



COMPENDIUM OF GOOD PRACTICES

Urban Solid Waste Management in Indian Cities



The background image shows a vast, sprawling garbage dump or landfill. In the distance, several tall, thin industrial chimneys or smokestacks rise against a hazy sky, suggesting a nearby industrial facility. The foreground is covered in a thick layer of discarded waste, including plastic bags, metal scraps, and other unidentifiable debris.

**IMPROVEMENTS IN
WASTE SEGREGATION,
COLLECTION AND
TRANSPORTATION**

**INITIATIVES IN WASTE
RECOVERY**

**INITIATIVES IN
SCIENTIFIC WASTE
DISPOSAL**

**PLANNING, POLICY
AND ENFORCEMENT
INITIATIVES**

**INITIATIVES IN IEC
COMMUNITY LED
INITIATIVES IN SOLID
WASTE MANAGEMENT**



an initiative of



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Disclaimer

This report is based on the information collected by Urban Management Consulting Private Limited (UMC) in collaboration with Centre for Environment Education (CEE) for a study commissioned by the National Institute of Urban Affairs (NIUA), from sources believed to be reliable. While all reasonable care has been taken to ensure that the information contained herein is not untrue or misleading, NIUA accepts no responsibility for the authenticity of the facts & figures and the conclusions therein drawn by UMC - CEE.

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Urban Solid Waste Management in Indian Cities



Prepared by



Urban Management Consulting Pvt. Ltd (UMC)

In association with



Centre for Environment Education

Centre for Environment Education

PREFACE

The National Institute of Urban Affairs is the National Coordinator for the PEARL Initiative (Peer Experience and Reflective Learning). The PEARL program ensures capacity building through cross learning and effective sharing of knowledge related to planning, implementation, governance and sustainability of urban reforms and infrastructure projects – amongst cities that were supported under the JNNURM scheme.

The PEARL initiative provides a platform for deliberation and knowledge exchange for Indian cities and towns as well as professionals working in the urban domain. Sharing of good practices is one of the most important means of knowledge exchange and numerous innovative projects are available for reference on the PEARL website. “Knowledge Support for PEARL” is a program supported by Cities Alliance that aims to qualitatively advance this initiative. One of its key components is to carry out a thematic and detailed documentation of good practices in various thematic areas related to planning, governance and service delivery.

In an effort to fill the critical knowledge gaps for efficient service delivery in Indian cities, a number of exemplary good practices from cities across the country have been compiled into five thematic volumes. Each volume addresses a specific issue such as water supply & sanitation, urban transportation, solid waste management, cultural heritage and urban reforms. Cases are examined from the perspective of increasing operational efficiency, enhancing systemic capacity, the creation of efficient public private partnerships and building long-term sustainability.

The present volume focuses on the theme of ‘Urban Solid Waste Management’ (SWM), which includes planning; practices; projects and innovations in improving the quality and efficiency of solid waste management in Indian cities. The documentation includes good initiatives adopted and practiced by ULBs in collection and treatment of solid waste as well as the overall management of waste as a resource including aspects of recycling; environmental issues; disposal etc. of municipal waste. It also strives to study examples of people’s participation in these projects for overall enhancement of services and quality of life.

We hope that this volume can become a useful resource for the practitioners and officials who will provide momentum to the project of improved solid waste management in India.

Jagan Shah
January 2015

ACKNOWLEDGEMENTS

The compendium of good practices titled "Urban Solid Waste Management in Indian Cities" is an outcome of a collective contribution of several individuals as well as institutions. NIUA would like to acknowledge their contribution to the extent possible.

Firstly, we wish to sincerely thank the Cities Alliance and World Bank whose grant support and knowledge partnership for PEARL has made the documentation possible at a time when urban infrastructure is one of the main agendas of the Government of India.

We would like to thank Urban Management Consulting Private Limited (UMC) in collaboration with Centre for Environment Education (CEE) for undertaking this documentation, their teams comprising of Manvita Baradi, Vanishree Herlekar and Meghna Malhotra from UMC; Madhvai Joshi and Ketki Gadre from CEE who have completed this activity successfully. NIUA acknowledges their valuable contribution.

We are grateful to all the Peer Review Group members Khader Saheb, Prof. Dipak Banerjee, Suneel Pandey and Prof Shyamala Mani, whose valuable inputs through the entire duration of the documentation have only enriched its content.

NIUA duly acknowledges all who supported and contributed in providing valuable information which has helped compile the document specially the members of local authorities, consultants and other relevant stakeholders. Sharing project details and information with UMC-CEE in their busy schedule is appreciated.

The report would not have been complete without the coordination and editorial support of the PEARL Team comprising of Shabana Charaniya, A. Nanda Kishore, Yogita Lokhande, ShilpiMadnawat, Shoma Mathew, Sridipta Ghatak; and Deep Pahwa and Kavita Rawat for designing and formatting the compendium.

Finally, a special thanks to Ajay Suri, Regional Adviser-Asia, Cities Alliance and Prof. Jagan Shah, Director NIUA for their support, guidance and inputs. We have all been enriched by the experiences gained in this process and sincerely hope that the report will contribute towards strengthening solid waste management in India in cities.

Dr. Debjani Ghosh
Project Coordinator

LIST OF ABBREVIATIONS

ALM	Advanced Locality Management	MCGM	Municipal Corporation of Greater Mumbai
AWMS	Animal Waste Management System	MGV	Medium Goods Vehicle
BOO	Built Own Operate	MoEF	Ministry of Environment and Forest
C&D	Construction and Demolition Debris	MoUD	Ministry of Urban Development
CBO	Community Based Organization	MSW	Municipal Solid Waste
CCTV	Close Circuit Television	MT	Metric Tons
CDC	Community Development Centre	NDMC	New Delhi Municipal Council
CEE	Centre for Environment Education	NGO	Non-governmental Organization
CIDCO	City and Industrial Development Corporation	NIUA	National Institute of Urban Affairs
CMDA	Chennai Metropolitan Development Authority	NMC	Nashik Municipal Corporation
CO2	Carbon Dioxide	NUSP	National Urban Sanitation Policy
CTDP	Chhattisgarh Tribal Development Programme	O&M	Operation and Maintenance
DCB	Delhi Cantonment Board	OREDA	Orissa Renewable Energy and Development Agency
DtD/ D-D	Door to Door	OSRT	Off-site Real Time
D2D	Door to Door	OWC	Organic Waste Converter
EDMC	East Delhi Municipal Corporation	PCMC	Pimpri-Chinchwad Municipal Corporation
GHMC	Greater Hyderabad Municipal Corporation	PEARL	Peer Experience and Reflective Learning
GIS	Geographical Information System	PPP	Public Private Partnership
GPRS	General Packet Radio Service	PPPP	People-Public-Private Partnerships
GPS	Global Positioning System	RDF	Refuse Derived Fuel
GUDC	Gujarat Urban Development Company Ltd	RFID	Radio Frequency Identification
HBEPL	Hanzer Biotech Energies Pvt. Ltd	RRR	Reduce, Reuse and Recycle
HCE	Health Care Establishments	RTI	Right to Information
HGV	Health Goods Vehicles	RWA	Resident Welfare Association
HH	Households	SEWA	Self Employed Women's Association
ICT	Information Communication Technology	SHG	Self Help Group
IEC	Information Education and Communication	SLB	Service Level Benchmarking
IFFCO	Indian Farmers Fertilizer Cooperative Limited	SMC	Surat Municipal Corporation
INR	Indian Rupee	SMS	Short Message Service
IT	Information Technology	SWaCH	Solid Waste Collection and Handling
JAS	Jan Adhar Sevabhavi Sanstha	SWM	Solid Waste Management
JnNURM	Jawaharlal Nehru National Urban Renewal Mission	ToR	Terms of Reference
JSPCB	Jharkhand State Pollution Control Board	TPD	Tons Per Day
KKPKP	Kagad Kach Patra Kashtakari Panchayat	ULB	Urban Local Body
LACG	Local Area Citizen Groups	UMC	Urban Management Consulting Pvt. Ltd
LGV	Large Goods Vehicle	UNDP	United Nations Development Program
LMC	Latur Municipal Corporation	USD	United States Dollar
MCA	Municipal Corporation of Amritsar	VMC	Vadodara Municipal Corporation
MCD	Municipal Corporation of Delhi	VTS	Vehicle Tracking System



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EXECUTIVE SUMMARY

BACKGROUND

Urban areas in India generate more than 1,00,000 MT of waste per day (CPHEEO, 2000). A large metropolis such as Mumbai generates about 7000 MT of waste per day (MCGM, 2014), Bangalore generates about 5000 MT (BBMP, 2014) and other large cities such as Pune and Ahmedabad generate waste in the range of 1600-3500 MT per day (PMC, 2014). Collecting, processing, transporting and disposing this municipal solid waste (MSW) is the responsibility of urban local bodies (ULBs) in India. The Municipal Solid Waste (Management & Handling) Rules notified in 2000 by the Ministry of Environment and Forest require ULBs to collect waste in a segregated manner with categories including organic/food waste, domestic hazardous waste, recyclable waste and undertake safe and scientific transportation management, processing and disposal of municipal waste. However, most ULBs in India are finding it difficult to comply with these rules, implement and sustain door-to-door collection, waste segregation, management, processing and safe disposal of MSW.

The National and State Governments have provided an impetus to improve the solid waste management in urban areas under various programs and schemes. The Jawaharlal Nehru National Urban Renewal Mission (JnNURM) funded 49 SWM projects in various cities between 2006 and 2009 (MoUD, 2014).

Several cities in India have taken positive steps towards implementing sustainable waste management practices by involving the community in segregation, by enforcing better PPP contracts and by investing in modern technology for transportation, processing and disposal. The role of waste pickers/ informal sector in SWM is also increasingly being recognized. These interventions have great potential for wider replication in other cities in the country. This compendium documents eleven such leading practices from cities across India and highlights key aspects of the waste management programs including operational models, ULB- NGO partnerships, and innovative outreach and awareness campaigns to engage communities and private sector.

The National Institute of Urban Affairs (NIUA) is the National Coordinator for the PEARL initiative (Peer Experience and Reflective Learning). It is a program that enables effective sharing of knowledge (related to planning; implementation; governance and; sustainability of urban reforms and other infrastructure projects) among the cities that are being supported by JnNURM (Jawaharlal Nehru National Urban Renewal Mission). A number of tasks have been planned to achieve the objectives of the program. One of the key tasks encompassed by this program is Documentation of Good Practices in various thematic areas related to planning; governance and service delivery.

Categories	Documented Best Practices
Category 1A - Improvements in Waste Segregation, Collection and Transportation	Involving waste-pickers to improve door-to-door collection, Pune
	Community led initiatives in sustainable waste management, Vrindavan
Category 1B - Initiatives in Waste Recovery	Involving waste pickers in community level waste recycling and processing, Mumbai
	Waste-to-Energy from segregated vegetable market waste, Chennai
Category 1C - Initiatives in Scientific Waste Disposal	Moving towards scientific waste disposal, Srinagar
Category 2 - Planning, Policy and Enforcement Initiatives	Planning for improved solid waste management, Ahmedabad
Category 3A - Initiatives towards IEC	Involving community in solid waste management, Bangalore
	Reaching out to school students to generate awareness about Solid waste management, Gangtok
	Generating awareness about sustainable waste management through creative campaigns, Warangal
Category 3B - Community Led Initiatives in Solid Waste Management	Using PPP to establish sustainable waste management system in small towns, Pammal
	A sustainable model for a fully privatized waste collection and management, Patna

Urban Management Consulting Pvt. Ltd. in consortium with Centre for Environment Education (CEE) has been selected (through a competitive process) for the said task.

METHODOLOGY

To identify and list initiatives in solid waste management, the team prepared an exhaustive inventory of leading practices from all across urban India by reviewing existing publications and best practice studies, sanitation policies of various state governments, city level plans, and news articles. The team also interviewed and interacted with subject matter experts, NGOs working at grass-root level in the sector and government and private in-service officials in solid waste sector in India. Based on the above research, a preliminary list of 73 potential best practices was identified.

These best practices were then categorized into three broad groups, (1) Operational improvements in the value chain of municipal solid waste, (2) Policy, planning and enforcement initiatives, and (3) Initiatives involving community in solid waste management.

The 73 identified practices were further analyzed and reviewed on parameters such as the size and location of the city, scale and spread of the initiative, category of the initiative, and sustainability, reliability and adaptability of the initiative. Eleven of these seventy three initiatives from across the country were identified as best practices and documented in detail.

KEY FINDINGS

1. Waste collection, processing and disposal

Majority of the documented cases in the best practice catalog reflect a thrust on improving door-to-door collection and waste segregation at source with a varying degree of government involvement. SWaCH's segregated waste collection initiative in Pune is fully endorsed and supported by the Pune Municipal Corporation (PMC). The collaborative partnership between PMC and SWaCH was established on the premise that, SWaCH is not a contracted agency but an equal partner to PMC in implementing a sustainable solid waste management system in the city. While SWaCH is responsible for collecting segregated waste from households, commercial establishments and institutes, PMC plays the role of a facilitator by educating and informing citizens about waste segregation, and asking them to pay a user fee to SWaCH for their services. PMC has also provided an operational grant to SWaCH for a period of five years and partially subsidized the cost of waste collection from slums.

The ParisarVikas Program in Mumbai is largely a NGO driven initiative but has been able to leverage some government support under the Shahari Rozgar Yojana (SJSRY). The Municipal Corporation of Greater Mumbai (MCGM) has provided sorting sheds in seven wards in the city under the infrastructure development component of SJSRY and has also provided the waste pickers with dry waste collection tempos. The MCGM however has not yet fully embraced the program and provided it with the necessary boost to scale up to other areas of the city.

Other initiatives like those in Vrindavan, Patna and Pammal

are completely led by NGOs and community groups with little or no support from the local bodies. However the involvement of waste-pickers in waste collection in most of these initiatives (government or community driven) is a promising trend that needs to be encouraged. The other important learning from these door-to-door waste-collection initiatives is charging of user fees from citizens to cover collection costs and bring in accountability. Many ULBs are cautious of asking citizens to pay for municipal services as such tariffs and charges do not always align with political interests. Charging user fee should be viewed as a positive change towards more responsible & sustainable waste management practices as it promotes a direct, accountable relationship between the user and the service provider.

The best practice cases from Mumbai, Pammal and Koyambedu focus on decentralized solid waste management systems that help reduce the quantity of waste disposed at dump sites by adopting practices of recycling and waste processing by composting, bio-methanation etc. While the ParisarVikas Program in Mumbai has encouraged societies, institutions and office parks to become zero-waste campuses, the Exnora Green Pammal (EGP) initiative has been successful in recovering household waste and converting it into marketable products. Wet waste is processed and converted to manure and bio-gas while dry waste is up-cycled to make bags, mats, stationery items. The case of converting waste to energy using bio-methanation technology from Koyambedu emphasizes the need for establishing proper operations and maintenance procedures when using expensive, foreign technology. While most cities in India are using various technology options for waste processing, there are still very few cities exploring safe and scientific waste disposal. The modernization of the garbage dump site into an engineered landfill in Srinagar provides useful insights for other cities to revamp their dump sites.

2. Planning, policy and enforcement

Most cities in India are used to undertaking need-based, piecemeal changes across the value chain of waste management to address pressing issues in SWM sector. Preparing an integrated solid waste management master plan, allows an urban local body to assess its current and future waste management needs, identify problems and deficiencies within the current system and identify strategies and solutions to address those gaps. For a solid waste management plan to be effective and implementable, it should be accompanied with a strong enforcement framework. The Ahmedabad case documents the planning and enforcement processes adopted by the Ahmedabad Municipal Corporation towards making Ahmedabad a zero-waste city.

3. Involving various stakeholders in waste management

Achieving zero-waste cities is possible by making the community and other key stakeholders such as elected officers, bulk generators, corporations, environmentalists and technology providers, active partners in the waste management process. The cases from Warangal, Bangalore and Gangtok highlight the importance of

reaching out to communities and these other stakeholders garner public support on key policy and planning initiatives. By initiating the ‘KasaMuktha’ program coupled with a massive information and outreach campaign targeting bulk generators, corporates and resident welfare associations, BBMP was able to generate a momentum around pressing solid waste issues and implement a change in policy direction towards more sustainable practices. Similarly the creatively conceived and implemented Clean Cities Campaign (CCC) in Warangal provided a much needed impetus to the neglected state of solid waste management in the city as well as the state, and provided an opportunity for leadership and competitive participatory learning to implement the MSW Rules, 2000.

Conclusion

Several cities in India have successfully demonstrated that the challenges of solid waste management can be addressed through streamlining operational and contracting procedures, by involving the informal sector in waste management and making the community active partners in the process. It is necessary to document such initiatives to facilitate discussion and promote these ideas. UMC believes that dissemination of innovative practices encourages city managers to adapt and evolve new ideas in the local context leading to more efficient effective urban governance and management.

INTRODUCTION

URBAN SOLID WASTE MANAGEMENT

BACKGROUND

Solid waste is defined as discarded solid fractions, generated from domestic units, trade centres, commercial establishments, industries, and agriculture, institutions, public services and mining activities. Characteristics of waste vary based on place of generation and season in which it is generated. The Central Public Health and Environmental Engineering Organisation, the technical wing of Ministry of Urban Development has classified solid waste in fourteen categories based on source, origin and type of waste. These include domestic waste, municipal waste, commercial waste, institutional waste, garbage, rubbish, ashes, bulky waste, street sweepings, dead animals, construction and demolition waste, industrial waste, hazardous waste and sewage waste (CPHEEO, 2000).

A solid waste management (SWM) system includes collection, segregation, transportation, processing and disposal of waste.

The report by the High Powered Expert Committee (HPEC) on India Urban Infrastructure and Services notes the following

"The management and disposal of solid waste generated in Indian cities leaves a great deal to be desired, although the generation of solid waste is at much lower rates than in most countries. Neither households nor municipalities in India practice segregation of biodegradable waste from the rest, and public awareness on the benefits of segregation is low. The collection of the garbage from dumpsites is infrequent, processing is not done in most cases, and disposal rules are followed more in the breach. The Municipal Solid Waste Rules were put in place in 2000 but their enforcement has been poor. Besides ULBs, non-governmental organisations (NGOs), community based organisations, and private companies are involved in the collection of solid waste, but little attention is paid to waste disposal. Typically, collection of solid waste from roadside dustbins to transfer stations is done by ULBs with varying degree of efficiency. Transportation of waste to transfer stations often takes place in open vehicles with manual loading. This is followed by transportation to open dumping grounds. The expansion of city limits has led to old dumping sites which were relatively remote, now becoming part of the city."

Source: (HPEC, 2011)

Overall Status of Solid Waste Sector in India

Urban areas in India generate more than 1,00,000 MT of waste per day (CPHEEO, 2000). A large metropolis such as Mumbai generates about 7000 MT of waste per day (MCGM, 2014), Bangalore generates about 5000 MT (BBMP, 2014) and other large cities such as Pune and Ahmedabad generate waste in the range of 1600-3500 MT per day (PMC, 2014). Collecting, processing, transporting and disposing this municipal solid waste (MSW) is the responsibility of urban local bodies (ULBs) in India. Most local bodies are struggling to provide efficient waste management services to citizens. The coverage and efficiency of waste collection is still low; waste is collected in open trucks in an unsafe and insanitary manner; there is limited waste recovery and processing; and the waste is often dumped indiscriminately at open dump sites without leachate treatment (HPEC, 2011). Improper waste management has led to worsening sanitation conditions in urban areas. Recent events such as closing of landfills in Pune and Bangalore and processing plant in Thiruvananthapuram following protests by villagers highlight the severe impact of poor waste management on public health and environment.

Legal and Regulatory Framework for SWM in India

In India, various acts, rules and regulations have been framed to ensure qualitative municipal solid waste management services in the cities. The applicable acts and rules are listed in the Table 1.

The most significant piece of legislation is the Municipal Solid Waste (Management & Handling) Rules, 2000. The Rules are applicable to every urban local body in India responsible for collection, segregation, storage, transportation, processing and disposal of municipal waste.

As per the MSWM rules, waste should be collected in a segregated manner with categories including organic/ food waste, domestic hazardous waste, recyclable waste and silt and construction and demolition waste. Further, transportation, processing and disposal should be planned in accordance with the national plan as explained in the diagram (Figure 1).

Compliance with the MSW Rules, 2000 requires that appropriate systems and infrastructure facilities be put in place to undertake scientific collection, management, processing and disposal of municipal waste. However, most ULBs in India are finding it difficult to comply with these rules, implement and sustain door-to-door collection, management, processing and disposal of MSW. Some ULBs are unable to provide efficient services because of technical, managerial and financial deficiencies and others because of a lack of vision or willingness to engage with the private sector, NGOs, and citizens to address SWM challenges and find solutions.

TABLE 1: APPLICABLE ACTS AND RULES FOR SOLID WASTE MANAGEMENT IN INDIA

National Acts and Rules for Solid Waste Management
Municipal Solid Waste (Management and Handling) Rules, 2000
The Bio-Medical Waste (Management and Handling) Rules, 1998
The Plastic Waste (Management and Handling) Rules, 2011
E-Waste (Management and Handling) Rules, 2011
Batteries (Management and Handling) Rules, 2001
The Environment (Protection) Act, 1986
EPA - Rule and Implementation Information for Standards of Performance For Municipal Waste Landfills
EPA - Non-Hazardous Waste Regulations
EPA Municipal Solid Waste Landfill Regulations
The Water (Prevention and Control of Pollution) Act, 1974
The Water (Prevention and Control of Pollution) Rules, 1975
The Water (Prevention and Control of Pollution) Cess Act, 1977
Water (Prevention and Control of Pollution) Cess Rules, 1978
The Air (Prevention and Control of Pollution) Act, 1981
The Public Liability Insurance Act, 1991
The National Environment Tribunal Act, 1995
The National Environment Appellate Authority Act, 1997

Source: (Centre of Environment and Development, 2012)

Recent policy and program initiatives

The SWM sector has seen positive changes in the past decade. The Jawaharlal Nehru National Urban Renewal Mission (JnNURM)

by the Government of India GoI funded 49 SWM projects in various cities between 2006 and 2009 (MoUD, 2014).

SWM is also one of the key areas under the National Mission on Sustainable Habitat (2010) announced by the Central Government in 2010. The Mission is one of the eight missions under the National Action Plan for Climate Change and addresses sustainability concerns related to habitats, primarily urban areas. Similarly State Governments also provide financial support to ULBs to improve their waste management systems under various schemes and programs. For example, the Gujarat Urban Development Corporation (GUDC) will provide financial assistance to 50 cities in the State to augment their solid and liquid waste management systems under the Mahatma Gandhi Swacchata Mission.

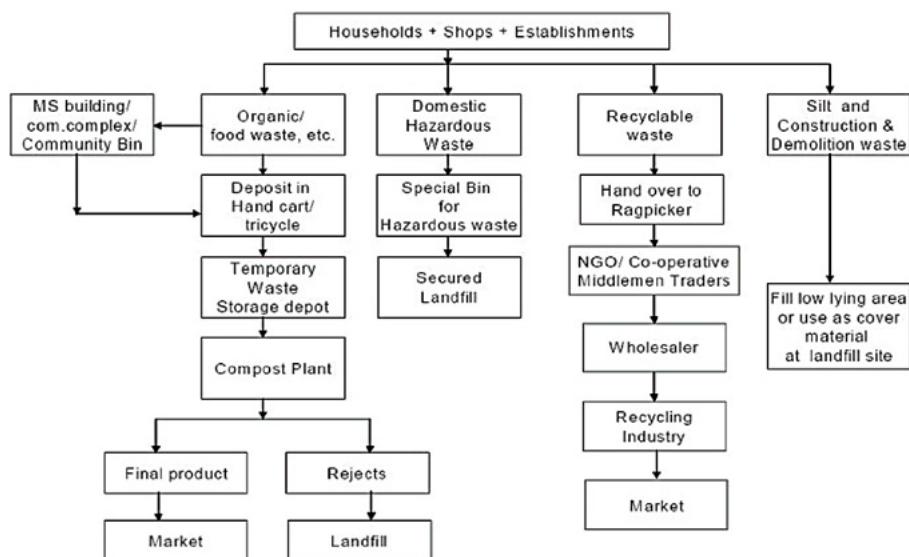
Several cities in India have taken positive steps towards implementing more sustainable waste management practices by involving the community in segregation and collection, by enforcing better PPP contracts and by investing in modern technology for waste transportation, processing and disposal. The role of waste pickers/ informal sector in SWM is also increasingly being recognized. These interventions have great potential for wider replication in other cities and urban areas in the country.

This compendium documents ten such leading practices from cities across India and highlights key aspects of the waste management programs including operational models, local government- NGO partnerships, financial sustainability and innovative outreach and awareness campaigns to engage communities and private sector.

METHODOLOGY FOR THE DOCUMENTATION OF GOOD PRACTICES

The following methodology was adopted to prepare this com-

FIGURE 1: NATIONAL PLAN FOR MUNICIPAL SOLID WASTE MANAGEMENT



Source: Cited in (Kurien, 2002) from (Supreme Court Committee Report, 1999)

pendium of good practices in urban solid waste management:

Preparing an inventory of leading practices in SWM

Initiatives in solid waste management sector are relatively new (mostly post JnNURM). In order to identify and list these initiatives, the team prepared an exhaustive inventory of leading practices from all across urban India by using the following methods:

- Review of past best practice documents, state of infrastructure reports, city development plans, etc.
 - Best practice publication by various organisations including National Institute of Urban Affairs (NIUA) amongst others
 - Special reports on SWM sector including report by High Powered Expert Committee (HPEC), 2011
 - Other publications and academic papers published on solid waste sector
 - Review of service level benchmarking (SLB) indicators and identifying cities with better performance
 - SWM and sanitation policies of various state governments
- Website scans of all major cities in India
- Review of past awards in solid waste sector by various organisations such as Housing and Urban Development Corporation Limited (HUDCO), CRISIL
- Media scan in various solid waste and sanitation categories, and tracking of news and activities in urban SWM sector in all major geographical areas of the country
- Using the team's domain knowledge, discussions and interactions with subject matter experts including NIUA, NGOs working at grass-root level in the sector and government and private in-service officials in solid waste sector in India.

Based on the above methodology, a preliminary list of 73 potential best practices was identified. The inventory of the practices included a general outline of the initiative, implementing agency, key stakeholders involved, and scale of the project, funding and budgets (information available through reports, studies and websites of the respective ULBs or state government or central government). A brief profile of each case is provided in Annexure.

Categorisation of best practices

These best practices were then categorised into the following groups based on key interventions in areas of operations, policy and planning, and involvement of citizens, NGOs and private players in SWM sector.

- Category 1: Initiatives in value chain of municipal solid waste
- Category 2: Policy, planning and enforcement initiatives
- Category 3: Initiatives involving community in solid waste management

While some initiatives qualify to fit in one of the above categories, most initiatives identified in the inventory relate to more than one category. In such cases, initiatives' primary emphasis was identified and used to categorise them.

Category 1: Initiatives in value chain of municipal solid waste

The complete solid waste management process includes waste collection, transportation, disposal and treatment. Initiatives that have achieved operational improvements across this value chain of waste management were identified under this category.

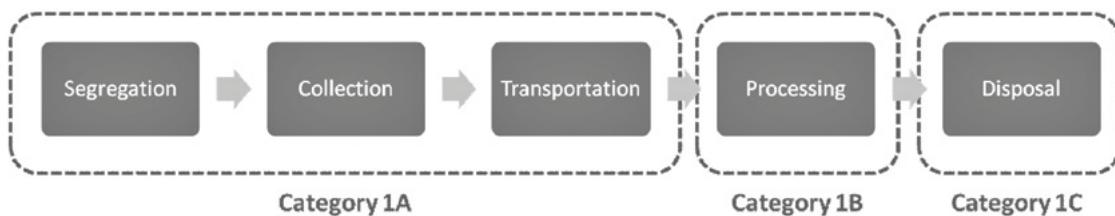
Category 1A: Improvements in waste segregation, collection and transportation

Segregated waste collection from households is the key to reducing landfilling. Segregation ensures maximum recycling and treatment at the local level. The emphasis in this category is on initiatives that have strengthened the door to door collection system and have involved informal sector/waste pickers and citizen groups to collect segregated waste. This category relates to three indicators from the SLB framework:

- *Household coverage of solid waste management services*: Percentage of households and establishments that are covered by a daily doorstep collection system.
- *Efficiency of collection of waste management service*: The total waste collected by the ULB and authorized service providers versus the total waste generated within the ULB, excluding recycling or processing at the generation point.
- *Extent of segregation of solid waste*: Percentage of waste from households and establishments that is segregated. Segregation should at least be at the level of separation of wet and dry waste at the source, that is, at the household or establishment level. Ideally, the separation should be in the following categories: biodegradable waste, waste that is non-biodegradable, and hazardous domestic waste such as batteries, etc.

Category 1B: Initiatives in waste recovery

The high degree of biodegradable content in municipal solid waste in India makes it ideal for techniques like composting wherein the chemical and biological transformation processes reduces the quantity of waste and products of economic value are



recovered. Various initiatives being undertaken by cities to incorporate decentralized waste treatment options such as composting units, bio gas plants, waste to energy plants etc. are documented under this category. This category relates to following indicators from the SLB indicator framework:

- *Extent of municipal solid waste recovered:* This is an indication of the quantum of waste collected, which is either recycled or processed. This is expressed in terms of percentage of waste collected.

Category 1C: Initiatives in scientific waste disposal

ULBs are challenged to dispose waste in engineered/ sanitary landfill sites. The various issues that have been cited include lack of land, lack of capacity to design and operate a landfill site. This category relates to following indicator from the SLB indicator framework:

- *Extent of scientific disposal of municipal solid waste* (this is the amount of waste that is disposed in landfills that have been designed, built, operated and maintained as per standards laid down by Central agencies. This is expressed as a percentage of the total quantum of waste disposed).

Category 2: Planning, policy and enforcement initiatives

Policy and planning initiatives undertaken by state and local governments ensure that long term improvements in SWM infrastructure and systems are carried out in a logical, systematic way. Several cities have also taken the initiative to prepare health and sanitation bye-laws that clearly spell out the role of the urban local body and citizens in the solid waste management process. The byelaws also allow ULBs to put in place an enforcement framework to deal with solid waste violations. This category documents innovative initiatives in SWM planning and enforcement.

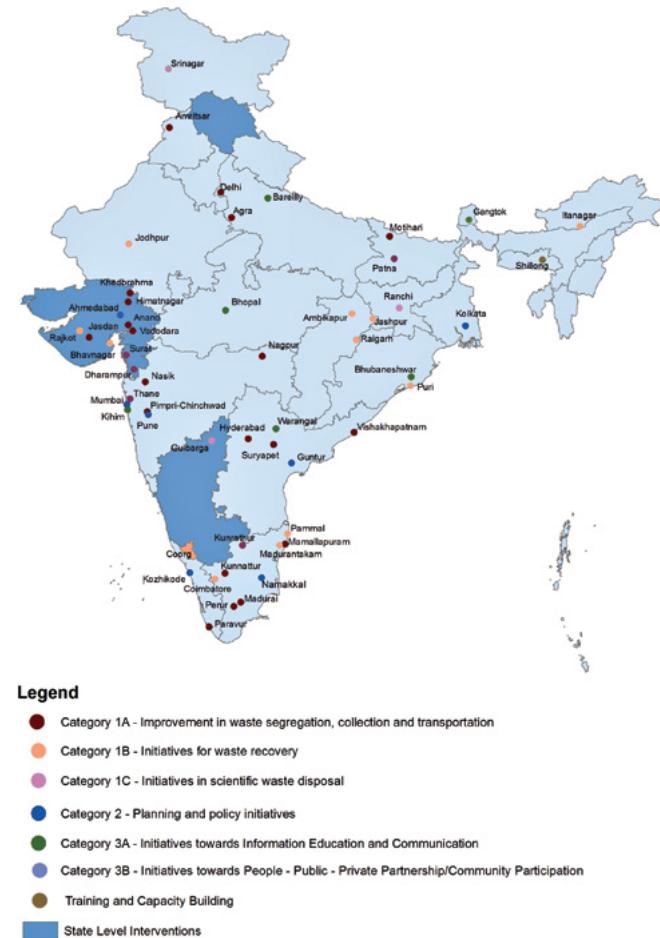
Category 3: Initiatives involving community in solid waste management

Sustainability of initiatives has been a key challenge for most efforts undertaken for SWM sector in the past. The challenges are due to various factors including human resource shortage, insufficient training and motivation of staff, delayed procurement of equipment and vehicles, poor enforcement of policies, poor financial recovery, casual engagement of stakeholders, shifting priorities of ULBs amongst many others. Some initiatives which have sustained over a long period of time have been listed in the following categories. It is important to analyse the strengths and weaknesses of these cases in order to replicate it in other cities and activities in SWM.

Category 3A: Initiatives towards Information Education and Communication

While ULBs are undertaking numerous initiatives for efficiently managing municipal waste, it is also important to create awareness amongst citizens on their roles and responsibilities. Cities have also created public health bye-laws and a

MAP SHOWING LOCATIONS OF CASE STUDIES INVENTORIED



regulatory framework and are taking steps to communicate these to citizens.

Category 3B: Community Led Initiatives in Solid Waste Management

This category documents the emergence of citizen/ community led initiatives in solid waste management to fill the gaps in municipal solid waste management services. For effective waste management, cities have to enter into partnerships with citizens, community based organizations, other stakeholders in the city and private sector for either end-to-end contracts or service contracts. This is also due to the fact that ULBs lack capacity in terms of adequate and skilled human resources. Many cities have shown innovative partnerships and contracting mechanisms towards such partnerships.

Category 3C: Initiatives towards training and capacity building

Category 3C: Initiatives towards training and capacity building
Training and capacity building (TCB) of officials and workers is key to sustenance of initiatives in SWM sector. SWM sector involved large scale human resource management challenges. Cities like Ahmedabad employ around 12,000 sanitation

TABLE 2: LIST OF SHORTLISTED CASE STUDIES

Categories	Detailed Documentation	Snapshot Documentation
Category 1A - Improvements in Waste Segregation, Collection and Transportation	Involving waste-pickers to improve door-to-door collection, Pune	Community led initiatives in sustainable waste management, Vrindavan
Category 1B - Initiatives in Waste Recovery	Involving waste pickers in community level waste recycling and processing, Mumbai	Waste-to-Energy from segregated vegetable market waste, Chennai
Category 1C - Initiatives in Scientific Waste Disposal		Moving towards scientific waste disposal, Srinagar
Category 2 - Planning, Policy and Enforcement Initiatives	Planning for improved SWM, Ahmedabad	
Category 3A - Initiatives towards IEC	Involving community in solid waste management, Bangalore	Reaching out to school students to generate awareness about SWM, Gangtok Generating awareness about sustainable waste management through creative campaigns, Warangal
Category 3B - Community Led Initiatives in Solid Waste Management	Using PPP to establish sustainable waste management system in small towns, Pammal	A sustainable model for a fully privatized waste collection and management, Patna

workers, mostly working in SWM sector. Regular training of technical issues, reporting regimes, work discipline, health and safety need to be regularly provided for an efficient system. The challenges increase with engagement of private companies and other informal workers in the sector. Cities undertake TCB as a component under projects or programs. Many case studies listed above involve TCB and hence, no case studies have been listed under this category exclusively.

Shortlisting Practices for documentation

The 73 identified practices were further analysed based on the following parameters to arrive at a list of ten leading practices that were documented in detail.

- **Size of the city:** Shortlisting has been done to cover metropolitan cities, large cities (ranging in population from 100,000 to 1 million) and small and medium cities with population less than 100,000.
- **Nature/ category of initiative:** Varied types of initiatives have been shortlisted to cover all aspects of SWM practices.
- **Geographical spread:** Care has been taken to ensure all geographical regions have been covered and varied geo-climatic conditions are taken up including hill towns, hot and dry climate, and coastal cities.
- **Sustenance of the initiative:** Case studies which have demonstrated sustenance over a long period of time have been given priority.
- **Replicability/ adaptability:** Many cities have adopted indigenous solutions while many have adopted generic solutions. Case studies have been shortlisted to include both types to increase their replicability and adaptability.

The UMC-CEE team shortlisted the following initiatives to be

documented under each category, based on the comments and feedback received from PRG members and the NIUA team. Five practices were studied in detail and other five are presented as snapshots.

Case Documentation of Leading Practices

Involving waste-pickers to improve door-to-door collection, Pune

PPP between Pune Municipal Corporation and SWaCH, a cooperative of self-employed waste-pickers for waste collection

Community led initiatives in sustainable waste management

Vrindavan Kuda Prabandhan Pariyojana: A program by Friends of Vrindavan

Involving waste pickers in community level waste recycling and processing, Mumbai

Parisar Vikas Program: an initiative supported by Stree Mukti Sangathan and the Municipal Corporation of Greater Mumbai

Waste-to-Energy from segregated vegetable market waste, Chennai

Biomethanation plant at Koyambedu Wholesale Vegetable Market

Moving towards scientific waste disposal, Srinagar

Converting an open dump site into a scientifically engineered landfill, Srinagar

Planning for improved solid waste management, Ahmedabad

Municipal Solid Waste Management Master Plan & Public Health and sanitation bye laws prepared by Ahmedabad Municipal Corporation

Involving community in solid waste management, Bangalore

Wake-up Clean-up campaign and zero waste program by BBMP

Reaching out to school students to generate awareness about sustainable waste management, Gangtok

Engage-14: An initiative to engage school students by Gangtok Municipal Corporation

Generating awareness about sustainable waste management through creative campaigns, Warangal

Clean Cities Championship, a five day competition in Warangal to improve collection and management of waste

Using PPP to establish sustainable waste management system in small towns, Pammal

Door-to-door collection, transportation and waste processing services by Exnora Green Pammal

Involving waste-pickers in solid waste management in Patna

Nidan Swachhdhara Pvt. Ltd (NSPL): A sustainable model for a fully privatized waste collection and management system



CATEGORY 1A

IMPROVEMENTS IN WASTE SEGREGATION, COLLECTION AND TRANSPORTATION

PPP BETWEEN PUNE MUNICIPAL CORPORATION AND SWACH, A COOPERATIVE OF SELF-EMPLOYED WASTE-PICKERS FOR WASTE COLLECTION, PUNE

INVOLVING WASTE-PICKERS TO IMPROVE DOOR-TO-DOOR COLLECTION

The Alliance of Indian Waste-pickers (AIW) estimates that there are close to 15 lakh waste-pickers in India who make their living by recovering, sorting and selling recycling materials such as paper, plastic, glass and metal. By reducing, reusing, and recycling municipal waste, they play a vital role in ensuring environmentally sustainable solid waste management practices. Yet, their contribution often goes unrecognized. With little support from local authorities, they often face harassment, suffer from low social and health status, and continue to live and work in unsanitary conditions.

Several cities in India are now making efforts towards organizing and integrating waste-pickers in the formal waste management system. Pune is at the forefront of these initiatives, and has been successful in integrating waste-pickers in front-end waste management services. The case study documents the SWaCH-PMC model of door-to-door collection which has been operational in the city since 2008.

City Profile

Pune with a population of 31 lakhs is the second largest city in Maharashtra, and is the ninth largest in the country (Census, 2011). The city is located near the western boundaries of the Deccan plateau at the confluence of Mula and Mutha rivers. The origins of Pune can be traced to a small rural agricultural settlement called Punyak in the 8th Century AD which gradually developed into a small town called Kasba-Pune and became the seat of the Peshwas by mid-18th century. Pune later emerged as a prime administrative and educational center during the British period and since then has remained the prominent educational hub in the western region. Today, the city is also regarded as one of the most preferred corporate destination for software, technology and business processing companies.

Growth and Urbanization Pattern

Proximity of Pune to the economic capital Mumbai has influenced the economic growth of Pune for decades. The establishment of Industrial area in Pimpri-Chinchwad in 1953 further gave an impetus to this growth. During the 1990s, Pune started emerging as a strong Information Technology (IT) centre in the region.

As the employment base widened, the city witnessed migration of qualified professionals and also laborers and workers from all across India. As the central part of the city is densely populated, the city grew outwards to accommodate the migrant population.

High end residential enclaves and townships like Magarpatta sprung up along the fringes and the formation of slums also proliferated. The emergence of IT sectors in Wakad and Hinjewadi

Year	Population	Decadal growth Rate	Area (Sq. Km)	Density/ Sq. km
1961	606777		138.94	5204
1971	856105	41.09	139.79	7154
1981	1203363	40.56	147.66	9346
1991	1691430	40.56	166.11	10445
2001	2538473	50.08	243.84	10410
2011	3115431	22.73	243.84	12777

in the Pimpri-Chinchwad municipal limits also influenced spatial growth in Pune and drove development further towards the north-west direction in Balewadi and Baner. Today the city is spread over an area of 244 Sq km with a population density of 128 people per hectare.

Local Governance Structures

The Pune Municipal Corporation (PMC) is the urban local body responsible for civic administration of the city. PMC was constituted by the Maharashtra State Government on 15 February 1950 under the Bombay Provincial Municipal Corporation (BPMC) Act, 1949. PMC is one of the better established and significantly robust urban local bodies in India and is leading in service delivery and efficiency across several sectors. Some of the leading practices of PMC include processing of municipal solid waste recognized by National Solid Waste Association of India (NSWAI, 2009), property tax reforms recognized by NIUA (NIUA, 2010) and empowerment of slum communities recognized by NIUA (NIUA, 2012). With an annual budget of Rs. 3633 Crore (PMC, 2012), the PMC is also among the financially strongest administrative bodies.

The Corporation is governed by the General Body comprising 152 councilors elected from the seventy six electoral wards and five appointed members. The General Body is headed by the Mayor of the city. This General body is assisted by various committees, the chief being the Standing Committee consisting of 16 councilors selected from the elected officials.

The Municipal Commissioner is the administrative head of PMC. PMC is divided into fifteen administrative wards. Each ward is overseen by an Assistant Municipal Commissioner. The wards are grouped into four zones each led by a Deputy Municipal Commissioner. The zonal governance structure in Pune in line with the 74th Constitutional Amendment and is an

important reform that aids better city management and service delivery.

Under section 63 of this act the Municipal Corporation is mandated to provide 25 basic services like maintenance and development of public streets, collection, treatment and disposal of sewage, solid waste management, fire safety, lighting of public spaces, maintenance of public hospitals, control of diseases and medical relief, public vaccination, registration of births and deaths, primary education, water works etc. Other than these, under section 66 the Corporation may provide 42 other services like provisions of gardens and parks, electrification, shelter for destitute and homeless, provision and maintenance of libraries, provision and maintenance of public transportation, provision and maintenance of ambulance, plantation and maintenance of trees along streets etc. (BPMC Act, 1949).

Organizational Structure of Solid Waste Management Department

The Health and Solid Waste Management Department of PMC is in charge of all functions concerned with municipal waste collection, transportation, treatment and disposal and is headed by a Joint Municipal Commissioner.

The Solid Waste Officer is the technical head of the Department who works closely with the Joint commissioner. At the zonal level, there is one Deputy Municipal Commissioner in charge of all administrative aspects in the zone. The SWM services at the zonal level are monitored by the Medical Officer (SWM). The MO manages a team of sanitary inspectors, investigators and sweepers.

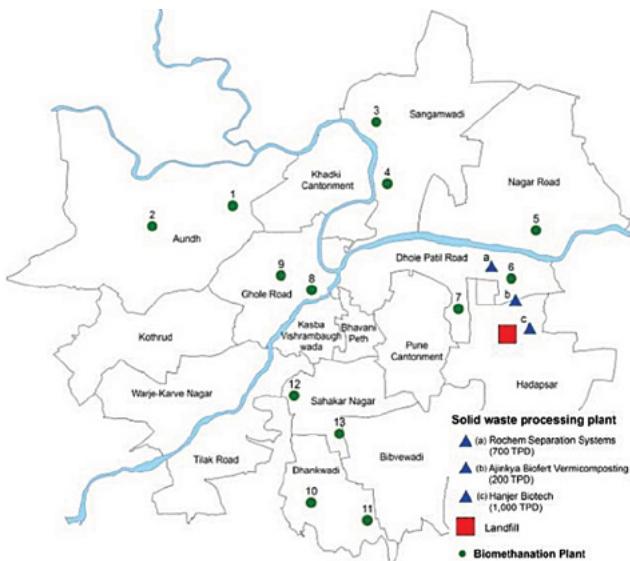
Overview of municipal solid waste sector

Pune generates about 1500-1600 MT of solid waste per day. Approximately 40% of this waste is collected from households,

TABLE 3: WASTE PROCESSING PLANTS IN PUNE

Name of operator/treatment	Processing Capacity	Output
Hanjer Biotech	1000 TPD	Composting, RDF, Pellets and Bio-fuel
Rochem Separation Systems	700 TPD	Electricity (10 MW)
Ajinkyा Biofert	200 TPD	Vermi-compost and compost
Disha Waste Management	100 TPD	Vermi-compost and compost
Decentralized Bio Gas Plants (13)	60 TPD	Electricity and compost
Mechanical Composting Units (2)		Compost

Source: (PMC, 2014)



25% from bulk generators such as hotels and restaurants, 25% from commercial establishments and another 10% from fruit and vegetable markets. PMC collects bio-medical waste and garden waste separately. 56% households in the city are covered by door-to-door collection service provided by PMC and SWaCH. Slum households are largely dependent on community containers for garbage disposal. About 50% of the households in the city segregate waste. The recyclables are collected separately and sold by the waste collectors and the remaining waste is handed over to trucks, locally referred to as Ghanta trucks which transport the garbage to one of the seven transfer stations in the city.

85% of the waste generated in Pune is recovered/ processed in one of the processing plants and the remaining mixed/ inert waste is disposed at the landfill on Urali Devachi. Other than the large waste to energy plants at the landfill site and in Hadapsar, PMC also uses smaller, decentralized processing units to process biodegradable solid waste to generate power and compost. The Corporation has installed 13 biomethanation plants and two mechanical composting units in the city; the compost generated is supplied to the municipal gardens and used as manure. PMC has received an ISO 9001 certification for its decentralized waste management system.

Background

Pune had a limited door-to-door waste collection service prior to 2005. More than 80% households in the city were dependent on community bins for waste disposal. These containers were often not emptied and cleaned regularly and garbage overflowed onto the roads causing nuisance of stray animals and unhygienic conditions. In some areas, garbage was dumped along roads, open plots and in storm water drains and nallahs. The mixed waste was collected from the community and open plots by PMC's own staff in a ghanta truck and directly disposed at an open dump site. These works were carried out by the Public Health and Conservancy Department when there was no SWM Department within

PMC to collect, transport and manage the solid waste efficiently. Waste segregation was not institutionalized, but was being carried out to some extent by the waste pickers who rummaged plastics, glass, paper and other recyclables from the community bins and the open dump sites and sold them to scrap dealers. Their work helped reduce the amount of municipal waste being taken to landfills, thus saving transportation costs for PMC and safeguarding the environment. Yet their contribution often went unrecognized. The waste pickers worked in unsanitary conditions, suffered from poor social and health status, and were often harassed by the police and local authorities.

During early 1990s, the waste pickers in the city decided to organize into a union to get their work recognized, assert their rights and demand for better working conditions. The Kagad Kach Patra Kashtakari Panchayat (KKPKP) was thus formed as a registered trade union of waste pickers and scrap dealers. Today the KKPKP has more than 9000 members who pay an annual fee towards the operational expenses of the organization.

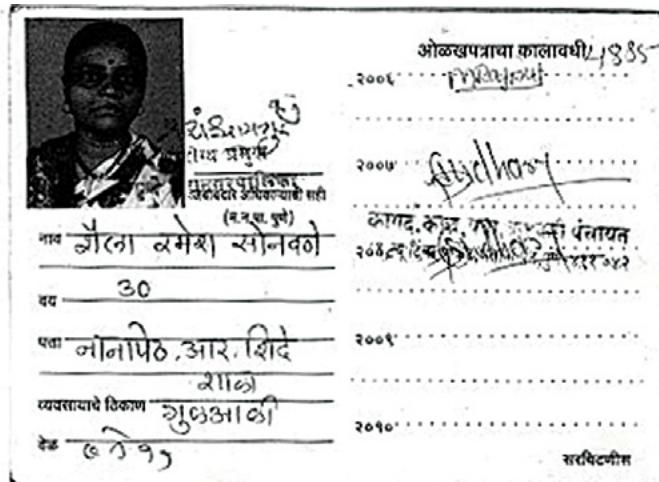
The KKPKP advocated with the PMC to recognize waste-picking as work and recognize the contributions of the waste pickers in managing solid waste. The PMC agreed to KKPKP's demands and agreed to register the waste pickers. In 1995, PMC became the first urban local body in the country to issue and authorize identity cards to waste pickers to authorize them to collect recyclables and scrap from the municipal waste. In 2002-03, the PMC also extended medical insurance benefits to all registered waste-pickers in its jurisdiction.

Around 2005, the KKPKP approached the PMC to involve waste pickers into the municipal waste management system to comply with the requirements of the municipal solid waste (MSW) rules (management and handling), 2000. With a limited staff and institutional capacity to carry out all the functions mandated by the MSW rules on its own, PMC agreed to partner with KKPKP to establish a door-to-door collection in the city and move towards more sustainable waste management practices.

The initiative: PPP between PMC and SWaCH to institutionalize door-to-door collection

In 2005-2006, PMC launched a pilot program for door-to-door collection in partnership with KKPKP and the SNDT Women's University. KKPKP trained 1500 waste pickers in door-to-door collection to provide services to 1.25 Lakh households in exchange of a user fee. The PMC played the role of an enabler and facilitator and provided equipment, infrastructure and management support. The pilot proved to be a success, as it offered a sustainable mechanism for institutionalizing door-to-door collection in Pune and also improved the working conditions for the waste pickers.

The pilot project continued for two years from 2006 to 2008 after which PMC decided to scale up the initiative to cover the whole city. The waste picker members of KKPKP came together to form SWaCH (Solid Waste Collection and Handling or, officially, SWaCH Seva Sahakari Sanstha Maryadit, Pune), a cooperative of self-employed waste pickers to provide front-end waste man-



Identity card authorized by PMC. The recognition of waste pickers by PMC was a key step towards mainstreaming them in the municipal solid waste management process.

1993-1994	•Kagad Kach Patra Kashtakari Panchayat registered as a trade union of waste-pickers
1994-1995	•PMC becomes the first ULBs in the country to officially register waste-pickers through the KKPKP.
2000	•Notification of the MSW (Management and Handling) Rules making door-to-door collection and waste segregation mandatory for ULBs
2005	•KKPKP approached PMC to involve waste pickers in door-to-door collection to comply to MSW Rules
2006-2008	•PMC launched a pilot program for door-to-door collection in 1.25 Lakh households in partnership with KKPKP and SNDT University
2008	•SWaCH is registered as a co-operative of waste pickers. signs a MOU with PMC to provide front end waste management services in the city
2013-2014	•MOU with SWaCH expired, PMC expected to renew MOU in June 2014

Institutionalizing door-to-door waste collection service in Pune by involving waste pickers: a timeline

agement services to the citizens of Pune. The managing board of SWaCH comprises waste pickers, representatives of KKPKP and two representatives from PMC. On 24th August 2008, PMC signed a Memorandum of Understanding (MOU) with SWaCH and entered into a public-private-partnership. The MOU authorized SWaCH to collect segregated waste from households and commercial establishments by charging a user fee, and deposit the waste in PMC's secondary bins or designated collection points. The MOU authorized waste collectors to retrieve and sell recyclable waste and retain the earnings.

Today SWaCH provides door-to-door waste collection services to 4 Lakh households in the city and covers 60% of PMC's geographical area. Remaining 40% households are dependent on PMC's ghanta trucks or community bins for disposal. Out of 144 municipal wards, 122 are covered by SWaCH.

Roles and Responsibilities of SWaCH, PMC and Residents

The collaborative partnership between PMC and SWaCH was es-

tablished on the premise that, SWaCH is not a contracted agency but an equal partner to PMC in implementing a sustainable solid waste management system in the city. SWaCH is responsible for collecting segregated waste from households, commercial establishments and institutes and depositing this waste at designated locations or in PMC's collection vehicles. PMC plays the role of a facilitator in primary waste collection by educating and informing citizens about waste segregation, and asking them to pay a user fee to SWaCH for their services. PMC is solely responsible for secondary waste collection, transportation, processing and disposal. The roles and responsibilities of SWaCH and PMC across the value chain of sustainable solid waste management are presented in the matrix below.

Operational Model of SWaCH

Currently 2,300 waste pickers are members of SWaCH and provide door-to-door waste collection, housekeeping, facility management and local waste processing services to more than 4 Lakh households and several institutions in the city. A team

"I segregate my garbage into dry and wet waste. SWaCH members come and collect it every day. SWaCH is helping us keep our society clean and green!"

Anjali Deodhar,
PMC resident

"I used to enter into garbage containers to retrieve whatever scrap I could find. Now I collect garbage from households and get paid. I now earn better and live in dignity."

Anita,
SWaCH member

"The user-fee based model based for waste collection is a good model for PMC. We are committed to extending our partnership with SWaCH and will renew our MOU."

Dr. Ketaki Ghatge, Zonal MO
(SWM), PMC

Source: interview by UMC

Source: interview by UMC

Source: interview by UMC

	Source Segregation	Door-to-Door Collection	Waste recycling and resource recovery at local level	Transporting segregated waste	Waste Processing	Disposal
Operations	Residents/ RWAs	SWaCH	SWaCH (through private service contracts with RWAs/ Institutions)	PMC		
		PMC (in areas where SWaCH is not operational)				
Monitoring	RWAs	SWaCH	SWaCH	PMC		
	PMC (through enforcing MSW Rules-2000)	PMC (in areas where SWaCH is not operational)				
Financing		SWaCH (user charges, operational grant and subsidy of Rs. 5 per slum household by PMC)	SWaCH (Sale of recyclables, service charges paid by RWAs/institutes for composting, operating bio-gas plants)	PMC (through SWM Cess charged on the property tax)		
IEC Campaigns	PMC and SWaCH			PMC		
Complaints Redressal	RWA and PMC	SWaCH	SWaCH	PMC		
Uniforms, equipment and infrastructure	PMC (Bins for dry and wet waste)	PMC (Uniforms, push carts, brooms)	PMC (Sorting sheds)			
Levy fines and penalties	PMC					



A team of 2 waste pickers collects waste from 300-400 households, the recyclables are retrieved and the waste pickers retain the income from their sale.

of two waste collectors collects segregated waste from 300-400 households, offices or commercial establishments in separate bins using manual pushcarts. The waste collectors sort the dry waste in sorting sheds provided by PMC or in areas designated by RWAs and retrieve recyclables such as paper, glass and plastic. They retain the income from the sale of this material. The wet waste and non-recyclable dry waste is handed over to PMC's collection vehicles at designated spots. The waste collectors work for an average of 4 hours a day and are entitled to a weekly holiday. SWaCH makes alternate arrangements in case of absence of a waste collector. The waste pickers collect a monthly user charges ranging from Rs. 10 to Rs. 40 per household for waste collection. The PMC partially subsidizes the cost of collection from slums to the tune of Rs. 5 per household per month. SWaCH members also enter into private service contracts with resident welfare associations (RWAs) and institutions to compost the wet waste on site and provide allied housekeeping services.

The PMC-SWaCH partnership has allowed PMC to put in place a simple, transparent and sustainable model of door-to-door waste collection and resource recovery at local level. It has also significantly helped the waste pickers to upgrade their livelihoods and earn a living in a dignified, safe manner without having to rummage into garbage piles and community bins.

Monitoring Framework

SWaCH has established an internal management structure to monitor the day-to-day operations in the field as well as carry out other administrative and managerial functions such as account keeping, data monitoring and reporting, training of waste pickers, coordination with PMC as well as citizens etc. The central

office of SWaCH is responsible for the overall operations and management of the organization and comprises an Operations Manager, Data Manager, Outreach Manager, Administrative Manager, Accounts Manager and allied staff who all work under the direction of the CEO. The field staff comprises supervisors and coordinators who manage teams of waste collectors on ground in coordination with the PMC staff. The supervisors and coordinators are largely women from within the waste picking community who have received formal education and are able to perform basic accounting and managerial functions. The office and field staff of SWaCH is employed by the cooperative whereas the waste collectors rely on the user fee and sale of recyclables for their livelihood. SWaCH sends a monthly report to PMC indicating the number of households served and number of waste collectors and other field staff engaged in the collection process in each ward.¹

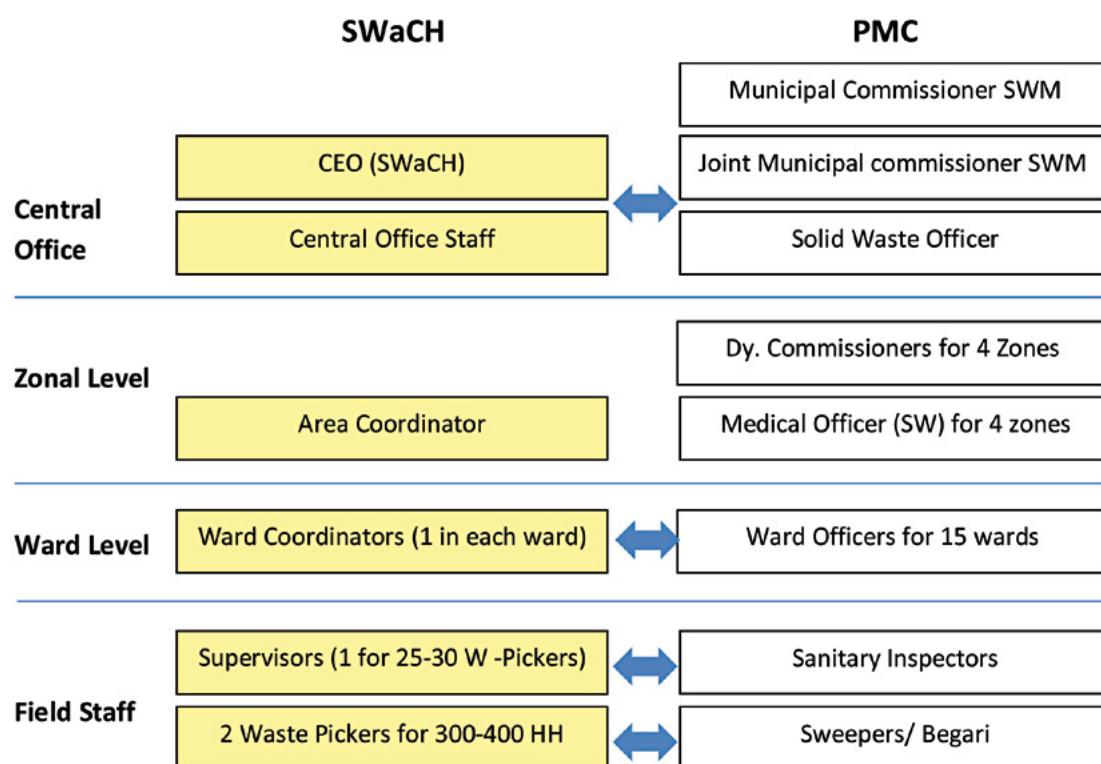
The institutional arrangement for monitoring waste collection in Pune is presented below:

SWaCH has established a direct helpline where citizens can register their complaints about any issues with waste collection service. Complaints registered with PMC are also routed to the SWaCH helpline.

Financial Sustainability

The SWaCH model for door-to-door waste collection is a sustain-

¹At the time of documentation of the case study, SWaCH had purged down its central office and field staff since September 2013 after the MOU with PMC expired. The waste collectors continue to service the households for a user fee with minimal monitoring from SWaCH or PMC. The MOU between PMC and SWaCH is going to be renewed in July 2014.



FINANCIAL OVERLAY OF PMC-SWaCH INITIATIVE

	Component	Funding Source	Annual Contribution in INR
SWaCH	Towards supporting livelihood of waste Pickers including 5% towards operational/ management expenses of SWaCH	Collection of User Charges from 4 Lakh households (Rs. 10-40 per household per month)	14,40,00,000
PMC	Operational and administrative expenses of SWaCH including training and community awareness initiatives	Operational Grant by PMC (only for five years)	1,64,00,000
	Cost of waste collection from slum households	Subsidy of Rs. 5 by PMC for 28000 slum households	16,80,000
	Welfare Benefits to waste pickers	Rs. 7000 per waste picker per year	16,10,000
	Expenses towards uniforms, equipment and infrastructure by PMC	-	-

able model designed to become financially self-sufficient within a period of five to six years. The waste picker members of SWaCH make their living by collecting user fees from households and by selling the recyclables recovered from garbage. They pay 5% of their monthly earnings to the cooperative towards the cost of management staff, logistics and overheads. Since more than 30% of the total households in Pune are slum households who do not have the capacity to pay user charges, PMC is responsible for partially subsidizing the cost of waste collection from slums. The PMC's financial responsibilities also include providing an operational grant to SWaCH for a period of five years to cover initial management costs and providing welfare benefits to all waste picker members of SWaCH. The financial contribution by SWaCH and PMC (as outlined in the MOU) towards supporting the door-to-door collection service in Pune is provided in the table above.

The cost to PMC per household per month amounts to Rs. 4.38 which is significantly lower than the cost of providing door-to-door collection service in any other city in India. The PMC-SWaCH partnership has been operational in Pune for five years. Door to door collection services have never stopped in the city, despite lapses in financial contribution by PMC towards operational and administrative expenses. The model is being largely supported by the citizens paying the user charges directly to waste pickers for the collection services.

Promoting decentralized waste management

Under the MOU, PMC has also authorized SWaCH to enter into private service contracts with housing societies, institutions and corporate offices for waste collection, on-site waste processing as well as housekeeping and facility management services.

To encourage citizens to treat waste at source, PMC provides a rebate of 5% on property tax to societies, institutes and commercial establishments who compost on site. SWaCH provides complete waste management services to several entities such as the University of Pune, Karve Group of Institutes, housing societies and corporate parks. SWaCH members compost close to 10 tons of waste every day in 80 housing colonies across the city. SWaCH members are trained to operate bio-gas plants, organic waste converters, and provide these services where needed.

Results

Key achievements of the SWaCH initiative in the past 5 years of implementation are summarized below:

- The PMC-SWaCH initiative has been able to divert 60 MT of waste away from landfills every day. PMC is committed to make Pune a zero landfill city. Currently 80-85% of the waste generated in the city is being recycled/ processed. PMC has stopped open dumping at Uruli since June 2010.
- With the success of the initiative, PMC started a zero waste campaign in Katraj Ward in collaboration with SWaCH, Janwaani and Cummins India. PMC has now expanded the initiative in 20 prabhags in the city. The initiative involves focused training of waste pickers as well as citizens about waste segregation, handling and management. PMC also provided the waste collectors with necessary infrastructure, including multiple bins for the segregation of waste, raincoats, gloves, soap, pushcarts and cycle rickshaws. The level of segregation in these wards is 60-70% as compared to 45-50% in the rest of the city.
- The SWaCH door-to-door collection model has saved PMC approximately Rs. 15 Crores annually in waste handling and transportation costs and also contributed to saving envi-



SWaCH members managing composting pits at a residential society and bio-gas plant at Karve Institute

ronmental costs by reducing carbon emissions. PMC is also claiming for Certified Emission Reductions (CERs) (a type of carbon credits) issued by the Clean Development Mechanism (CDM) body.

Sustainability

The PMC-SWaCH initiative has been largely successful despite lapses on PMC's part towards disbursement of the operational grant, provision of infrastructure and equipment as well as payment towards welfare benefits of waste collectors. However, PMC's support is critical for the long-term sustainability of the initiative. It is important that PMC clears all the past dues and provide necessary infrastructure such as sorting sheds, equipment, uniforms etc., and works together with the waste cooperative in the future to ensure a cleaner, greener future for the city. In order to scale up the initiative and achieve 100% door-to-door collection, PMC will also have to actively engage with elected officials, citizens and NGOs and spread awareness about segregation and importance of user fee. The PMC is also in the process of developing public health bye-laws which will allow PMC to enforce MSW 2000 rules and penalize defaulting citizens.

Lessons Learned

Pune was the first city in India to formally register waste pickers way back in 1995. The organization of waste pickers into a union which later led to the formation of the cooperative is the key to the success of this model which SWaCH refers to as a 'pro-poor public private partnership'. The model has evolved as a result of more than 20 years of consistent dialog and deliberations

between the PMC and the KKP KP which is an important learning for ULBs willing to work with waste pickers to improve solid waste management in their cities. The other important learning from the initiative is the insistence on charging user fees from citizens for door-to-door collection. Many ULBs are cautious of asking citizens to pay for municipal services as such tariffs and charges do not always align with political interests. Charging user fee should be viewed as a positive change towards more responsible & sustainable waste management practices as it promotes a direct, accountable relationship between the user and the service provider.

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VRINDAVAN KUDA PRABANDHAN PARIYOJANA: A PROGRAM BY FRIENDS OF VRINDAVAN

SNAPSHOT

COMMUNITY LED INITIATIVES IN SUSTAINABLE WASTE MANAGEMENT

City Profile

Vrindavan, a town in Mathura district in Uttar Pradesh, is an important religious centre in India, revered among Hindus as the birthplace of Lord Krishna. As per the 2011 Census of India, the current population of the town is 63,000, however during religious festivals like Holi, Rath Mela, Navratri and Diwali, the town sees an additional influx of 25,000 to 30,000 people per day. The religious pilgrims have created a demand for additional infrastructure and transit facilities such as public toilets, bathrooms and dormitories; however the urban local body is finding it challenging to cater to such occasional peaks in the floating population in Vrindavan. The urban local body is also stressed to efficiently provide key municipal services such as drinking water, sanitation and solid waste management. As result several community led groups and NGOs have become active partners in addressing the issues of congestion, sanitation and pollution to preserve the religious, cultural and environmental heritage of Vrindavan.

SWM Situation in the City

Despite being a town of such religious significance, Vrindavan is in a deplorable condition with piles of garbage dumped along roadsides and in nallahs and water bodies. The total amount of solid waste generated in Vrindavan from households, ashrams, temple complexes, institutions, etc. is approximately 40 MT per day. There is a 25 percent escalation in the quantum of waste generated during the peak festival seasons. A large proportion of the waste comprises temple waste such as garlands, flowers, offerings and other bio-degradable waste. The waste collected from larger establishments such as temples, ashrams, hotels, universities, schools, colleges, hospitals, satellite dumping stations by FoV is used to generate manure by vermicomposting. The remaining waste collected from the town is disposed at a dumpsite near the main government hospital in the city. The dumpsite has big trenches, with enough capacity to contain the garbage for next twenty years or more. A large portion of the dump site was recently allotted to the Mandi Samiti to build a whole sale market of grains, flowers, vegetables etc. However the plant has not been implemented because of certain legal issues relating to the ownership rights of the land. The site is currently being used only as a dumping site.

Efficient addressing of SWM in Vrindavan is more of a social

challenge. The Jajmani system (a system of interaction between societal classes, where the lower castes provide a service to the upper castes for economic gains) is rampant in the solid waste sector. Certain families of the dalit / Valmiki community illegally own the Jajmani right in certain institutions, hotels and housing colonies for collection of waste. So much so is their right of collection that even the Municipality vehicles are not allowed to collect waste from these places. Households pay money to this community for taking their waste out. The waste collected is often disposed in a nearby waste land or nallah or sometimes even on streets. The Municipality vans and NGO vans then collect the waste and transfer it to the dump site.

To address the worsening situation of solid waste in the city, FoV felt the need to develop a new model for solid waste collection that addresses these social issues, and makes these communities as well as citizens at large, active participants in the garbage management process. During the same time, the Central Pollution Control Board (CPCB) of India conceptualized the Eco City Program under the tenth five year plan for improving the environment and promoting sustainable development in six religious town of India. This project for improving solid waste management in the ecocities was called Achieving Action in Waste Management (AaWAM) which was conceived, designed and implemented by the Waste and Resource Management group of the Centre for Environment Education (CEE), which established field offices in these towns and worked along-side the municipalities, while handholding the NGOs for implementing the sustainable waste management projects in their respective towns.

Government and Private Institutions Involved in SWM

Vrindavan Municipality was established in 1866 and is responsible for providing basic services such as water, sanitation and roads to its citizens. The Health and Sanitation Department is responsible for the collection and disposal of solid waste. The Department has a staff of one sanitary inspector assisted by two office clerks and ten supervisors. Each supervisor monitors a team of waste collection workers responsible for street cleaning and garbage collection. With limited staff and resources, the Vrindavan Municipality is unable to provide efficient SWM services to all its citizens.



Cleanliness drive involving school students

The service gap in SWM services is being fulfilled by Friends of Vrindavan (FoV), a non-governmental and non-profit making organization established in 1996 with the purpose of preserving the ecological heritage of the city. FoV has been working in the area of garbage management for more than a decade now. It launched a pilot street-cleaning project near the Banke Bihari temple in 1997, addressing one of the worst spots in the town. FoV has also started a waste recycling project involving widows, the disabled and other destitute groups and has also initiated bio-medical waste collection in the city to ensure safe disposal of hospital waste by incineration.

Vrindavan was identified as an Eco city under the program. Keeping in view the ongoing efforts by FoV to address garbage issues in Vrindavan, it was identified as the partner NGO to help implement the program in the city. This was the genesis of the 'Kuda Prabhandhan PariYojna' in Vrindavan.

The Initiative: Vrindavan Kuda Parabhandhan PariYojana (VKPP)

VKPP was developed as a pilot model under the Religious Eco cities programme in the year 2005. The CPCB funded the program under which FoV introduced door-to-door collection of segregated waste in two wards of the city based on user charges. Waste pickers in the city were trained and employed by FoV as safai mitras in the door-to-door collection process. The households segregated wet and dry waste. The dry recyclable waste collected from households was sold by the safai mitras to scrap dealers for extra income and the wet/ non-recyclable waste was deposited at the community bins. FoV also collected a huge amount of floral and other bio-degradable waste from local temples and shrines and established a vermi-composting unit to process this waste. A paper recycling unit was also established to recycle paper and cloth waste generated in schools, institutions and markets. As part of the program, FoV also constructed two garbage ramps to allow direct transfer of waste from rickshaws to tractor-trolleys.

VKPP was further supported by the Global Environment facility (GEF) and UNDP's Small Grants Program (SGP) and GTZs ASEM program to help promote a sustainable model for



Waste collection trucks donated by TATA motors

street cleaning and waste management in Vrindavan. The GEF SGP provided a total grant of Rs. 29 Lakh in two phases for duration of four years. During the project period, door-to-door collection was expanded to include 3 wards in the city (Ward 3, 4 and 7). The wards were selected as the pilot area because of their religious and cultural significance. The pilot project area included four market places and six residential areas, along with several major temples and shrines. Waste was collected from colleges, universities, institutions, commercial complexes, temples and ashrams generally once in a day and sometimes twice a day during peak festival seasons. Large community waste bins were also installed at several locations to offer a way of waste disposal to households not covered by door-to-door collection. The 3R theory to Reduce Reuse & Recycle the waste was widely propagated under the program. Vermi-composting units were established at five different locations in the city to process organic kitchen waste and floral waste.

The waste pickers or safai mitras employed in waste collection and processing were organized into a cooperative society (Vrindavan Bandhu Cooperative Society) to encourage training, capacity building, skill building activities and enable the waste pickers to access alternative livelihoods. The SGP also supported a series of capacity building initiatives, knowledge sharing workshops and cleanliness drives which were conducted by Centre for Environment Education (CEE). The FoV worked with CEE to engage city officials, elected representatives, citizens, school students, NGOs, waste pickers as well as prominent institutions in the city to promote a community based approach to waste management. FoV also undertook campaigns targeted towards pilgrims and tourists to inform and involve them in the waste management initiatives.

The success of the VKPP, allowed FoV to garner additional funding from industries, donor agencies and private corporations. Sri Ratan Tata Trust supported the establishment of vermi-composting units and a handmade paper industry which employs trained waste pickers to create new products from recycled paper.

Tata Motors Ltd. donated four Tata-Ace mini dumpers to

transport the garbage from different locations of the town. Other philanthropic organizations such as Times of India, Hero Honda Group and the Yash Birla Group also supported the VKPP initiative through various stages.

The SGP grant ended in 2009 but FoV continues to provide waste management services in the city with local community support and corporate grants. The door-to-door collection started in two wards in 2005 now covers 6000 households and 250 establishments in the city. FoV charges a user fee in the range of Rs. 20 to Rs. 500 per month from households, shops and commercial establishments for waste collection and processing. FoV also provides housekeeping and waste management services to larger institutions and organizations. The service charges for these services range from Rs. 500 to Rs. 20,000 per month. There is no fixed charge for the street cleaning service provided by FoV but is sustained by voluntary contribution of the beneficiaries. The user charges and donations received from the shopkeepers, temples, households and commercial complexes are collected under the Vrindavan Cleaning Fund (VCF). Under the VCF, FoV also conducts regular cleanliness drives in the un-serviced areas of the town on request.

Key Outcomes

- About 9-10 metric tons (25% of the total waste generated in the city) of waste is collected daily under the VKPP.
- The door-to-door collection services are provided to 6000 households in the city. Nearly 80 per cent of the households make regular payments towards waste collection. FoV collects a total of Rs. 35,000 every month from user fees.
- The project has provided employment and livelihood support to more than 50 waste pickers in the city by employing them as *safai mitras* and in waste processing and recycling units.
- The Vrindavan Bandhu Cooperative Society promotes the rights of waste pickers through regular meetings, documentation, and skill training in alternative livelihoods such as making handmade paper products, basket weaving etc.
- The VKPP has promoted waste segregation at source and decentralized waste processing and recycling. A minimum amount of waste is transported to landfill site for disposal. Recyclables worth Rs. 100,000 have been retrieved and sold in the scrap market by the *safai mitras* (as of March 2014). One metric ton of organic compost is produced weekly from 5 composting

units. FoV has been successful in marketing the manure.

- FoV has also established workshops and plants where non-biodegradable items like plastic bags are recycled into baskets and other products which are sold in market. These workshops employ widows, handicapped and destitute and provide them with a regular income source.
- FoV has been able to generate awareness about sustainable waste management practices in the city through various education initiatives, workshops and public rallies.

Sustainability and transferability

The VKPP case study documents the emergence of community led waste management programs in the absence of a well-functioning, efficient municipal waste management system. The VKPP has been successful in putting in place a waste management program in the city with the support of community and by leveraging funding from international agencies, institutions, corporates and individuals.

However, the sustenance of community based systems can be endangered without the full support of the local government. Solid waste management is a mandatory municipal function. Currently the Vrindavan Municipality has provided the FoV with a no-objection certificate to collect waste from households and other establishments. As the Municipality begins to grow and becomes more robust and financially stronger, it is likely to improve its SWM services by investing in infrastructure, human resources and systems. The Vrindavan Municipality is already charging a solid waste tax along with the property tax to provide these services. If the municipality offers collection services in the future, the citizens are likely to be unwilling to pay for SWM twice in the form of user charges/SWM tax unless the Municipality enters into a partnership arrangement with FoV and advocates for user fee based collection in the city.

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CATEGORY 1B

INITIATIVES IN WASTE RECOVERY

THE PARISAR VIKAS PROGRAM: AN INITIATIVE SUPPORTED BY STREE MUKTI SANGATHAN AND THE MUNICIPAL CORPORATION OF GREATER MUMBAI

PROMOTING DECENTRALIZED WASTE MANAGEMENT BY INVOLVING WASTE PICKERS IN WASTE RECOVERY AND PROCESSING

Decentralized solid waste management systems help reduce the quantity of waste generated at source by involving community in segregation and processing of waste by adopting practices of recycling, composting, bio-gas generation etc. Such decentralized systems encourage citizens to become responsible for their own waste management and help urban local bodies save costs of collection, transportation and disposal of waste.

The Parisar Vikas Program in Mumbai encourages societies, institutions and office parks to become zero-waste campuses, by employing trained women waste pickers called Parisar Bhagini for waste collection, handling and processing by using compost pits and bio-gas plants.

City Profile

With a population of more than 1.2 Crore, Mumbai is the largest metropolitan city in India and the financial and commercial capital of the country. Geographically the city is divided into the island city (South Mumbai) which is the commercial and financial centre of the city and the suburbs, separated by the Mahim Creek. The suburbs are further categorized as eastern and western suburbs. The island and the suburbs together constitute Greater Mumbai with an area of 437.71 sq km. As the financial, commercial and entertainment capital of India, the city is a major employment hub in the region. Mumbai and its surrounding regions contribute close to 35% to the State's GDP (MCGM, Economic Profile, 2004).

Population Growth and Urbanization Pattern

Mumbai established itself as a major port city and a 'Gateway to India' during the British rule. As the area around the port developed and industrialized, more and more services grew around the port activities and the city's economy began to diversify. The city continued to witness a steady population growth and urbanization even after independence. Around 1970's Mumbai's population began to grow exponentially owing to the growth in mills and industries. The city saw a huge influx of migrant workers into the city. Several chawls or one room multi-storied residential units were constructed in and around the mill premises to house these workers. These chawls were one of the first established low-income residential areas in the city.

As the population of the city continued to grow, migrants were forced to settle in slums and informal housing colonies in the absence of adequate affordable housing.

Most mills and industries in Mumbai were shut down, although the city continued to witness rapid growth with emergence of new industries such as diamonds polishing, IT, healthcare and finance.

The quality of life in Mumbai has also worsened and the decline is quite steep. Slums have proliferated and congestion, pollution and water problems have skyrocketed. All of this has resulted in a slippage in rankings (Mumbai fell from 26th place in 1996 to 33rd in 2000 in Asiaweek's rankings of the top 40 cities in Asia). On the international stage, Mumbai ranks a poor 163rd (out of 218 cities world-wide) on the Forbes' quality of life survey and 124th (out of 130 cities world-wide) on EIU's hardship ratings. The situation is likely to worsen over the next decade with an expected population increase of over two million. (Source: Vision Mumbai, Transforming Mumbai into a World-class City)

Urban Local Governance

The Municipal Corporation of Greater Mumbai (MCGM) is the local administrative body responsible for providing civic infrastructure and municipal services to citizens of Mumbai. The MCGM is the wealthiest and one of the most robust urban local bodies in the country.

Under the Maharashtra Municipal Corporation (MMC) Act, the Municipal Corporation is mandated to provide 25 basic

services like maintenance and development of public streets, collection, treatment and disposal of sewage, solid waste management, fire safety, lighting of public spaces, maintenance of public hospitals, control of diseases and medical relief, public vaccination, registration of birth and death, primary education, water works etc. Other than these, under section 66 the Corporation may provide 42 other services like shelter for destitute and homeless, provision and maintenance of public transportation, provision and maintenance of ambulance, etc. (MMC Act,1949). As per the MMC Act, collection, removal, treatment and disposal of waste and watering, scavenging and cleansing of all public streets and places are obligatory functions of MCGM.

The Mayor heads the elected wing while the Municipal Commissioner heads the executive wing of the Corporation. MCGM is divided into six zones and 24 wards to facilitate decentralized administration. The 24 wards of Greater Mumbai are grouped under three zones, the City zone, the eastern suburban zone and the western suburban zone. Solid waste management activities are undertaken at the ward level in Mumbai.

Waste management in Mumbai

Organizational Structure of Solid Waste Management Department

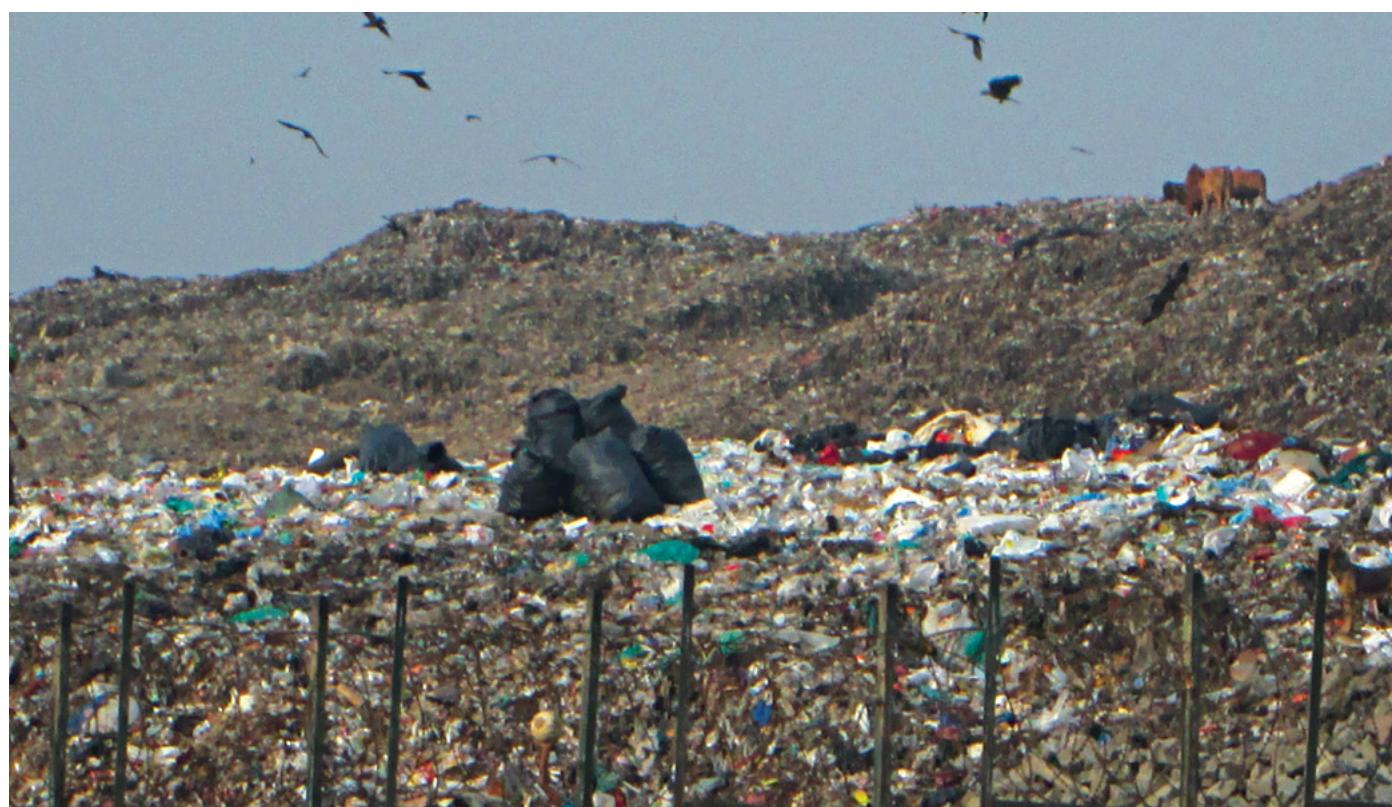
The Solid Waste Management (SWM) Department is in charge of all functions concerned with municipal waste collection, transportation, treatment and disposal. The Solid Waste Management Department is divided into two wings, the Conservancy Wing

and the Transport Wing. The Department is headed by a Chief Engineer who is supported by 3 Deputy Chief Engineers (one each for the city, eastern suburbs and western suburbs). The Chief Engineer reports to the Deputy Municipal Commissioner (SWM). There is one Executive Engineer (Transport) and one Deputy Head Supervisor assigned in each zone who work under the Deputy Chief Engineer. The SWM activities are carried out at the ward level in each of Mumbai's 24 wards and are supervised by the Assistant Head Supervisor (AHS). The AHS manages a team of sanitary inspectors, mukadams and street sweepers.

Overview of municipal solid waste sector

Mumbai generates more than 7,000 MT of solid waste per day. Of the total waste generated, about 5000 MT is municipal waste, 2000 MT is silt and construction debris and about 10 MT is bio-medical waste. Waste collection in the city happens through a combination of community bins and door-to-door collection. There are more than 4000 secondary collection bins installed all across the city. Waste is collected from these bins and transported to one of the three transfer stations in the city from where it is taken to the disposal sites through bulk refuse carriers. The level of waste processing and recovery is very low. Most of the municipal waste collected is disposed at the dumpsite at Deonar. The Mulund and Gorai dumpsites have already reached their capacity and MCGM has recently allocated another dumping site at Kanjur.

The construction waste and debris is disposed at abandoned mines and quarries within MCGM limits. The bio-medical waste



Unsanitary conditions at the Deonar Landfill

is mostly disposed at private incineration facilities in hospital complexes. MCGM has also developed a bio medical waste processing facility with a capacity of 10 MT. MCGM also carries out regular sweeping on 2000 KM streets in the city and garbage management activities at four beaches in the city.

Despite these initiatives, Mumbai is still facing challenges to effectively and sustainably manage its solid waste. In 2011-12, Mumbai accounted for 6.11% of the total waste generated daily in India and the amount of waste generated is only expected to increase in the future. In the absence of adequate waste processing infrastructure, majority of the waste is finding its way into the landfill. The garbage dumps in Deonar are now more than 50m in height and a source of nuisance for the surrounding neighborhoods. The air quality in the area is deteriorating because of the stench of putrefying garbage and frequent burning of trash. With the untreated leachate polluting the ground water and soils, the dumpsite poses major public health and environmental threats.

The MCGM is not able to comply with the MSW Rules, 2000 because of lack of waste segregation and processing. MCGM collects and transports mixed waste to the dump sites. With the availability of new dump sites increasingly becoming challenging and a national level policy push towards more sustainable waste management practices, more and more cities in India are exploring innovative ways of waste management involving local communities in the process.

Recent Initiatives by MCGM in the SWM Sector

In recent times, the MCGM has also undertaken few key initiatives to address the waste management problem in the city in a decentralized manner in partnership with NGOs, CBOs and citizen groups. These initiatives have been summarized below:

Advanced Locality Management Program

The Advanced Locality Management (ALM) Program was initiated by MCGM in 1997 with the objective of involving citizens in solid waste management of their area. The program was piloted in a neighborhood in Ghatkopar where mounds of garbage piling up on streets was becoming a huge nuisance for the citizens. MCGM decided to address this issue with the support and participation of the citizens. The citizens were asked to segregate and store waste into dry and wet categories. MCGM involved waste pickers in door-to-door collection of the segregated waste. Citizens also formed a Committee among themselves to advocate waste segregation and recycling and keep a check on littering. The program was adopted by surrounding neighborhoods, and the residents formed their own committees to monitor it.

The partnership between the Committee and MCGM was soon formalized with the roles and responsibilities of MCGM and Citizens Committee clearly spelled out. While the Committee is responsible for waste minimization and segregation, organizing waste collection/ proceeding in their society/area, and preventing littering in the neighborhood, MCGM's responsibilities include regular street cleaning, waste collection from bins/ households and waste disposal.

The ALM program is now running successfully in various areas of Mumbai. Once a group of citizens in an area organize and form a Citizens Committee, they register the Committee in their respective ward office as an ALM Society. The citizens commit to maintaining separate streams of dry and wet waste. The dry waste is recycled and the wet waste is processed on site through vermi-composting or other means. An ALM Officer is appointed by MCGM in each ward to coordinate with the registered ALMs and address citizen complaints. As per MCGM's website, currently there are 658 ALMs registered with MCGM covering all 24 wards of Mumbai.

Parisar Vikas Program

The Parisar Vikas Program (PVP) is an initiative implemented by the Stree Mukti Sanghatana (SMS), a Mumbai based NGO and supported by MCGM since 2002. Under the program, SMS has trained waste pickers in waste collection, handling, processing and transportation and organized them into cooperatives. These cooperatives of waste pickers undertake waste management and facility management services in housing societies, industrial parks and other campuses under the ALM program of MCGM. The key operational and business aspects of the program are described in Section 3.

Slum Adoption Scheme

Close to 50% population in Mumbai lives in slums which are characterized by unhygienic and poor sanitation conditions. The Slum Adoption Scheme (Dattak Vasti Yojana) was initiated in select slums of Mumbai in 2001 to address solid waste management issues in slums. The scheme encouraged local community based organizations (CBOs) to undertake door-to-door waste collection services in slums with technical and financial assistance from MCGM. The slum households were encouraged to pay user charges of Rs. 10 per month to the CBOs. MCGM provided a financial assistance of Rs. 2000/- per 1000 population in the first year, Rs. 1800/- per 1000 population in the second year and Rs. 1600/- per 1000 population in the third year to the CBOs. It was envisioned that the program will eventually become self-sustainable and run solely on the basis of community contribution.

Currently, the scheme is being implemented in more than 250 slums in the city through a network of 419 CBOs. The following activities are conducted under the scheme:

- Collection of garbage from every slum household
- Encouraging slum dwellers to segregate garbage into wet and dry categories
- Sweeping of all public roads, bye-lanes and open spaces
- Cleaning of public toilets
- Storing of segregated garbage and involving waste pickers in recycling of dry waste
- Co-ordination with MCGM vehicle to ensure regular street sweeping and waste collection

Formulation of public health bye-laws

The MCGM formulated and adopted the Greater Mumbai Cleanliness and Sanitation Byelaws in 2006 for regulating all

ABOUT STREE MUKTI SANGHATANA (SMS)

Stree Mukti Sanghatan is a Mumbai based NGO working in the areas of gender equality, health, women empowerment, poverty eradication and development. The SMS conducts large scale awareness campaigns & training programs on women's issues, sanitation & environmental issues and also undertakes programs that improve the health and quality of life of women working in the poor informal sector.

matters and things connected with the collection, removal and disposal of solid waste. The bye-laws are applicable to every public and private space, commercial centres, residences and all other premises within MCGM limits. The bye-laws spell out obligatory responsibilities of MCGM, waste generators and service providers of solid waste management and also identify penalties for the contravention of the byelaws. In order to implement these bye-laws, MCGM has involved private security agencies and deployed them as 'Clean up Marshals' in all wards of the city.

Parisar Vikas Program: Involving waste pickers in decentralized waste management

The Parisar Vikas Programme (PVP) is a program initiated by Stree Mukti Sanghatan (SMS). Under the program, waste picker women are organized and trained to provide waste management services to housing societies and campuses under the ALM scheme of MCGM.

Inception of the Program

The ALM program launched by the MCGM promoted the role of waste-pickers in decentralized waste collection and management. However, the waste pickers in Mumbai were yet unorganized.



Under the Parisar Vikas program, Waste picker women were registered and involved in door-to-door collection of segregated waste (Image source: Stree Mukti Sanghatan)

There were more than 50,000 itinerant waste pickers in the city informally engaged in waste picking and sorting at community bins, garbage collection points and dump sites working in extremely unhygienic conditions.

During this time SMS conducted a household survey of 2000 women waste pickers to identify their concerns and issues and identify opportunities to engage them in the formal waste management value chain. Based on the findings of the survey, SMS initiated the Parisar Vikas Program in 2002 with the support of War on Want, a London based NGO. The NGO provided SMS with a funding of Rs. 20 Lakh for a period of four years. SMS undertook the following activities under the program:

- Organizing women waste pickers and issuing identity cards to them with endorsement from MCGM.
- Training of women waste pickers in alternative skills such as gardening, vermiculture, operating biogas pants etc.
- Providing child care and pre-primary education support to children of waste pickers by establishing crèches and kindergartens.
- Health check-ups and health and sanitation outreach and awareness programs for waste pickers.

The trained waste pickers were called "Parisar Bhagini" or neighborhood sisters. The bhagini collected dry and wet waste separately from households as mandated under the ALM program. The wet waste was composted and the dry waste was sorted, recycled and sold in the scrap market. The bhagini retained the earning from the sale of scrap.

Today, SMS has registered more than 3000 waste pickers and the Parisar Vikas program has expanded to 13 wards in the city. The Parisar Bhagini collect segregated waste from every household for a user fee of a minimum of Rs.10 per household. The money collected through user fees is used by the SMS for training and monitoring activities. The bhagini retain the income generated by selling of recyclables.





MCGM has provided 7 sorting sheds and dry waste collection vehicles to support the Parisar Vikas Program

	Description of service contract	Select locations where the contract is operational
1.	House to house collection of waste, fine segregation, processing of wet waste on site and recycling of dry waste	RBI Colony (Taddev), Orchid Society (Thane), Shivanil Society (Chembur)
2.	Collection of non-medical waste from hospitals	KEM Hospital (Parel), Prince Hospital (Byculla)
3.	Collection of dry waste from shopping malls	-
4.	Maintenance of biogas plants	TISS, BARC training hostel (Anushakti Nagar),
5.	Collection of consumed tetrapack cartons and sending them to recycler	Parle Agro (Parle)
6.	Collection of dry waste from Special Economic zone and disposal	SEEPZ (Andheri)
7.	Collection of dry waste from Corporates and providing them recycled paper	Axis Bank
8.	Collection of dry waste with MCGM provided tempos	BEST Depots, Kamathipura, Maratha Mandir
9.	Collection of waste from school and college campuses	SPGRC (Lower Parel)

Leveraging Government Support

The SMS also leveraged government support for the Parisar Vikas Program under the Swarna Jayanti Shahari Rozgar Yojana (SJSRY), a centrally sponsored scheme aimed to provide gainful employment to the urban unemployed poor, through encouraging the setting up of self-employment ventures. More than 200 Self Help Groups (SHGs) or micro credit societies were established among waste picker women under SJSRY. A grant of Rs.10,000 was given to each SHG as a running capital to start their micro enterprises. About 63 groups also received a revolving fund of Rs.678,000 under the 'Thrift and Credit Societies' component of SJSRY. The federation of these groups was formed as an independent organisation Parisar Bhagini Vikas Sangh (PBVS) under the Charitable Trusts Act and registered as a Community Development Society. The MCGM also sanctioned construction of

sorting sheds in seven wards in the city under the infrastructure development of SJSRY.

SMS continuously advocates with the MCGM to promote the interest of the waste pickers and integrate them in the formal municipal waste management system. MCGM has constructed sorting sheds in seven wards (Wards A, E, F North, M East, M West, S, T). The waste pickers operate and maintain the sheds under the aegis of PBVS. In 5 wards of the city, MCGM has also provided the waste pickers with dry waste collection tempos. The tempos are operated by MCGM staff and work on fixed routes and timings. The waste pickers collect all dry waste from different locations and wait for the tempo on designated locations. The tempos collect the waste picker women along with the recyclables and take them to the nearest sorting sheds. Here the waste picker women sort the recyclables into various catego-



Decentralized Waste Management at Tata Institute of Social Sciences (TISS), a case study

The TISS campus is spread over an area of 21 acres in the Deonar neighborhood in the North-East Section of Greater Mumbai. The PBVS provides all waste management services in the campus including collection, recycling and sorting of waste. The PBVS also employ waste picker women to operate a snack bar/ restaurant at the campus. The restaurant generates 25-30 kg of organic waste every day. This waste feeds into a 100/kg/day bio gas plant along with additional waste from outside sources. The gas generated is supplied back into the kitchen. TISS has installed a larger bio-gas plant with a capacity of 500kg/day to process the wet waste generated from its larger canteen. The biogas plant has saved the institute close to 4000 kg of LPG. The manure is used to landscape the gardens at the institute.



Tetrapack recycling



Composting of wet waste in housing societies



ries (paper, glass, plastic, glass, tetrapacks etc.) and sell it in the scrap market.

The PBVS has employed field supervisors who monitor the work of parivar bhagini on ground and coordinate with the MCGM staff about every day transportation and logistics.

Facilitating Zero-Waste Campuses through decentralized waste management

As the program expanded and waste picker women were professionally trained in waste handling and management, SMS facilitated the formation of waste cooperatives to secure waste management contracts with the housing and office complexes and provide waste pickers with alternative livelihoods. There are currently 10 registered cooperatives with 25-50 members each. The cooperatives enter into service contracts with housing

societies, institutions, and businesses parks to provide waste management services such as general housekeeping, composting and recycling. The SMS has developed nine business models under which these contracts are secured. These models and select locations where these contracts are operational are shown in the previous table.

Currently more than 600 women are employed under these 10 cooperatives and providing decentralized waste management services to various institutions and housing societies. The service contracts are in the form of letters of agreement between the cooperative and the institutions/ society that allow bhagini to collect/ compost/ recycle waste for a set monthly fee. In some cases the bhagini are paid directly. In some cases (for instance in hospitals), the cooperatives also receive a letter from MCGM that authorizes them to collect and recycle dry waste.

Decentralized Biogas generation

SMS has trained parisar bhagini to operate the Nisarguna Biogas plants developed by Bhabha Atomic Research Centre (BARC) for processing biodegradable waste and generating Biogas and high quality manure. The waste picker women are currently operating and maintaining 8 Nisarguna Plants in the city. The Nisarguna technology is designed to digest almost any biodegradable waste including kitchen waste, paper, animal dung, bio-sludge, poultry manure, agro-waste, and biomass. The Biogas plants have three stages of operation. First, the waste is properly separated and contaminants and inappropriate organic material is sorted out. Second, the waste is placed in a mixer with hot water to break down fibers and create homogeneous slurry. This slurry enters into the aerobic tank and is converted to organic acids. Finally, the acidic slurry is transferred to the anaerobic tank, to be converted into methane which can be used for heating. The plant also generates high quality manure which can be used in gardens. A plant with a processing capacity of 100 kg per day requires only 50 sq mt of space. The small footprint and direct use of biogas for heating makes it ideal for use in campuses & institutions.

Results

The Parivar Vikas Program reaches out to more than 10,000 households and several institutions in the city. The program has helped several of these housing societies and office campuses achieve a zero-waste status by waste recovery on site by means of recycling and composting. Organizing and training waste picker women in collection, handling and management has offered them dignified work conditions, a stable income and alternative skills to diversify their income generating activities. The program has also successfully demonstrated a decentralized method of waste recovery and management using low cost, indigenous technology such as vermi-composting pits and Nisarguna bio-gas plants. Close to 200-300MT of waste per day is diverted away from landfill by the Parivar Bhagini. SMS has now been recognized as a training institute for sustainable solid waste management and has established two training centres in the city. SMS has conducted vocational training programs (seminars and on job training) on cleaning, waste collection, composting, gardening, vermi-composting and operating bio-gas plants to more than

2000 waste picker women. More than 3000 waste picker women have gained employment and work as housekeepers, facility managers and waste managers in institutes and societies. SMS also promotes independent social profit organizations in the field of sustainable waste management by linking them with potential clients as well as trained bhagini.

Sustainability

Parivar Vikas Program is largely an NGO driven initiative and operates within the framework of the ALM scheme where citizen groups engage the bhagini to provide waste management services. The sustainability of the initiative is largely dependent on the ability of waste cooperatives to secure service contracts from private institutions. These cooperatives are critical to ensuring decentralized waste management by undertaking recycling and waste processing on site thereby significantly reducing the burden on the local government to collect, transport and dispose waste. The MCGM however has not yet fully embraced the program and provided it with the necessary boost to scale up to other areas of the city. Other than SMS, there are several other NGOs in Mumbai such as Force, Aakar, Triratna Prerana Mandal, and Apnalay involved in decentralized waste management including collecting, segregating, recycling and reusing wastes. The role of MCGM is currently limited to providing sorting sheds and collection tempos in a few wards, which though is a step in the right direction is not enough to sustain these initiatives. The future sustainability of these programs is dependent on active support of the MCGM and its willingness to mainstream waste pickers in the formal waste management system.

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BIOMETHANATION PLANT AT KOYAMBEDU WHOLESALE VEGETABLE MARKET, CHENNAI

SNAPSHOT

WASTE-TO-ENERGY FROM SEGREGATED VEGETABLE MARKET WASTE

City Profile

Chennai, the capital city of Tamil Nadu is the fourth largest metropolitan city in India and is a prominent industrial and commercial centre in South India. As per the Census of India (2011), the current population of Chennai city is close to 46 Lakh (46,81,087), however the city has a much larger urban agglomeration. The Chennai Metropolitan Area (CMA) comprises the city of Chennai, 16 Municipalities, 20 Town Panchayats and 214 Village Panchayats in 10 Panchayat Unions, and is spread over an area of 1189 sq km. The population of the Chennai Metropolitan Area is above 86 Lakh (86,96,010).

Governance Structures

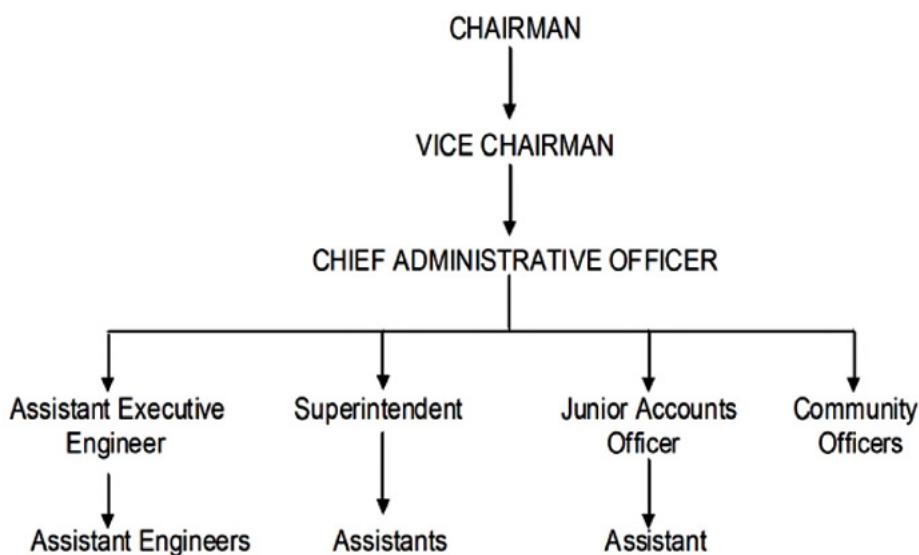
The Corporation of Chennai (CoC) is the civic body that governs the city of Chennai. The governing body includes the Mayor and over 200 councilors each of whom represents one of the 200 wards of the city. The executive wing is headed by the Commissioner. There are Deputy Commissioners and heads of departments who are in charge of various municipal services and infrastructure provision. The CoC has a decentralized structure of governance in line with the 74th Amendment Act. There are 15 Zonal Officers each responsible for administering one of the 15 zones in the city. In addition to CoC, there are several other state-level statutory

bodies involved in planning, development and management functions in the Chennai Metropolitan Area, the chief being the Chennai Metropolitan Development Authority (CMDA).

CMDA was constituted as an ad-hoc body in 1972 and became a statutory body in 1974 vide the Tamil Nadu Town and Country Planning Act of 1971. The primary function of CMDA is to prepare the land use plan for the Chennai Metropolitan Planning Area and provide infrastructure and services. Some key projects in Chennai undertaken by the CMDA include the construction of the Chennai Mofussil bus terminus, a wholesale vegetable market at Koyambedu and Chennai Mass Rapid Transit System.

The Koyambedu wholesale market complex was conceived and implemented by the Chennai Metropolitan Development Authority (CMDA) to decongest the central business district of Chennai city and to facilitate trading of perishable items like vegetables, fruits and flowers. The market is spread over nearly 290 acres, and has about 3,200 shops. The Koyambedu Wholesale Market Complex is maintained by the Market Management Committee (MMC) constituted as per the Tamil Nadu Specified Commodities (Regulation of location) Act 1996 so as to give necessary legal protection to the administration of Koyambedu Wholesale Market Complex.

The Market Management Committee is an autonomous func-





Koyambedu vegetable market



Biomethanation plant at Koyambedu Market with a processing capacity of 30 MT

tioning body that oversees the functions of the Market. The main functions of MMC include administration, management, and maintenance, security of the market complex as well as operation and maintenance of the biomethanation plant. The Market Management Committee has a total of 18 members with the Member Secretary of CMDA as the Committee Chairman. Non official members on the Committee include trader representatives. The organizational structure of the MMC is illustrated in the diagram.

Waste generation and management at Koyambedu Market

The market complex is visited by about one lakh people daily and receives 700 trucks every day. The market generates annual revenue of Rs.4 Crore through collection of entry fee. This market complex being one of the largest in Asia generates large quantity of organic wastes. About 150 MT of waste is generated every day. Prior to the installation of the biomethanation plant, the waste was collected and transported by a private agency and transferred to a transfer station within the market complex. From there, it was transported to the Perungudi dumpsite by the Corporation of Chennai.

However such large amounts of perishable organic waste dumped at the dumpsite emitted obnoxious odours and gases like methane and carbon dioxide. This posed a potential threat to the environment and to the health of the people living around the dumpsite. The MMC and CMDA actively considered installing a decentralized waste processing plant at the market to manage the organic waste more efficiently and sustainably.

Installation of the Biomethanation Plant

In 2005, the CMDA approached the Ministry of Non-conventional Energy Sources, (now Ministry of New and Renewable Energy (MNRE)), Government of India to support a biomethanation plant at the Koyambedu Market under the Ministry's waste-to-energy program. The MNRE agreed to support 75% of the cost of the plant under the United Nations Development Program (UNDP)- Global Environmental Fund (GEF) Program. The MNES appointed the Central Leather Research Institute, (CLRI)

as the technical agency to identify the technology most suitable for implementing a viable biomethanation plant for generating energy and manure from vegetable wastes at the site. A biomethanation plant with a capacity of 30 MT per day was proposed under the Waste-to-Energy program at Koyambedu. The plant was designed based on a unique technology patented by CLRI in which the Biogas Induced Mixing Arrangement (BIMA) digester has a unique mixing part which does not require mechanical moving parts and has the ability to control scum/ sediments while handling high solids concentration. A financial support of Rs. 5.5 crore was provided to CMDA by UNDP/GEF through MNRE to implement the pilot project. Prime objectives of the project were:

1. to evaluate the feasibility of biomethanation of vegetable, fruit and flower waste for energy generation and manure production.
2. strengthening institutional capabilities in developing indigenous technology.
3. absorption of process technology for improvisation, scale-up and widening the scope for implementation of biomethanation technology for management of same or similar type of solid wastes.
4. capacity building in development of technology package, transfer of technology, project management & implementation.

The biomethanation plant was established in 2006 in the Koyambedu Wholesale Market as a unique national level demonstration project in order to utilize the organic waste generated from the market for power generation. The waste generated from the market was characterized to reveal that that the major components of waste included vegetable wastes (21%), fruit wastes (15%), flower wastes (10%), banana stem and related materials (38%) and packing materials (hay, straw, paper, etc. 16%).

Non-organic waste such as stones, plastics, wood etc. was limited to less than 1% of the waste quantity. There were also seasonal variations in the quantity and nature of waste generated daily from the market. The total solids and volatile solids content



Collection of vegetable waste by a mechanical grab

were 25% and 73.7% respectively. The moisture content was 75%.

Logistics and Operations

The vegetable and fruit waste is disposed by the shopkeepers in the open ground near their shops. A private contractor collects all the waste from the market complex. About 30 MT is separated and transferred to the receiving platform at the biomethanation unit. The remaining waste is transported to the landfill site by the contractor.

The waste is lifted by grab from the receiving platform and transferred into the hopper provided in the belt conveyor and is carried through the conveyor to the shredder to reduce the size of the waste to about 15-20 mm. The shredded waste is blended with water in a collection tank. The mixed waste is macerated and pumped into the digester by means of screw pump. Biogas Induced Mixing Arrangement (BIMA) digester has a unique mixing part which does not require mechanical moving parts and has the ability to control scum/ sediments while handling high solids concentration. The biogas generated, as a result of stabilization of the waste, leaves the digester to a dry typed gas holder (530m³) made of a synthetic membrane (polyester). An in-situ biological desulphurization unit has been installed in the digester to reduce the H₂S concentration in the biogas below 500 ppm. A group of facultative bacteria which adhere to the walls of digester separating the upper and main chamber are utilized for biological desulphurization. The biogas, after removal of H₂S, is used as fuel in the engine to produce electricity. The gas is drawn from gas holder by gas blowers and fed into the gas engine and alternator is connected to the engine to produce electricity.

The net power generated after in-house consumption is exported to Tamil Nadu Electricity Board (TNEB) grid. In the case of maintenance of gas engine and when gas generation exceeds beyond the storage capacity of the gas holder, the biogas is burnt in the flare. The dewatered cake is discharged at the other end of the press. The cake from screw press is converted in to manure by composting.

Key Outcomes

1. The average biogas production from the Biomethanation plant at Koyambedu is 2500 m³ per day in which methane content is 65%.
2. The power generation of plant is on an average 2600 Kwh/day which translates to about 500 units per day. The units are sold to the grid by CMDA. The revenue generated takes care of the operational expenses of the plant.
3. This plant has reduced Green House Gas (GHG) emission. The reduction accounts to be 8308 tons of CO₂ equivalents per annum. The current price of emission reduction credits in existing markets is in the range of US \$ 5 to 15 per ton of CO₂ equivalents. Hence in the present project considering the minimum value of US \$ 5 per t of CO₂ equivalents, the revenue generated apart from energy generation accounts to be Rs 16,61,600/- per annum (considering 1 US \$ = Rs 40/-) with considerable significance in Green House Gas (GHG) emission reduction.
4. Of the 4500 MT municipal waste disposed at open dumping site everyday, 30 MT is diverted and used for producing energy.

Lessons Learned

The plant was inaugurated in 2006 and was operated by the MMC till 2008. The plant remained dysfunctional from 2008 to 2011 because of machine failure and lack of easy availability of the machine parts. The parts were finally procured and the plant became operational again in 2011. The plant functioned successfully between June and October 2011, but was closed for the second time because of equipment malfunction. The plant started its operations again in May 2014. The Koyambedu plant was established at a huge cost using sophisticated and expensive technology but remained closed for most part since it was installed, and hence could not achieve the desired outcomes in terms of emission reduction. Proper operations and maintenance of such plants is critical for their success. Preparing and adopting standard operating procedures for the day-to-day operations and routine maintenance of the plant can help prevent the frequent malfunctioning of the equipment. All staff should be trained in operating the plant. In the long-term, development of local technology for biomethanation should be promoted and use of imported equipment should be limited.

The CMDA also faced challenges in managing contracts for transportation of waste from the market to the plant. The private contractor earlier responsible for transporting all the waste to the landfill was asked to divert 30MT to the processing plant. Since the contractor was being paid to transport the waste to the dump site on a per ton basis, it was not in his interest to divert part of the waste to the plant. It is important that such contractual agreements are worked out and finalized before implementing the project to avoid such situations.

Sustainability and Transferability

Establishing a routine operations and maintenance procedure is critical to the long term sustainability of the plant. The



Manual sorting of waste for metal or plastic pieces

operation of the plant is currently outsourced to a private contractor who has invested Rs.1 Crore to revamp the facility. The selling price of the electricity produced is Rs.5 per unit. This cost is sufficient to cover the operational cost of the plant if it runs efficiently. CLRI has submitted a proposal to MNRE to upgrade the plant and increase the capacity from 30 MT to 60 MT.

All large to medium sized cities in India have large vegetable/meat market which generate a huge amount of organic waste every day. Decentralized treatment of this waste will help cities reduce the burden on their landfill sites and also contribute to energy generation. Biomethanation of organic waste is still an expensive option for bio-energy generation in India. The MNRE provides a capital subsidy to institutions interested in establishing such urban and waste-to-energy projects. A biomethanation was also piloted in Pune at the Gultekdi market where 1 MT waste was converted to biogas every day which was supplied to restaurants in the vicinity. The plant was later scaled to 10 MT per day. A similar plant is being currently constructed in Coimbatore.

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CATEGORY 1C

INITIATIVES IN SCIENTIFIC WASTE DISPOSAL

CONVERTING AN OPEN DUMP SITE INTO A SCIENTIFICALLY ENGINEERED LANDFILL, SRINAGAR

SNAPSHOT

MOVING TOWARDS SCIENTIFIC WASTE DISPOSAL

City Profile

Srinagar, the summer capital of the state of Jammu and Kashmir, is one of the oldest cities in India and a prime tourist centre in the country. It is famous for its picturesque sites, lakes, pleasant gardens and mountain views. The city has a population of around 12.3 Lakh (Census 2011) spread over an area of 300 sq km. Srinagar city's civic affairs are entrusted to the Srinagar Municipal Corporation (SMC).

SMC was established in 1956 after converting the Srinagar Municipal Committee, which functioned as a State Department into an urban local body. All functions of the Committee such as sewerage and drainage, water works, street lighting, maintenance of city roads, gardens and parks were transferred to the Srinagar Municipal Corporation. The Mayor heads the political wing of the Corporation and the Commissioner is the administrative head. SMC has a zonal governance structure for ease of administration and has 4 zones and 34 administrative wards.

SWM Profile

SWM services provided by SMC include street sweeping, and collection, transportation and disposal of waste from within the municipal limits. The SWM services are carried out at the ward level under the overall supervision of the Ward Officer. Each Ward Officer is assisted by a Sanitary Inspector and several supervisors. At the city level, the Health Officer, Chief Sanitation Officer and Sanitation officers supervise and monitor the functioning of the SWM Department. SMC's annual SWM budget is about Rs. 40 Crore per year, which includes the salary, uniforms, operational expenses, capital items, and vehicles.

Srinagar generates about 600 MT of waste per day. The waste is collected from 1.87 lac households, 1240 hotels/restaurant facilities, and 8560 commercial establishments. At present 80% of the total waste generated is being collected by SMC. Secondary level segregation of waste is carried out at the zonal level. The municipal waste is disposed at a dumping site at Syedpora Achan. The dumping site occupies 0.27 sq km of land. The existing dumping site is being improved and modernized into a scientifically engineered landfill site with financial and technical guidance from Asian Development Bank.

Situation before the project

Over the last three decades the state of Jammu and Kashmir

has witnessed rapid urbanization. Majority of the urban population is concentrated in major centres like Srinagar, which are struggling to deliver municipal services efficiently to meet the increased demand.

According to Master Plan of Srinagar Metropolitan area 2000-2021, the city generated 538 MT of waste per day in the year 2000. 300 tons was collected and handled by the SMC. Out of the remaining 236 tons, some percentage of recyclables was being salvaged, but a majority of the household domestic waste was being dumped in water-bodies, ditches and along roadsides. The waste polluted the water bodies. Open dumps of waste attracted street dogs, besides spreading local obnoxious smell in these particular areas.

The unscientific waste disposal at the landfill in Achan was a source of nuisance in the surrounding villages. During summers the terrible stink of the leachate used to engulf the entire city. The leachate also polluted the underground water in the region.

Modernization of the Achan Landfill accompanied by improvements in overall SWM services in the city

The initiative to improve the Achan dumping site was undertaken by J&K Economic Reconstruction Agency (ERA) with financial and technical guidance of The Asian Development



Achan landfill before modernization



Laying of geogrid



Overlaying the HDPE Liner



The underground drainage system for leachate collection



Weighing bridge



Leachate collection pond

Bank (ADB). ERA is a special purpose vehicle formed in 2004 to implement externally aided projects in the State. The modernization project has been initiated and ADB has released an amount of Rs. 22 Crore for the construction and development for the first cell of the landfill project. Another Rs. 4 Crore was released for procurement of waste handling equipment and vehicles. For the second cell of the landfill, a budget of Rs. 18 Crore for construction and development and Rs. 6 Crore for procurement of equipment has been envisaged. The operation and maintenance of the landfill site has been outsourced to a private contractor, while the SMC is responsible for timely collection and disposal at the site.

The scientific landfill meets all pollution control standards including those of air quality, ground water quality as per the guidelines of J&K State Pollution Control Board. The design and landscape will further improve the aesthetic appearance of the site. The construction of the first landfill cell was completed in December 2011, and the cell was put into operations in February 2012. The construction of the second cell was completed in the end of 2013.

Laying of geogrid

In order to control the odour at the Achan landfill site, 8.60 metric tons of an anti-odour chemical has been used. The regular application of this odour control agent, on the waste has shown encouraging results and the bad odour has been minimized significantly. As part of the project, a permanent facility for regular monitoring of the landfill has also been established.

Following are some salient features of the modernization project:

- Construction of a new 7mt wide access road from Ali John road directly into the landfill site, thus avoiding crossing the congested Saidapora village.
- Construction of internal roads for free movement of garbage vehicles, shoulderings and construction of drains for disposal of storm water.
- Landscaping and plantation around the landfill site (within SMC land) to improve aesthetic view of the site.
- Administration offices with sanitation and rest facilities and environmental monitoring facility.
- Weighing bridge
- Lined sanitary cells

- Equipment, workshop and garage building.
- Waste transport equipment and washing facilities.
- Leachate collection and treatment facility
- Compound wall around the landfill site.

The Jammu and Kashmir Pollution Control Board regularly monitors the solid waste collection, transportation and disposal system of SMC including the modern landfill site.

As part of the overall strategic plan to improve SWM services in the city, 170 refuse collection points have been identified where the waste generation is very high. 241 MT of non-biodegradable waste from these points is being collected and dumped at the Achan landfill site, in an isolated patch of 15180 sq mt of land. Dedicated actions have also been undertaken for household level and institutional segregation. SMC has provided dustbins for collection/storage of household garbage to 33,000 households in the city.

Dumpers and smart bins have been made available to hotels including Grand Lalit, Vivanta Taj, Royal Spring Golf Course and some educational institutions, for segregating biodegradable and non-bio-degradable solid waste. The SMC has a fleet of 69 trucks of different capabilities, which carry the municipal waste to the landfill site Achan daily till 2.00 pm. The SMC has also started a hopper vehicle service which collects garbage from door to door, and dispenses the collected garbage into the garbage compactors. At present 12 hopper vehicles are in operation and additional 22 are being acquired. SMC has also procured 4 high-tech garbage compactor machines which would be inaugurated in June 2014. This would significantly improve the efficiency of transportation of solid waste. SMC collects user fees from households for collection of municipal waste. The user fee is Rs. 30 per month in the older parts of the city; Rs.50 in newer areas and Rs.100 in the suburbs. An amount of Rs.2.5 Crore was collected by SMC in 2013 as user fee from residents.

Key Outcomes

- Before December 2011, municipal solid waste was being dumped at Achan in an unscientific manner. After the operationalization of the landfill site, the garbage is being dumped

in lined cells, due to which there is no adverse effect on the environment and on the health of the surrounding population. The completion of the balance work on the cells including final capping of first cell, plantation and turf layout of buffer zone is currently being implemented. About 4000 plants have been planted around the lining of the first landfill.

- 3 leachate ponds of 1.2 lakh litre capacity have been set up at the site to help prevent the pollution of underground water in the second landfill site.
- The SMC has also undertaken parallel initiatives to improve the overall performance of SWM services in the city which has diverted waste from the landfill. Initiatives include collection of waste from hotels and street cleaning at night.
- Srinagar had 640 small open dumping collection points. 240 of these have been either closed or replaced with smart bins to beautify the city.

Sustainability and Transferability

In order to make this project sustainable a detailed DPR has been submitted to the Union Urban Development Ministry entitled "Solid Waste Management for Srinagar" under JNNURM-II at an estimated cost of Rs. 116.86 Crore. This project envisages modernizing house to house garbage collection from the entire Srinagar City by way of providing of household garbage bins, organizing of door to door garbage collection through the use of modern hopper vehicles, and providing waste compactors. The proposal further envisages that a waste processing plant with processing capacity of over 500 MT per day be established at Achan. This project once approved will allow Srinagar to fully comply with the requirements of MSW Rules of 2000 and will also bring the city at par with national and international best practices. The model is fully replicable in any other medium to large towns having basic required infrastructure to revamp their existing open dumping yard into scientific sanitary landfill site.

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CATEGORY 2

PLANNING, POLICY AND ENFORCEMENT INITIATIVES

MUNICIPAL SOLID WASTE MANAGEMENT MASTER PLAN & PUBLIC HEALTH AND SANITATION BYLAWS PREPARED BY AHMEDABAD MUNICIPAL CORPORATION

PLANNING FOR IMPROVED SOLID WASTE MANAGEMENT

Comprehensive planning is the first step towards achieving an efficient and robust solid waste management system in a city. Many cities in India are keen to achieve “zero-waste” status by improving and strengthening their waste management practices. Preparing an integrated solid waste management master plan, allows an urban local body to assess its current and future waste management needs, identify problems and deficiencies within the current system and identify strategies and solutions to address those gaps. The solid waste master plan also provides a framework for prioritization of various initiatives and resource allocation. For a solid waste management plan to be effective and implementable, it should be accompanied with a strong enforcement framework, community involvement and awareness campaigns.

This case study documents in detail, the planning and enforcement processes adopted by the Ahmedabad Municipal Corporation towards making Ahmedabad a zero-waste city.

City Profile

With a population of 60 lakh, Ahmedabad is the largest city in Gujarat and the fifth largest metropolis in India (Census 2011). Founded in the year 1411 AD, on the eastern banks of Sabarmati River, Ahmedabad has always been an important city in the Gujarat-Maharashtra region. The city was at the forefront of the Indian independence and civil rights movement in the first half of the 20th century. By mid-20th century, Ahmedabad was the epicentre of the developing textile industry in India. During the same time several notable and prestigious institutions such as Ahmedabad Textile Industry's Research Association (ATIRA), Indian Space Research Organization (ISRO), Indian Institute of Management (IIM), Physical Research Laboratory (PRL), etc., were also established in the city making it an important centre for higher education, science and technology. It was chosen as the capital of Gujarat state after it got separated from the State of Bombay in 1960. Ahmedabad has been flourishing and advancing its importance in various areas such as commerce, trade, industry and education. Today, the city is recognized as a

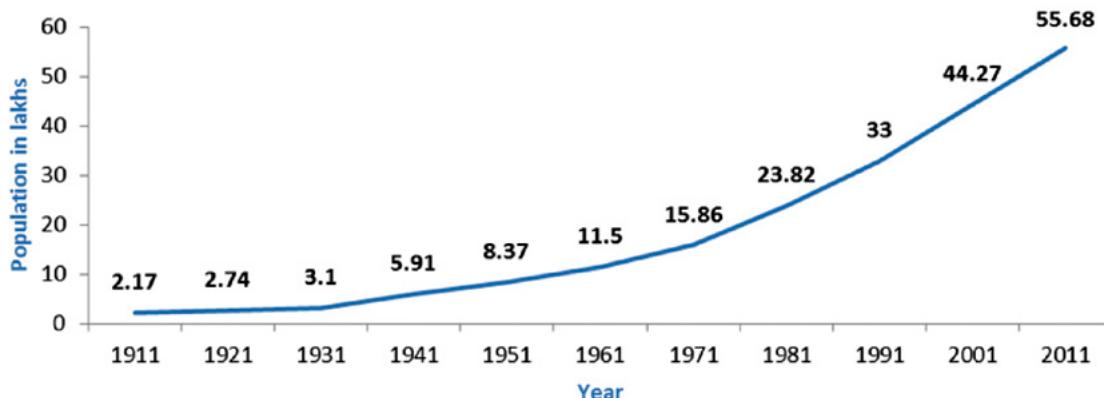
thriving metropolis in the forefront of real-estate and infrastructure development.

Population Growth and Urbanization Pattern

Ahmedabad saw a significant growth in population during 1970's owing to the growth in industry. Till this time majority of the city's population was concentrated in the eastern part of the city, especially in the walled city area. Expansion of the city into peripheral areas began in the 1980s and has continued since then. Earlier only the eastern periphery registered a fast growth rate, but in the recent few decades, west Ahmedabad has seen a more rapid expansion.

The population of the city has increased from 35 lakh in the year 2001 to 55.68 lakh in 2011. The population growth during this past decade can largely be attributed to the expansion of municipal limits in 2006, when 17 municipalities and 30 gram panchayats were added to AMC. Today the city comprises a geographical area of 464 sq km. Historical population growth of Ahmedabad is illustrated in the table and graph below.

Year	1901	1911	1921	1931	1941	1951	1961	1971	1981	1991	2001	2011
Population (in lakh)	1.86	2.17	2.74	3.10	5.91	8.37	11.50	15.86	23.82	33.00	44.27	55.68



S. No.	Zone	2011	
		Total Population	Total Households
1	North	1,012,760	225,058
2	South	988,356	219,635
3	East	979,362	217,636
4	West	844,661	187,702
5	Central	565,288	125,620
6	New West	1,178,268	261,837
	Total	5,568,695	1,237,488

Source Census, 2011

Spatially, Ahmedabad is divided into eastern and western parts by the Sabarmati River flowing through the city. In the past decade, the city has expanded largely towards the west. Areas between the 132 feet road and Sarkhej-Gandhinagar Highway such as Ghatlodiya, Chandlodiya, Thaltej and Sarkhej have seen rapid real estate growth. SG Highway has emerged as an important commercial area in the city. The emergence of new industrial centres such as Sanand has also influenced spatial growth in Ahmedabad and has driven development further towards the fringes between SG Highway and SP ring road. The table on the following page indicates the population distribution in the city by zone. From the data it is evident that the newly added new-west zone has the highest population amongst all zones in the city.

Urban Local Governance

Local government came into existence in Ahmedabad on January 19, 1857. This existing local body was recognized by the statute and designated as a city municipality in 1873. The Ahmedabad Municipal Corporation was constituted in 1950 under the Bombay Provincial Municipal Corporation (BPMC) Act, 1949².

² Adapted in Gujarat as the Gujarat Provincial Municipal Corporation Act.

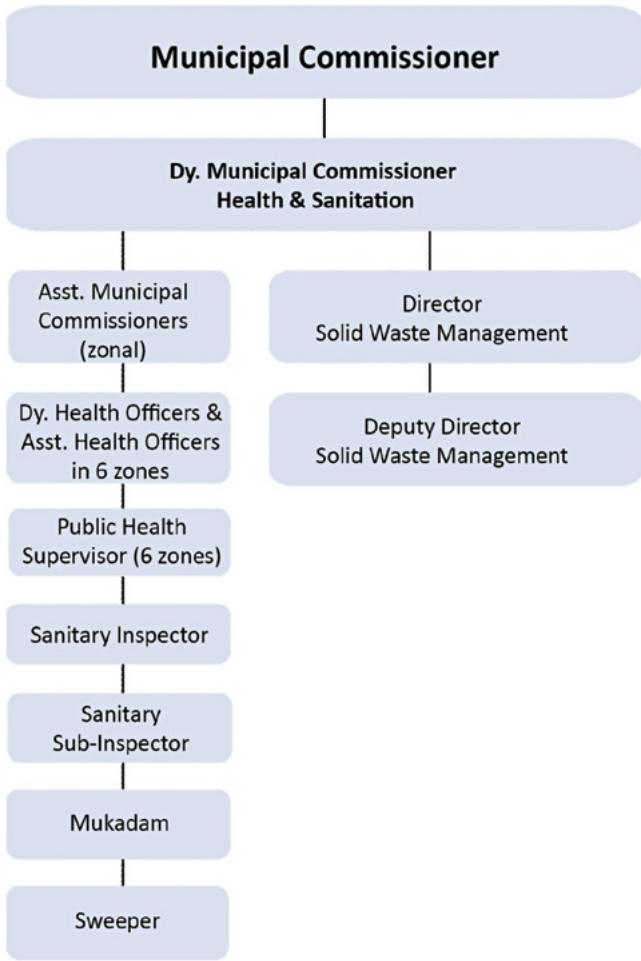
The Municipal Commissioner is the administrative head of AMC and is supported by Deputy Municipal Commissioners who are in charge of various aspects of city administration. Ahmedabad has a decentralized model of urban governance. The city is divided into six zones for ease and efficiency of administration. Each zone is headed by an Assistant Municipal Commissioner. The zonal governance structure in Ahmedabad is in line with the 74th Constitutional Amendment and is an important reform that aids better city management and service delivery.

The city is divided into 64 electoral and administrative wards. Each ward is represented by three elected municipal councillors including one woman councillor. The Corporation is governed by a general body of these councillors. The general body appoints the Mayor and the Deputy Mayor. It also elects the members for the three statutory committees (Standing Committee, Transport Committee and School Board) and 14 other committees. All the policy decisions are taken by the general body. It approves the budget and sanctions appointments and expenditure estimates sent by various departments.

Under section 63 of the BMC Act, the Municipal Corporation is mandated to provide 25 basic services like maintenance and development of public streets, collection, treatment and disposal of sewage, solid waste management, fire safety, lighting of public spaces, maintenance of public hospitals, control of diseases and medical relief, public vaccination, registration of birth and death, primary education, water works etc. Other than these, under section 66 the Corporation may provide 42 other services like shelter for destitute and homeless, provision and maintenance of public transportation, provision and maintenance of ambulance, etc. (BMC Act, 1949). As per the BMC Act, collection, removal, treatment and disposal of waste and watering, scavenging and cleansing of all public streets and places are obligatory functions of AMC that are handled by the Solid Waste Management Department.

Organizational Structure of Solid Waste Management Department

The Solid Waste Management (SWM)/ Conservancy Department is in charge of all functions concerned with municipal waste collection, transportation, treatment and disposal. The Department



is headed by a Director who is supported by a Deputy Director. The Director reports to the Deputy Municipal Commissioner (SWM). At the zonal level, there is one Assistant Municipal Commissioner in charge of all administrative aspects in the zone. The SWM staff at the zonal level includes the Deputy Health officers, Assistant Health Officer and Public Health Supervisor.

The Director and Deputy Director (SWM) are responsible for coordinating all zonal SWM department activities, ensuring the implementation of municipal solid waste (MWS) rules in the city and supervise city wide SWM initiatives such as preparation of plans and detailed planning reports (DPR), IEC campaigns etc.

Waste management in Ahmedabad: Current Situation

Overview of municipal solid waste sector

Ahmedabad generates about 3500 MT of solid waste per day. Out of this, 98 per cent is collected daily by AMC. A majority of this solid waste collection is from residences, commercial establishments, institutes, offices, etc. through the door/gate to dump collection system. AMC also collects solid waste generated from hotels & restaurants, construction & demolition waste and debris, and waste from special markets (including slaughter house, meat/ fish/ vegetable markets) separately.

SWM SECTOR PROFILE FOR AHMEDABAD (MONTHLY AVERAGES)

Waste Generated	110,667 MT
Waste Collected	108,454 MT
Waste Processed by processing plants	10,663 MT
Waste picked by waste pickers (estimated)	100 MT
Waste Dumped at Open Dumping Site	97,591 MT
Inert Waste Disposed at Scientific Landfill after processing	2166 MT

Upon collection, AMC transfers waste to either processing plants or open dumping site at Pirana using a fleet of mechanized vehicles.

AMC has 2 processing plants; one for converting waste into compost and another for producing refuse derived fuel (RDF). In addition to the existing processing plants with a cumulative capacity of 1000 MT per day, new processing plants with an additional capacity of 1300 MT per day are currently being setup in the city. Currently, total MSW processed in Ahmedabad is 10,000 MT monthly which is less than 10% of what is generated. Of this waste that is processed, around 8 per cent is recovered while 2 per cent which is inert waste is disposed at a scientific landfill site at Gyaspur. A total of 97,000 MT of MSW is disposed at the open dump site at Pirana.

AMC spent a total of Rs. 310 Crore on solid waste management for the year 2012-2013. To efficiently dispose and manage this waste, AMC spends around Rs. 2500 per metric ton of solid waste collected per day.

Issues and Challenges in SWM

Despite a huge O&M expenditure in the SWM sector, AMC realized that it is significantly falling short of achieving its goal of a totally sanitized city. Currently there is no segregation happening at the source, there are evident inefficiencies in collection and transportation, and the city has an extremely low rate of diversion of waste from landfill. Currently Ahmedabad achieves less than 10% diversion of waste from Landfill. Most waste is dumped in the open at Pirana, where the landfill and the surrounding environment is highly polluted. Another key concern is that there is lack of community awareness, and limited ownership and involvement among citizens on sustainable waste management practices.

Ahmedabad also achieved a low score in the National Sanitation Ranking undertaken by the Ministry of Urban Development, Govt. of India in 2009. The city was ranked 19th at the national level. The predominant areas where AMC lost marks with reference to solid waste management were:

- Poor collection efficiency of segregated MSW
- Extremely high level of littering
- Poor MSW treatment capacity and negligible scientific disposal of MSW
- Extremely poor performance in recycling of waste
- Very poor cost recovery in SWM services at 15 percent

The City Sanitation Plan prepared in 2011 also highlighted key issues in SWM and recommended improvements across the value chain. Recognizing these key issues and concerns, the AMC decided to develop a comprehensive solid waste master plan and accompanying legal framework in the form of health bylaws to position its future as a modern, clean, attractive and liveable city.

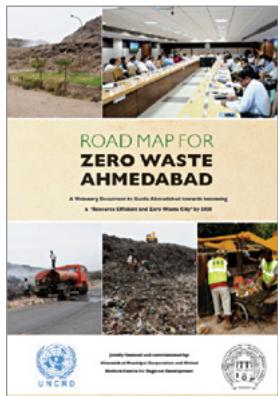
Planning and policy initiatives by AMC to strengthen solid waste management

The beginning: signing of the IPLA Declaration

The International Partnership for Expanding Waste Management Services of Local Authorities (IPLA) was launched at United Nations Commission on Sustainable Development in May 2011. One of the key goals of IPLA is to help local governments move towards a zero waste society. The concept of Zero Waste aims to minimize use of resources and maximize the ongoing benefits of the intrinsic value within the waste generated by society. The IPLA Declaration for Moving towards Zero Waste was signed at the International Solid Waste Association (ISWA) conference held in Daegu, Republic of Korea held in October 2011. AMC was among the participants in the international conference and agreed on the Declaration. With the signing of the declaration, Ahmedabad became one of the first metropolitan cities from the developing world to adopt a zero waste goal.

Road Map for Zero Waste Ahmedabad

After signing of the declaration and having an opportunity to learn about zero waste management best practices from other cities of the world, the AMC decided to undertake a visioning exercise to lay out strategies for Ahmedabad to become a Resource Efficient and Zero Waste City by 2031. As part of the initiative, AMC developed a road map for Zero Waste Ahmedabad with technical assistance from the United Nations Centre for Regional Development (UNCRD) and Zero Waste South Australia. The Road Map consists of ten focal areas and thirty four strategic actions, to guide AMC to introduce and implement policies and strategies, and to raise awareness amongst private, business, industrial, scientific and research communities in Ahmedabad to work together towards a resource efficient and zero waste society.



October 2011	March-May 2012	March 2012- March 2013	2012- Ongoing	2012 (Pending adoption)	2012
Signing of IPLA declaration for moving towards zero waste	Road map for zero waste Ahmedabad (Visioning Document)	Municipal Solid Waste Management Master Plan	IEC Campaign for Solid Waste Management	Public Health Byelaws	Implementing penalties and charges for sanitation related offences

Municipal Solid Waste Management Master Plan

The Road Map for Zero waste provided a conceptual framework to address solid waste management issues in Ahmedabad. The AMC engaged Urban Management Centre (UMC), a local not for profit organization in parallel to prepare a detailed Master Plan for solid waste that would include a comprehensive analysis of existing situation of municipal solid waste management in Ahmedabad followed by an overall strategy, clear recommendations and associated budget for making Ahmedabad a zero-waste city by the year 2031.

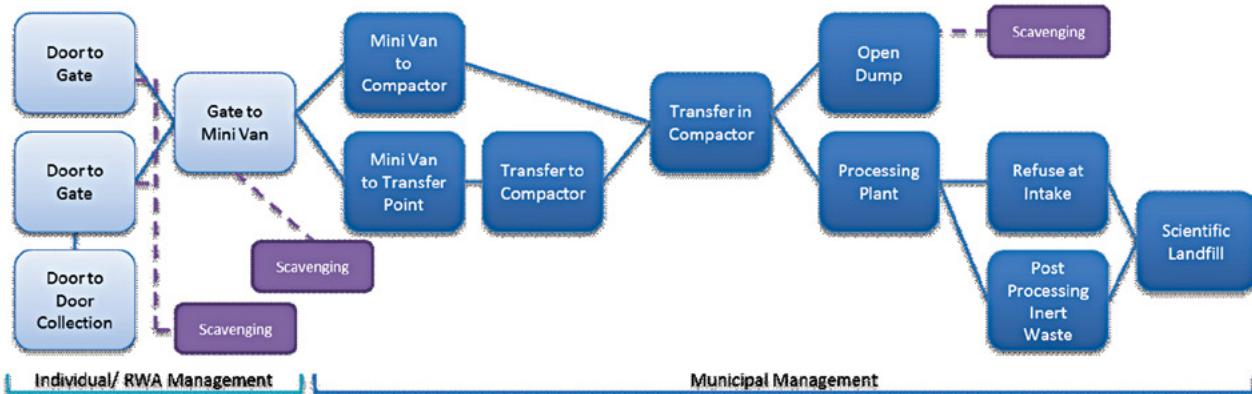
The Solid Waste Management Master Plan for Ahmedabad includes:

- Profile of Ahmedabad Municipal Corporation
- Overview of the existing solid waste management arrangements
- Alternate scenarios for achieving zero-waste goal
- Selection of the preferred scenarios
- Recommendations across the SWM value chain for strengthening services in Ahmedabad
- Institutional arrangements and human resource requirements
- Capital investment plan and potential funding sources.

The methodology adopted for preparing the master plan is described below:

Developing a City Profile

The first step in solid waste planning process was to develop a city profile. Latest available information on population, households, and growth trends for the city was compiled and analyzed. Existing governance structures were also assessed. The planning team conducted a comprehensive review of organizational structures within AMC and specifically in the SWM sector. Roles and responsibilities of various stakeholders in the health and sanitation sector were mapped and analyzed. The aim of this exercise was to understand the existing state/city administration structure, process of decision making, flow of funds and finances, sharing of information, current monitoring regime and key linkages between the SWM Department and allied departments such as health and engineering.



Process tracking of waste collected through door-to-door service

EXPERT ORGANIZATIONS CONSULTED DURING PREPARATION OF SOLID WASTE MANAGEMENT MASTER PLAN

- Mahila Housing Trust (MHT)
- Gujarat Urban Informal Economy Board
- Gujarat Pollution Control Board (GPCB)
- Navsarjan Trust
- Kamdar Swasthya Suraksha Mandal (KSSM)
- Centre for Environment Education (CEE)
- Ahmedabad Women's Action Group (AWAG)
- Excel Industries
- SEWA and their member waste pickers
- Abellon Clean Energy

Assessment of existing waste management practices

Base data on solid waste management such as total waste generated in the city, waste collection, transportation and disposal mechanisms in AMC, processing technologies and their capacities, existing SWM infrastructure including bins, transport vehicles, sorting sheds, collection points etc. was provided by the AMC.

The planning team also conducted extensive site visits to various solid waste generation points (residential, commercial, special (including meat & vegetable)), market areas, dumping sites, transport hubs, public and private institutions, industrial estates, slum settlements, health facilities etc. Process tracking of various streams of solid waste such as residential waste; waste from meat markets, hotel etc. was also conducted. The purpose of these field visits was to establish a qualitative relationship between the data provided by the ULB and the actual ground realities, which in many cases, were found to be in conflict with each other.

Stakeholder consultations

The AMC had formed a multi-stakeholder City Sanitation Task Force (CSTF) during the preparation of the city sanitation plan. The task force members also provided their valuable inputs and insights for preparation of the solid waste master plan. The list

of members of the taskforce is provided in annexure. In addition to conducting regular meetings with the task force, the planning team also conducted one-on-one interviews with various experts in the SWM sector in the city.

Future population and waste generation projections

The planning team estimated future waste quantities using population projections for the established time period of the master plan. These quantities were used to develop potential waste management strategies and estimate long-term costs for infrastructure and management.

Developing alternate scenarios for strengthening solid waste management

Based on the waste generation projections, three micro planning scenarios were explored towards achieving the zero-waste target. Scenario 1 envisioned a bin-free City; scenario 2 explored an alternative where the secondary collection system is strengthened, and scenario 3 encompassed improving door-to-door collections and optimizing secondary collection system (minimized bins). All three scenarios were assessed for mixed waste (current situation) and segregated waste (ideal situation) entering the municipal stream. Scenario 3 was selected as the preferred option.

Drafting key recommendation for strengthening municipal SWM services in Ahmedabad

The strategies for strengthening SWM services of the city were finalized in a consultative manner with concerned ULB staff and elected officials. The planning team presented the existing condition of SWM sector along with identified gaps to AMC officials and the taskforce, and facilitated discussions among them to identify prioritized areas for preparation of the multi-year plan. The priorities identified were used to strategize interventions and programs for bridging the gap for optional health coverage. The key recommendations of the SWM master plan are highlighted in the table below:

Preparing Process Improvement and Capital Investment Plan: The investment requirements for the projects and programs identified in the master plan were calculated and an investment plan was prepared to ensure availability of capital funds for execution

	Strategy	Time Frame
1.	Segregate waste at source of generation	Short term (less than five years)
2.	Planning at micro level to rationalize door-to-door collection routes and street sweeping beats	Short term (less than five years)
3.	Segregated collection and transportation of waste from bulk generators such as hotels, restaurants, meat, vegetable and other special markets	Medium term (five-ten years)
4.	Mainstream waste-pickers into the municipal solid waste management system	Medium to long term (five-ten years)
5.	Training of sanitation workers for use of modern mechanized equipment and safety gears	Short term (less than five years)

of projects in an appropriate manner. The SWM plan recommended that the investment plan be revisited every year in order to make adjustments based on financial market dynamics, new technologies, introduction of central/state schemes and growth trend of the city.

Health Bylaws

Along with preparing a solid waste management master plan that guides the policy decisions and investments in the sector, there is a need to put in place an adequate legislative framework which empowers the ULB to ensure strict enforcement of SWM rules & regulations.

Along with the SWM Master Plan, AMC has prepared public health bye-laws for creating standards and norms at the local level for various SWM processes. The byelaws currently in the final approval stage will be applicable to every public and private space, commercial centres, residences and all other premises within AMC limits. The byelaws also deal with violations and fines, obligatory responsibilities of AMC, waste generators and service providers of solid waste management. The Health Byelaws include detailed regulations on:

- Classification of waste into different categories
- Classification of waste generators
- Segregation of waste
- Storage of waste
- Delivery & collection of waste
- Processing & disposal of waste
- Liquid Waste Management
- Prevention of Waterborne, Vector borne and Food borne diseases
- Offences under the bye-laws
- General offenses which is applicable to all the citizens within city limit, (23 in number)
- Enforcement of the provisions
- Schedule of Fines



Making citizens aware about solid waste management through local folk theatre and street plays



Alasiyalal- The AMC Mascot for SWM in the shape of an earthworm; the mascot is used in all IEC material including posers, publicity vans, publications and pamphlets

The byelaws have been approved by the Standing Committee and have been submitted to the State Government for final approval.

Information, Education and Communication Campaign

AMC believes that creating awareness among citizens and ensuring their participation and co-operation in the management of solid waste is also an important aspect of solid waste management planning. With that view, AMC initiated an Information, Education and Communication (IEC) campaign to create awareness among citizens about the importance of cleanliness and hygiene and make all fractions of society – individuals, citizen groups, associations, NGOs, industries, communities – feel responsible for management of solid waste.

AMC collaborated with local organizations for design, implementation and dissemination of communication activities like making short films, publicity of AMC's endeavors through advertisements in newspapers, information pamphlets, banners and hoardings, training programs in schools and colleges and showing short films in movie theatres. All communication was designed using classification of the targeted audience.

The IEC campaign also explored other creative ways to inform and educate the public on sustainable solid waste management practices. 'Bhavai', a local folk theatre format was used

to stage street plays with messages about littering, use of waste-bins, cooperating with AMC safai karmacharis etc.

AMC also got a special mascot designed to create a brand identity and facilitate easy recollection of information and communication provided by AMC's SWM department.

Strengthening Enforcement Mechanisms

Mobile Court

The AMC established a health and sanitation mobile court in the city in 2009 which is still working regularly and efficiently in the city. It is the first mobile court in the country that deals with health and sanitation violations.

The mobile court is staffed by a Magistrate and an administrative clerk who are Government of Gujarat employees and 8-10 sanitary inspectors designated by AMC. The Mobile Court travels to different areas of the city and monitors the health licenses of establishments as mandated under the BMC Act. The court is also authorized to fine establishments (shops, vendors) if they dispose solid and liquid waste inappropriately on streets, public spaces or water bodies. The schedule of the van is pre-decided by the Magistrate. Once the van reaches the designated area, the sanitary inspectors go and inspect various commercial establishments for their licenses or other health violations. The establishments identified for violations are immediately asked to go to the mobile court, pay their dues and get their license or pay appropriate fines. The authority to levy fines is only with the Magistrate. All revenue collected in the form of license fees, fines or penalties is transferred to AMC's account by the end of the day.

About 600-750 cases of missing licenses and other violations are cleared each month by the mobile vehicle. The mobile court has significantly helped reduce the burden on municipal courts, and has improved the collection efficiency of SWM related charges and penalties. Till August 2012, a total of 95,566 cases were registered with the mobile court and penalties to the amount of Rs. 3.25 Crore were levied for against offenders.

The fines levied to individuals etc. for littering are levied by AMC officials. Since AMC cannot levy fines, they are called administrative charges and are in the range of Rs.100 to Rs. 1000.

Lessons Learned

The AMC initiative highlights, that leveraging international platforms to initiate policy level decisions can prove advantageous for the ULBs. The signing of the zero-waste city declaration by the Ahmedabad Commissioner not only brought significant attention to the city, it also allowed AMC to bring together a variety of stakeholders on one platform and tap into the technical expertise of national and international experts. AMC was able to sustain the momentum that was generated and follow up with other city-wide initiatives.

AMC was used to undertaking need-based, piecemeal changes across the value chain of waste management to address pressing issues in SWM sector. The preparation of the solid waste management master plan allowed the Corporation to holistically assess the status of SWM in the city and plan for improvements

and investments in the sector in a systematic manner. The plan also allowed AMC to reach out to and garner support from various sections of the society including NGOs, industry, service providers, waste picker associations and Ahmedabad citizens. The SWM Master Plan is a working document that clearly delineates the goals and strategies to strengthen the SWM system in the city.

Having established goals and allied strategies to achieve those goals will allow the SWM Department staff to continue their efforts in improving municipal waste management in the city even if there is a change of leadership at the local level. The plan should be revised often to keep it current and updated. AMC recognizes that planning is a crucial first step towards bringing about changes in the SWM system. The local body will have to continue making concerted efforts towards implementing the strategies outlined in the plan to accomplish actual changes on ground.

Transferability

The Manual on municipal waste management by Central Public Health and Environmental Engineering Organization (CPHEEO) recommends all ULBs to prepare a municipal solid waste management plan to systematically address issues related to safe collection, transfer and disposal of waste, however only a few cities in India have yet prepared these master plans. The Ahmedabad SWM master plan can act as a resource for other cities to frame their own plans and associated capital investment budgets.

The Mobile Court is a unique initiative by AMC that can be replicated in cities with relatively larger population and geographic spread where the investment in additional court staff and mobile vehicles can be justified. Cities such as Vadodara and Surat are actively considering starting mobile courts to address sanitation violations based on the Ahmedabad model.

AMC also undertook parallel initiatives such as the IEC campaign and drafting of public health bylaws to ensure citizen participation and co-operation in implementation of the plan. While many cities have implemented similar policies and programs in isolation, the success of the Ahmedabad initiative lies in its integrated approach. AMC was successful in bringing together government institutions, citizens, NGOs, international organizations and other stakeholders in a short and specified time-frame to provide a boost to the SWM sector and move closer towards realizing its vision of a zero-waste city.

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CATEGORY 3A

INITIATIVES IN IEC

IEC FOR SEGREGATION AT SOURCE, BANGALORE

INVOLVING COMMUNITY IN SOLID WASTE MANAGEMENT

Many cities in India have initiated programs for waste recycling and processing to minimize the amount of garbage going into landfills. The success of these initiatives is fundamentally based on proper segregation of waste at source, for which the involvement of community is imperative. Bangalore faced a severe garbage crisis in August 2012 when two dumpsites in the outskirts of the city were shut following protests by villagers against deteriorating environmental and health conditions. The city came to a standstill as vast mounds of garbage lay scattered on streets and open plots all across the city. The crisis situation pushed the Bruhat Bengaluru Mahanagara Palike (BBMP) to initiate a change in course towards more sustainable waste management practices. The BBMP decided to enforce waste segregation and decentralize waste processing to divert waste away from the landfills, and actively involve the community and large corporations in this endeavor. This case study documents the zero-garbage program initiated by the BBMP with an emphasis on the Information Education and Communication (IEC) activities that were started and continue to be undertaken to inform and educate citizens about waste segregation and make them active stakeholders in the waste management processes.

City Profile

Bengaluru³, the capital city of Karnataka, is a bustling metropolis and home to India's booming information technology (IT) industry. Touted as the back office of the world, it is a major economic, educational and cultural hub in south India with a concentration of premier educational and research institutions, technology companies and defence organizations such as Indian Institute of Science (IISc), Infosys, Wipro and Indian Space Research Organization (ISRO). With a current population of over 80 lakh, Bengaluru is the third most populous city in the country (Census, 2011).

Growth and Urbanization Pattern

Bengaluru witnessed its first growth spurt immediately after independence when it was declared the capital of Mysore State. A strong industrial and government employment base was established during this time, and the population of Bengaluru almost doubled from 4 Lakh to 7.8 Lakh. The 70's was also a high growth decade for the city, before the advent of IT

TABLE 4: POPULATION GROWTH IN BENGALURU

Census	Population
1941	4,10,968
1951	7,86,343
1961	12,06,961
1971	16,64,208
1981	29,21,751
1991	41,30,288
2001	56,88,844
2011	87,19,939

industry in the city. Bengaluru began to emerge as an IT hub during the 90s. The population growth rate in the city during this time hovered around a moderate 40%, but the spatial footprint of the city expanded significantly.

Most of this growth was haphazard and unplanned. Large IT parks were established on the fringes of the city with limited access to basic services and transport infrastructure. Servicing such a large area became increasingly challenging for the urban local body and service delivery began to suffer.

Today, with a population close to one Crore and an area of 800 sq km, Bengaluru has established itself as a prominent mega-city of international importance, but is grappling with issues of congestion, pollution and inadequate sanitation services. Concerned with the deteriorating quality of life, citizen groups and industrial associations are increasingly engaging with the local government demanding and advocating for better services.

Governance Structure

The Bruhat Bengaluru Mahanagara Palike (BBMP) is the urban local body in charge of all municipal functions in Bangalore. BBMP was formed in 2007 by merging the Bangalore Mahanagara Palike with seven neighboring municipal councils (Bommanahalli, Byatarayanapura, Dasarahalli, KR Puram, Mahedevapura,

³ The city's name was Bangalore earlier which was changed to Bengaluru in 2006.

RR Nagar, Yelahanka) one town municipal council (Kengeri) and 110 adjacent villages.

The BBMP is divided into 198 electoral wards each represented by an elected councillor. The Corporation is governed by an elected body of these councillors which is headed by the Mayor of the city. This elected body is assisted by 12 standing committees which are granted jurisdiction over various municipal functions such as public health, education and tax reforms.

The Municipal Commissioner is the administrative head of BBMP. Bangalore has a decentralized model of urban governance. The city is divided into eight zones for ease and efficiency of administration. Each zone is headed by an Assistant Municipal Commissioner. The zonal governance structure is in line with the 74th Constitutional Amendment and is an important reform that aids better city management and service delivery. As per the Karnataka Municipal Corporations Act, 1976, BBMP is mandated to provide 31 obligatory functions including the collection, removal, treatment and disposal of sewage, offensive matter, regular cleansing of streets and maintenance of public markets and slaughter houses and the regulation of all markets and slaughter houses. All these functions are carried out by the Solid Waste Management Cell of BBMP.

The Solid Waste Management (SWM) cell is responsible for all functions concerned with municipal waste collection, transportation, treatment and disposal. The cell is headed by a Joint Commissioner (Health and Solid Waste). The technical head is the Chief Engineer who is supported by a team of environmental engineers. The cell is responsible for the overall implementation and monitoring of SWM activities in the city including establishing new infrastructure, ensuring the implementation of municipal solid waste (MWS) rules, preparing plans, budgets documents and engaging with the community to improve SWM services. At the zonal level, the Zonal Commissioner is in charge of all administrative aspects in the zone. The SWM staff at the zonal level includes superintending engineers, environmental engineers and health inspectors.

Overview of Municipal Solid Waste Sector

The city of Bengaluru generates about 5,000 MT of solid waste per day, 1,700 MT of which is generated by bulk generators such as hotels/restaurants, malls, marriage halls, institutions, public offices and railway stations. All wards in the city are covered by door-to-door collection which has been in place in the city since 2003. Waste collection, transportation and disposal services in most BBMP wards are outsourced to private contractors and waste collection from 30% households in Bengaluru is carried out by BBMP itself.

Bangalore has four waste processing plants which collectively process 1000 MT of waste per day. The largest processing plant is operated by the Karnataka Compost Development Corporation (KCDC). The plant processes 250 tons per day of mixed waste generated from households and commercial establishments and additional 50 tons of market waste. Other outsourced processing plants include a vermicomposting plant and a waste to energy plant. The BBMP runs an organic waste converter at

the Malleswaram Market. BBMP has also established dry waste collection centres (DWCC) in each of the 198 wards in the city. The remaining municipal waste that is not processed or recycled is sent to the dumpsite in Mandur.

The Bangalore Garbage Crisis

Prior to 2013, bulk of the solid waste generated in Bengaluru municipal limits was being sent to the dumpsites in Mavallipura and Mandur villages on the outskirts of the city. The incessant disposal of garbage in the dumpsites without any leachate treatment contaminated the soil and polluted ground water. The stinking mountains of trash became a nuisance for the surrounding communities. The deteriorating environmental and health conditions in the two villages led to violent protests by the villagers. In August 2012, the villagers protested and stopped all garbage disposal trucks going to the landfill sites.

At the same time, the private contractors responsible for collection and transportation of waste from the city went on strike claiming that BBMP had not disbursed their payments for months. Door-to-door collection was stopped in many areas of the city. In some neighborhoods, garbage was not collected for weeks! People started throwing out their domestic garbage in secondary bins or in open. The bins were not cleared and hence overflowed within a matter of days. The city stank as vast mounds of putrefying garbage lay scattered on streets and open plots all across the city.

The situation was brought to the attention of the Karnataka High Court through a public interest litigation. Seriously concerned about the severe risks, non-engineered landfills pose on the health and environment of surrounding communities, the High Court ordered the closure of Mavallipura dumpsite and asked BBMP to devise more sustainable ways to handle waste in the long term. The court also ordered waste segregation at source to be made mandatory in the city.

The severe crisis brought to light the ill-practices and inefficiencies prevalent in the waste management sector and forced the authorities to question the status-quo. The High Court order pushed the BBMP to look at alternatives to landfilling. Within weeks the BBMP implemented a change in course and announced an ambitious waste reduction and recycling program in the city.

BBMP's initiatives in sustainable waste management

Once the immediate problem of garbage piling up in the city was addressed, BBMP embarked upon a massive initiative to overhaul the solid waste management system in the city. Waste segregation at source was central to this initiative. The Corporation also decided to move away from the centralized model of waste disposal, where all waste is hauled out of the city to a more decentralized system, in which waste would be recycled or processed at the ward/ zonal level.

BBMP established Dry Waste Collection Centres (DWCC) in all 198 wards in the city. Residents, commercial establishments as well as scrap dealers can take dry recyclable waste to these



Dry Waste Collection at Domlur

centres and sell it at a designated price. The centres also collect low value plastic which does not have a high recycling value. BBMP is exploring potential of setting up a processing plant to convert this plastic to crude oil. Part of the wet waste collected is currently processed at KCDC composting plant and organic waste converters (OWC).

In addition, The BBMP is planning to construct 16 biomethanation plants, each with a processing capacity of 5T in 16 different wards in the city. The BBMP actively solicited citizen support and cooperation in their endeavour to make Bangalore a garbage-free city. The Corporation partnered with industry associations and NGOs to organize education and awareness campaigns about waste management and encouraged households, large corporate and commercial establishments to segregate, recycle and process their waste on site. BBMP also invited citizens to become community watchdogs and help them monitor the functioning of their waste management program.

The Wake-Up Clean-Up Campaign

The Wake-up Clean-Up initiative was conceptualized as a waste management exposition to bring together all stakeholders including government agencies, bulk generators, corporate houses, NGOs and environmental organizations, solid waste experts, service providers and citizens at large on one platform and build large-scale consensus around sustainable waste management practices. The one-week expo was organized by BBMP in February 2013, in association with the Federation of Karnataka Chambers of Commerce and Industry (India) FKCCI and Bangalore City Connect Foundation (BCCF).

The expo comprised workshops, expert talks, exhibitions, and focused training programs and sessions catering to different categories of waste generators (businesses and corporate houses, residential apartments, hospitality industry, hospitals, institutions etc.). Technology service providers and recyclers showcased their tailor-made waste management and recycling solutions for implementing waste management at different scales. Hoards of citizens including school children from the city's government and private schools also participated in the expo and pledged to make Bengaluru a cleaner, greener city.

The expo was successful in garnering wide-spread support from public as well as private sector stakeholders. Key commitments made during the expo include:

- The BBMP agreed to launch a model zero-waste program in select wards of the city. The Corporation also committed to aggressively publicizing waste segregation at source by using all BBMP hoardings in the city and also through flyers, radio announcements etc. continuously for 2 months.
 - Councillors, BBMP officials, NGOs and resident welfare associations (RWA) came together to commit to cleaning their own wards. RWAs agreed to participate in an intensive three-hour cleaning drive every week spearheaded by the elected councillor. The councillor of Vignan Nagar committed to allocating 10 acres of land for building waste processing and recycling centres.
 - Corporate houses and IT Parks agreed to support BBMP in its



L: Invitation for Wake Up Clean Up Expo, R: Industry leaders and decision makers discuss strategies for reducing waste



Source: wakeupcleanup.tumblr.com



School children learn about the valuable contribution of waste-pickers in reducing the amount garbage in the city,

Source: wakeupcleanup.tumblr.com

initiatives and pledged their support towards reducing the quantum of waste generated by treating / recycling the waste on site. Infosys committed to become a zero-waste campus . Biocon expressed interest in adopting the dry waste collection centre at Koramangala.

- The Confederation of Real Estate Developers' Associations of India (CREDAI) agreed to undertake pilot projects for installing on-site waste management systems in existing commercial and apartment complexes. CREDAI also ensured that it will advocate for a waste management component in all future real estate projects.
- Several hospitals committed to becoming zero-waste and also offered to become processing community centres for domestic sanitary and biomedical waste.

The wake-up-clean up initiative has now taken the shape of an ongoing citizen and industry led movement to inform and educate people about sustainable waste management and advocate for a green, garbage-free Bengaluru. (www.wakeupcleanup.in)

The Kasa Muktha Program by BBMP

After the success of the wake-up-clean-up campaign, the BBMP launched the the Kasa Muktha (garbage free) program in June 2003 to move towards a zero-waste future. The program currently being implemented in 22 wards in the city on a pilot basis, emphasizes segregation of waste at source. '1 Mane, 2 Dabba, Mix Maada Beda' or one home, two dustbins was the key message that the Kasa Muktha program spread among citizens and garbage contractors. The dry and wet waste collected separately from the households is transported to different locations. Wet waste from

nine wards is sent to the KCDC plant and the processing plant operated by Organic Waste India (OWI) receives waste from 11 wards. Waste from remaining two wards is collected by a private wet waste management company. The dry waste is transported to the DWCCs in the respective ward.

The program also introduced separate collection and disposal of sanitary and other bio-medical waste from households in partnership with the Manipal Hospital. The sanitary waste is collected in separate bags and is transferred to the hospital where it is stored safely in a separate bin with covered lid.

The hospital monitors the amount of sanitary waste coming in daily from households before transporting it to the incinerators for safe disposal.



Launch of the Kasa Muktha program in the presence of the Honorable Chief Minister

Source: BBMP

BBMP carried out a door-to-door awareness campaign asking residents in these wards to segregate wet and dry waste and imposed a fine of Rs. 100 for not segregating and for littering. The Corporation also assigned dedicated 250 *Pourakarmikas* (garbage collection workers) in these 22 wards and trained them in waste segregation and handling. The total amount of waste generated in each ward is tracked and analyzed.

Citizen involvement is also a key idea behind the *Kasa Muktha* Program. RWAs and interested citizens of these 22 wards were involved as volunteers in the program to monitor the collection and transportation of segregated waste. Each volunteer called the "shuchi mitra" is given charge of one street to co-ordinate with the BBMP officials and garbage contractors. These volunteers also visit various locations in their wards to ensure that streets and public spaces are regularly swept and kept clean.

IEC campaign to promote waste segregation at source

As part of the *Kasa Muktha* ward program, BBMP launched an extensive information, education and communication campaign to spread awareness about waste segregation at source and inform citizens about the new garbage collection and disposal regime put in place by the BBMP. Around Rupees one Crore was spent on newspaper, radio and television advertisements, public hoardings and special programmes. The following activities were undertaken as part of the campaign.

Announcement System on Garbage Collection Vehicles

BBMP installed an automated announcement system on its garbage collection vehicles which continuously played a message in English and Kannada asking citizens to segregate their waste.



L: Hoarding displayed on important street junctions, R: Poster informing citizens about segregation and collection regime



Streetboard designed by Wake Up Clean Up for kasa muktha wards

Radio Jingles

Special jingles were created asking citizens to be responsible about waste management and segregate and locally recycle/process their garbage. The jingles were repeatedly played on key radio channels for a period of two months. Posters were also displayed on the sides of the trucks.

Hoardings and Banners

BBMP used its hoardings across the city to broadcast the message of garbage segregation at source. BBMP also designed flyers and banners that were displayed in apartment complexes, institutions and public places.

Public notices and circulars

BBMP issued legal public notices addressing bulk generators asking them to segregate wet and dry waste and compost the wet waste on site wherever possible and hand over all the dry



Kasa Muktha Wards
Ejipura
JP Nagar
Koramangala
Pattabhiramanagar
V Nagenahalli
Shantala nagar
Konanakunte
RR Nagar
Sarakki
Rajmahal Guttahalli
Gangenahalli
Dattatreya Devasthana
HSR Layout
Chokkasandra
Nagapura
Gandhinagar
Kadumalleswara
JC Nagar
Marappanapalya
Kengeri
Attur
Yelahanka



From left: Guidebook for apartments to process wet-waste on site, poster on composting kitchen waste, Bio-gas generation

waste at the nearest dry waste collection centres. The notices also informed the bulk generators about the frequency of collection of the remaining inert waste by BBMP⁴.

Educational Material on waste segregation and processing

BBMP published a variety of educational material in the form of hand books, pamphlets, posters etc. in partnership with various organizations like Namma Bengaluru Foundation etc. on waste segregation, composting etc. to help citizens become responsible for sustainably managing their own waste.

Results

BBMP's zero-garbage program coupled with an extensive citizen awareness campaign has been a step in the right direction at the right time to address growing garbage woes in the city. Key achievements of the program in the last one year of implementation are summarized below:

- 15-20% households in the city are segregating wet and dry waste as compared to the 10% households that were segregating before the launch of the program.
- A substantial amount of waste has been diverted away from the landfills. Out of the 5000 MT of garbage generated every day, only 2000 MT is disposed at the Mandur dumpsite. Earlier close to 3000-3500 MT was sent to the two dumpsites.
- BBMP has taken concrete steps to move towards decentralized waste management by opening the 198 DWCCs in the city. With the opening of the biomethanation plants in the

city, the Corporation will also be able to process wet waste

- BBMP has been able to effectively engage and involve the community in waste management. Citizens and corporates now view managing waste as their own responsibility and are active partners in making Bangalore a cleaner, greener city.

Lessons Learned

In crisis lies an opportunity. The massive floods in Mumbai in 2006 led to the adoption of a State level legislation addressing solid waste management, the plague in Surat in 1994 pushed the local body to undertake a mammoth city cleaning exercise and put in place systems to sustain the positive change that the city was able to bring about. The garbage crisis that Bangalore faced in late 2012 forced a change in BBMP's solid waste management practices as well as in citizens' attitudes towards waste. The protests by villagers in Mavallipura and Mandur and the ensuing order by the Karnataka High Court to close the dumpsites brought a realization that landfilling is not a socially or environmentally sustainable way of waste disposal. The BBMP decided to put in place systemic changes to help divert waste away from landfills through reduction, recycling and decentralized processing.

The Wake up Clean up Exposition and Campaign provided a platform to spearhead this change in policy direction and build consensus among BBMP, citizens, elected officers, bulk generators, environmentalists and technology providers around solid waste, in a focused span of one week.

With the announcement of the *Kasa muktha* Program, BBMP has been able to initiate a change on ground by streamlining its waste management system and making citizens active stakeholders.

⁴The notice can be seen at :[http://218.248.45.169/download/engineering/SWM%20PublicNotifn\(Bulk%20Genr\).pdf](http://218.248.45.169/download/engineering/SWM%20PublicNotifn(Bulk%20Genr).pdf)

ers in the process. The program currently being implemented in few wards in the city is definitely a step in the positive direction and the BBMP is committed to continue implementing integrated sustainable waste management practices to make the vision of garbage free Bangalore a reality.

The BBMP has also set systems for regular monitoring of the SWM processes. Roles and responsibilities of each staff member have been charted out and monitoring sheets have been prepared.

Sustainability and Transferability

Moving towards sustainable waste management is a huge challenge; especially in mega-cities where SWM services are largely outsourced to multiple private contractors. Since in most cities, the payment of contractors is based on the amount of waste collected and transported, the system does little to promote recycling and diverting waste from landfills. Like Bangalore, many cities in India are now finding it increasingly challenging to identify suitable sites for disposal of solid waste and are considering alternatives to landfilling.

Reducing, recycling and processing waste at the local level has proven to be the most sustainable and economically viable way to divert garbage away from landfills. The Bangalore case

demonstrates that this can be successfully achieved by making the community active partners in the waste management process. By initiating the ‘Kasa Muktha’ program coupled with a massive information and outreach campaign targeting bulk generators, corporates and resident welfare associations, BBMP was able to generate a momentum around pressing solid waste issues and implement a change in policy direction towards more sustainable practices.

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ENGAGE-14: AN INITIATIVE TO ENGAGE SCHOOL STUDENTS BY GANGTOK MUNICIPAL CORPORATION

SNAPSHOT

REACHING OUT TO SCHOOL STUDENTS TO GENERATE AWARENESS ABOUT SUSTAINABLE WASTE MANAGEMENT

City Profile

Gangtok is the capital city of Sikkim and is located on a ridge at a height of 5500 metres. The city was an important transit point for traders travelling between Tibet and India, and today is a busy administrative and business centre which presents a mix of culture and communities. Gangtok is located in the East district of Sikkim and lies between 27°21' to 27°16' N latitude and 88°37' longitude. According to Census 2011, the total population of Gangtok is 1,00,289 and the total number of households in the city are 23,773. In the last decade, Sikkim has witnessed a huge influx of floating population and acceleration of tourism sector. The infrastructure in Gangtok has seen visible improvements, but the city still needs to address challenges of increasing traffic congestion and pollution and growing amounts of garbage in the city.



Engage Outreach Initiative Poster



Figure 2 Poster for the 1 KM initiative

Urban Local Governance

Gangtok Municipal Corporation (GMC) was formed in May 2010 under the Sikkim Municipalities Act, 2007. Prior to 2010, most of the city infrastructure and municipal services were being provided by the Urban Development & Housing Department, Govt. of Sikkim. Currently, GMC provides services such as solid waste management, providing trade & hawker licenses, parking, markets, installation and maintenance of advertisements and also undertakes implementation of schemes such as SJSRY. The GMC is divided into 15 municipal wards for ease of administration.

Solid Waste Management Profile

Gangtok city generates about 50 metric tons of solid waste daily. The waste is collected, transported and disposed at Martam dumping site which is located 20 KM away from Gangtok. However there is no level of waste segregation or processing before disposal. The door-to-door collection in the city is also limited and residents are used to throwing their waste in open areas, jhoras, drains, or in open plots close to their houses. Because of improper disposal of solid waste, the city is witnessing increasing instances of disease outbreaks especially during the summer seasons.

Gangtok Municipal Corporation decided to address this issue by informing, educating and inspiring the young minds of students about various aspects of sustainable solid waste management. An agency called 24hours Inspired was engaged by GMC to plan a series of innovative events and workshops to sensitize school students of Gangtok and make them partners in waste management.

The Engage 14 Outreach Initiative

The 'Engage 14' outreach initiative was launched in January 2014 by the GMC in collaboration with 24hours Inspired, a personality development and leadership enhancement firm that facilitates workshops and leadership programs in schools, colleges and corporate firms. GMC and 24hours Inspired have designed a program to engage school students from classes 4 to 12 in the process of understanding aspects of waste management.

The program is designed as a three-phase intervention with

Engage Quiz for junior school students, Engage Discussion for Secondary school students and Engage Race for Senior Secondary Students.

The phase 1 Engage Quiz competition is a program designed for students of classes 4, 5 and 6 to propagate the message of reduce, reuse and recycle. The quiz addresses issues such as reducing waste from households, intelligently reusing household items and not discarding them just after one use. The quiz program also highlighted issues of handling electronic waste. The quiz competitions were held in several schools in the city between March and May 2014.

Phase 2 of the outreach program involves panel discussions on Reduce, Reuse and Recycle and Creative exercises such as poster making, essay writing on themes such as 'Urban Gangtok-Leading the Sanitation change'. This phase is designed to engage students of classes 7, 8 and 9. This phase will be initiated in 10 secondary schools from July 2014 onwards.

Phase 3 of Engage-14 called the 1 KM initiative is envisioned as a race towards positive change for students of classes 10, 11 and 12. As part of the race, students will be given a specific timeline and budget to visit 5 sites in the city pre-decided by GMC. The students will visit these sites to understand better the solid waste and sanitation situation in and around Gangtok. Once the students reach the site, they will be given specific activities and tasks which they will need to complete before moving to the next site.

- Taking pictures of specified areas.
- Talking to people and taking their opinion on issues related to urban sanitation
- Generating awareness on reducing, reusing and recycling among residents of that area
- Developing a tag line for improving urban sanitation in Gangtok

Activities carried out so far

Engage quiz competitions were conducted in 16 schools during the months of March to May 2014. More than 3000 students participated in the inter school quiz competitions. The grand finale of the quiz was completed in May 2014.

Inspired by the Engage-14 initiative, some schools have undertaken cleanliness drives around their school buildings. Students of 14 junior schools across also participated in the 1 km initiative and spent an hour spreading awareness about cleanliness amongst the public in an area of 1 km.

So far the program has seen an enthusiastic response and has generated great interest among students on the issue of solid waste management. The yearlong program will help sensitize the younger generation on the adverse effects of pollution and their responsibility towards keeping their surroundings clean and spreading awareness about recycling and waste management.

Sustainability and Transferability

The rapid growth in population, technology and consumerism has led to a steady increase in the consumption of packaged

"The engage 14 program is intended to motivate students to undertake solid waste management in their respective schools and the surrounding area"

Anil Rai, Commissioner,
Gangtok Municipal Corporation



Quiz competitions on waste management were conducted in 16 schools in the city

items and subsequently the generation of municipal waste. Since youth and students now form an important component of the consumer arm and also, schools play an important role during the formative years of the students the project is specifically targeting these groups. Ingraining the idea of sustainability and waste management in young students through creative and innovative approaches can go a long way in helping change the current scenario.

Municipal Corporations can actively target the young population through their IEC initiatives to sensitize them about basics of solid waste management.

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CLEAN CITIES CHAMPIONSHIP: A FIVE DAY COMPETITION IN WARANGAL TO IMPROVE COLLECTION AND MANAGEMENT OF WASTE

SNAPSHOT

GENERATING AWARENESS ABOUT SUSTAINABLE WASTE MANAGEMENT THROUGH CREATIVE CAMPAIGNS, WARANGAL

City Profile

Warangal with a population of 6.2 Lakh is the second largest city in the newly formed State of Telangana. Known for its majestic fort, temples and other historic remains, Warangal is located at a distance of 145 km from the state capital, Hyderabad. It is one of the fastest growing cities in South India and has emerged as a regional hub for education with numerous schools, graduate and post graduate degree colleges and reputed professional institutions like National Institute of Technology (NIT), Kakatiya University (KU), Kakatiya Medical College and Kakatiya Institute of Technology and Sciences (KITS).

With the establishment of new industries and institutes, Warangal has witnessed significant growth in the recent decades. This rapid pace of growth has contributed to economic development and improved quality of life for citizens. However, the growth has also outpaced the provision of infrastructure and the historic city is facing challenges with respect to adequate housing, transportation and safe sanitation.

Urban Local Governance

Warangal Municipal Corporation (WMC) is the urban local body responsible for civic administration in the city and the towns of Hanamkonda and Kazipet. Warangal has one of the oldest local governments in India. The Warangal Municipality was

established in 1899 and was upgraded to a special grade municipality in 1951 and to a selection grade municipality in 1960. The city was declared a municipal corporation in 1994. The Corporation discharges its functions through the mayor-in-council, which comprises the Mayor, and corporators elected from the 53 electoral wards in the city. The Commissioner is the administrative head of WMC. WMC provides majority of the services as listed in the 12th Schedule of the constitution, which include urban planning, providing building permissions, construction of roads and bridges, provision of water supply, public health, sanitation, conservancy and solid waste management; slum improvement and up-gradation; provision of urban amenities and facilities such as parks, gardens, play grounds; burial and burial ground among others.

Solid Waste Management Profile

Warangal generates about 300 MT of garbage daily, which includes the waste collected from households, hotels and restaurants, markets, commercial establishments and through street sweeping. The coverage of door-to-door collection in Warangal is low at only 59.7%. According to the City Development Plan of Warangal, about 40% of the waste generated is bio-degradable and the remaining 60% is degradable. The waste collected is transferred to community bins which is later collected through tractors/dumpers and transported to one of the two open dumping sites located at Reddipuram and Ammavaripet.

TABLE 1: POPULATION GROWTH IN WARANGAL

Year	Population	Decadal Growth Rate (%)
1971	207520	32.94
1981	335015	61.44
1991	461123	37.64
2001	530636	15.07
2011	620116	16.87

Situation before the Initiative

Prior to 2012, the solid waste management situation within WMC was not encouraging. The city did not have proper waste collection, transportation, and treatment and disposal system. The door-to-door garbage collection was only 40%. There was no segregation of waste at household level and no processing and proper disposal methods. No effort was made to create infrastructure to collect the segregated waste at primary level. Mixed garbage was dumped in cement bins kept on roads. WMC had inadequate equipment and fleet for waste collection and transportation. The SWM system was not synchronized and was

poorly maintained. The vermi-composting unit was built, but was not in use and hence all the municipal waste was dumped in open without any processing and recovery, resulting in unclean and polluted environment.

The Initiative: Clean Cities Championship (CCC) Campaign

The Clean Cities Championship (CCC) originated when a group of three environmental activists approached the State Government of Andhra Pradesh, with an idea to conduct a sporting event among various municipalities to generate public enthusiasm around the topic of solid waste management and public health in the State. The idea was well received and backed by the Joint Director of Municipal Administration, Government of Andhra Pradesh. The State Department of Municipal Administration and Urban Development decided to implement the initiative in Warangal. The Andhra Pradesh Pollution Control Board (APPCB) agreed to sponsor the campaign provides a financial support of Rs. 24 lakhs. The Andhra Pradesh Urban Finance and Infrastructure Development Corporation APUFIDC also agreed to provide some financial assistance for the event.

The CCC was designed as an intensive one week campaign where teams from various municipalities in the State would participate in a solid waste collection and management drive in the host city and demonstrate correct methods of segregating, recycling, dumping and composting municipal solid wastes in line with the MSW Rules, 2000. 57 municipalities from the northern part of the State agreed to participate in the 7 day event and nominated a team of one sanitary inspector accompanied by two staff.

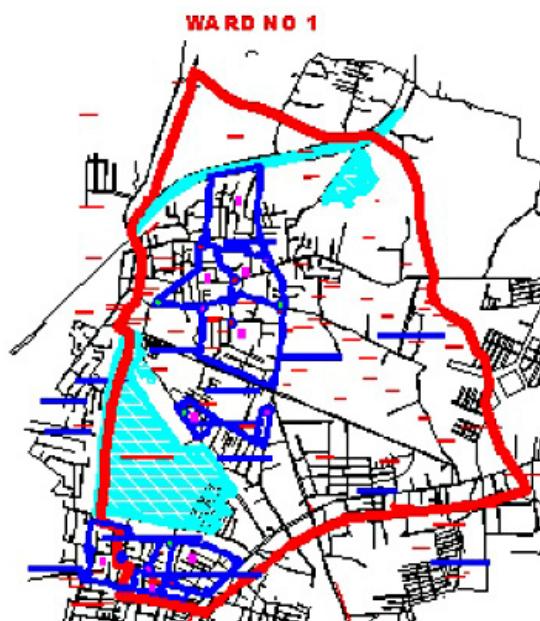
The Warangal Municipal Corporation planned the whole

initiative as well as pre-competition activities including training and capacity building of staff and information, education and communication (IEC) campaigns in the city to spread awareness about the initiative, gain public support and inculcate better MSW practices amongst the generators and managers of solid waste. A core team was established which comprised all corporation executives, subject experts and other partners.

The campaign was planned in a phased manner. The first phase included strategic planning and resource procuring, primary collection and transport mapping and awareness campaign and championship planning. The core team undertook meticulous planning and resource mapping exercises. The sanitation inspectors guided by core team members, AutoCAD and GIS specialists, and the municipal staff designed and mapped the routes for waste collection. 13 circle-routes and 359 micro-routes were planned for door-to-door collection in all 53 wards. A primary and secondary transportation plan was also developed.

Based on the resources mapping exercise, the Warangal Municipal Corporation procured all the necessary equipment and vehicles including 402 pushcarts and 14 auto trolleys for door-to-door collection, 3200 bins, 500 dry resource bags, personal gear, caps, masks, gloves and other safety gear. Waste recovery and processing facilities for dry and wet waste including bio-methanation plants, vermi-composting and windrow composting units were prepared and equipped with all necessary equipment.

The second phase included awareness generation and community orientation and engagement. Many IEC activities were planned for generating awareness amongst the citizens. An awareness campaign was initiated with a cycle rally of 10 km, spreading the message on waste collection and segregation. Two different coloured bins per household were distributed for segre-



Ward No	1
Route No	5
Route Manager	DHARAMSINGH K
Route Manager Cellno	9701999041
Push Cart No	0105

Route Map Details

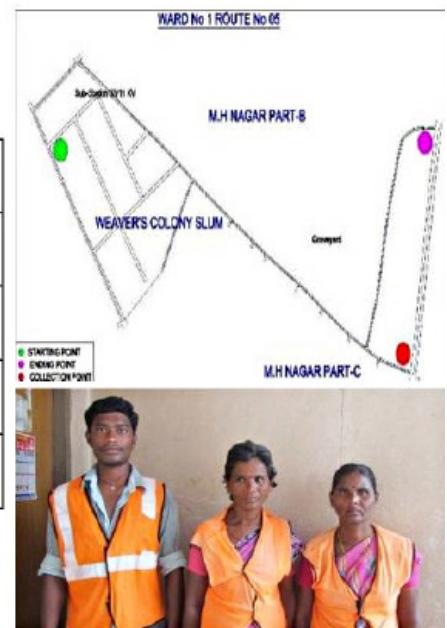


Figure 4: Each team was assigned route for waste collection in a specific ward



Figure 5: A participating team collecting segregated waste

Source: ipsnews.net, Credit: Keya Acharya/IPS

gating dry and wet waste. Self-help group (SHG) women, NCC cadets and school students, religious leaders, teacher groups, nursing staff, NGOs, apartment association, etc. were roped in for message dissemination. Attractive hoardings, pamphlets, posters, flags, banners, tee shirts, caps, etc. were developed and displayed. Tableaus, *kalajathas*, street plays, municipal vehicles, mobile vans plied in the streets carrying the message on types of waste and the importance of source segregation. Information was also disseminated through using web portals, press briefings and television shows.

The third and the final phase included intensive capacity building and training exercised for staff from the host city as well as guest teams. The main aim of these capacity building exercises was to empower and equip the public health staff to spread awareness about waste segregation and waste recovery among citizens of their own constituencies. The sanitary staff participated in on-site trainings where all the 1450 public health workers were trained to collect and segregate waste. In addition, several interactive sessions were also organized which employed creative methods like management games, yoga, classroom sessions and demonstrations to inspire the participating teams.

Finally, the CCC campaign was conducted for a period of seven days. A total of 386 teams (134 from other municipalities and 252 from WMC) were formed comprising of the sanitary inspector as the team leader and two guest staff accompanied by three officials from the host city. Each team was allotted a designated route and a personal protection including caps, gloves, masks and whistle was given to all participating team members. Each team was given a push cart and 4 bins for collecting and segregating waste. Each push cart was given a spring balance to weigh the quantity of 4 types of waste segregated and collected. Each team had to cover 500 households daily, weigh the waste collected and duly record it against their team work.

All dry waste collected was transferred from collection points to the dry resource centre and weighed and tallied with the push cart data. Firstly, plastic and paper were segregated

at the resource centre. Thereafter, paper was baled and sold to ITC. Fuel waste and other waste like coconut shells, dry leaves, etc. were sold separately. The wet waste was compressed and transported to the SWM Park. Vegetable waste was sent to the vermi-composting plant. Waste from slaughter houses was sent to the bio-gas plant and the remaining wet waste was sent to windrow composting.

Every team was assigned a group of NCC cadets/ SHG women who monitored and evaluated the team's performance every day. The teams were marked against set criteria. The public was also engaged in the monitoring process to ensure evidence of source segregation. Contest cards with colour coding for different target groups were designed. Over 135,000 cards (orange colour for schools, blue for government staff, green for SHGs and white for households) were distributed through nodal officers, schools and SHGs.

These cards were in operation throughout the campaign. Daily verification of source segregation was done, wherein households, students and SHGs got their card signed by route monitors. Anyone with a card with valid signatures for all 7 days was eligible to participate in a lucky draw for their target group. The active participation of citizen groups, volunteers through out the event ensured that the daily operations went in smoothly. Each municipality's commissioner was invited to come observe the proceedings for at least two days. At the end of the seven day competition, the best team was awarded the championship trophy. In addition, one male and one female staff of each route were awarded daily.

Key Outcomes

The Clean Cities Championship campaign was a hugely successful event which led Warangal to undertake sustainable waste management practices for the long term. Warangal became the first ULB in the country to undertake 100% door-to-door collection and 70% source segregation. As many as 420 cement bins and 128 bumper bins were removed from the city, making Warangal a 'no dump city'. As the waste is getting reduced, reused and recycled, the dumping yard is getting converted to a beautiful park with compound wall, approach road, plantations and vermi-compost sheds in it. Awareness levels amongst the municipal staff and the citizens has increased, resulting in better waste segregation, collection and handling practices. Processing units like vermi-composting, windrow composting and biogas generation have been started. 500 kg of manure was made ready from the wet waste and kept on sale. Electricity of 12KW is being generated from the bio-gas plant, which lights up the children's park and nursery. The sale of paper, plastic, mixed and fuel resource as a part of dry processing resulted in generating funds for public health workers. With extensive exercises on route mapping and synchronizing of primary and secondary collection, effective utilization of all vehicles is saving a fuel of approximately 90 litres per day. Enforcement of MSW Rules also saw attitudinal change wherein households that give waste without segregation are fined and public littering is heavily penalized. Gradually, the environs have started becoming clean.

Sustainability and Transferability

The CCC campaign provided a much needed impetus to the neglected state of solid waste management in the city as well as the state, and provided an opportunity for leadership and competitive participatory learning to implement the MSW Rules, 2000. Such creative campaigns involving a multitude of stakeholders, decision makers, field staff as well as the general public have the potential to bring about attitudinal shifts in the system as well as among the masses. While such events and campaigns can bring focus to an issue, the key to success is to sustain the spirit and the positive changes on ground.

The WMC used the campaign successfully to transform the solid waste management system in the city. WMC has appointed nodal officers belonging to various wings in all the 53 wards to monitor and supervise door-to-door collection, segregation and transportation, which has become a daily habit now. Better

performing push cart team is selected everyday based on their performance and the public health workers and sanitation supervisors are rewarded. Thus, the entire activity is now owned by one and all through participation, decentralized management and system of rewards. The model is completely replicable in any other medium to large towns if they develop accurate plan and implement is systematically.

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CATEGORY 3B

COMMUNITY LED INITIATIVES IN SOLID WASTE MANAGEMENT

DOOR-TO-DOOR COLLECTION, TRANSPORTATION AND WASTE PROCESSING SERVICES BY EXNORA GREEN PAMMAL

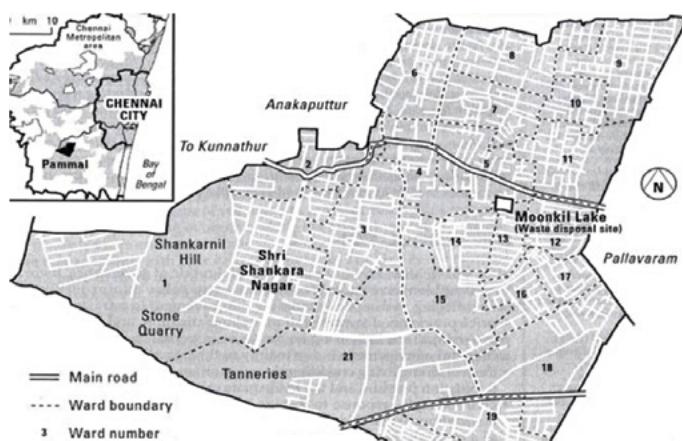
USING PEOPLE- PUBLIC-PRIVATE- PARTNERSHIP (PPP) TO ESTABLISH SUSTAINABLE WASTE MANAGEMENT SYSTEM IN SMALL TOWNS

Pammal town is situated on the periphery of the city of Chennai in southern India. The grave condition of waste in the area made a resident take initiative to form an informal group and start creating awareness about waste management among local residents. Their efforts began to pay off when they started collecting user fees and involved some waste pickers to clean their area. Once they got noticed, they were funded by PepsiCo and registered themselves as Exnora Green Pammal and initiated several activities to deal with solid waste in Pammal town. Their journey from a few hundred households to their reach of 75,000 households currently, speaks of success from 1994 to 2014.

City Profile

Pammal is a part of Kancheepuram District and is located 25 km from Chennai in Tamil Nadu. Pammal has a population of 75,870 according to 2011 census while the floating population is approximately 20,000. The town primarily comprises residential, commercial, institutional and industrial area and is famous for tanneries, which are located in and around the municipal boundary.

There are 323 leather industries located here. About 10% of the town's population lives in slums. The Pammal Municipality is divided in 21 Municipal wards and it also covers one revenue village.



Map showing location of Pammal in CMA and Pammal Municipality

Population Growth and Urbanization Pattern

Pammal Municipality falls under the Chennai Metropolitan Area (CMA) comprising of the City of Chennai, 16 Municipalities, 20 Town Panchayats and 214 Villages. The extent of CMA is 1189 km².

Pammal exhibited a sudden growth in population in the 1970s and has been growing at a steady pace since then. The reasons for the growth of Pammal are proximity to work places such as electrical, leather and pharmaceutical industries, and a good access to road and rail network. The western part of Pammal town-Shri Shankara Nagar saw an unprecedented growth due to the presence of tanneries in the area. A major reason that is also attributed to the growth of Pammal is its proximity to airport especially industrialists wanting to reduce travel time to and from airports have started residing in Pammal town.

Governance Structures

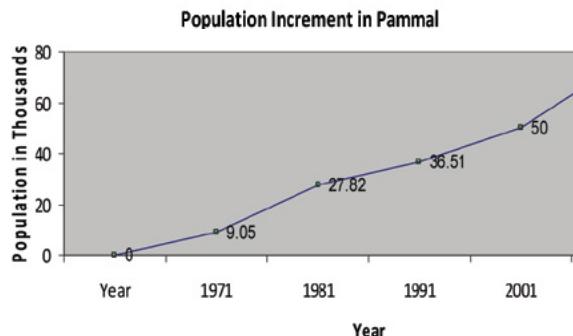
In 2004, Pammal was constituted as a Third Grade Municipality⁵. It is divided into 21 administrative wards and is spread over an area of 13.8 sq km. In 2010, Pammal became a Selection Special grade municipality⁶.

The Pammal municipality has an elected committee and official committee. The Chairperson of the elected committee is the administrative head of the Municipality and is supported by

⁵ Urban local bodies in Tamil Nadu are classified based on their population and annual revenues. A third grade municipality is a town with more than 30,000.

⁶ Classified as a city with an average annual income exceeding rupees six crores and not exceeding rupees ten crores.

Year	Population (in thousands)
1971	9.05
1981	27.82
1991	36.51
2001	50
2011	75.87



the Vice Chairperson and councillors. The Municipal Commissioner is the head of the Official Committee and has a team of executive officers. The municipality is responsible for provision of basic services like maintenance and development of public streets, water supply connections and repairing, collecting water charges and property tax, issuing of birth and death certificate and solid waste management.

The Public Health and Engineering Department of the Pammal Municipality is responsible for the collection, removal, treatment and disposal of waste and street sweeping. The aim of the Public health and Engineering department of the municipality is to ensure 100% collection, transportation, treatment and disposal of garbage generated in the town daily. The public health department is headed by a sanitary inspector who has a team of two sanitary supervisors and 55 sanitary workers. The engineering department is headed by a municipal engineer who has a team of one overseer, an electrician, water supply fitter and water supply valve operator.

Overview of municipal solid waste sector

The total municipal waste generated in the town is 35 MT per day. The waste management in the town is entrusted with the municipal sanitary staff and a team of 7 groups. The municipality is responsible for solid waste management in 5 of the 21

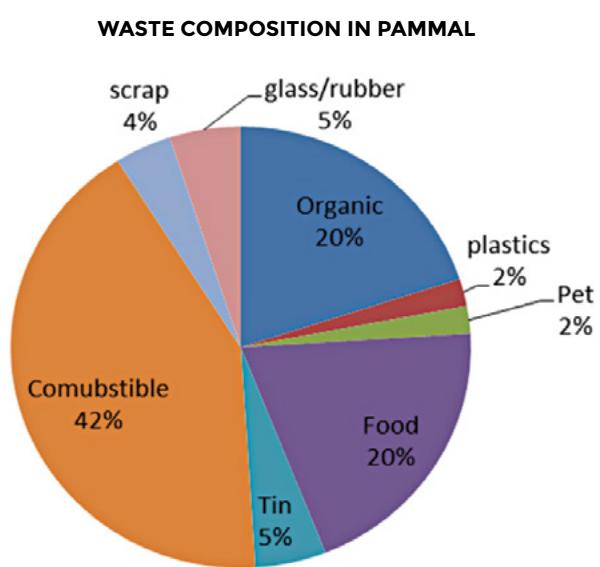
wards (in ward number- 7, 8, 9, 10 and 11). The municipality lifts 18.5 MT per day. Waste collection, transportation and disposal of waste from remaining 16 wards is carried out by an NGO-Exnora Green Pammal.

The functions and services of the Municipality include street cleaning, disposal of municipal waste at open dumping site at Vishweshwarapuram, bulk clearance of waste from marriage halls, removal of construction waste, maintenance of public toilets and removal of dead animals. Out of the total waste generated, organic waste is approximately 5 MT, food waste approximately 5.5 MT.

Inception of the civil society group

In 1994, Pammal was a town panchayat and had a team of 70 sanitary workers, 22 of whom were permanent and 48 temporary. Of the 48 temporary workers, only 29 worked on waste collection. The other 19 were deputed to other departments. The panchayat could not employ additional required staff due to lack of finance. In 1994, a local resident initiated the formation of a civil society organization to address the issues of solid waste collection and cleanliness. Ten women residents, who were also interested in these issues, volunteered and joined in to form an informal citizens group called Shri Shankara Nagar Mahalir Mandram. They initiated a campaign to involve the local residents in cleaning the area. They organized a mass cleaning campaign for the first time in Shri Shankara Nagar area of Pammal. House to house discussions were done to educate citizens to store their waste in bins and not throw it in open spaces and also to segregate waste. The Mandram explored possibilities of collecting a service charge of Rs. 10 per month per household for the waste collection services. However, residents opposed the idea saying that this was the municipality's duty. In 1995 with some financial support from a private company -Sterling Tree Magnum, the Mandram bought tricycles for door to door collection and appointed two street cleaners. The waste collected was then disposed in the town's secondary collection bins.

In 1996, as the Mandram's influence grew, they started facing various challenges from the municipality as well as from the residents. Mandram's crew collected waste from individual households and disposed it in secondary bins of the town. The residents felt that this was not enough and the panchayat did not want the Mandram to collect user charges from residents. In late 1996, the Mandram members explored composting of waste on



an experimental basis under a tree. A monthly service charge of Rs. 10 was collected from households who gave their waste. This money supported salaries of the waste collectors and to erect a shed. With more households segregating waste at source, most of the compostable waste was converted to manure. Further support came from an eye hospital that provided space for vermicomposting and the Mandram, now registered as a self-help group obtained a loan for construction of a shed.

80 per cent of the total waste generated in the Shri Shankara Nagar was now composted and sold. The recyclable materials such as paper, plastic, metal, glass and rubber was also sold. Hence, only 10 percent of the total waste generated in the Shri Shankara Nagar was disposed at the town's dumpsite. By mid-1998, more than two-thirds of residents regularly paid service charges for this waste management service. Their work caught attention of many officials including the Executive Officer of Pammal Municipality.

Institutionalization of the Mahila Mandram: Formation of Exnora Green Pammal Zero Waste Programme

This success of the Mahalir Mandram's community-based solid waste management project started getting published and got noticed by an international NGO- Exnora International⁷. The initiative was also applauded and encouraged by the Mayor of Chennai. Inspired by this citizen led initiative in Pammal, the mayor of Chennai city also organized awareness rallies in Chennai. He advised the elected council of Pammal town panchayat, to take up vermicomposting on a large scale. He also inaugurated the municipality's "Pasumaiyana Pammal" or the Green Pammal Zero Waste Programme that reached out to six wards of Pammal.

In 2004, representatives of a multinational beverage company PepsiCo visited the project and suggested that the Mandram's activities be expanded to cover a larger area. They extended financial support of Rs 32 lakh for extending the Mandram's initiative to seven wards of the city. However, there were issues in accessing this money since the Mandram was not registered as a formal institution. Here, Exnora International supported in formalizing the Mandram and registered a NGO called Exnora Green Pammal, under the Societies Act, 1860. With PepsiCo's support, door-to-door collection was expanded and a MoU was signed with the Municipality. In 2005, the NGO employed 52 people as waste collectors and also constructed a larger shed for vermicomposting. The land of 1.1 acres was provided by the municipality. This shed had 108 cells for composting. To support the operations of the waste management services, the service charge was increased to Rs 15 per household in more affluent areas.

⁷Exnora International, a non-profit, environmental service organisation focuses on mobilizing and empowering communities to participate in preserving nature and preventing environmental degradation. Exnora's work includes solid waste management, liquid waste management, rain water harvesting and recycling of inorganic waste.

City-wide scaling up of the initiative

In 2007, the Pammal Municipality approached the Exnora Green Pammal (EGP) to expand its services across all the 21 wards of the town. The NGO agreed to provide services in 16 of the wards. The municipality and Exnora Green Pammal entered into a MoU to provide waste management services including primary collection, segregation, and secondary collection, lifting of debris from drains and disposal to the compost yard. As part of the MoU, the Municipality and the NGO provided 70 and 80 tricycles each.

The municipality introduced an annual house tax that included SWM taxes as well and hence it was decided to discontinue the collection of service charges. As per the MoU, it was also decided that the municipality would pay Exnora Green Pammal at the rate of 95 paise per house per day.

The NGO now had a waste management team of 5 supervisors and 100 workers who were called 'Green Ambassadors'. EGP has trained and employed over 135 green ambassadors. The workers and green ambassadors are all drawn from the same localities, who were previously engaged in illicit liquor brewing and from leprosy rehabilitation settlements. The workers are part of the SHG federation and they are employed as federation workers. The workers are given dignity of labour and are paid a monthly salary of Rs. 4000-5000 according to the Minimum Wages Act. The waste pickers also get an additional income by selling the recyclables collected by them.

This arrangement continues to function in the 16 wards of the city. EGP has deployed 10 trucks and 2 mini trucks for the

"Employed with EGP since a decade, my day begins from 6:00 am where I collect segregated waste from 250-300 households everyday. 90% waste from households is segregated. I am happy to be a 'Green Ambassador' and now I live in dignity and earn my living. I have been able to educate 3 of my children due to the salary paid by EGP and the benefit of loans from SHGs."

Thilagavathy Mulaswami, Green Ambassador, EGP



A regular day at work for waste pickers



Summer program for kids, training of women and street play as a part of IEC campaign



Vermicomposting of Organic waste by EGP in Pammal

secondary transportation of municipal waste from the wards to the compost and dumpsite at Vishweshapuram. The payment mechanism has now changed with the municipality paying Rs. 850 per MT to Exnora Green Pammal. After the waste is collected

by green ambassadors in hand carts, it is transferred into trucks for weighing. Since the year 2010, a two-year contract has been formed based on which, the EGP will pay Rs 500 to the Municipality for each MT of compost that EGP produces from the municipality's waste, and Rs 100 per tonne of recyclable material recovered. This payment from EGP to the municipality ranges between Rs 35,000 and Rs 45,000 per month.

SOLID WASTE GENERATION IN PAMMAL

Month	Municipal solid waste collected (in MT)
April - 12	1042.68
May - 12	970.24
June - 12	918.362
July - 12	1042.09
August - 12	1010.58
September - 12	968.78
October - 12	1028.87
November - 12	958.41
December - 12	1056
January - 13	1046.95
February - 13	850
March - 13	1024

Source: EGP Annual Report 2013

IEC Campaigns

EGP along with the Pammal Municipality imparts education and training on livelihood options for disadvantaged groups in the community. They also conduct training programs for external self-help groups on income generation and livelihood options related to waste, paper recycling, mushroom cultivation, etc. Summer camps focusing on environmental issues and waste management are held for children. Street plays for community awareness are also regularly conducted. Depending upon the IEC activity, funding is sought from agencies such as PepsiCo for materials, toolkits, games, etc.

Results and Waste Recovery

The average monthly waste collection in Pammal by EGP is about 994 MT. EGP has collected and segregated a total of 11, 934 MT of waste in the year April 2012 to March 2013 from the 16 wards.

Waste Recovery

Municipal solid waste is segregated and further sent for process-

ing as vermicomposting, biogas, or upscaling.

Vermicomposting: The segregated organic waste is partly utilized for feeding the biogas plant and partly for the vermicomposting processing shed. A total of 383 MT of organic waste was collected in the last financial year, of which 115 tons was utilized for biogas production and 268 tons was utilized for vermicomposting process.

Biogas: A considerable amount of food gets wasted in the restaurants. EGP uses biomethanation technology to use the waste to produce electricity. The EGP has set up 3 biogas plants in the town, one to handle kitchen waste from restaurants and two in temples to handle temple wastes.

The model biogas plant to handle kitchen waste from restaurants has a capacity of producing 25 cu.mt of gas and electricity output of 5 kVa per day. The electricity is sold to the grid and used to power streetlights and to produce cooking gas. Under the 'Temple Green Project', waste from temples such as flowers, milk, prasadham, fruits and cow dung are used to produce biogas. The biogas is used for cooking of the prasadhams in the temple premises.

Upcycling plastic waste: A total of 6623 numbers of plastic carry bags and 41097 plastic water pouches were segregated and utilized for the plastic upcycling initiative called "Project Avthar". This upcycling process diverted 47,720 numbers of plastic carry bags and water pouches from the dumpsite and also from clogging drains and ending up in water bodies. These plastic bags are then used to make into bags, mats, stationery items. This technology was transferred to EGP by Centre for Environmental Education (CEE) Coorg through a series of workshops and training programmes.

Briquette making: The coconut leaves collected from the wards are used for making briquettes, which are used as a fuel in industrial boilers. The briquettes are prepared by a slow pyrolysis process.

Lessons Learned

The reason that the segregated waste could be used efficiently for various waste recovery processes is due to the fact that citizens segregate waste at the source itself.

When residents don't segregate their waste, the workload of green ambassadors increases because they have to then segregate the waste. The value of recyclable material also reduces considerably since recyclables are mixed and become



Biogas plants for processing organic waste; L- Model biogas plant for managing kitchen waste R-Temple Green initiative

WASTE TREATED IN BIO-GAS PLANTS AND ELECTRICITY GENERATED

Month	Food waste (kg)	Units of electricity produced, Kwh
April - 12	2491	6229
May - 12	2240	5898
June - 12	7843	7813
July - 12	7659	7799
August - 12	6509	7522
September - 12	7979	8309
October - 12	9041	8529
November - 12	12584	7780
December - 12	8851	7953
January - 13	6073	7873
February - 13	7529	8072
March - 13	6435	8109
Total	85234	91886

Source- EGP Annual Report, 2013

MONTHLY WASTE SEGREGATED AND DIVERTED FROM DUMPSITE

Month	Plastic carry bags	Plastic water pouches
April - 12	426	3425
May - 12	533	3724
June - 12	590	5125
July - 12	523	5730
August - 12	513	4124
September - 12	557	1399
October - 12	423	6026
November - 12	622	4196
December - 12	566	3876
January - 13	364	1629
February - 13	923	985
March - 13	583	858
Total	6623	41097

Source- EGP Annual report

dirty. The quality of biodegradable material deteriorates as well. In the absence of source segregation or inefficient segregation of waste at source, the amount of landfilled material increases. A much more intensive and sustained awareness campaign and a regulatory framework is essential to encourage maximum



Upscaling of plastic waste into innovative products



Briquette making from coconut leaves

residents to segregate their waste at source. Raising awareness to achieve widespread public cooperation in terms of segregation of waste requires continuous effort and is likely to take several years. Changing people's habits is a gradual process. Although, Pammal has demonstrated a successful waste collection, segregation and waste recovery process, it still lacks a scientific landfill site. Sanitary landfills urgently need to be constructed for disposal of waste that cannot be recycled or composted.

Sustainability and Transferability

The involvement of waste pickers in solid waste management in towns or cities is of utmost importance; especially in areas where it is difficult for the municipality to undertake door-to-door waste collection. Formalizing them is not only environmentally sustainable but has social and economic benefits. Proper channelizing of the waste pickers for operation and monitoring is important for a trouble free waste management system 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.

This project offers 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 as well as added income by selling recyclables and upscaling products to generate more income.

Small towns as well as ULBs can replicate this successful model for efficient services to the community through their involvement, and add to the well-being of waste pickers.

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NIDAN SWACHHDHARA PVT. LTD (NSPL): A SUSTAINABLE MODEL FOR A FULLY PRIVATIZED WASTE COLLECTION AND MANAGEMENT SYSTEM

SNAPSHOT

INVOLVING WASTE-PICKERS IN SOLID WASTE MANAGEMENT IN PATNA

City Profile

Patna is the capital city of Bihar State. Bihar is one of the most populous and socioeconomically backward states in the country and part of the Empowered Action Group (EAG) created by the Ministry of Health and Family Welfare (MoHFW) to ensure population stabilization by targeted interventions and programs. With a current population of 16.8 Lakh (Census 2011), Patna is the second most populous city in Eastern India after Kolkata and one of the oldest continuously inhabited city in the world. Though the city has seen little development in the past few decades in terms of basic infrastructure and municipal services, Patna is experiencing renewed impetus on economic growth in recent years. With an annual growth rate of close to 4%, Patna is one of the fastest growing cities in India today. With recent economic growth the aspirations of its citizens are rising towards higher quality of services.

Local Governance

Patna Municipal Corporation (PMC) is the local urban governing body of the city of Patna. PMC was established on 15th August 1952 by a Special Act, brought by the Government of Bihar in 1951. Under the act, the 88-year-old Patna City Municipality and the Patna Bankipore Joint Water Works Committee were merged to pave the way for establishing the Patna Municipal Corporation. The first local elections were conducted in March 1954. As Patna's apex body, the Corporation discharges its functions through the mayor-in-council, which comprises the Mayor, the Deputy Mayor, and councillors elected from the 72 wards in the city. The functions of the PMC include water supply, drainage and sewerage, sanitation, solid waste management, street lighting, and building regulation. Street sweeping, cleaning of open and covered drains on the sides of the roads and lifting and disposal of animal carcasses are key conservancy services that the PMC provides under its solid waste management (SWM) Department.

SWM Profile

The total solid waste generated in Patna is about 700-800 MT/ Day. Door-to-door collection has recently been introduced in the city in the year 2008. The waste collected from across the

72 wards in Patna, as well as part of the waste collected from the adjoining three ULBs of Danapur, Phulwari and Khagaul is disposed at the open dumpsite in Bairia Village on Gaya Road. The said site at Bairia has an area of 77.5 acres and the land is in the possession of PMC.

The site is being used for open dumping for the last 2-4 years. As of now about 20-25% of the site area is covered with waste dumps of varying height. The site lacks necessary infrastructure such as an all-weather approach road, boundary wall, caretaker room, equipment for moving and compacting waste, leachate and surface water collection.

Situation before the initiative

Prior to 2008, there was no proper system of door-to-door collection, transportation or processing in the city. The residents/ establishments were expected to dispose the waste at designated community waste depots (CWD) located all across the city. PMC had installed mobile bins with wheels with a capacity of 1.1 cubic meters at the designated CWDs in varying numbers; however the numbers proved to be inadequate. As a result, in many areas, waste was disposed indiscriminately on road sides, outside the bins at the CWDs, into the drains on the sides of the roads, in nallas and other depressions/ low lying areas, etc. A team of 1200 street sweepers deployed by the PMC, picked up the indiscriminately disposed waste manually and brought it to the designated CWDs by trolley handcarts.

In selected areas of the city there were informal groups and NGOs providing door collection service, however the services were limited to few areas and were not able to reach a larger population. In the absence of formal systems for waste management, the informal waste pickers in the city played a key role in reducing waste loads by recovering reusable and recyclable material like paper, plastics, metals, etc. from the garbage.

The initiative: Solid Waste Management Program by Nidan

Nidan was formed in 1996 to work with the poor working in informal sectors. The fields of intervention of the organization include livelihood, food security and social dignity. Nidan helped establish self-help-groups amongst the urban poor and



Swachata Mitras employed by NSPL for door-to-door collection

supported these groups with micro finance and micro credit. Nidan facilitated the 'Chakachak Patna', initiative undertaken by the PMC in late 2002. The goal of the project was to demonstrate a sustainable system for solid waste collection and disposal by involving the waste picker community. The project was provided technical and financial support by the UNDP-Small Grants Program (SGP) to an amount of Rs.16.8 Lakh. An additional amount of Rs 8 Lakh was envisaged as co-financing by Nidan. Under the program, PMC and Nidan piloted a fully privatized model for door-to-door collection and street cleaning in 300 households in Patna. The model relied on collecting user fees from the community for providing these services. Several capacity building and knowledge sharing workshops for tourists, pilgrims, waste pickers, CBOs, NGOs and local community were also organized as part of the initiative.

After the success of the pilot, the SGP supported the formation of Nidan Swachhdhara Pvt. Ltd (NSPL), a solid waste management company established under the Company Act (1956) to provide livelihood security and improved quality of life to the waste-pickers in 2008. A professional workforce of sanitation workers - called Safai Mitras - was created from amongst the erstwhile waste pickers and sweepers and employed by NSPL.

NSPL signed a memorandum of understanding with the PMC to provide door to door garbage collection service in 5000

households in 2 wards. The door-to-door service was provided to households, restaurants and shops in these wards for a monthly fee of Rs. 20-30 per month, collected by NSPL and used towards salaries of the safai mitras. The PMC also supported NSPL with a seed amount of 3 Lakh to cover operational costs.

The workers segregated the waste into bio-degradable and non-degradable waste. The non-biodegradable, recyclable waste sold to scrap dealers or 'kabadi' market provided a source of revenue for the waste pickers involved in the collection. About 500 kg of dry waste was recycled every day. The bio-degradable kitchen waste was converted to organic manure by vermicomposting. Approximately 50 kg of manure was generated per day which was branded and supplied to market chains.

The service, earlier started in 5000 households in 2008 was scaled up to cover 63,000 households in the city in 2014, thus the model of privatized waste collection and management model has proved successful in the city. NSPL advocates sustainable waste management by ensuring that dry recycle waste and the organic waste is segregated at the source. The mainstreaming of waste pickers into the formal collection process is a key attribute of the model. NSPL provides salaries to all safai mitras involved in the collection process and also provides them with social security benefits such as health care, insurance and education through tie-ups with local hospitals and NGOs.

Stakeholders and Partners

PMC has provided active support to Nidan in its endeavour to provide solid waste management services in Patna. Other stakeholders such as the District Collector, Patna Regional Development Authority, Public Health Department, Water and Sewerage board, Tourism Department and State Pollution Control Board were also kept informed and involved in the planning stages.

Nidan has networked with many institutions and partners on the emerging technologies, skills and approaches. Over the last few years in partnership with UNDP GEF SGP, Nidan has made more than 25 presentations in various leading seminars and meetings.

The Program enroute has built many partnerships and has also got the support from many like-minded institutions such as banks (easy credits for the SHGs and links for opening all accounts), hospitals (quality medical services to the waste pickers and the staff of Nidan and partners), industry (providing management services and also support in terms of in kind contributions), insurance companies (need based insurance policies for the staff and safai mitras and also policy claims settlements for nearly Rs 200,000) and TATA motors (subsidized credit and provisions of 9 vehicles purchased by Nidan).

Key Outcomes

- The project started working with 50 households and scaled it up to 63,000 households and mobilized the residents into Community Based Organizations as Resident Welfare Associations (RWAs).
- The project started with 4 Safai Mitras and later through regular capacity building efforts, meetings and continued dialogues, institutionalized more than 332 local waste pickers into 11 small groups.
- The project promoted social security. More than 20,000 informal workers are currently insured in the city. 10 crèches are functioning and 300 women are linked to maternity scheme within the solid waste management program.
- The user fee established in 2003 at Rs. 20-30 per household was increased to Rs. 30-50 per household in 2011 when the project was scaled up to cover 63,000 households. The fee has further been increased to Rs. 70 per household indicating a willingness to pay among citizens for better services.
- The garbage management systems have led to reduction of nearly 43 MTs of landfill, thus saving methane release. 3 MT of garbage per month is being recycled by composting. Although, only 15% of the total waste collected by the NSPL,

which is nearly 29 MTs per month, is being recycled as the PMC has given two spots for composting.

- The NSPL is raising nearly Rs. 7000 per month from the sale of compost. It is also recycling paper through the paper plant and is raising nearly Rs. 4000 per month from the sale of paper.
- The NSPL has set up a retail outlet managed through the society - "ANGANAA", for the sale of products from the SGP project. It is also retailing products manufactured and managed through the SHGs and other partner institutions in the area.
- The NSPL has also procured plastic recycling machines, the training and capacity building of the waste pickers is being done for operations and maintenance. The waste pickers are segregating the entire waste and are nearly earning Rs. 7000-8000 per month per group through sale. This money is directly getting in the waste pickers society.

Sustainability and Transferability

NSPL's integrated approach of offering solid waste management services by involving the waste picker community has proved to be socially significant as well as financially sustainable. However, sustaining such models in the long term requires support of the local authorities as well as continued advocacy with citizens. Because of lack of willingness among citizens to pay the user fee and little financial support from PMC, the NSPL is currently providing door-to-door collection services to only 10,000 households for a user fee of Rs. 70 per month. NSPL still manages to collect a total of 15 MT of waste per month with a small fleet of vehicles and cooperation of safai mitras.

Involving waste pickers in the municipal solid waste management can prove to be a financially sustainable method of increasing door-to-door collection coverage in small to medium cities. With proper training and capacity building of waste pickers, cities can very quickly cultivate a strong workforce for garbage collection, transportation and disposal and also promote sustainable waste management practices such as source segregation, recycling and waste processing.

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GLOSSARY OF TERMS

(COMPILED FROM DEFINITIONS PROVIDED IN DRAFT MSW RULES, 2013)

- i. **"Anaerobic digestion"** means a controlled process involving microbial decomposition of organic matter in absence of oxygen.
- ii. **"Biodegradable substance"** means a substance that can be degraded by micro-organisms.
- iii. **"Biomethanation"** means a process which entails enzymatic decomposition of the organic matter by microbial action to produce methane rich biogas.
- iv. **"Buffer zone"** means a zone of no-development which shall be maintained around landfills, processing and disposal facilities of municipal solid waste.
- v. **"Central Pollution Control Board (CPCB)"** means the Central Pollution Control Board constituted under sub-section (1) of Section 3 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974).
- vi. **"Collection"** means lifting and removal of municipal solid waste from collection points or any other location.
- vii. **"Composting"** means a controlled process involving microbial decomposition of organic matter
- viii. **"Construction and demolition waste"** means the waste arising from building materials debris and rubble resulting from construction, Re-modeling, and repair and demolition operation.
- ix. **"Disposal"** means the disposal of municipal solid waste in terms of the specified measures to prevent contamination of ground-water, surface water, ambient air quality and source of bird attraction.
- x. **"Generator of waste"** means persons or establishments generating municipal solid waste.
- xi. **"Landfilling"** means the disposal of residual municipal solid waste on land in a facility designed with protective measures against pollution of ground water, surface water and air fugitive dust, wind-blown litter, bad odour, fire hazard, bird menace, pests or rodents, greenhouse gas emissions, slope instability and erosion.
- xii. **"Leachate"** means the liquid generated from municipal solid waste that seeps through solid waste or other medium and has extracts of dissolved or suspended material from it.
- xiii. **"Municipal authority"** means the Municipal Corporation, Municipality, Nagar Palika, Nagar Nigam, Nagar Panchayat, Municipal Council including notified area committee (NAC) or any other local body constituted under the Acts for time being in force and, where the management and handling of municipal solid waste is entrusted to such agency.
- xiv. **"Municipal solid waste"** includes the commercial and residential waste generated in a municipal or notified area in either solid or semi-solid form excluding industrial hazardous waste; e-waste and including treated bio-medical waste.
- xv. **"Municipal solid waste management"** means the collection, segregation, storage, transportation, processing and disposal of municipal solid waste, including reduction, re-use, recovery, recycling in a scientific and hygienic manner.
- xvi. **"Processing"** means the process by which municipal solid waste is transformed into new or recycled products.
- xvii. **"Recycling"** means the process of transforming segregated solid waste for producing new products.
- xviii. **"Segregation"** means to separate the municipal solid waste into the groups of organic, inorganic, recyclables, industrial hazardous waste and e-waste.
- xix. **"Storage"** means the temporary containment of municipal solid waste in a manner so as to prevent littering, attraction to vectors, stray animals and excessive foul odour.
- xx. **"Transportation"** means conveyance of municipal solid waste from place to place hygienically through specially designed transport system so as to prevent the foul odour, littering, unsightly conditions and accessibility to vectors.
- xxi. **"Treated bio-medical wastes"** means the wastes generated in hospitals and health care institutions which have been prescribed as treated under the Bio-medical Waste (Management and Handling) Rule1998, as amended time to time.
- xxii. **"Treatment"** means the method, technique or process, designed to modify physical, chemical or biological characteristics or composition of any waste so as to reduce its potential to cause harm.
- xxiii. **"Vermicomposting"** is a process of using earthworms for conversion of bio-degradable waste into compost.
- xxiv. **"Waste pickers"** mean the individuals or groups of individuals engaged in the collection of municipal solid waste.

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ANNEXURE

INVENTORY OF SWM PROJECTS

Category 1: Initiatives in value chain of municipal solid waste

Category 1A: Improvements in waste segregation, collection and transportation

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
1	Ahmedabad, Gujarat	Segregated collection from bulk waste generators	Planning by the ULB to achieve segregated waste collection	Contracting mechanisms and learning	Ahmedabad Municipal Corporation	ongoing
2	Amritsar, Punjab	Improved Collection and Transportation of Municipal Solid Waste through Public-Private Partnership in Amritsar	Public-Private-People Partnership		Municipal Corporation of Amritsar (MCA).	2006 onwards
3	Anand, Gujarat	Door-to-door waste collection	Outsourcing of waste collection to CBOs		Anand Municipality, sakhi mandals	2009 onwards
4	Delhi	Use of IT for improved monitoring of waste collection systems	Use of IT for improved monitoring	Planning for setting up the system and internal monitoring systems of the ULB	East Delhi Municipal Corporation	not known
5	Guntur, Andhra Pradesh	Community driven campaign on municipal solid waste management	Micro planning of the ULB and community participation	market tie ups, contracts etc.	Guntur Municipal Corporation and the community	not known
6	Himmatnagar, Gujarat	Towards bin free city	Planning by the ULB and strategies to become a bin-less city		Himmatnagar Municipality	2011 onwards
7	Hyderabad, Andhra Pradesh	Off-site real time monitoring system of SWM	OSRT system, systems based monitoring	Internal monitoring systems of GHMC; contracting of the solutions provider	Greater Hyderabad Municipal Corporation (GHMC), Private Sector-(Blue Frog Mobile Technologies Pvt. Ltd.)	not known
8	Khedbrahma, Gujarat	Segregated chain of waste management - from source to processing site	Planning by the ULB to achieve segregated waste collection	Community participation	Khedbrahma Municipality	2006 August
9	Mamallapuram, Tamil Nadu	Household level segregation of waste and decentralized treatment	Segregated waste collection, reduced use of plastic	Multi-stakeholder strategy	Mamallapuram Town Panchayat, NGO (Hand in Hand India)	2010 onwards

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
10	Nagpur, Maharashtra	Segregated door to door waste collection	Planning and setting systems for segregated waste collection	IEC/ enforcement	Nagpur Municipal Corporation, CDC	2005 onwards
11	Nagpur, Maharashtra	A fleet vigil approach to Live Vehicle Tracking	Use of IT for improved monitoring		Nagpur Municipal Corporation, CDC	not known
12	Namakkal, Tamil Nadu	Zero Garbage Town	Planning for becoming a zero waste city, community participation		Namakkal Municipality,	2003 onwards
13	Nashik, Maharashtra	Nashik-comprehensive planning to make the city into a bin-less city and segregated waste collection	Involvement of waste pickers for segregated waste collection	Contracting mechanism	Nashik Municipal Corporation	not known
14	Paravur, Kerala	Segregation of waste & utilizing organic waste into making compost.	Vermi-composting		Paravur Municipal Corporation	2004
15	Perur, Tamil Nadu	Incentive driven efforts in segregating household waste	Incentivizing waste segregation, awards to households		Perur town Panchayat	2013 onwards
16	Pimpri-Chinchwad, Maharashtra	Monitoring its SWM services through the use of ICT.	Use of IT for improved monitoring		Pimpri-Chinchwad Municipal Corporation	
17	Pithoragarh, Uttarakhand	A hilly town's initiative for efficient waste management			Pithoragarh Municipality	
18	Surat, Gujarat	Efficient door-to-door waste collection	ULB's plan to achieve high door to door collection		Surat Municipal Corporation	2008 - ongoing
19	Suryapet, Telangana	Bin-less waste collection	Micro planning of the ULB to make Suryapet a zero waste city	IEC	Suryapet Municipality, citizens	2003 onwards
20	Vadodara, Gujarat	GPS based tracking of vehicles in Vadodara Municipal Corporation	Use of IT for improved monitoring		Vadodara Municipal Corporation	2010 onwards
21	Visakhapatnam, Andhra Pradesh	Bin-less waste collection	Micro planning of the ULB to make Visakhapatnam a zero waste city	IEC	Greater Visakhapatnam Municipal Corporation	not known

Category 1B: Initiatives for waste recovery

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
1	Bargur Town, Tamil Nadu	Door to door collection of waste, composting of biodegradable waste by using panch kavyam	CBO/SHG based waste collection and treatment		Bargur town Panchayat, Om Shakti self-help group	2008
2	Bhavnagar, Gujarat	Decentralized composting of organic waste	Decentralized waste treatment of organic waste	Contracting mechanisms and roles and responsibilities of all involved stakeholders	Bhavnagar Municipal Corporation, Private Sector (Excel Industries)	2008 onwards
3	Chennai, Tamil Nadu	Bio-methanation plant based on vegetable market wastes at Koyambedu whole sale market complex	Decentralized bio-composting of vegetable waste		Corporation of Chennai, Central Leather Research Institute	2005 onwards
4	Coimbatore, Tamil Nadu	Recycling waste plastic bags	CBO/SHG based waste collection and reuse of plastic waste		Coimbatore Municipal Corporation	2013
5	Itanagar, Arunachal Pradesh	Composting of biodegradable waste from households	Setting up and operations of the bio-compost plant		Itanagar Municipal Corporation, Anderson Biotech Pvt. Ltd.	On going
6	Jodhpur, Rajasthan	Composting of City waste	Composting of waste	Contracting, operations of the site	Jodhpur Municipal Corporation	2006
7	Kodagu, Karnataka	Eco waste Recycling Unit	Reuse of waste, multi-stakeholder strategy		Centre for Environment Education	1999 - ongoing
8	Kunrathur town Panchayat, Tamil Nadu	Organic waste composting	Door to door segregated waste collection		Kunrathur town Panchayat, Hand-In-Hand and Seed Trust	2008
9	Mumbai, Maharashtra	Achieving zero waste societies and colonies and use of NISARGRUNA Biogas plant	Door to door segregated waste collection through waste pickers and setting up of decentralised composting plants		Stree Mukti Sanghatana, Municipal Corporation of Greater Mumbai, BARC	
10	Nashik, Maharashtra	Processing of solid waste in Nashik	Using technology for waste segregation		Nashik Municipal Corporation	2009

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
11	Pan -India	Use of Plastics in Road Construction	Reuse of plastics, the technology, operations and use by various states and ULBs			
12	Puri, Odisha	Solid Waste Management through Bio-Composting: Puri, Orissa;	Composting of waste	Contracting, operations of the site	Puri Municipality	2004 onwards
13	Raigarh, Jashpur & Ambikapur, Chhattisgarh	Decentralized Animal Waste Management practice through Vermi-composting	Vermi-composting		Chhattisgarh Tribal Development Program (CTDP)	2007
14	Rajkot, Gujarat	Waste processing plant through Public Private Partnership (PPP)	Action items undertaken by the ULB	Contracting mechanisms	Rajkot Municipal Corporation	ongoing

Category 1C: Initiatives in scientific waste disposal

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
1	Gujarat	Regional pooled municipal solid waste landfill systems and vermi-composting sites in ULBs	Pooled landfills, planning and operations		Gujarat Urban Development Company Ltd. (GUDC), ULBs, Urban Development Department, Govt. of Gujarat	
2	Gulbarga, Karnataka	Common Healthcare Waste Appropriate Management Plant	Reuse of waste, multi-stakeholder strategy		CEE, INEP	2004
3	Kolkata Metropolitan Area, West Bengal	Planning, implementation and operation of pooled landfill sites for a cluster of ULBs	Pooled landfills, planning and operations		Kolkata Municipal Corporation	2011
4	Mumbai, Maharashtra	Urban rejuvenation of Gorai dumping ground through successful closure of landfill	Landfill closure process, contracting		Municipal Corporation of Greater Mumbai	2005 - onwards
5	Ranchi, Jharkhand	Waste disposal by plasma technology	Technology for waste disposal		Jharkhand State Pollution Control Board (JSPCB)	Proposed
6	Srinagar , Jammu and Kashmir	Modernizing of an existing dumpsite into a scientific landfill site,			Srinagar Municipal Corporation, ADB, J&K Economic Reconstruction Agency	Ongoing
7	Thane, Maharashtra	PPP in processing of Bio-Medical Waste Treatment	Public-private participation		Thane Municipal Corporation	not known

Category 2: Planning, policy initiatives and enforcement

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
1	Ahmedabad, Gujarat	1. Preparation of Public Health Bye-Laws; 2. City Sanitation Plan; 3. SWM Master Plan for Zero-Waste City	Regulatory instruments and details of enforcing the bye-laws, planning and policy, integrated planning	Process of framing the bye-laws	Ahmedabad Municipal Corporation	2011-2014
2	Himachal Pradesh	Enabling environment for SWM through a) Notification of plastic ban in the state - no plastic wrapped products allowed in the state, b) Non-biodegradable waste rules 1998	State ban on plastic		Government of Himachal Pradesh, Dept. of Science, Technology and Environment	
3	Karnataka	State policy for SWM	Policy		KUIDFC	Not known
4	Mumbai, Maharashtra	Litter cops in Mumbai	Enforcing MCGM bye-laws	PPP	Municipal Corporation of Greater Mumbai	2009 onwards
5	Pune, Maharashtra	Initiatives to make a zero waste ward			Pune Municipal Corporation, SWaCH, NGO (KKPKP)	Not known
6	Surat, Gujarat	Enforcing cleanliness through rigorous fines and penalties				
7	Warangal	Clean city championship	Micro-planning for SWM		Warangal Municipal Corporation	2012

Category 3: Sustainability Initiatives

Sustainability of initiatives has been a key challenge for most efforts undertaken for SWM sector in the past. The challenges are due to various factors including human resource shortage, insufficient training and motivation of staff, delayed procurement of equipment and vehicles, poor enforcement of policies, poor

financial recovery, casual engagement of stakeholders, shifting priorities of ULBs amongst many others. Some initiatives which have sustained over a long period of time have been listed in the following categories. It is important to analyse the strengths and weaknesses of these cases in order to replicate it in other cities and activities in SWM.

Category 3A: Initiatives towards Information Education and Communication

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
1	Ahmedabad, Gujarat	IEC Campaign for generating awareness amongst citizens on compliance with AMC's SWM systems	IEC campaign		Ahmedabad Municipal Corporation, Urban Management Centre, CEPT University, other NGOs	ongoing
2	Bangalore, Karnataka	IEC Campaign for segregation of waste	IEC		BBMP	2012
3	Bareilly, Uttar Pradesh	Township waste management	IEC, community participation		IFFCO, CEE	2008
4	Bhubaneswar	Knowledge & Information Centre for MSW	IEC		Orissa Renewable Energy and Development Agency (OREDA), Housing and Urban Development (H&UD) Dept., Government of Orissa, CEE	2008
5	Chennai	IEC Campaign for community for improved SWM	IEC		Chennai Municipal Corporation	Ongoing
6	Hyderabad	Hussain Sagar lake and catchment area improvement	IEC		Hyderabad Metropolitan Development Authority	2008
7	Gangtok	IEC initiative	IEC		Gangtok Municipal Corporation	2014
8	Kihim	SWM project in Kihim	IEC		Kihim Gram Panchayat, Hindustan Construction Company Ltd., CEE	2008
9	Shillong	IEC campaign for community	IEC and training of SWM workers		Shillong Municipal Board	

Category 3B: Initiatives towards People-Public-Private Partnerships/ Community Participation

LIST OF IDENTIFIED BEST PRACTICES IN CATEGORY 3B (INITIATIVES TOWARDS PEOPLE-PUBLIC-PRIVATE PARTNERSHIPS/ COMMUNITY PARTICIPATION)

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
1	Agra, Uttar Pradesh	Involvement of community volunteers in door to door collection, composting of organic waste, in 1 km radius of Taj Mahal	Improved waste management around a heritage precinct	Multi-stakeholder strategy, capacity building	Agra Municipal Corporation, Indian Environmental Society	2011
2	Ahmedabad, Gujarat	Mainstreaming Waste pickers for door to door waste collection, Ramapir no Tekro	Involvement of NGOs and process of formalizing the role of waste pickers		Ahmedabad Municipal Corporation	2012-13
3	Bhopal, Madhya Pradesh	Local Action in Managing Plastic Waste	Involvement of waste pickers in plastic waste collection	Reuse and recycling of plastic waste	Sarthak Samudayik Vikas Evar Jan Kalyan Sanstha, Bhopal Municipal Corporation, Madhya Pradesh Pollution Control Board	2010-not known
4	Delhi	Safai Sena	Advocacy and Involvement of waste pickers in waste collection		Chintan NGO	2001 onwards
5	Dharampur, Gujarat	Improved waste management by creation of local CBOs	Outsourcing of waste collection to CBOs	Plastic ban	Dharampur Municipality and Sai Om Sakhi Mandal	2008 onwards
6	Jasdan, Gujarat	Improved waste collection through local community based organizations (CBOs)	Facilitating formation of CBOs for improved waste collection		Jasdan Municipality	2010
7	Kozhikode, Kerala	Efficient waste collection through women SHGs	Facilitating formation of women CBOs/ self-help groups	planning and strategies of the ULB	Kerala Pollution Control Board, Kozhikode municipal corporation	2004

S.No.	Location	Title of the practice	Primary emphasis	Secondary emphasis	Key Stakeholders	Time-Period
8	Latur, Maharashtra	Engaging waste pickers in collection and recovery of waste	Involvement of waste pickers in segregated waste collection	Multi-stakeholder strategy	Jan Adhar Sevabhavi Sanstha (J.A.S.), Plastic Manufacturers Association, Pune; Latur Municipal Corporation (LMC), Aarvi Gram Panchayat	2009-not known
9	Madurai, Tamil Nadu	Implementation of Solid Waste Management in Thideer Nagar Slum, Madurai, Tamil Nadu	CBO/SHG based waste collection and treatment	IEC, training, multi-stakeholder strategy	Madurai Municipal Corporation, CBOs	not known
10	Motihari, Bihar	Direct implementation of integrated solid waste management by private company where the households directly pay the company	Outsourcing of waste collection		Waste Ventures India	On going
11	Mumbai, Maharashtra	Slum Adoption Scheme			MCGM, CBOs	2001 onwards
12	Mumbai, Maharashtra	Local Area Citizen Groups - from ALM to LACG, case of Chembur	Community participation		MCGM, RWA CBOs	not known
13	Pammal, Tamil Nadu	Waste treatment process with community's involvement	CBO/SHG based waste collection and treatment	Multi-stakeholder strategy	Exnora Green Pammal,	1994-not known
14	Patna, Bihar	Strengthening roles of rag pickers	Community participation and involvement of waste pickers		Patna Municipal Corporation, SGP, CEE, UNDP	2008
15	Pune, Maharashtra	Mainstreaming Waste pickers in waste collection and handling	Formalizing role of waste pickers in waste collection strategy	A multi-stakeholder strategy	Pune Municipal Corporation, SWaCH, NGO (KKPKP)	2013
16	Surat, Gujarat	Involvement of Resident Welfare Association in door to door waste collection	Community participation		Surat Municipal Corporation	2005-ongoing



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Cities Alliance
Cities Without Slums

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