the areas under their control so that if a vehicle fails to arrive, affected households can directly approach the staff.

4. Several meetings with residents of areas and concerned ward officer are also held to improve the collection system.

Some other strategic action steps are:
- Selection of vehicle based on width of road.

- Coverage of number of units on each route between 1,000 and 3,000.

- Creating public awareness on garbage management.

- Drivers and *Swachchhta Mitras* are provided with uniforms and identity cards.

- Concession period of this project is kept as seven years, keeping in mind the life of vehicle, and the long-term financial interest of the agencies.

- All the garbage vehicles are equipped with proper alarm system when they go to every door step regularly at scheduled time.

- First shift collection timing is 7.00am to 1.00pm daily for residential zones. Facility of second shift for collecting waste from commercial units between 4.00pm and 11.00pm daily in each zone

- This system operates round the year.

- Citizens can register complaints through phone or online on SMC's website. Every zone has a fixed complaint number which is displayed on the body of garbage collection vehicles of the concerned zones. Citizens can register complaints on these numbers at their zonal offices.

- Segregated waste collection (dry & wet).

Overcoming Challenges and Constraints
- The payment to contractors is made on weight basis. Constant monitoring is required to avoid malpractice in collection of waste from areas not under the scope of agency (to deliberately increase the weight).

- Public awareness played a key role in the success of the system, especially segregation of garbage into dry and wet waste at source.

Roles / Activities of the Partners at Each Stage

- Handling of door-to-door garbage collection system is carried out entirely by SMC through its own budget. Hence, there is no involvement of any partner in respect of financial collaboration / aid.

- However, the initial investment on the procurement of vehicles was made by the contractors/agency.

- The agency is paid for the work executed on metric tonne (MT) basis.

- As part of innovative activities, agencies conduct survey at regular intervals and make changes in TPM schedule for maximum coverage.

Results and Impact

- During 2008-09, 7.84 lakh residential households, and 1.45 lakh establishments were covered by door-to-door collection services. The coverage of door-to-door waste collection was 91 percent.

- In the year 2012 (as per data till November 2012), 8.61 lakh residential units and 1.64 lakh commercial units—in total 10.25 lakh units—were covered by the door-to-door collection services.

- Improvement in the overall environment has been achieved because of public consciousness and a habit of keeping waste in domestic bins

- Timely collection of waste from houses/shops every day.

- Reduction in numbers of stray animals around containers spots.

- Environment around the community containers improved. Reduction in nuisance due to smell associated with container spot.

- Avoiding multiple handling of waste.

- Reduction in number of containers.

- Reduction in the number of container spots resulted in curtailment of costs for lifting of containers.

- Available sweepers/workers can be engaged for carrying out sanitation work of new developing areas in most effective manner.

- Awareness of citizens about the need for cleanliness has improved the environment.

- Cost curtailment; savings used by SMC for repairing and maintenance of containers and hydraulic dumper placers.

- Overall appreciation of the program.

Lessons Learnt

Some notable factors of success were: payment on weight basis; awareness of public; close monitoring of system; the seven years' contract period.

Sustainability

The system of door-to-door garbage collection involves a huge cost of capital investment in procurement of vehicles for collection of garbage. It also involves the human resources component to run the system effectively and efficiently. The system has been outsourced. As SMC is paying the agency for the garbage collected from residential and commercial units on weight basis, it has become viable for it to run the system effectively. SMC paid Rs. 2.27 lakh in 2011-12 to various agencies. As per the contracts with the 7 agencies in the year June 2011, each agency (as per zones) has decided on a fixed rate of payment against collection of a fixed MT of garbage per day—a 5 percent increase in the rate is being allowed to each agency to compensate for the inflation per year.

As indicated above, all the capital investment has been done by agencies and the contract period is kept at seven years. This is an attractive period for the agency to recover the capital investment. The other main factor of sustainability is the mode of payment on weight basis, which is also an attraction for the agency to work effectively.

Transferability

The door-to-door collection of MSW has been successfully being replicated in many cities in Gujarat.

Towards ensuring quality water supply, reforming O&M and energy efficiency

Situation before the initiatives

Over the years, the SMC has developed a well-established, networked water supply system providing drinking water to nearly 40 lakh people with 3.5 lakh service connections (2008-09) in its city limits of 326.52 sq km. There are 10 major water distribution stations and four pumping stations for the effective distribution of treated water in various parts of the city. All waterworks, water distribution stations and pumping stations are inter-connected to the grid network.

The water supply system comprises a network of 2,550 km in length. Presently, SMC is supplying nearly 690 MLD of water against the installed capacity of 828 MLD.

The challenging task of sustainable water supply cannot be without management, operational and conservation issues. For example, with increase in water demand, SMC constructed an additional water reservoir and associated infrastructure such as water treatment plants (WTPs), storage tanks, and distribution stations. However, it was observed that the raw water quality was deteriorating due to the absence of fresh water (during non-monsoon season) in River Tapi and pollution-caused upstream of the river. Consequently, the WTPs were unsuccessful in maintaining the desired quality of treated water. SMC also faced constraints in monitoring the quality of treated and supplied water. Issues pertained to checking of turbidity in raw water once a day; outdated equipment; instrumentation and generation of reports and need for more institutionalized approach towards water quality control.

Additionally, with a large operating network of numerous WDS, water works and pumping stations, the O&M practices in the existing system were highly inadequate.

Water supply map of SMC
(image courtesy SMC)
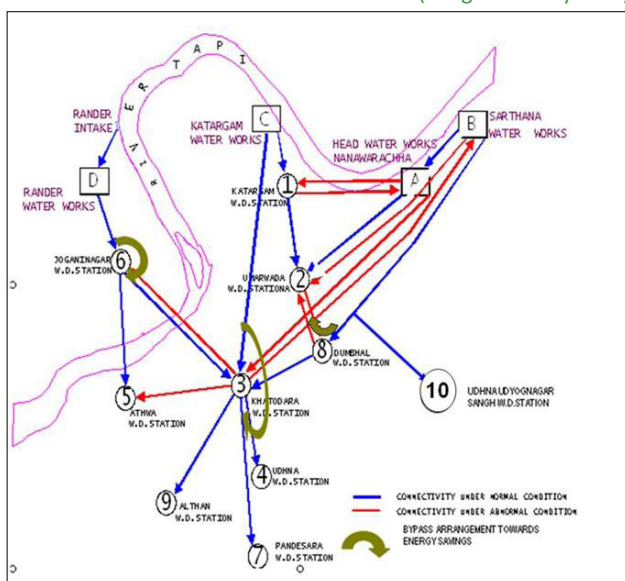
The O&M staff carried out only routine maintenance, particularly during breakdowns. They were not aware of quantity-related measurements, critical operating parameters, and did not have equipment to measure them. Roles and responsibilities were not properly delineated; awareness of minimum safety measures was lacking. The concept of preventive and predictive maintenance activities for electrical and mechanical machines was not there. Critical operating parameters like power factor, voltage, amperes and contract demand for power, water flow rate, etc., were not measured or checked. Routine shutdown for cleaning and energy-conservation measures and related improvements, were not practiced. All this led to the mismanagement of WTPs and consequently, non-performance in maintaining the desired quality of treated water.

Finally, there was the over arching concern regarding high costs of energy consumption by the water supply network. Growth-related increased demand for water led to the energy cost of water supply going up to Rs. 43.12 crore in 2003-04 from Rs. 39 crore in the year 2001. On an average, the consumption of electricity for water supply system was nearly 60 percent of the total electricity. SMC realized the need for several steps to increase energy efficiency in water sector.

Initiative

1. SMC installed state-of-the art technology and introduced quality control mechanisms, including Human Resource Development, all towards monitoring water quality and ensuring quality supply to citizens.

2. To improve operations and maintenance of the system, certain aspects related to maintaining quality were institutionalized. SMC standardized the functions in accordance with ISO 9001:2000, procured new technology and introduced refined maintenance schedules; and outsourced a few areas of service and maintenance.

3. The Energy Efficiency Cell, established in 2001, carried out and coordinated systemic changes to reduce energy consumption and overall operating costs.

Water quality testing

One of the pumping station of SMC

Bulk flow meter and pressure monitoring equipment

Implementation Strategies

Monitoring Water Quality

SMC's Hydraulic Department established various water-testing laboratories with modern instruments and equipment. A decentralized water-quality monitoring system was established with one main laboratory at a key water distribution station and water-quality testing facilities at other waterworks stations. Appropriate technology, instruments and equipment were installed as per ISO 10500 standards for effective sampling and monitoring of water quality. In addition, the Water Quality Surveillance Program was implemented to ensure the quality of water supplied.

For monitoring water quality of the river and to check parameters like pH, turbidity, total dissolved solids, dissolved oxygen, chlorine, ammoniacal nitrogen, SMC has deployed instruments like river-monitoring instrument, digital turbidity meter and a digital residual chlorine analyzer. Arrangements were made for conducting in-house chemical as well as bacteriological tests on a regular basis. Uniform procedures were followed for record keeping at all the workstations. Fogging activities were taken up in surrounding areas of WTPs.

Human Resource Development (HRD)

As part of HRD, continuous education and capacity-enhancing programs were organized for lab technicians, operators, etc., for effective performance of duties. A number of experience-sharing sessions were organized to exchange good practices in the sector. In addition to the above, SMC approached the Central Industrial Security Force (CISF) to conduct a comprehensive survey to assess the vulnerable points in water supply system against any terrorist attack. As per recommendations, SMC installed an online Total Organic Carbon(TOC) analyzer as a water-contamination information tool.

Improving O&M Systems

All operational functions of waterworks were standardized in accordance with Quality Management System ISO 9001:2000. Accordingly, responsibilities were clearly delegated.

Preventive and predictive maintenance schedules for electrical and mechanical machinery and those relating to routine breakdown, as well as water quality control measures were formulated and executed. A dedicated electrical and mechanical maintenance team for preventive and predictive maintenance work was constituted.

Calibration, service and maintenance works of the instruments/ equipment were outsourced to authorized service agencies. Safety measures relating to electrical and mechanical systems were undertaken as per the Factory Act, including mock drills.

A Quality Control Engineering Department for quality monitoring of engineering materials was created. An online Water Quality Monitoring System was established to monitor and judge the performance of WTPs. Material management software was introduced to maintain inventories, and to generate periodic reports for material under stock, re-order quantity etc.

Through a unique grid network approach, a capability and self-sufficiency plan was developed to ensure uninterrupted water supply even in a contingency/ abnormal situation. Flow meters were installed at WTPs, distribution stations and for industrial customers. Security measures at waterworks stations and reservoirs were strengthened with the assistance of the CISF.

Lastly, a vendor-appraisal system was developed for a smooth and transparent tendering process.

Reducing/Optimizing Energy Consumption

SMC identified the following major energy consumption areas:

- Raw/filtered water collection,
- Filtration of raw water including chlorination
- Filtered water transmission and
- Filtered water distribution

SMC water supply system consists of four WTPs, nine WDS and four pumping stations. Most of the water distribution stations are interconnected and a water transmission grid has been made for achieving reliability in availability of water. Detailed studies, including an energy audit, were made of interconnections between WDS and WTP in the context of specific energy consumption i.e. kWh/ML required for transmitting the water. Accordingly, the most economical route for transmitting water has been derived. The studies revealed that savings were possible in the filtered water transmission; dedicated efforts were made in re-engineering of the filtered water transmission routes.

Re-engineering of filtered water transmission routes included calculation of specific energy consumption in transmission of water in the existing situation, and determining the more economical channels for transmission for all water distribution stations. Actions taken for making transmission more economical include:

- making connections between existing transmission lines more effective
- laying new transmission lines and connecting to existing ones
- replacing existing pumps as per energy auditor's suggestion

Other energy saving measures taken up included installation of thyristor-based Automatic Power Factor Correction (APFC) panels in the WDS, coating of pumps at the booster house of head waterworks, installation of pump sets at old and new booster pump houses, replacement of impeller at booster house and raw water wells and replacement of energy-inefficient pumping machinery.

To further augment efforts in energy conservation, SMC installed a 0.5 MW capacity power plant based on bio-gas generated from liquid sewage waste at Anjana Sewage Treatment Plant, becoming the first urban local body in India to do so. SMC currently has four such gas generating plants.

Results

Monitoring Water Quality

- Technical and financial measures, in particular the institutionalization of predictive and preventive maintenance, have resulted in marked reduction in failures of equipment and downtime of plants. Further, revenue from industrial consumers has shown a significant increase. Overall customer satisfaction is also perceptible.

- Four laboratories at the waterworks and one at the main distribution station have been installed with state-of-the-art technology and modern instruments and equipment.

- The staff was specially trained in water-quality monitoring and positioned as microbiologists, technicians and operating chemists. Consequently, there is now regular and accurate monitoring of the quality of raw and treated water.

- Parameters such as turbidity, chlorine, total dissolved solids, pH, colour, dissolved oxygen, etc. are measured and monitored. Microbiological parameters are also monitored at the dedicated microbiological laboratory. Tapi river water quality is also measured and monitored through the use of imported deployable instrument. Various test formats and logbooks are being maintained for recording water quality. An agency is authorized to perform external maintenance and calibration, and standardized reporting procedures as defined in ISO 10500 standards are being strictly followed.

- A weeding machine was procured to avoid impurities at the source itself and the operation has been outsourced to a third party. Further, the installation of online Total Organic Carbon (TOC) analyzer is planned.

- During 2006–07, 99 percent samples collected on a daily basis were found to be of good quality.

Improving O&M Systems
- As part of O&M reforms, several innovative practices were introduced. These are as follow:

  1. a grid-connected water network was put in place to maintain continuity in water supply, to ensure consistent quality and quantity of water supplied, and for transmitting water via energy-efficient routes;

  2. Emergency Response Centre was established to ensure uninterrupted water supply even during emergencies;

  3. Conventional coagulant alum was replaced with advanced coagulant—poly aluminium chloride (PAC) since 2003–04;

  4. A weeding machine was purchased for removal of floating, submerged and rooted vegetation.

- Preventive and predictive maintenance has become part of regular maintenance. With a dedicated electrical and mechanical maintenance team in place, breakdowns in electric and mechanical systems have been reduced significantly.

- Installation of ultrasonic-type flow meters for water quantity measurement has helped the Hydraulic Department of SMC to assess water losses during water treatment. Online water-quality monitoring system has minimized the wastage of chemicals and assured better quality of water to the customers. Timely calibration of inspection has enabled the department to generate reliable data on performance of instruments/equipment.

Reducing/Optimizing Energy Consumption
- Energy audit of 34 services with contract demand of more than 75 kWh was done by an auditor approved by the government of Gujarat. SMC was successful in revising its tariff (a process done through Gujarat Electricity Regularity Commission); from HTP-I to HTP-II (A) for 18 HT (high tension) services meant for water supply and a sewage disposal system.

- It resulted in saving Rs. 1.45 crore per annum. The audit identified total energy saving possibilities of Rs 2.21 crore/annum with an initial investment of Rs 1.8 crore.

- From the overall perspective of SMC Energy Cell that also includes street lighting, the corporation reduced its overall energy consumption from 342.29 kWh/ML (2003-04) to 316.95 kWh/ML (2006-07).

- Savings achieved by re-engineering the pipelines at four major locations amounted to Rs 3.26 crore. For example, by changing the transmission route for Umarwada WDS underground tank from Varachha Water Works to Sarthana Water Works, SMC has annually saved Rs 1.68 crore till 2009 (41.63 lakh kWh/ annum).

- Similarly, SMC has saved Rs 85 lakh per annum (20.8 lakh kWh/ annum) by modifying the transmission route for filling underground tanks of Athwa and Khatodara WDS.

- Average power factor for all HT services improved to 0.991 from 0.986 by installing Thyristor-based APFC panels (HT sensing) and quick replacement of faulty and de-rated capacitors wherever required. This has resulted in the saving of Rs. 17.69 lakh/annum.

- The energy consumption of SMC water supply system is monitored regularly on a daily basis and was found to have reduced from 356.87 kWh/ML in 200-2001 to 316.95 kWh/ML in 2007.

- The total energy savings achieved through re-engineering and energy conservation was Rs 3.5 crore per annum.

- The bio-gas plant had, till December 2008, generated 80.11 kWh of energy, leading to a direct saving of Rs 3.22 crore.

- As a result of these concerted actions, SMC received the first National Urban Water Award from MoUD in 2008 for 'Operation & Maintenance Practices in Water Management'.

Lessons Learnt

In every urban local body, as far as water supply infrastructure and related human resource development are concerned, there is always great scope for improvement, improvisation and efficiency measures so necessary for expenditure control and sustenance of revenues. SMC has shown that rather than a piece-meal approach, it is profitable, in the long term, to look at the water sector as a whole and institutionalize integrated reforms.

Sustainability

SMC's integrated approach to improving water quality, operation and maintenance of water infrastructure and to conservation of energy has resulted in a cascading effect – sustainable finances, sustainable services to the benefit of the consumers and, most importantly, contribution to sustainability of environment.

Transferability

The challenging task of sustainable water supply in a large city such as Surat cannot be accomplished without management, operational and conservation issues. It is possible to replicate similar efforts in an integrated manner in other large cities of India.

Watch this video to know more about the initiative

Energy generation from sewerage

Setting up of sewage gas power plants

Situation before the initiative

SMC had established a sewerage scheme with sewage lifting stations at Singanpor, Karanj, and Bhatar in 1954 and a Sewerage treatment Plant (STP) at Anjana in 1958. The STP had a capacity of 25 MLD with primary and secondary digester systems. All this happened even before the constitution of the Central Pollution Control Board (CPCB) and the Gujarat Pollution Control Board (GPCB), thus indicating the attitude and keenness of SMC to keep the urban environment clean and pollution-free.

With the development of Surat city, it was required to increase the capacity of the STP. Over the years, an elaborate network of sewers supported by sewage pumping stations has been set up to transport the domestic sewage to the STPs. The network of sewer lines and rising mains has increased from 757.39 km in 1996 to 1,028.5 km in 2008, while 28 sewage pumping stations and six STPs have been set up.

Details of STPs in Surat

S. No.	Name of the STP	Capacity (MLD)	Treatment Technology	Year of Commissioning
1.	Anjana	82.5	CASP*	1956
2.	Bhesan	100	CASP	1995
3.	Karanj	100	CASP	1998
4.	Bhatar	100	CASP	2003
5.	Singanpore	100	CASP	2003
6.	Bamroli	100	UASBr**	2001

*CASP : Conventional Activated Sludge Process

**UASBr : Up flow Anaerobic Sludge Blanket Reactor

Energy Consumption

With the development of Surat, SMC has increased its infrastructure investments in water supply, drainage and sewerage sectors. Operation and maintenance of these projects involves the consumption of electricity which in turn has imposed an increased burden on SMC's revenue expenditure. SMC's electricity expenditure has increased from Rs. 8.72 crore to Rs. 56.75 crore in 2007-08. The increasing trend in expenditure on energy consumption over the last few years is as shown in the graph on the next page.
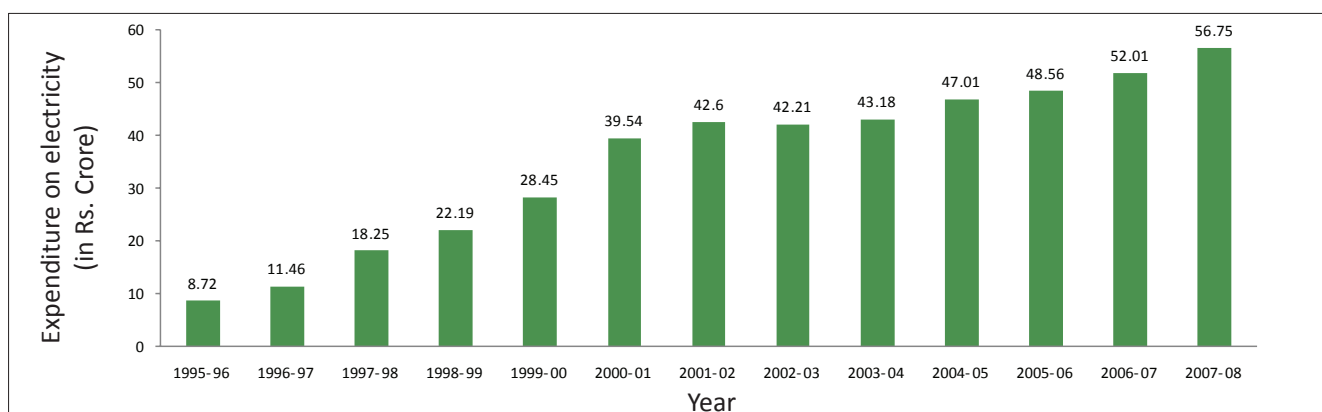
Electricity bills of Surat Municipal Corporation (in Rs. crore)

Looking to the trend of increasing electricity bills, the challenging step of power generation from the sewerage at STPs was initiated.

Initiative

Generation of electricity by utilizing gas generated from the STP is a proven technology. SMC first established the required technology at Anjana STP in 2003, as a demonstration project. Later, in 2008, SMC replicated the process at Singanpore, Karanj and Bhatar STPs and came out with well-proven results from these sewage gas-based power plants.

Besides power generation and cost savings in energy bills of the corporation, the sewage gas-based power plants project led to processing of claims for the CER under Clean Development Mechanism of UNFCCC.

Implementation strategies

Under the umbrella of the National Program on Energy Recovery from Urban and Industrial Wastes, the Ministry of Non-Conventional Energy Sources (MNES) has been promoting and financially supporting demonstration projects involving recovery of energy from wastes of a renewable nature, besides attempting to reduce emission of green house gases into the atmosphere. SMC initiated a proposal with the MNES for productive use of the energy-rich constituents of sewage gas emanating from the existing digesters at Anjana STP as a demonstration project.

Conceived in January 1997, a blueprint of the project was prepared by SMC and tabled before the MNES in July 1997 for scrutiny. This early initiation led to in-principle agreement between MNES and SMC to co-steer such a project subject for scientific confirmation about its techno–commercial feasibility and viability. Finally, MNES and SMC agreed to move forward toward putting the sewage gas-based power generation project at Anjana. It was agreed that financial assistance of up to 50 percent of the total project cost would be provided as grant by MNES.

This prestigious project, first of its kind in India to generate green energy from sewage gas, was based on the use of an imported technology from Spain with high levels of automation and a state-of-the-art, polymer-based, inflatable gas-holding balloon. To oversee the project, SMC formed the Project Implementation Committee constituted by leading consultants from academia and industry. In October 2003, the completely integrated plant had successfully generated 500 kWe of electricity during the trial runs leading to commissioning. The present generation of power from this plant is 8000 to 9000 units/day, which is consumed to run Anjana STP itself.

Processes in STP
SMC has five STPs having Sludge Treatment Process and one STP on Up-Flow Anaerobic Sludge Blanket Reactor (UASBR) process.

During the treatment process, sewage is passed through various stages of treatment, such as inlet chamber, screen chambers, primary clarifiers/UASB reactors, primary sludge pump house, aeration tank, secondary clarifier, return sludge pump house, sludge thickener, sludge feed pump house, anaerobic digester, digested sludge pump house, sludge drying bed or mechanical sludge dewatering system, final treated sewage chlorination system, etc.

Each unit has its own function in the process of treatment of sewage. Gas is generated during the treatment of sewage sludge as part of the treatment processes.

Conventional Activated Sludge Treatment process has a digester for the treatment of sludge. The objective of the sludge digester is to reduce volatile organic matters from the sludge by anaerobic digestion. The sludge digester is a closed circular RCC tank. The sludge from the sludge thickener is pumped to the digester for effective digestion before it is dewatered in sludge drying beds or mechanical sludge dewatering system. The digester is provided with a screw pump type stirrer/gas mixing system/sludge circulating system for maintaining the uniformity of the sludge concentration. In the digester, a proper volatile acid/alkaline ratio is maintained for digestion.

Present sewage characteristic at STP

Parameter	Inlet Parameters	Outlet Parameters
BOD	357 ppm	20 ppm
SS	365 ppm	30 ppm
COD	758 ppm	100 ppm
Flow	70 MLD	-

The digested sludge is periodically withdrawn to the sludge drying beds or to mechanical sludge dewatering system for dewatering.

Anaerobic fermentation or digestion is the most common process for converting organic material to methane and other gases. Sewage gas usually contains about 60 to 70 percent methane, 30 to 40 percent carbon dioxide, and other gases, including ammonia, hydrogen sulfide and other noxious gases. It is also saturated with water vapor. Precautions are required to be taken while processing and handling the gas. It is highly explosive and also difficult to detect. Sewage gas, which is a mixture of methane and other gases, is also known as swamp gas, sewer gas or fuel gas. The calorific value of sewage gas is 4,700 kCal/SM3 to 5,500 kCal/SM3.

Calculations for Sewage Gas Generation at STP

- Primary sludge VSS = 11,498 kg/day

- Secondary sludge VSS = 7,422 kg/day

- Total VSS of primary & secondary Treatment = 18,919 kg/day

- Sewage gas generation will be 13,007-20,811 m3/day

- Sewage gas calorific value 5,200 Kcal/nm3

- Considering Loading on Generator as 80 percent & Electrical Efficiency of Engine as 36 percent: Approx electricity generation capacity = 1,180 to 1,888 kW

According to the practical experience and actual figures of conversion efficiency, effect of temperature due to seasonal variations on anaerobic treatment of sludge, etc., it was estimated that a minimum 120 units of electricity per 1 MLD of sewage flow can be generated from the sewage treatment.

Process diagram of conversion of sewage gas into electricity
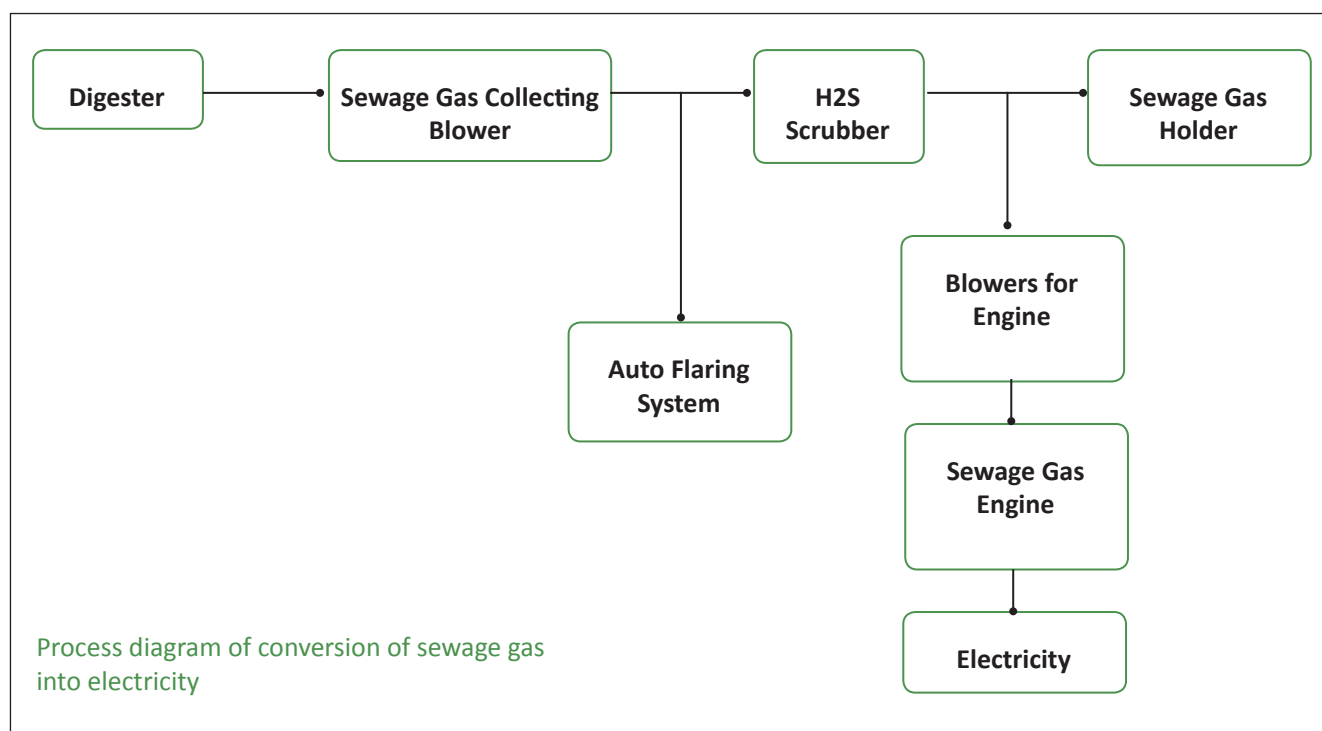
Some important components in the Process Diagram

Gas Collection System

Sewage gas generated in the digester has low gas pressure. Hence, a gas extraction system is required in order to make up for the line losses and convey the gas to a storage unit via gas cleaning mechanism. This is done by sewage gas blowers, which are operated depending on the pressure of digester.

Gas Cleaning System

The sewage gas contains hydrogen sulfide (H2S), a corrosive gas. The corrosion will reduce the life of machinery involved in the system. Hence, level of H2S needs to be reduced. For that, H2S scrubber is required to reduce its level in the sewage gas before utilizing methane for power generation.

Gas Storage System

The gas generation rate of digester depends on various process operational aspects. To enable the gas generation to be evened out, so as to provide a constant flow to power generation unit, a Sewage Gas Storage system is required. This storage unit acts as buffer storage to match the load requirement with the generation rate of sewage gas.

Power Generation System

At present, the most efficient method of converting sewage to electricity is through the sewage gas engine generator set. The sewage gas is fed through the sewage gas feed blowers at specific pressure. The engine is spark-ignited, which is connected with the alternator. Electricity generated at the alternator terminals is fed to the sewage treatment plant itself to run various units. The technology for the sewage gas engine generator set is provided by various manufacturers.

Excess Gas Flaring System

The excess gas flaring system is provided to flare the sewage gas when the engine generator set is under maintenance, and storage is full. As methane is a greenhouse gas and highly inflammable, it cannot be released into the atmosphere in that form.

Supervisory Control and Data Acquisition (SCADA) System

This system is implemented for precise and efficient control over plant process, as also to collect and store data generated from various field instruments such as digester pressure transmitter, sewage gas flow meter, on line CH4 and on line H2S analyzer, various engine generator set parameters, etc.

Sewage gas engine (photo courtesy SMC)

Sewage gas holder (photo courtesy SMC)

H2S Scrubber (photo courtesy SMC)

SCADA system

Results

Cost Economics of Anjana Sewage Gas Power Plant

Total Cost of project	Rs. 2.86 crore
Grant from MNES /GEF	Rs. 1.30 crore
Total Expenditure of SMC	Rs. 1.56 crore
Present Power Generation	9,500 - 10,500 Units/day
Total Unit Generated (till Jan. 09)	82,93,364 kWh
Equivalent Value of total Electricity Generation in Rs.	Rs 3.73 crore
Net Saving after subtracting Auxiliary Consumption and O&M Cost (till Jan. 09)	Rs 3.43 crore
Power generation cost per Unit	Rs. 1.20 per Unit
Pay Back Period (for SMC fund)	40 months (After deducting plant shutdown period of two months due to engine inter cooler problem and eight months due to modification work of Anjana Sewage Treatment Plant.)

Replication of Anjana STP Gas Power Plant

After the successful commissioning of a purely sewage gas-based power plant at Anjana STP, SMC took quick actions to set up other sewage gas power plants at three STPs at Singanpore, Karanj and Bhatar. These projects were commissioned in 2007-08 in the short duration of 10 months, and are now operational and providing electricity to respective plants.

Power Generation at various Sewage Gas-based Power Plants

No.	Name of STP	Installed Capacity of Power Plant (MWe)	Year of Commissioning	kWh units generated since commissioning	Generation in crore Rs. (till July 2008)
1	Anjana	0.5	October,2003	82,93,364	3.73
2	Singanpore	1.0	March, 2008	16,67,916	.75
3	Karanj	1.0	March, 2008	23,28,443	1.5
4	Bhatar	1.0	August, 2008	6,68,092	.3

SMC now incorporates biogas-based power plant along with construction of STP in tendering processes so that power production can start as soon as construction work is completed. Tenders are floated for construction of new STPs by SMC at Dindoli and Variav, and installation of biogas power plant has been incorporated with construction of treatment plant. The work contract specifies the minimum electricity that should be generated from power plant based on incoming sewage quality and quantity. Failing this precondition, the shortfall in guaranteed power generation will have to be borne by the contractor.

Benefits

- A sewage gas-based power generation plant requires less human resources and is simple to operate with SCADA.

- The production of electricity through sewage gas-based engine generator technology has many more advantages and cost benefits over the earlier technology of duel fuel engine generator set.

- Nearly, 80-85 percent electricity required in the STP is generated from sewage. This will reduce the use of fossil fuel for power generation.

- Power generation and its utilization in STP reduce the electricity consumption of grid power. It also saves on electricity bills, thus reducing revenue expenditure of the STP, which contributes to reduced municipal taxes to the citizens.

- It is well known that 1 unit of energy saved at user end will reduce generation of 2 units (considering the transmission loss, etc.). Therefore, distributed power generation through such type of power plant is always beneficial to project proponent and the society at large.

- Reduction of emission of green house gases for the protection of environment.

After successful implementation of the project, various organizations, municipal corporations, private agencies and industries at national and international levels have visited the Anjana STP. Presently, several municipal corporations in India have implemented or taken up implementation of similar kind of projects in their cities.

Registration of Project under Clean Development Mechanism

The Clean Development Mechanism (CDM) is a project-based flexibility mechanism designed to facilitate voluntary contribution of developing countries to the achievement of the greenhouse gas emission mitigation targets to which industrialized countries have committed themselves under the Kyoto Protocol. The achieved emission reductions can be certified and sold to countries that have taken on binding targets under the Kyoto Protocol. The host countries may reap a share of the credit sale revenue and secure 'Sustainable Development' benefits from the project activity.

CDM and Sewage Gas-based Power Generation by SMC

The sewage gas-based power generation at STPs at Karanj, Singanpore and Bhatar are eligible for assistance under CDM mechanism for various reasons. The STPs are designed to generate the sewage gas by treating the sludge generated from primary and secondary clarifier of sewage in an anaerobic processing system (Digester) so as to restrict the atmospheric emission of methane gas. At the same time, the methane gas is recovered without leak in the atmosphere

The electricity generated from the utilization of sewage gas in gas engine is used for captive purposes. Thus greenhouse gas reduction by decreasing consumption of fossil fuel for grid power supply equivalency is possible.

For the registration of these projects under CDM, the project falls under the small scale in following categories:

- TYPE III. H. Methane recovery in wastewater

- TYPE I.D: Grid connected renewable electricity generation

SMC will obtain:
- 39,630 CERs from Methane recovery from wastewater and

- 16,624 CERs from grid connected renewable electricity generation categories.

Work Progress

- A consultant has been appointed for registration of these projects under CDM, obtaining CER and sale thereof.

- Project Design Documents have been prepared and Host Country approval has been obtained from Ministry of Environmental & Forest, Government of India, New Delhi, which is Designated National Authority for CDM.

- A registered validator of UNFCCC has been appointed for the validation & registration of these projects at UNFCCC.

- The validation process is in progress.

Lessons Learnt

The sewage gas-based power plant projects are beneficial in sustaining the environment and reducing global warming in following ways:

- Prevent free methane emission from the digester.

- Generate electricity which reduces the use of grid power. This will reduce use of fossil fuel for power generation.

Distributed power generation at user end (load centre) is always beneficial to the power generation and transmission system. It will reduce the transmission losses of the grid and also improve the grid voltage. Confirming to the advantages as described in the above case study, it can be concluded that power generation through sewage gas should be adopted as an integral part of sewage treatment system. This will reduce the power need of STP and revenue expense of the urban local bodies besides providing environmental benefits to the cities.

Sustainability

Both from points of view of cost benefit and environment, the sustainability of the sewage gas-based power production is self-evident, given the discussions above.

Transferability

Operation and maintenance of sewage-related projects involves consumption of electricity which in turn imposes an increased burden on revenue expenditure of the ULB. The demonstration project already exists in Surat. Newer technology is also presently available. SMC's initiative and project processes can be replicated in other mega cities in India.

Vadodara

GPS-based vehicle tracking system for efficient waste management

Situation before the initiative

Door-to-door garbage collection method is now being adopted by many Urban Local Bodies (ULBs) in Gujarat. Several models of door-to-door collection have been deployed by civic bodies. Some cities have deployed *sakhi mandals*, Community Based Organizations (CBOs), Non-governmental Organizations (NGOs) or their own staff for this purpose. In Vadodara, the door-to-door collection is being undertaken by a private agency appointed by Municipal Corporation. There are also issues and complaints related to irregularity of their service. Vadodara Municipal Corporation (VMC) started door-to-door garbage collection service in 2006. Everyday the city generates about 580 metric tons of waste. Despite deploying a large number of staff, resources and waste collection vehicles for daily garbage collection, there were complaints about irregularity and inefficiency in door-to-door collection service of the private agency appointed by VMC. There was also criticism that the collection vans do not collect waste from interior housing societies/high-rise apartments. Prior to commencement of door-to-door collection service, there were 651 garbage container sites in Vadodara which were eyesores of the city. There was a serious need for proper monitoring and evaluation system of the Solid Waste Management (SWM) services and to reduce open waste dumping.

Initiative

All these factors made VMC to put in place an integrated system for monitoring and tracking of solid waste management services provided by private agency. It was decided to adopt GPS (Global Positioning System) based on a vehicle tracking system which enables VMC to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals.

The GPS tracking system installed in every SWM collection truck

Monitoring of trucks equipped with the GPS tracking system at VMC control room
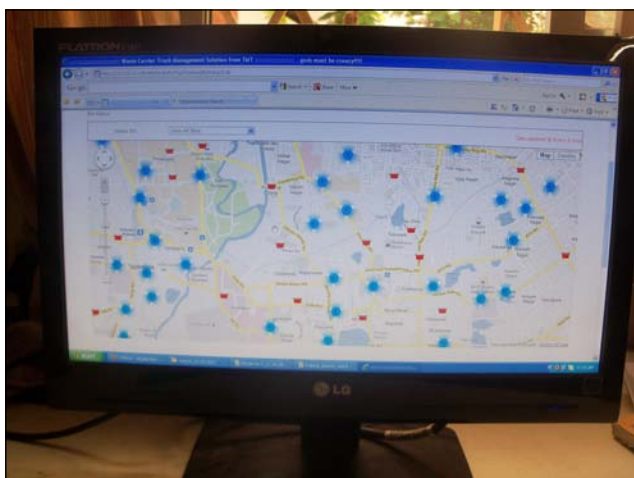
The Municipal Corporation passed a resolution in the general body and 5 years' work contract was allotted to a private agency called Centre for Development Communication (CDC) through a tendering procedure for collection and disposal of waste to dump sites.

Vadodara Municipal Corporation introduced a GPS-based SWM vehicle tracking system in door-to-door garbage collection in November 2010. As per the tender conditions, it is the responsibility of the appointed private agency to set up a whole mechanism for door-to-door garbage collection, which includes vehicles, installation of GPS device in each vehicle, appointing garbage collection staff (1 driver and 2 labourers per van), and collection, transportation and compaction of waste and monitoring of all the vehicles. CDC has deployed 158 vehicles, including collection vans and compactors, for collection and disposal of the waste. A GPS device is installed in each of these vehicles. Each GPS device cost Rs. 10,000 to the private agency which is a one-time cost, plus a SIM card worth Rs. 500 has to be inserted in the GPS device to make it functional. VMC provided a small space and infrastructure to the CDC in each of its ward offices to set up a monitoring & control room. Route maps for door-to-door collection were identified and defined by VMC on Google map and the same route list has been provided to the agency by VMC. Currently 129 routes have been defined in Vadodara. Slum areas are also covered under this service.

The monitoring systems at the control rooms use TRACO and i-Track software to track the location and movement of the vehicles on different routes. The defined routes have been entered into the software to generate daily track reports automatically. Virtual bins have been created on the software in the name of each society to mark a spot. Depending on the speed of the internet service, the software updates movement of the vehicle on a route every 3 to 5 minutes. It is almost real time and so information about the movement of the vehicle or whether it has stopped on the way can be traced from the control room. If there is any problem, the ward supervisor can also contact control room to inform about the problem or to know about exact location of the vehicle at that time.

The monitoring staff in ward control rooms are employed by CDC.

To solve the problem of waste collection from high-rise apartments interior societies and open dumping of waste, VMC provides community dustbins of 100 litres in housing societies/apartments with more than 50 households.

Collection of waste from these community dustbins is also undertaken by CDC. VMC has distributed 1066 community dustbins in such societies/high-rise apartments across the city. The residents dump their household waste in these community bins and the waste collection van collects waste from them every morning. But to make the society/apartment residents responsible for the community dustbin, VMC has signed an agreement with all societies that if the community dustbin is damaged or stolen, the society has to replace it to avail the service. The tender terms applicable to the private contract agency included the cost of the bins and its replacement, if needed.

VMC pays around Rs. 560 to CDC per metric ton waste collected and raises it by 5 percent rate every year. It also provides a uniform and a kit to the waste collection staff twice in a year. The agency has also started a toll-free complaint number service from 1st September, 2012. The Corporation is also planning to distribute informative pamphlets to citizens for creating awareness about SWM.

Penalties Levied on the agency for inefficiency in work
In order to bring efficiency in service delivery of the contractor agency VMC has put in place several measures in the tender conditions which includes regular monitoring of the work, charging fines for non-delivery of the service, and periodic evaluation of the vehicles and equipment, etc.

For example, if waste is found spilling out of the vehicle it amounts to Rs. 1,000 fine per day per vehicle. If the GPS device is not installed in the vehicle or if it is not working, VMC charges Rs. 2,500 and Rs. 400 respectively per vehicle per day. If the vehicle has skipped any house, the agency is charged Rs. 5 penalty per house per day on the first day, Rs. 10 on the second day and Rs. 15 on third consecutive day, and so on.

In any case if a van is unable to reach the spots for waste collection, it is to be replaced within 2 hours time.

On late replacement, the agency is fined Rs. 2000 per day per vehicle and on failing to replace the van it will have to bear a penalty of Rs. 4,000 per day per vehicle. In July 2012, VMC collected Rs. 7 lakh as fines from CDC. VMC receives on average 7 to 8 complaints per day from citizens which are mostly related to delay in waste collection or no collection by door-to-door vans.

The vehicles have to pass through an examination every month. Zone and ward officers along with a foreman inspect the condition of the vehicle, its cleanliness, the locking system of the container door, opening of the container box, etc. Based on this vehicle maintenance regime, the officers give a marking to vehicles per month. A minimum 75 percent marking is to be achieved mandatorily. CDC's vehicles gain 78- 80 percent marking every month. The practice needs to be carried on in the long term for reaping fruits of success.

Results

The GPS-based SWM vehicle tracking system helped Vadodara Municipal Corporation to monitor the door-to-door garbage collection service effectively. It is now possible for VMC to see if a large zonal area is left without service by the contractor. It made the private agency more responsible towards its job; the citizens are also at ease as waste is regularly collected from their locality. They wait for the van to come and collect waste instead of throwing it out in any open dumping area and consequently open dumping sites and container sites reduced drastically. Earlier, there were 651 container sites in Vadodara which has now decreased to 261 and VMC is striving to reduce it further to make Vadodara a bin-free city. The overall environment and visual beauty of the city has improved after the initiative.

A waste collection truck deployed by VMC

Lessons learnt

The system is proving to be effective without doubt but there is always scope for improvement. The implementers and the monitoring staff at the control room suggest improvements for the software, including the following:

- The software does not generate a report that detects societies and apartments that have been left out.

- The current track time of 3-5 minutes should be reduced to real time.

- The current system only shows the waste bin points on the route; it should show the route by line.

- The control room should get intimation if the vehicle goes out of the route.

Sustainability

It is observed that the current system is sustainable since it has been beneficial to the Corporation. However awareness among citizens will be necessary to achieve full results in a sustained manner.

Transferability

The system can be adopted by any large municipal body where it is difficult to monitor the service delivery and keep track of the collection vehicles. It has the capacity to bring change in the service delivery by putting in place an effective monitoring mechanism. The model has been implemented in Chennai and Nagpur is also planning to do it. Bharuch, Ankleshwar and one zone of Surat are also discussing to adopt the practice.

Khedbrahma

Unjha
Vadnagar
Himmatnagar
Mansa

Petlad
Anand

Jasdan
Gondal

Bardoli
Navsari
Dharampur

Case studies from
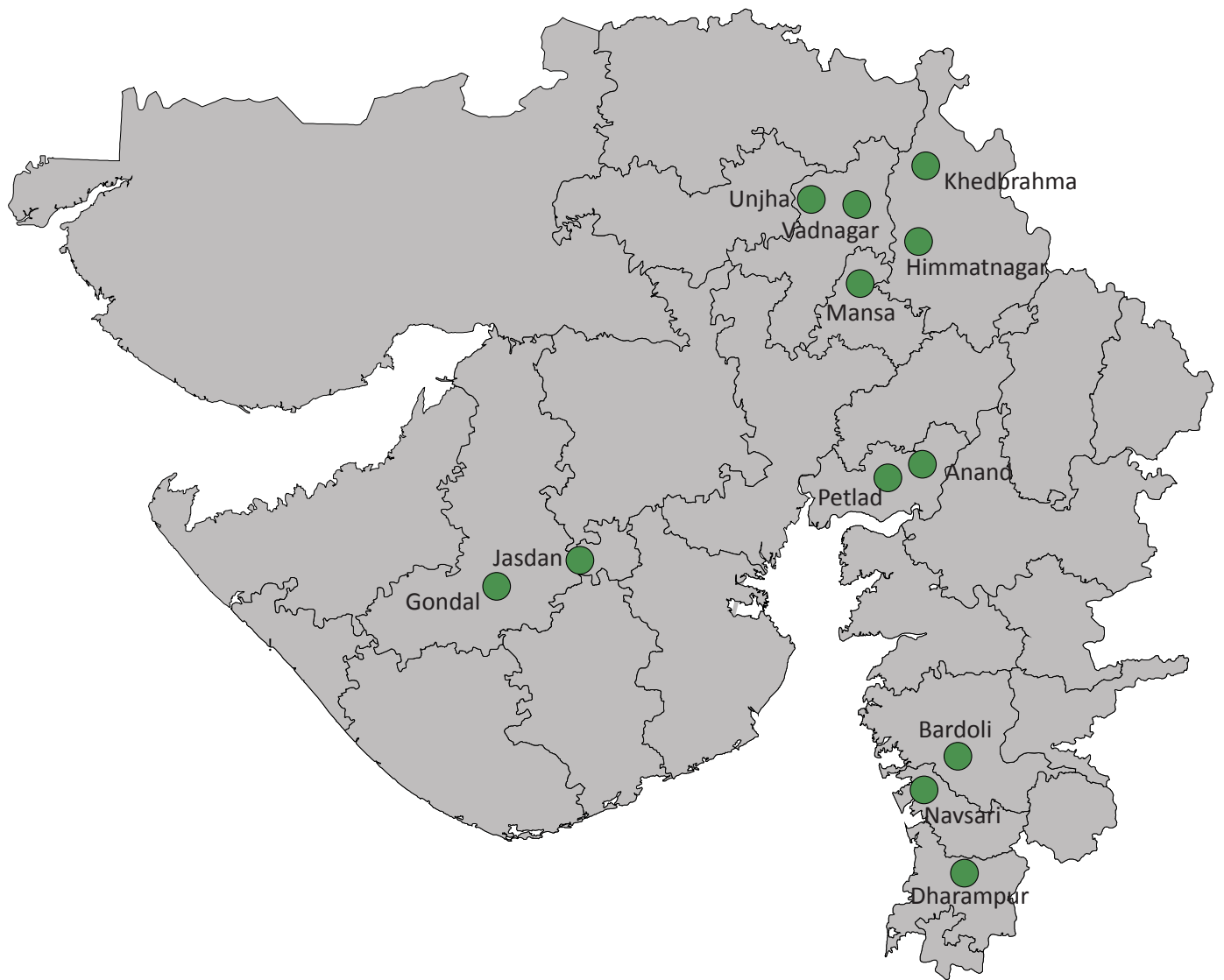
municipalities

Anand

Door-to-door waste collection

All information provided by
Vibhakar Rao
(Chief Sanitary Inspector, Anand Municipality)

Solid waste collection vehicle

Complaint registration regarding door-to-door service was centralized at the Municipality Office.

Situation before the initiative

Anand Municipality had hired a contractor for door-to-door garbage collection. The coverage of the service was 76 percent then. All complaints including those related to SWM were registered zone-wise. Regular reports were submitted to the municipality. However, this left scope for the possibility of some complaints being missed out either deliberately or by chance. On an average, 25 complaints were received for door-to-door garbage collection every month.

However, this contract was terminated due to irregularities by the end of 2007. For a few months after that, there was no door-to-door collection. The ULB did not have adequate staff. Of the sanctioned 182 positions, it had only 143 filled posts, which included the ULB staff and the daily wagers.

Initiative

In 2009, a new governing body took over the municipal administration. They took following steps to improve the door-to-door waste collection service.

Step 1
The door-to-door collection was outsourced to three local *sakhi mandals* and simultaneously advertisements were placed in local newspapers informing the citizens of such a change. Also, residents were invited to register complaints in case of any lapse on part of the *sakhi mandal* workers at the municipal central office.

Step 2
Instantaneously, the Municipality centralized the complaint registration. Complaints are now to be registered directly at the Municipality office. Earlier, when the complaint registration was zone-wise, the zonal in-charge was required to submit a report of the complaints received.

Previously in the absence of IT-enabled services that would provide seamless movement of zonal data to the chief officer, it was observed that, many times, information of the true situation of services at zones didn't reach the central office.

Step 3

A penalty system was introduced by the Municipality for the best service outcome from the *sakhi mandals.* Complaint registration at the central municipality office ensured that the ULB got the true picture from the field. Once the door-to-door collection was outsourced, the *sakhi mandals* were accountable for the regular collection of waste. For every complaint received of irregularity in garbage collection, a certain amount was deducted from the remuneration paid to the *sakhi mandals*.

As part of its strategy, the Municipality hired three *sakhi mandals*. In total, these *sakhi mandals* have 120 sweepers. The equipment used by the sakhis for waste collection is also arranged by the *sakhi mandals.*

The *sakhi mandal* workers collect garbage from individual houses and dump them in secondary dustbins. From there, the ULB staff collects the garbage and dumps it at the disposal site. The *sakhis* are paid Rs 12 per house per month. Anand Municipality has 142 workers in the garbage collection chain. Of these, 120 are employed by the *sakhi mandals.*

Step 4

Ward-wise sanitary inspectors were appointed to monitor the work of the *sakhi mandals* and submit daily reports to the chief sanitary inspector.

Results

The initiative of outsourcing the door-to-door waste collection worked positively for both the ULB and the residents. Even though the ULB was in short of staff, they could provide good service with smooth operation to citizens. The number of complaints received has reduced drastically. Now there are 20 complaints on an average per month, as against 25 earlier. After outsourcing to *sakhi mandals*, the waste collection is 100 percent, which translates into increased citizen satisfaction.

Lessons learnt

Setting up a systematic mechanism for solid waste management and complaint redressal helps the civic body to achieve service efficiency. However for waste segregation at source to be successful, much awareness and accountability needs to be created among citizens.

Sustainability

With public and government participation, this approach can be very sustainable. Such an arrangement promises to be favourable for the local body and the residents.

Transferability

Door-to-door waste collection is being carried out in many ULBs. (A case study of Khedbrahma Municipality that has a segregated chain of MSW from source to vermi-compost plant has been discussed on page 113 in this document.)

While door-to-door collection has been taken care of, the municipality has not succeeded in its attempt to put in place segregation of waste as per rules. The reason is being attributed to the casual approach of the residents. According to the chief sanitary inspector of Anand Municipality, Vibhakar Rao, the ULB's efforts of total segregation have been unsuccessful so far because, as he says, "People do not want to spare a few extra seconds to segregate waste into dry and wet waste in their homes. Till the residents understand the importance of segregation, there is not much that we can do."

Another aspect that is of equal importance is the litter on the roads. "Roads are swept every morning. But, if they are strewn with litter by afternoon, it is a waste of time, money and energy," says Rao.

Through a government grant, the Municipality had received tricycles for garbage collection in 2007, containers in 2010 and lifter in 2011. But, the equipment could not be put to optimum use as their delivery was scattered.

Bardoli

Taking strict action against water wasters

Situation before the Initiative

Bardoli Municipality is located 30 km southeast of Surat and is experiencing a rapid growth. The decadal population growth of Bardoli between 2001 to 2011 was 28.02 percent. With the increase in population, the demand for water is also increasing, whereas the Municipality has limited sources to meet a growing demand. Water scarcity is a major issue in Bardoli which gets worse in summer.

It was observed by the citizens as well as by ULB officials that the citizens were wasting large amounts of water for the purposes of washing porches, verandahs and vehicles, spraying on the road or being careless and leaving taps open during water supply time. This caused problems of low pressure during water supply hours and water shortages in areas situated on higher altitude.

Initiative

As the summer of 2012 was approaching, Bardoli municipality started receiving complaints regarding shortage of water supply, especially from areas located on higher altitude. There were also complaints about low water pressure. To solve these complaints and to find out reasons, a team from municipality visited various societies in different locations of Bardoli and they found that people were wasting water.

Bardoli Municipality officials decided to take strict action against the water wasters and prevent misuse of this precious natural resource.

The chairman of the Water Committee of Bardoli Municipality took the lead and thought of an initiative to curb this malpractice. The following action plan was prepared:

1. A resolution was passed in the committee with a provision for issuing show-cause notices and fines to those found wasting water. It was decided that three show-cause notices should be issued to a person and each time Rs. 100 will be charged on the spot as fine. This fine is just a token amount, levied to make people understand the value of water.

2. Even after this, if citizens failed to stop wasting water, their water supply would be disconnected by the municipality. The person would have to re-apply for a water connection and Rs. 300 would be collected as a water re-connection charge.

3. Prior to the implementation of this action, citizens of Bardoli were informed via loudspeaker announcement by auto rickshaw throughout the city.

A team from the municipality carried out surprise checks in March 2012. They visited societies and *falias* at the time of water supply in the morning to catch water-wasters. They would visit areas from where more complaints were received. In about one and a half month municipality officials issued notices to around 25-30 water-wasters during these surprise visits. The civic body staff has not faced any confrontation from citizens or influential people as they go in a group during surprise checks.

Results

The initiative has made quick impact on citizens. The wastage of water has reduced. It was observed that in most cases, the second notice was not required to be issued to the water-wasters by the ULB. People have started using water sensibly. However, it was found necessary to develop communication champaign to educate all the citizens.

Lessons learnt

The attitude of some of the Bardoli citizens have changed because of the municipality's actions, however, some of the citizens still continue to waste water. This could be due to the very minimal penalty charges levied or they are unaware of the importance of the scarce resource of drinking water. Continued follow-up and surprise visits are needed in order to sustain the effort and prevent citizens from wasting water .

Sustainability

The Municipality should launch a communication campaign to create awareness of clean drinking water. The misuses and wastage should be discussed within the staff and elected persons.

Transferability

This remarkable initiative of Bardoli municipality is very much replicable in any municipality. The penalty can be adjusted and levied as per the ULB and local conditions to make people understand the importance of water.

Chhaya

Towards improving cost recovery in water supply —increasing water tax

Situation before the initiative

The city of Chhaya is located next to Porbandar on the coast of Gujarat. The Municipality of the city was not able to meet the expenses that it incurred in supplying water to its citizens. Even though the city doesn't face any serious power, drainage or water problem, the electricity bill/costs of water supply system was higher than what it received as water charges. During the year 2008-09, the annual expenditure of Chhaya Municipality on water supply was 12.29 lakh, while its cost recovery from water supply was only 9.25 lakh. Chhaya gets 4.2 MLD water supply from Kodal dam. The municipality supplies water to citizens through individual water connections and stand posts. Still, there are some areas where there are no piped connections; the civic body has to supply water through water tankers. The water supplied through stand posts and water tankers does not generate any revenue for the municipality. Therefore, Chhaya municipality was facing a problem in meeting expenses of water supply.

Initiative

After observing that the water supply costs of the municipality are increasing against its revenue, which is being levied only from the properties with piped-water connection, the civic body decided to find a way to cover the water supply expenses arising from supply through water tankers and stand posts. Mr. B.K.Khunti, President of Chhaya Municipality in 2009-10, decided to increase water charge of residential properties to fill this gap.

The decision was taken to increase residential water charges from Rs. 600 to 800 and was also supported by the elected body. The same rate was also applicable to water connections in slum households.

An advertisement was published in local newspapers by the Information Department of the Govt. of Gujarat to inform citizens about the proposed increase in water charges of residential properties.

It was also informed through this advertisement that if any individuals had objection to this decision, they could submit a letter to the municipality within one month from the date of publishing of this advertisement. If any disagreement or objection is received, it will be discussed to reach a consensus between the civic body and the citizen. However, no complaint or disagreement was received. So another advertisement was published in local newspapers after one month that the municipality did not receive any objection on the increase of water tax and hence it will be implemented by the Municipality from 1st April, 2010.

A resolution was also passed in a general meeting of the Municipal Body on 26th March, 2010, to collect Rs. 800 as water charges from residential properties from 1st April, 2010. Generally, the municipality collects this water tax on a yearly basis, but considering the repayments and revenue generation, flexibility was offered to citizens to pay their tax in 2 to 3 instalments.

Lessons learnt

Active interest and support from the elected wing of the municipality to increase water charges is important. Tax increase has to be viewed as a positive change to wards improved services for citizens.

Sustainability

An increase in water tax from residential properties is sustainable as it is collected annually and from the generated additional income, municipalities can provide new water supply pipe lines to the areas where they didn't have water connections. The Municipality could carry out other development works within the city. Besides, the Municipality has offered flexibility in the payment of water charge by allowing payments to be made in instalments. This has ensured inflow of revenue to the Municipality at the convenience of the citizens.

Transferability

It is a good example for any other urban local body. It is important of all local governments to study the revenue-expenditure for any service and analyze whether they have been able to meet their service costs.

Dharampur

Improved waste management by creation of local CBOs

Door-to-door campaign for promoting eco-friendly bags
(photo courtesy Dharampur Municipality)

Door-to-door waste collection by sakhi mandals
(photo courtesy Dharampur Municipality)

Situation before the Initiative

Until 2008, there was no organized door-to-door primary collection of waste in Dharampur (in Valsad District). Some of the municipal *safai karmacharis* were allotted the task of assistance in primary collection.

Initiative

The door-to-door waste collection service was privatized in 2008. After due procurement process, Sai Om Sakhi Mandal was given the annual contract. Since no other agency has shown response to the advertisement the contract is renewed each year. The Sai Om Sakhi *Mandal* is paid Rs 3.50 per household or per shop per month. Communication and training strategy, and waste transportation details were designed by the Dharampur Municipality to make the initiative as effective as possible. As per 2010-11 data, the city generates an estimated 6 tonnes per day (TPD) of municipal solid waste. Approximately 1 TPD of organic waste is processed at the vermi-compost plant which has a capacity of 4 TPD. The inerts are then transported to an open dump site, 3 km outside the city.

To improve the solid waste management service of Dharampur, the municipal administration had prior consultations with elected representatives to rope them for improving citizen awareness regarding waste disposal. Ward-wise meetings were organized to educate people.

Basic statistics	
Number of households (Census 2011, provisional)	4,500
Total commercial properties (2011)	1,072
HH served by primary collection (estimated)	3600 (80%)
Commercial properties served by primary collection	700 (70%)
Total waste generated (2011 Estimated)	6.0 TPD
Waste processed at vermi-compost plant	1.0 TPD
Compost produced (estimated)	0.3 TPD

The following steps have been taken by the ULB over the years to improve waste management:

- *Sakhi Mandals* were trained and educated in collection of domestic waste from households. They were motivated by the potential regular income that they get besides contributing to the cleanliness of the city areas.

- The Municipality distributed wheelbarrows with dustbins among the *Sakhi Mandal* members for collecting dry and wet waste separately.

- Tractors are made to stand at definite points. Domestic wet waste is transported to designated tractor points by the *sakhi mandal* members.

- The vermi-compost plant was also constructed in 2008-09 with support from the GUDC.

- The sale of compost brings in additional revenue of nearly Rs. 8,000 every month.

Towards a plastic-free city

In 2008-09, the Municipality embarked on another mission to make Dharampur plastic-free by educating people about its advantages in reducing solid waste and making it recyclable. The Municipality has strictly enforced the ban on the use of plastic bags with thickness less than 40 microns. The Municipality, with the help of local people and NGOs, has distributed 5,000 eco-friendly bags to the citizens. The Municipality's resolve in enforcing the ban of using plastic bags is a pioneering lesson in local governance in Gujarat. In one instance, 879 kg of banned plastic bags were confiscated by municipal inspectors and sold to a recycling agency for Rs. 14,400.

Results

Dharampur Municipality has not only enhanced its revenue generation, but has also achieved sustainable solid waste management through its initiatives. The designation of tractor picking points has led to a reduction in fuel bill by 20 percent even as *sakhi mandal* members earn Rs. 300-500 monthly from segregating the dry waste for recycling. Sale of vermi-compost brings in additional revenue for the municipality. The ban on plastic bag usage has also helped in reducing the amount of plastic waste in the city.

Lessons learnt

Resolving issues in sanitation requires a holistic approach that includes strategizing procurement procedures and undertaking communication strategies for all stakeholders. Streamlining transportation logistics and working out marketing ideas is necessary in order to bring about environmental and financial benefits. Banning plastic bags is challenging and difficult to sustain unless there is a will in the local government.

Sustainability

The ULB has undertaken initiatives in SWM, in individual toilet coverage and also building of new community and pay & use toilets. The elected wing in synergy with the municipal administration can play a highly pro-active and motivating role in keeping the city clean. Privatization of primary collection can bring about increased garbage collection of coverage of households and commercial establishments.

Transferability

There are several small cities like Dharampur that can devise strategies for primary collection of waste leading to a cleaner environment.

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Toilets

Dharampur Municipality has been able to achieve a 100 percent target (2008-09) in constructing five pay-and-use toilets. During 2008-09, the municipality also completed the construction of 200 individual toilets for the urban poor in Dharampur. Under the state government's Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojna, Dharampur embarked upon an ambitious project of lake beautification at a planned cost of Rs. 2.25 crore.

It is in this background and under various incentive schemes that the State Government has awarded citations and various prizes totalling of Rs. 30 lakh to date to Dharampur Municipality.

Gondal

Identifying and penalizing illegal water connections

Situation before the Initiative

Gondal, in Saurashtra region near Rajkot, has about 35,000 properties. Most residential households have been provided with individual water connections. Commercial properties registered with the Urban Local Body (ULB) have also taken water connections. As commonly seen in smaller civic bodies, Gondal Municipality was also receiving several water supply-related complaints. Based on these and as part of self-corrective measures, the Municipality staff checked municipal water connection records and found that there were only about 13,000 water connections on records against about 35,000 total properties in the city. This difference in number of water connection on records against the registered properties drew attention of the Municipality officials as most properties in Gondal had municipal water connections.

Initiative

The Municipality decided to take action to find out the difference between the number of properties and the number of water connections. The President and the Chairperson, Water-Works, of Gondal Municipality took the lead in finding illegal water connections and regularizing them. An office order was issued in December 2011, by the civic body to check door-to-door illegal connections in Gondal and ask the property owner to regularize it after paying a fine of Rs. 1,500 within a stipulated time. A water tap connection checking squad was formed to carry out the task.

Citizens were informed about this action of the Municipality through advertisements in local newspapers, loudspeaker announcement in auto rickshaws and announcement through drum beating campaigns. This information and communication campaign received good response from the citizens of Gondal.

The Municipality started this drive to regularize illegal water connections in December 2011. A team of 8 to people including water-works supervisors, plumbers, tax department officials and society leaders visited properties & households and checked individual water connections with municipal records. If the team found any illegal water connection, they issued a fine of Rs. 1,500 on the spot to regularize the water connection and also issued a receipt of the charged fine. Initially, they issued a notice of 8 days to the properties with illegal water connection to regularize their connection on paying Rs. 1500 fine. The ULB also clarified that a larger-inch connection found on the ground that differed from the municipal water connections records would also be considered illegal and would require to be regularized.

The municipal team and the staff haven't faced any problems during the drive and they received good support from the political wing too. Property owners/citizens also cooperated and paid the fine to regularize their water connections. The ULB is of the opinion that there has not been any requirement to cut water connections till date. This drive was carried out continuously till June 2012. The civic body succeeded in regularizing about 300 illegal water connections per month.

Results

Over six months, Gondal Municipality has completed checking water connections in about 70 percent area of the city. The rest 30 percent area was planned to be covered after the monsoon of 2012. Through this initiative Gondal Municipality could regularize about 2,125 residential illegal water connections, which resulted in an additional revenue generation of about 31.87 lakh. The officials also collected previous water tax arrears of about 2.89 lakh. In addition to this, from the year 2012-13 the civic body will also receive water tax revenue of about 12.75 lakh every year from these newly regularized water connections. The number of water supply connections has increased from about 13,000 to 15,000.

Lessons learnt

Any civic body needs to check its records at regular intervals to find out answers to problems faced in efficient management of each municipal service. Support from the political wing is also very important to achieve success in the effort.

Sustainability

This particular initiative can be sustainable as it benefits both the municipality and the property owner. The municipality generates more revenue instead of supplying non-revenue water to such illegal water connections, and with more income they will be able to provide better service to their citizens. The proprietor also has an opportunity to regularize their illegal connection without much hassle.

Transferability

This action can be adopted by any urban local body facing the issue of illegal water connections and having a bigger gap in their service costs to generate revenue for the development of the city.

Himmatnagar

Solid waste management without the use of community bins

Municipal waste is directly transported to the vermi-compost plant

Tractor trolleys for door-to-door waste collection

Situation before the initiative

It was in 2001 that Himmatnagar Municipality in North Gujarat began door-to-door collection of municipal solid waste with its own staff. Open dumping was a regular practice and it led to unhygienic conditions. There was no composting facility. From 2008 to 2011, the municipality experimented with a private operator for door-to-door primary collection of waste. However, with a number of complaints and a general dissatisfaction with privatization, the municipality once again took over primary collection beginning April, 2011.

Initiative

Under the supervision of the chairman of the SWM committee, the SWM staff of the municipality aimed at 100 percent primary collection by various transportation vehicles, at the GUDC supported vermi-compost plant located outside the city. The waste was estimated at 24 tons per day (TPD) The waste was collected and directly taken to the vermi-compost plant, eliminating the need for secondary containers/bins in the city .

Human Resource
The municipality has very few staff but work efficiently as a team. It hires temporary workers as the sanctioned staff is only 48 for an estimated 28,000 properties. One truck, 12 tractor trolleys and a three-wheeler rickshaw (for narrow streets) move from door-to-door, among markets, commercial establishments and institutions to collect the waste. The vehicles carry informal waste-pickers for sorting out recyclables on the vehicle itself.

A total of 27 trips are made by all transport vehicles to the vermi-compost plant for directly dumping the waste, thus obliterating the need for containers on street corners.

Some significant data for the Municipality :

Number of households (Census 2011, estimated)	15,863
Total commercial properties (Census 2011, estimated)	12,444
Waste generated by households (estimated)	9.0 TPD
Waste generated from road-sweeping (116 kms)	5.0 TPD
Waste generated by hotels/restaurants	2.5 TPD
Waste generated by markets	3.0 TPD
Waste generated by commercial establishments	4.5 TPD
Total waste generated (2011 Estimated)	24.0 TPD
Recyclables taken away by waste-pickers(estimated)	6.0 TPD
Waste processed at vermi-compost plant	6.0 TPD
Compost produced (estimated)	1.8 TPD

Results

The primary collection of waste has 100 percent coverage of households and commercial/institutional establishments. This has resulted in a clean environment for Himmatnagar. Almost the entire 24 TPD of waste generated at Himmatnagar is directly transported to the vermi-compost site.

There are no containers/bins on street corners. This means that there are no placement areas for containers that usually present a dirty, foul-smelling site, with overflowing garbage. The need for special container lifters is also avoided.

The chairman of the SWM committee has a review meeting with the SWM staff every Friday. This ensures regular monitoring and feedback from concerned staff and mitigation of issues, thus reducing the complaints to a current minimum of approximately 15 complaints in a month.

Lessons learnt

Privatization of primary collection of waste is not a necessary condition for 100 percent coverage. The ULB can achieve this target on its own. Despite a majority of the ULB staff being on daily minimum wages in most smaller cities, it is possible to inspire them to achieve 100 percent coverage of the city. Informal waste-pickers can also be mainstreamed into the municipal system to avoid mixing wet and dry waste .

The pros and cons of having secondary containers versus direct transportation can be compared and an appropriate strategy adopted for garbage management. The elected wing, represented by the chairman of the SWM committee for a city, can play a highly pro-active and motivating role towards man-management and improved SWM.

Sustainability

It is over the past 10 years that Himmatnagar Municipality has succeeded in streamlining the waste collection process in a manner that containers have been done away with. The initiative is logistically and environmentally sustainable.

Transferability

There are several small cities in a similar category such as Himmatnagar. Many of them have containers that lie unutilized because of lack of space and/or narrow streets. Such cities can formulate strategies for primary collection of waste in a manner that the coverage of the service is 100 percent while also ensuring that there is no spilling of containers on their roads. Each city has to develop appropriate solutions which are specific to their needs. A leader's motivation and involvement is also very important for it to be 100 percent successful.

Jasdan

Improved solid waste management by creation of local CBOs

Situation before the initiative

According to the provisional data of Census 2011, there are nearly 10,000 households in Jasdan Town, in Saurashtra region near Rajkot. Prior to 2010, Jasdan did not have organized door-to-door waste collection service. Its 25-member staff (13 permanent and 12 daily wagers) was inadequate to meet the requirement of the Municipality. Due to inefficient door-to-door collection; residents had to resort to dumping waste in the open, creating unhygienic living conditions. To clean up the city, the Municipality gave periodic contracts to private agencies. These contractors would employ local people belonging to the *Valmiki Samaj* (the community that is commonly involved in the sanitation sector) and get the work done, but would not pay them adequately, indirectly exploiting the workers. Jasdan also had a vermi-compost plant set up by GUDC which was not being used because of unavailability of an operator, this despite the fact that the daily generation of solid waste in Jasdan was 11 TPD .

The vermi-compost plant in Jasdan was lying unused

Initiative

In 2010, the chief officer of Jasdan undertook a micro planning exercise to prepare a detailed sanitation plan for the municipality. The city was sub-divided into zones, wards, beats and blocks in order to achieve 100 percent door-to-door collection. However, the Municipality had 23 sanitation workers. To tackle the staff deficiency and provide satisfactory cleaning and effective garbage collection, Jasdan municipality hired women and men Community Based Organizations (CBOs) (*sakhi mandals and sakha mandals*) and organized municipal solid waste management.

The city is currently divided into 4 zones for street sweeping, door-to-door garbage collection and open drainage cleaning. These zones have been made by combining the 9 wards of the city as per geographical locations. Each zone is sub-divided into beats (for street sweeping) and blocks (for door-to-door garbage collection).

Zone	Wards	No. of Properties	No. of Beats	Length of Beat
1	1-6	1,945	16	9,315 m
2	2-3	2,020	18	8,950 m
3	4-5-9	3,085	29	15,960 m
4	7-8	2,069	22	12,150 m

Primary data collected in 2012 from the municipality:

Number of households (Census 2011, Provisional)	9,473
Total commercial properties (2012-13) as per tax register	2,123
Door-to-door primary collection – HH coverage @ 90 percent	8,453
Door-to-door primary collection – commercial properties coverage @ 90%	2,047
Total waste generated (2012 Estimated)	8-10 TPD
Waste processed at vermi-compost plant	6-8 TPD
Compost produced (estimated)	1.0 TPD
Efficiency in collection of MSW (%)	81
No. of complaints per month/all resolved in 24 hours	80-90
No. of containers (1.5 ton capacity)	56

The Chief Officer (CO) directly approached members of the *Valmiki Samaj.* Having explained the type of exploitation the *samaj* was facing, the CO made them aware that they could benefit if they worked directly with the Municipality. The CO successfully helped them form *sakhi mandals* and registered 8 such groups. As per the initial requirements, each *sakhi mandal* had a minimum of 10 members. As one registered group was unable to meet the requirement, it was not given work—the remaining 7 *sakhi mandals* were assigned the work of street sweeping, door-to-door waste collection, cleaning open drains and spraying insecticide as and when required. As per recent numbers provided by officials for the year 2011-12, Jasdan Municipality currently employs 11 permanent sweepers and 10 daily wagers. A total of 60 workers have joined together to form a total of 8 *mandals*—6 *sakhi mandals* and 2 *sakha mandals.*

શું આપણું શહેર એક કચરા પેટી છે ?

ના !

તો શહેરના જાહેર માર્ગો ઉપર કચરો નાંખવાનું આજે જ બંધ કરીશું ?

" નગરજનો નમસ્તે
કચરો ના ફેંકો રસ્તે "

ગુજરાત સરકારના સહયોગથી જનહિતમાં પ્રકાશીત
જસદણ નગરપાલિકા

An information board installed as part of the IEC campaign

Insecticide (in a 70:30 ratio of lime powder and malathion dust as per government norms) is normally sprayed once a week but during the monsoon it is sprayed daily to avoid disease epidemics. The municipality provided the *sakhi mandals* with containerized wheel barrows with six bins each. One of the bins is filled with the insecticide when it has to be sprayed. Sweepers first clean the area and then spray the insecticide in required amount. The work of the *sakhi* and *sakha mandals* is monitored by supervisors who report daily to the Chief Officer about the work efficiency. Each *sakhi* is paid Rs. 72.50 per day as per the Minimum Wages Act (half day pay as they work for four hours). If the *sakhi/sakha* does not report for duty on a particular day, then a day's salary is cut and a fine of Rs. 10 is also imposed.

Due to shortage of staff and to ensure that all workers get their sanctioned leaves, the municipality has employed *safai kamdaars* on temporary basis. These kamdaars work from 2:00pm-6:00pm and complete work that was not attended to in the morning hours. A supervisor is also employed to monitor these *kamdaars*.

- Jasdan Municipality has identified particular spots across the city where 56 closed bins of 4 m³ capacity, provided by the Gujarat Urban Development Company, have been placed.

- The municipality uses 3 tractors with trolleys and 2 container lifters to transport waste to the vermi-compost plant—a total of around 10 trips are made by these vehicles everyday for waste dumping.

- To solve the issue of open defecation, the municipality has set up 5 pay-and-use toilet facilities; awareness was created through hoardings and announcements.

Operationalizing the Vermi-compost Plant
The vermi-compost plant in Jasdan (with a capacity of 6.7 ton) that had been lying idle was revived by GUDC. GUDC contracted the operation and monitoring of the plant to Samarpan Majurbandhkam Sahakari Mandal, Morbi, Gujarat till 31 March, 2013; while Jasdan Municipality is responsible for ensuring that solid waste reaches the plant at the scheduled time, the NGO is responsible for the segregation of recyclable and biodegradable waste and sending the bio-degradable for composting. The compost is sold by the NGO at Rs. 2 per kg.

Information, education and communication (IEC) Campaign
In 2011-2012, Jasdan municipality budgeted Rs. 5 lakh for an IEC (Information, Education and Communication) campaign for solid waste management in the city. The ongoing program targeted different sectors of society and designed visuals to create awareness among the citizens about the need for their cooperation in the solid waste management program. As part of this program, Jasdan Municipality sanctioned and displayed:

- 5 hoardings (10 feetx20 feet) with awareness messages.

- 10 instruction boards.

- 125 wall paintings displaying awareness slogans.

- "Please give me waste" slogans painted on garbage containers.

- 15,000 pamphlets which were disseminated through door-to-door distribution.

- 35 flash banners with Gujarati slogans.

- 1 telefilm, shown to audiences at makeshift theatres set up in different areas.

According to Jasdan officials, the IEC initiative has generated a positive response and citizens are now cooperating increasingly with the Municipality in solid waste management; the Municipality has decided to continue the campaign with plans to develop more awareness campaigns to increase citizen participation.

Results

- The decision to hire members of the *Valmiki Samaj* directly removed the interference of agents and helped curb the exploitation of the community. Direct recruitment by the municipality helped generate employment opportunities.

- With door-to-door garbage collection, residential and commercial waste is not thrown on the road. It has helped increase citizen satisfaction in terms of service delivery by Jasdan Municipality.

- The collected solid waste is now composted at the plant instead of being dumped in the open.

- The vermi-compost plant is operating successfully—the NGO sells the end product at Rs. 2 per kg.

- The IEC campaign has increased awareness level and citizens' participation.

- Jasdan Municipality now has among the best organized garbage collection systems in the Rajkot district.

Lessons learnt

With proper leadership from ULBs, citizens can be taken into confidence for improving garbage management. Micro-planning exercise to spatially divide the city into zones and wards and appropriate allocation of staff helps to achieve good coverage of door-to-door collection.

Sustainability

This initiative is socially as well as financially sustainable. However, constant monitoring and supervision is a key to success.

Transferability

Till some time ago, Jasdan lacked infrastructure to support its requirement of an organized and effective solid waste management plan in the city. However, with focused efforts, the city has now developed a well-functioning SWM system through systematic changes. These changes can be implemented in other urban local bodies and could be customized as per requirement.

Khedbrahma

Segregated chain of waste management—from source to the processing site

Situation before the initiative

Prior to 2006, the streets of Khedbrahma Municipality located near the Gujarat-Rajasthan border were littered with waste and overflowing garbage containers. Citizens were not concerned about the situation until the municipality decided to take action about solid waste management especially since the city attracted many visitors due to the famous Ambika temple.

Initiative

In July 2006, the elected wing of Khedbrahma Municipality decided to organize a public meeting involving community leaders, intellectuals, temple trustees and *Vyaapari mandal* (traders association) representatives to involve them in the decision-making process for cleaning the city. A public-private scheme for door-to-door collection of waste was proposed and approved of by the people's representatives. The scheme was implemented in August 2006 with total cooperation of the citizens. An NGO, 'Natural Foundation of Modasa', was contracted for collection of waste on a door-to-door system. The municipality provided the foundation with 27 tricycles, each with four bins. Under this scheme, the contractor was in-charge of maintenance of vehicles and for provision of human resource. The municipality paid the contractor on the basis of Rs. 7 per property, per month.

However, over a period of time, the practice proved to be expensive to the Municipality. The Municipality found it difficult to pay the contractor. Hence from the year 2011, Khedbrahma Municipality did not renew his contract and took the responsibility of keeping the city clean. The shift from the contractual door-to-door garbage collection to door-to-door garbage collection by the municipality was implemented only after citizens agreed to the change. To confirm the consensus, the municipality conducted a detailed survey and got consent from 80 percent citizens to change the service provider.

The Municipality distributed bins to 8,000 households
(photo courtesy Khedbrahma Municipality)

2-bin tractor to collect segregated waste
(photo courtesy Khedbrahma Municipality)

The Municipality generated further awareness by informing the citizens about the change through distribution of pamphlets in residences and commercial establishments.

Currently, the Municipality has engaged 2 rickshaws with separate bins for segregated waste collection and 1 tractor. The rickshaws collect garbage from residential and commercial establishments. The tractor collects waste from the main market twice in a day- morning and evening—and dumps the waste at the vermi-compost plant.

The three permanent workers employed by the Khedbrahma Municipality for 2 rickshaws and 1 tractor are paid Rs 170/- per day each. Till date, there have been no complaints from citizens regarding services provided by the municipality. If a worker is absent on a particular day, or unable to collect garbage from a particular household, the citizen adjusts and gives garbage the next day.

Khedbrahma Municipality continued many practices and systems set up by the earlier contractors and with support from citizens made minor changes to save money and provide better service. In 2011-12, Khedbrahma Municipality claims to have reduced its expenditure by 83 percent.

Highlights

- The municipality, in consultation with the contractor, had placed 47 containers of 4.5 m^3 capacity each, at strategic points. Of these, 23 containers were coloured green for wet waste, and 24 black for dry waste. The municipality has continued to maintain these garbage containers.

- The municipality had initially distributed 8,000 bins to households for storing segregated waste. Now, citizens are habituated to the systematic waste disposal and replace their bins themselves.

- The 2 bin rickshaws and the tractor dump the waste daily at the vermi-compost site started with the help of GUDC. It is located at 3 km distance from the city.

- Street sweeping is done by a road browser and road brush machines every Saturday and Sunday. A total number of 8 permanent workers and 37 daily wagers, including truck drivers, are currently employed by Khedbrahma. The street waste is dumped in the 'black containers'. The dust and stones are used for filling eroded land around the city.

- Householder or a shop owners throwing waste on the streets are duly warned, failing which they are fined Rs 500 (as donation to municipality). In the worst-case scenario, the policy is that the offender's water connection be cut .

- In 2007, the municipality received a cash reward for sanitation under the Nirmal Gujarat scheme.

Lessons learnt

While most cities are not able to involve citizens in segregating the MSW at source, Khedbrahma has succeeded in creating two separate streams of dry and wet waste. Khedbrahma involved its citizens in decision-making processes and that has been the most decisive step that is worth emulating by other cities. Khedbrahma exemplifies people's will to implement SWM in total, if only led properly by good-intentioned leaders and a spirit of partnership.

Sustainability

Privatization and outsourcing of SWM is not always successful and sustainable, but with the involvement of citizens at the decision-making level, creating awareness among citizens, the Municipality can carry out SWM themselves and save subsequent amount of money.

Transferability

The need to segregate dry and wet waste need not be over-emphasized in view of the existing SWM (M&H) Rules 2000 of the Government of India. The participatory process of segregation of waste and the administrative steps for logistics involved in transportation of waste in segregated manner should be replicated in other cities where mixed garbage is still collected and transported.

Mansa

Formulation of rules to levy fines for solid waste littering

Situation before the initiative

Mansa Municipality situated 25 km north of Gandhinagar, covers the entire city area under door-to-door waste collection system since past ten years. Yet, there were issues of dumping waste in the open and littering on roads. People used to throw all kinds of garbage, waste water, bio-medical waste in the open, on public roads or directly in the open municipal drainage lines. Municipality would keep lifting and cleaning this waste without any kind of charge considering its duty and was helpless to take any strict action against the litterers in absence of any byelaws or rules in place.

Initiative

It was difficult to change the behaviour and attitude and age-old littering practices of citizens. Thus, looking at the situation and in consultation with the sanitary inspector, the chief officer of Mansa in 2010 decided to frame solid waste littering rules and fines in Mansa. A resolution was passed under section 99 (1) (6) of the Gujarat Municipal Act, 1963 to implement special cleaning tax and administrative charges rules, 2010 with effect from the year 2010-11.

Under this resolution, a set of rules and fines were defined. Rules of waste disposal for residential as well as commercial and industrial property owners/users, collection of special cleaning tax by the Municipality, rules against unauthorized disposal of different kinds of waste and different administrative charges to be levied from the litterers for various types of littering were defined. There are also strict guidelines regarding separate disposal of bio-medical waste and industrial waste from municipal solid waste. Under this resolution, all the citizens of Mansa have to abide by these rules and have to pay the special cleaning tax within the time frame.

Municipal staff collecting fine from litterers
(photo courtesy Mansa Municipality)

The special cleaning tax ranges from Rs. 120 to Rs. 700 for different types of properties. If found violating, stipulated procedure can be carried out against the violators under The Gujarat Municipal Act, 1963. The special cleaning tax is collected annually with other property and municipal taxes. The civic body had distributed information pamphlets and announced through loudspeaker in auto rickshaw all around the town to spread awareness among its citizens regarding the solid waste littering rules and fines. People were made aware also through a word of mouth by Municipality's sanitation workers.

A team of staff from the Municipality consisting of the Sanitary Inspector, Supervisor, Municipal Clerk and other staff make surprise visits to various residential, commercial or industrial areas of Mansa. The litterers are given verbal or written warning notices or are charged fines depending on the type of waste they have thrown and their frequency of violating the rules. The fines levied as administrative charges are to be paid on the spot otherwise they are added in the municipal tax bill of the property. The administrative charges range between Rs. 10 to 10,000 as per the seriousness of the violation. The President, Vice-President, Chairman of Sanitation Committee and Chairman of Water-Works Committee or the Chief Officer also make visits to check. The sanitary inspector also receives complaints about littering on phone or sometimes citizens come personally to municipality to complain to chief officer.

A litterer is given notices twice for littering offence in the same property. Even then if the property owner/user doesn't stop littering and complies with the Municipality's rules, the Municipality cuts the water connection of that property. The reconnection charge is Rs. 1200-1500. Mansa Municipality issued about 400 to 500 notices annually to citizens against littering, out of which administrative charges are levied on about 90 to 100 persons.

The fines collected are used for developmental works in municipality such as road construction, development of parks and public places, building water tanks etc.

Results

Introducing special cleaning tax and solid waste littering rules and fines in Mansa has made its significant impact in creating cleanliness awareness among its citizens. They have begun to understand to give their solid waste to municipality and not litter. Due to this initiative, persistent litterers have also started to change their practice to escape the shame in society or fellow members. The levying of the special cleaning tax and its acceptance by the political wing and citizens shows that user charges for such services are accepted.

Lessons learnt

Despite being a good initiative, it is realized that the municipal staff still have some limitations in penalizing the litterers. If the door-to-door collection and management contract is given to a private NGO or self help groups, the work can be done more regularly. This may stop the pressure from the political wing of the municipality. In that case the Municipality can act as a supervisor and actions be taken against a private agency for its inefficiency and the litterers for littering. However, the cost of hiring an agency will be an added expenditure but can be justified if they assist the Municipality in remaining clean and bringing in more penalty monies.

Sustainability

The framing of byelaws and fine schedule would bring attitudinal change in the littering practices of citizens. The littering fines levied as administrative charges can contribute to a municipality fund for operation of garbage management services.

Transferability

This initiative of imposing strict fines can be transferred to other ULBs as the problem persists in all cities. By framing rules and introducing charges for littering, the Municipality will bring change in the attitude and practice of the citizens and eventually will reduce the problem of solid waste littering in public places and surroundings. But it requires continuous follow-up and supervision by the Municipality throughout for it to be effective and successful.

Navsari

Revitalization of Lakes for improved drinking water supply and city beautification

Situation before the Initiative

Earlier, Navsari Municipality in South Gujarat depended mainly on bore wells for providing drinking water to its citizens. Before 2000, the city was drawing water from 28 bore wells located in different parts of the city with depths ranging up to 200 feet. Due to its proximity to the Arabian Ocean, the city was facing an acute problem of salinity ingress. Salinity in water in the city was as high as 2,600 mg/l to 4,000 mg/l TDS (the desirable limit for drinking water is 500 mg/l. The maximum permissible TDS limit as per IS 10500:1991 is 2000 mg/l). People faced problems due to such high salinity of water. The ground water level in the city was also depleting. Besides, the municipality also faced problems with operation and maintenance of the bore wells.

Since water had to be drawn from great depths, the expenditure on electricity was immense. Bills amounted to almost Rs 12.5 million per annum towards operating the tube wells, the pumping machinery and the three water works.

The city has a huge lake called Dudhiya Talao within its jurisdiction. However, the lake was ill-managed. Drainage lines of buildings along the lake discharged sewage into the lake. The situation was further aggravated due to the pollution caused by slum-dwellers living around the talao.

Besides Dudhia Talao, Navsari has several other large and small lakes e.g. Sarbatiya Talao, Desai Talao, Thana/Jalalpore Talao, Alifnagar Talao, Tata Talao, Ovai Talao etc. The name of the city suggests that it was the city of nine (*nav*) lakes (*sari*).However, these lakes and its surrounding peripheries were either encroached by slums or they were filled with mud, waste and clumps. City had lost its very lakes which brought the name of the city.

Revitalization of Sarbatiya Talao
(photos courtesy Navsari Municipality)

Initiative

The municipality reviewed the situation and concluded that it was possible to bring water from the Kakrapar Canal, situated 3 km from the city, by gravity and store it in the existing Dudhiya Talao. Navsari Municipality prepared a proposal and submitted the same to the irrigation department, Government of Gujarat, for obtaining necessary permissions. The Narmada Water Resources and Supply Board approved this proposal, following which, detailed project reports were prepared for the water supply scheme. The project was funded by loans from Life Insurance Corporation of India and Gujarat Municipal Finance Board and grant from Gujarat Water Supply and Sewerage Board.

As part of revitalization, the lake was cleaned up. Dredging was carried out in the lake bed to remove silt and to increase the capacity of the lake. The lake bed has been lined with low density polypropylene (LDP) sheet and brick pitching.

Dudhiya Talao was thus revitalized and converted into a storage place for raw water to be obtained from the Kakrapar canal. A filtration plant was also set up.

The new filtration plant has been installed at the Navsari Nagarpalika Water Works. This is based on the latest technology, which includes Sludge Blanket Lamella Clarifiers and High Rate Rapid Gravity Sand Filters. The construction of the filtration plant was awarded to a consultancy after tendering process. This new system is of 36 MLD capacity and has been designed to cater to a population till the year 2020. It requires less area and consumes less chemicals and power as compared to a conventional water treatment plant.

To ensure that the lake was free from pollution, it was important to relocate the slums that had come up on its periphery. Navsari Municipality obtained a financial sanction from Gujarat Slum Clearance Board worth Rs 30 million. The 350 slum-dwellers around the Dudhia Talao were shifted to Tighra, a site on the fringes of the city which was reserved for economically backward sections. The slum-dwellers were given plots as per the Sites and Services scheme. They were given plots on ownership basis and also given Rs. 2,000 as shifting charges. The new site is connected to the main city by private transport vehicles and the settlement has facility of roads, streetlight and drinking water. Municipality has also set up a temple, primary school and municipal clinic for them.

Dudhiya Talao

Other Lakes

Based on the model of Dudhiya Talao, Navsari Municipality decided and set an agenda to stage-wise rejuvenate and develop other large and small lakes situated in the city. The aims were to meet the increasing demand of water supply and to serve the purpose of water harvesting in order to improve ground water level in Navsari.

Desai Talao: A few years back, a new area of about eight to nine sq km was added to the municipal limits in western part of the city. Ward number 10 and 11 were also towards that part of the city. Due to limited storage capacity to cater to the large population of Navsari, these areas were supplied water only once a day from Dudhiya Talao. Desai Talao was situated in the same area but it was in dilapidated condition. The civic body decided to revive the lake as a raw water reservoir under 'Shaheri Vikaas Varsh' to meet the water demand of city's extended part. The total project cost of Rs. 2.80 crore was granted under drinking water scheme out of which Rs. 39 lakh was allotted for lake revitalization. The lake was filled with shrubs and garbage was being dumped into the lake by surrounding slum-dwellers. Moreover, the fisheries department had given permission for fishing in the lake. Navsari Municipality got this permission cancelled from Fisheries Department.

Municipal authorities also held meetings with the Mine and Minerals Department and agreed to pay royalty for clay excavated from the lake.

The lake was cleaned and deepened to increase its storage capacity, followed by brick pitching and fencing around it to prevent its misuse. This was followed by laying 4 km pipeline from Kakarapar Canal to bring water in the lake. A 10 MLD-capacity filtration plant with latest technology was also set up in Ghelakadi area near the lake to treat raw water stored in the lake. After successful completion of lake renewal work, the Municipality saved Rs. 4 to 5 lakh from the grant.

Desai Talao

Thana Talao: Thana Talao is situated in the Jalalpore area of Navsari. The lake is quite big and long. Like Dudhiya Talao there was problem of drainage lines discharging sewage into the lake, and it was also used as a dump yard for garbage by surrounding localities. Navsari Municipality started a lake development project worth Rs. 50 lakh and obtained a 50 percent grant of Rs. 25 lakh from the Municipal Finance Board under a lake beautification grant. The lake was deepened and its periphery lined with a low height wall and pitching.

The lake was revived with an aim to aid the purpose of rain-water harvesting and to improve ground-water level in the area. The civic body is considering taking up Thana Talao's development and beatification in future.

Sarabatiya Talao: Sarabatiya Talao was another large lake in Navsari and it is located at centre in the city. But the stagnant water of the lake caused problems of vegetation and foul smell in the lake. Under the lake beautification project, Navsari Municipality started developing Sarabatia Talao at the cost of Rs. 35 lakh and also use it for water harvesting. The lake was cleaned of vegetation and dredging was carried out to deepen the lake bed. The mud and clay removed from the lake bed was used for filling municipality's reserved plots which were in low lying areas.

As Sarabatiya lake had a problem of vegetation due to stagnant water, the Municipality decided to install an aerosol system worth Rs. 10 lakh to circulate air in water. A two years contract was given to a private agency through a tendering procedure. A compressor is fitted on one edge of the lake which passes air in the water through 3 tubes fitted on the lake bed at three different places. The system circulates the entire water in the lake once in 24 hours. It requires the energy of only 2 HP to run the system. They also do dosing with biochemicals. The problem is expected to get totally solved in two years. If proven successful, the civic body plans to implement the system in other lakes too.

To develop the surroundings of Sarabatiya lake as one of the hangout places in the city, the Municipality has installed four colourful fountains in the lake and has paved footpath for walking and to accommodate food stalls. Work is currently on to install lamp-posts around the lake periphery.

Thana Talao

Sarbatiya Talao
(photo courtesy Navsari Municipality)

Tata Talao
(photo courtesy Navsari Municipality)

Alifnagar Talao
(photo courtesy Navsari Municipality)

Tata Talao: The lake is located next to the Jamshedji Tata Memorial Hall which was built by Tata Group in his remembrance as Navsari was his birthplace. But the lake was surrounded by slums. After several discussions and convincing slum-dwellers, Navsari Municipality shifted 371 slum-dwellers around the both, Tata lake and Dudhiya Talao at Tighra village and provided them homes under Ambedkar Awaas Yojana.

After developing the lake, the civic body had started a colourful musical fountain show in Tata Memorial's garden. However, it has stopped for sometime now due to limited visitors. As an alternative, the Municipality has now started to give the place on rent of Rs. 2500 for private social functions that earns it extra income.

Alifnagar Talao: It is a comparatively small lake in Alifnagar area of Navsari. The lake bed was filled with waste and dirt. Navsari Municipality obtained a 50 percent grant of Rs. 25 lakh for the total project cost of Rs. 50 lakh from Municipal Finance Board under the lake beautification scheme. The lake was cleaned and deepened for rainwater harvesting. The periphery of the lake was lined with pitching and fencing to prevent waste dumping.

Results

The problem of high TDS in drinking water, which had persisted for 40 years due to a withdrawal of ground-water, has been solved due to the use of surface water, collected in the lakes. Citizens of Navsari now get potable water.

Dependence on ground-water has been reduced considerably. This has controlled the problem of salinity ingress. The Municipality now uses only 8 borewells for water supply instead of 28 before project implementation. The ground-water level has also improved due to rainwater harvesting in lakes. Earlier one had to dig up to 130 to 140 ft to find water; now, it can be found easily at around 70 ft depth.

Many citizens have closed their private bore-wells and applied for new water connections to the Navsari Municipality. This has further resulted in an increase in the revenue from water tax.

The annual water tax revenue of Navsari Municipality was about 35 lakh before project implementation, which has now rose up to Rs. 1.35 crore.

Slum-dwellers have been successfully relocated to the land reserved for economically weaker sections of the society and rehabilitated. New residential schemes and societies have come up near the slum area and the area has started developing due to the facility of roads, streetlights etc. The drainage lines discharging sewage in some lakes have been diverted which helped to get reed of water pollution in the lakes. The overall environment of surrounding areas of each lake has improved substantially.

The municipality's energy bills have also gone down. Now, instead of running 10 pumps of 25 HP, it operates just one pump of 75 HP. One estimate suggests that the municipality will save about Rs 4 million in operational costs. The municipality could also increase the water charges that will bring an additional income of Rs. 4.5 million.

The periphery around Sarabatiya lake has become a favourite hangout place for the young, as many food joints/stalls have opened up at the location. People are gradually becoming aware of maintaining cleanliness in and around these water bodies.

In totality, it has also made good impact on the health of citizens due to reduced TDS in water and improved surroundings. The places which were not visited by people earlier have now become favourite grounds for morning walks.

Lessons learnt

A ULB needs to realize an opportunity that has the potential within their jurisdiction. By resolving so many inter-linked issues on the sidelines and working in an integrated manner using holistic approach, the ULB can make its efforts economically, socially and environmentally viable.

Municipal authorities need to chalk out proper work plan keeping in mind long-term impacts and results. For example, merely developing lakes won't work; one has to also provide inlets for storm water in the lake for water harvesting, the resettlement of slum-dwellers, preventing future dumping of wastes into these lakes as well as installing water purification plants for water supply. They also need to check and control storage of excessive water in the lake.

Sustainability

The holistic efforts of the Municipality in combining various components/aspects of the project, including shifting of slums, the development of lake periphery, the cleaning of lakes and other pollution abatement measures prior to using the same as a storehouse for raw water and for rainwater harvesting, make it environmentally, economically and socially sustainable. It is also a financially viable project, having used multiple sources for funding, including cost recovery through increased water charges. Cost-recovery strategies (for loan and interest payments) by Navsari Municipality have made the project more viable.

Transferability

The municipality has replicated the process of Dudhiya Talao in other lakes and it is planning to take up improvement of two more lakes i.e. Ovai Talao and Sejyu Talao. All cities and towns mostly have such lakes within their boundaries, which are ill-managed and become dumping grounds. Such lakes are great resources for cities in terms of their capacities for water harvesting, recreation and aesthetics. The Municipal Finance Board provides 50 percent grants of the total project cost to any municipality for lake beautification. The initiative undertaken by the Navsari Municipality could be contextualized and replicated by other cities of Gujarat.

Petlad

Efficient citizen interface for public grievance redressal through civic centre
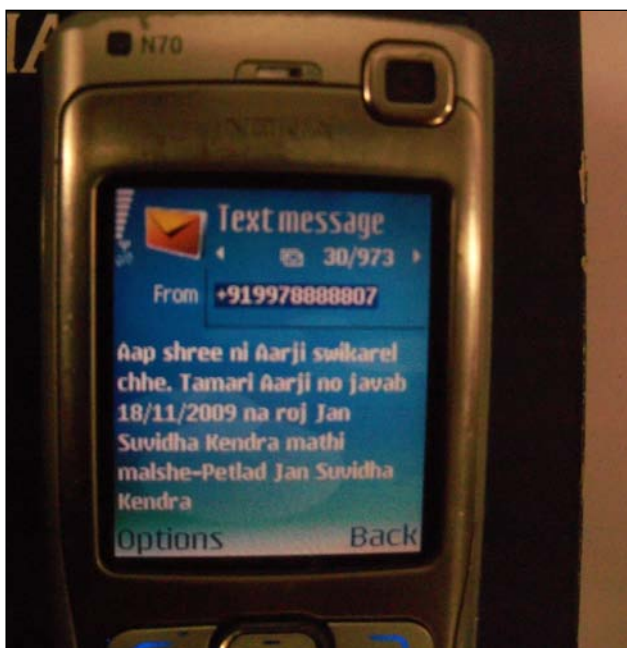
Situation before the initiative

It was felt that services provided by Petlad Municipality located southwest of Anand were not up to the mark. People had to wait for long to get information from any department as the procedures were lengthy and there were many formalities to be adhered to. Petlad Municipality, with its limited staff, was overburdened with work. The output was very slow and raised a lot of queries. It was not possible for higher authorities to get up-to-date reports immediately. Besides, there was lack of accountability and it was difficult to track the status of the complaint registered. At the same time, staff members were not able to maintain a database of all the complaints.

Initiative

Petlad Municipality formulated a special review committee to study the issue of complaint redressal threadbare. It identified and evaluated processes, and studied the existing formats followed by the complaint cell. It evaluated adoption of the modern technology and devising new methods that would enable speedy communication to the concerned department. The entire effort was directed towards tracking the complete process and providing information of the complaint status and its redressal to the complainant. The municipality gave the contract to prepare the required software to Bhaskaracharya Institute for Space Applications and Geo-informatics. As a result, the Jan Suvidha Kendra with ICT-enabled services for government-to-citizen delivery was established in May 2008 in Petlad Municipality. Once this centre was developed, the municipality identified and trained its own staff to operate it.

Each case is registered after filling a simple form which has a barcode on it. This is done either at the time of issuing the form or just before the submission of the form. There is no need to log the name of the applicant at the time of the issue of the form or the barcode.

Message received by Complainant about his complaint

This helps avoid queues and makes the process more convenient to the applicants. Registered citizens can obtain partly-filled forms by giving their fingerprint or registered government photo ID.

The applicant visits the token issue counter, where an operator scans the barcode on the form and the computer system directs the applicant to one of the counters, on the basis of the type of the issue. This ensures a minimum waiting time for the applicant.

The computerized token system also helps ensure optimal use of the resources at the centre, and avoids the formation of queues. Citizens can sit and wait till they are called to the assigned counter according to their token numbers.

The operator at the counter checks the enclosures with computer assistance and registers its receipt on the computer screen. The applicant does not need to re-submit enclosures previously submitted in any other application. The operator performs a qualitative check to ensure the complete fill-up of the form and marks that on the computer. Once all the required enclosures are checked, the software issues a bar-coded acknowledgement slip in two copies. One copy is given to the applicant and the second is attached to the application. The applicant copy shows up Jan Suvidha Kendra's help line number, latest delivery date and time.

The back office operator at Jan Suvidha Kendra scans the barcode on the application. The system shows up the concerned office and this way the received papers are sorted out. A list is generated for acknowledgement by the concerned branch.

Every department can access the information on pending cases on-line, through SMS query, or by requested printouts. Reminders and alerts are sent to the officers by the system to ensure timely completion of the cases. The Chief Officer also monitors the pending cases on his/her own computer. Once the complaint is received, it is forwarded to the respective department. Simultaneously, an SMS is sent to the complainant on the number that has been registered at the centre. Depending on the issue, the time expected for redressal of the complaint is conveyed to the complainant. This way, there is a single spot where the citizen can go to get any complaint registered.

The Municipality staff was trained to operate the grievance redressal software

Sign board displaying type of complaints

Operator at Jan Suvidha Kendra

Results

- With the establishment of the Jan Suvidha Kendra, there has been a significant saving of the citizens' time for the public. For example, the processing time for several issues has been reduced from several days to less than a few hours. The process of complaint redressal has become speedier and more organized.

- There has been a notable change in the attitude of government employees due to transparent systems including tracking the work in process.

- Transparency has helped increase the confidence of citizens in the administration. People can know the status of their paperwork through SMS at any time from any place.

- Complete accountability is maintained as papers are delivered to people within the promised time, printed on the acknowledgement slips. Daily summary of SMSs as well as availability of details of pending cases to the higher level officers has boosted the performance of the administrative staff.

- The efficiency of the administration has increased due to a significant saving of time by government officers as they receive all the applications in a completed manner and they do not have to meet people directly. Besides, the common man does not have to face the hassle of personally contacting concerned officers.

- Information and communication technology is applied and accepted in the true sense: Bar Code for traceability, SMS for alerts, and MIS software for continuous monitoring, tracking and reforms.

- Corruption is minimized as there is a single, systems-driven, computer-based front-end interface for the citizens. Incomplete applications cannot be accepted; processing is always in turn; applicant-to-officer interface is significantly reduced and time limits are observed in a highly transparent manner.

Lessons learnt

A dedicated complaint redressal cell is an interface between the citizens and the departmental staff in a municipality. The process of effective redressal leads to improved governance by increasing transparency with efficient services and reducing corruption to the satisfaction of the people.

Sustainability

Once the local government is perceived to be genuinely in the service of people, technological innovations are bound to succeed leading to good governance. Only good governance can sustain the local government in every sense.

Transferability

The complaint redressal system with a special cell and use of modern technology as an interface is easily replicable for any local governance that wants to improve their efficiency and performance.

Improved cost recovery in O&M of water supply

Situation before initiative

Nearly 10 years ago, the scenario at Petlad Municipality was bleak with the ULB incurring huge expenditure on operation of the machinery of the water supply system. Even electricity bills were high, with the municipality paying a penalty of approximately Rs. 33,000 every month.

Initiative

Using groundwater sources, the Municipality supplies 8 MLD of water through four Water Distribution Systems (WDS) and through nearly 36 km of a distribution network to 9,089 water connections.

It took determined efforts by the qualified staff of Petlad Municipality to revamp the water supply system of the ULB. The engineer at the municipality began reviewing the situation, including the distribution lines and the electric lines in the water distribution channel. A hydraulic audit and energy audit were conducted. Automation was made as required. Protection devices were installed on the machinery and on the electrical appliances so that the damage could be minimized.

Over the years, pumps have been regularly checked for head statistics, switches, capacitors and other related parts; repairs/replacement has been done immediately whenever necessary.

Mahesh Patel, engineer at Petlad Municipality, says, "We believe in taking precautionary measures to keep the system efficient. It is known as preventive maintenance." Patel is a qualified mechanical engineer and has working knowledge of electrical engineering. He oversees the working of the pumping machinery and the entire water distribution system. He visits the head works every morning and takes cognizance of the defects detected at any point.

O&M figures

Total annual operating expenditure: *Rs. 39,45,660*
Total annual operating revenue: *Rs. 39,27,932*

(The cost recovery comes out to be 99.55 percent)

Petlad Municipality revamped its water supply system including distribution lines

Strategies towards cost recovery

Some of the O&M activities include the following:

- Preventive maintenance. Daily regular visit to site, inspecting electrical appliances and tracing faults for immediate recovery.

- Before designing any hydraulic system, parameters like diameter of pipe, head, discharge capacity, friction, head loses, quality of water, quantity of water, etc., were considered.

- Regular checks are conducted to ensure that the electrical contract demand is near to requirement; the excess power deal with GEB was disconnected.

- Regular checking of electricity bill is done for the unit consumption which is close to designed motor HP/kW; the efficiency of motor is checked.

- Auditing of the bills is done for unit consumption, tariff, power factor penalty, etc.

- Installation of capacitor on each motor as per HP capacity.

Results

With the revamping of the water supply system, the expenditure was reduced significantly. The revenue income and revenue expenditure for water supply (2008-09) indicate that Petlad Municipality recovered an estimated 100 percent of the total operating expenses for water supply (O&M). As the approach towards O&M involved taking precautionary measures, expenditure was reduced.

Lessons learnt

It is important to plug holes that result in wastage of resources. Petlad Municipality succeeded in achieving a milestone in O&M cost recovery as it managed to bring in some discipline in the area of repair and maintenance, besides optimizing the utility value of its equipment.

Sustainability

The initiative is financially sustainable as without much further investments, just by improving general and precautionary maintenance, the O&M expenses were reduced. Striking a balance between expenditure and generation of revenue is important for any ULB to continue providing any service satisfactorily. Besides, the administrative wing has complete support of the elected wing to carry out activities to improve service delivery. The process was gradual, but over a period of time, the benefits have become obvious.

Transferability

As this initiative involves regularizing the work of operation and maintenance, it is easily replicable as well as advisable for ULBs working towards improving their cost recovery figures and wants to use energy saving modes to bring environmental benefits.

Unjha

Efficiency in collection of water and sewerage-related charges

Context

Unjha in North Gujarat is a major trading centre for cumin and isabgul. The average income of the population living here is very high compared to the national average. A sense of financial well-being with a good paying capacity pervades the town.

Initiative

Tax collection in Unjha is not incentivized. Unlike other ULBs, there is no 10 percent rebate. However, there is a 15 percent notice fee collected after March 31 every year. The payment capacity of the residents is good, which is seen as the major reason behind taxes being paid on time.

To improve the collection efficiency further, the municipality came up with a unique plan. Whenever a citizen approaches the municipality office for a document, the status of his tax payment is checked. If it is found pending, the person is asked to first pay up the taxes and then take the document. This practice is being followed for almost 10 years now. Therefore, the tax collection, towards both water and sewerage charges, has been found to be very efficient.

Performance Efficiency

The water and sewerage taxes are included in the general property tax bill.

Some significant data:

Financial year	Water tax collection (percent)	Sewerage tax collection (percent)
2008-09	91.15	92.56
2009-10	91.53	91.13
2010-11	91.25	92.20

Every time a citizen approaches the Municipality for any purpose, his tax payment is checked and he is asked to pay the pending dues

Strategies towards efficiency

Policy level

Ascribing reasons for the efficiency in tax collection, the Chief Officer of Unjha Municipality mentions good administration, improved urban management and overall good governance by the elected wing and its whole-hearted support to the tax staff. The combined effect of these aspects has also led to citizens' faith in the municipality.

Unlike other municipalities, an important aspect of tax collection in Unjha is the 'defaulters first' approach. Defaulters during the first three months of the new financial year, as well as the defaulters of the previous fiscal year were targeted. A list is prepared and the notice including a bill with 15 percent penalty and a threat of water supply disconnection if the taxes are not paid within a certain period were issued to each defaulter.

Administrative

Other steps taken by Unjha Municipality towards efficient tax collection include:

- Computerized and timely billing (by October of the previous year, the deadline being March-end) supported by awareness creation through loudspeakers, particularly in the market yard.

- A tax collection drive by a special municipal team includes door-to-door serving of bills and/or notices and spot collection. These teams make four visits annually to remind people to pay up their taxes, both current and previous years'.

- Tax-related complaints can be lodged with ward inspectors whose telephone numbers are well publicized.

Lessons learnt

The practice of 'give-and-take' has proved to be a good way to ensure more tax collection.

A tax collection drive and their follow-up also has improved the tax collection rate.

Sustainability

The measure is financially viable. No extra expenditure is involved. Besides, it means more revenue for the ULB.

Transferability

ULBs with low tax collection efficiency can emulate Unjha's practice to improve their tax collection efficiency.

Vadnagar

Efficiency in collection of water supply-related charges

Initiative

Performance efficiency

As per the data of 2008-09, Vadnagar Municipality located bout 30 km northeast of Mehsana sources 3 MLD of drinking water from Dharoi Dam irrigation scheme and supplies the same, through four Water Distribution Systems, to 4,204 connections.

The water taxes are included in the general property tax bill. It was observed that for the year 2008-09, while the demand for water tax was Rs 16 lakh, the collection has was Rs 15.9 lakh, indicating an excellent performance efficiency of 99 percent.

Financial year	Water tax (percent)
2008-09	99
2009-10	101.99*
2010-11	96.30

* The excess figure is due to the charge on issuing a new connection after prior disconnection.

Strategies towards efficiency

The municipality sets an incremental target of 10 percent over the previous year's collection and sets its target tax collection accordingly. In any year, bills are prepared in August and dispatched by September 30. A 10 percent rebate is offered for one month after the date of issuance of the bill. A penalty of 18 percent is charged over the tax for payment between January and March. The first notice to pay up taxes is issued in January, followed by the second in March. A seizure notice is issued in April.

At the outset, the ward-level staff is directed to begin the drive for tax collection from major institutional contributors.

There are general announcements made, mainly at the library. Senior citizens played a key role in motivation through word-of-mouth publicity. In fact, the 10 percent rebate draws a major response. A list of defaulters is displayed on public notice boards.

The elected wing plays a major role in motivating and supporting the tax collection staff.

Results

Adopting a systematic approach facilitates smoother operation. Since Vadnagar issues property tax bills in September, its collection begins in October itself, with a major chunk getting collected in the first month due to the 10 percent rebate system. This can be considered a good practice as many ULBs take much longer to prepare and dispatch bills. As a result, their collection is delayed.

In the past three years, Vadnagar has posted an impressive figure. ULB sources say that the deficit is due to locked or vacant properties whose owners are unable to pay the taxes on time.

Vadnagar Municipality initiated a tax collection drive for water supply charges

Lessons learnt

A systematic approach towards tax collection is important for better efficiency.

Incentives, such as a 10 percent rebate on the payment of taxes within the first month, are very useful tools for motivating people to pay tax on time.

Publicly published defaulter lists of tax payers, senior citizens involvement, etc., are other useful tools for in-time tax collection by municipalities.

Sustainability

The entire procedure is financially sustainable. Vadnagar has been able to sustain its efforts at systematic tax collection for a few years now. This has been the reason behind excellent tax collection efficiency year after year.

Transferability

Many ULBs are faced with very low tax collection efficiency. They may adopt Vadnagar's approach and organize their tax collection procedures. Timely preparation and disbursement of bills, rebates on on-time payment will enable better collection efficiency.

Vijapur

Identifying and regularizing illegal water connections

Situation before the Initiative

Water supply is one of the most important functions of Urban Local Bodies (ULBs). In Gujarat, where the water is a scarce resource, the ULB with assistance from several state organizations takes immense initiatives to provide water to citizens. Estimates at county level suggest that almost 30-40 percent of water supplied is 'Non Revenue Water' (NRW). Illegal connections form a significant portion of this NRW.

Vijapur, located in the Mehsana District supplies about 40 to 50 lakh litres of water everyday, of which about 25 lakh litres of water is from Narmada's water supply system and the remaining is drawn from three bore wells of the Municipality. As per the World Health Organization (WHO) standards of 135 lpcd per household, a supply of about 41 lakh litre is required everyday through out the city. The municipality often receives complaints from residents for low pressure of water and illegal tap connections.

Initiative

Based on public complaints, the municipality decided to carry out a check on property wise water connections in the town. For this, they undertook a step-wise approach:

- A team of municipal authorities went to areas from where they received complaints frequently and tried to find out reasons of complains for low water pressure.

- They carried out door-to-door checking of water connections in these areas as per the property-wise revenue records of Municipality.

- In some cases property owners had more than one water connection. Some property owners claimed that one of the connections is out of order. In that case, municipal authorities again went for checking at the time when water was supplied.

- After identifying illegal water connections, the municipality issued notices to the concerned property owners. Copies of the same were also sent to the president of Vijapur Municipality and police inspector of Vijapur police station.

- A public notice warning people about the offence was also published in the local newspaper. People were informed to close any illegal water connections within 15 days. Copies of a general awareness notice were posted all over the town to spread awareness among Vijapur residents.

- A resolution was passed in the general meeting of municipality that if any illegal property owner comes forward voluntarily to legalize the water connection, municipality would regularize it after taking a charge Rs. 1000. Otherwise the civic body would levy Rs. 500 as penalty charge for illegal water connection.

The next step was to take action against such illegal connection owners who did not comply with rules. Vijapur municipality formed 2 teams consisting of tax recovery officials and plumbers with labour. These teams regularly go for tax recovery and along with it they also identified illegal water connections. About 400 illegal connections were found by the teams between Oct. to Dec. 2011 and all of them were discontinued. The elected body fully supported and never opposed the staff in taking actions against illegal water connections.

Lessons learnt

The Municipality has to be strict in order to recover tax and penalty. The elected body and staff need to work together in benefit of the ULB. Such steps are important to be taken by ULBs to improve their cost recovery and for ensuring equitable water supply. They also need to keep their records updated and tidy for such follow-ups of tax recovery.

Sustainability

The Municipality is not conducting any special drives regularly for identifying illegal water connections. It also needs to do follow-up checking about disconnected water connections. For measuring the exact benefit or loss to the ULB, they must quantify the consumption of water everyday and keep a check on it regularly.

Transferability

This action can be replicated in any municipal body to curb the issue of illegal water connections.

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