

# Surat, India

## City Waste Management Profile



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# 1. Introduction to Urban Ocean

Urban Ocean is a capacity-building and accelerator program for cities that champions circular economy principles, builds awareness of ocean plastic pollution, and assesses waste management systems. The program leverages city leaders to bring new ideas, partners, and resources together and solve interrelated resilience challenges related to: waste management; plastic leakage; and protecting water bodies and the ocean. The program demonstrates how actions to improve waste management and recycling can provide resilient and sustainable solutions that reduce ocean plastic pollution while addressing key city priorities, such as improving public health, supporting economic development, and reducing greenhouse gas emissions. Furthermore, Urban Ocean provides cities with the opportunity to demonstrate thematic leadership and share knowledge and experience across the Resilient Cities Network (R-Cities) community and beyond. The program is jointly led by R-Cities, Ocean Conservancy (OC), and The Circulate Initiative (TCI).

**FIGURE 1**  
Urban Ocean cities map



## Overview of the Urban Ocean challenge

Cities are home to over half of the global population and account for nearly three-quarters of global greenhouse gas (GHG) emissions (IPCC, 2021). No climate nor social target will be met without a deep transformation of urban centers towards a more inclusive, sustainable, and resilient path. Approaching urban waste management systems through a resilience lens reveals complex, interrelated ramifications for social, economic, and environmental indicators. In 2018, the International Labor Organization estimated that the waste management sector alone has the potential to create 45 million jobs globally by 2030 while reducing GHG emissions by 15 to 20%. Additionally, circular economies offer a USD 4.5 trillion economic opportunity by reducing waste, stimulating innovation, and creating employment by 2030 (WRI, 2021). Currently, plastic usage is growing and continues to be a threat to public and environmental health in the ocean and in cities. A huge opportunity exists for city governments to implement policies and projects that promote a more resilient and circular waste sector in their cities. Now is the time to set out on the path towards a more resilient urban–ocean relationship that highlights the importance of preventing marine plastic debris.

## Program objective

The Urban Ocean program aims to collaborate with urban leaders to gather new ideas, partners, and resources to address interconnected challenges related to resilience in waste management, reduce plastic leakage and protect water bodies and the ocean. Urban Ocean provides a platform for ocean advocates and urban leaders to join forces in developing comprehensive solutions that meet the needs and priorities of governments, cities, communities, and other stakeholders to create real and lasting impacts.

## Cohort Two Cities

Urban Ocean works closely with cities to demonstrate tangible solutions and highlight progress in addressing waste management challenges. The first cohort of Urban Ocean cities included Pune (India), Can Tho (Vietnam), Panama City (Panama), Semarang (Indonesia) and Melaka (Malaysia).

The work further expanded to four additional cities in Cohort 2 – Chennai, Surat and Mumbai (all India) and Santiago (Chile) – to expand the geographic scope of the program, expand the waste management, circular economy and resilience ecosystem, increase collaboration with local governments and establish effective waste management systems that generate environmental, social and economic co-benefits to cities.

## Methodology

This report summarizes the information collected to develop a resilience-oriented analysis of the urban waste management system in Surat. The profile was conducted in collaboration with the Surat Municipal Corporation, R-Cities, Ocean Conservancy, The Circulate Initiative, and Centre for Environment Education. The analysis involved desk research, a collaborative workshop with city stakeholders, and interviews. The following table presents the key stakeholders who were interviewed as part of the development of this profile.

**TABLE 1**  
Interviewed stakeholders



**Government/ public sector agencies**

Surat Municipal Corporation

Sura Municipal School Board

Urban Health and Climate Resilience  
Center of Excellence (UHCRCCE)  
Surat



**NGOs**

Innovate4India

Resilience Strata Research and Action  
Forum

World Resources Institute, India

Project Surat

Nature Club Surat



**Private sector**

En-Vision Enviro Technologies Pvt. Ltd.

Mahavir Eco Projects Pvt. Ltd.



**Waste service providers**

Ecovision Environmental Resources  
LLP

Nirmal Vasundhara Pvt. Ltd.

PadCare



**Civil Society**

Ramkrishna Samvedna Trust

Team Prayas Environment

Navsarjan Trust



**Academia**

Sardar Vallabhbhai National Institute of  
Technology, Surat (SVNIT)



## 2. About the City Waste Management Profile

As part of Urban Ocean, cities create a City Waste Management Profile, in which a city's waste management systems are presented, including technical and sustainability aspects, and formal and informal actors in the system. The City Waste Management Profile ("the Profile") examines major disturbances and stresses prevalent in the city that impact the city's waste management system. It brings together preexisting data and information collected in the initial phases of the program to allow the city to assess the risks and vulnerabilities of the system, as well as support project design.

The Profile seeks to provide insight for the city to better plan and identify appropriate solutions to increase the resilience of their waste management system, reduce plastic leakage into the environment, and improve the city's ability to respond to, adapt to or otherwise address current and future shocks and stresses. It summarizes the baseline assessment conducted in all cities in the Urban Ocean program and highlights the most relevant data and information to address urban resilience, ocean conservation, and plastic pollution.

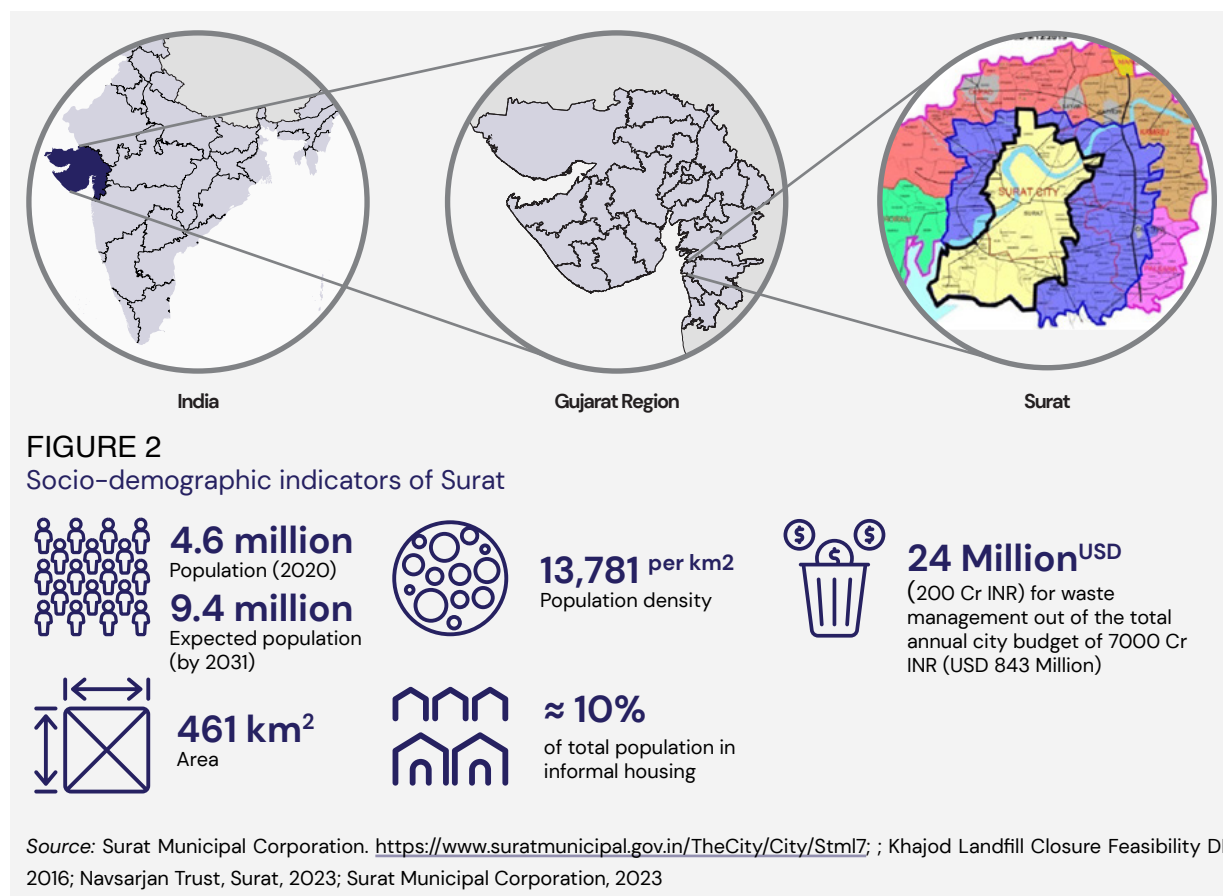
The Profile encourages a more holistic approach to existing challenges and supports cities in the development of individual solutions suited to their specific history, economy, demographics and culture while being aligned with the city's unique institutional, environmental, and financial resources. An added benefit of being part of Urban Ocean is how cities can learn from each other by comparing common elements in their respective Profile.



# 3. Overview of Surat and its resilience journey

Surat City, located in Gujarat, India, is the eighth largest in the country in terms of population with over six million residents. Surat has seen unprecedented growth in the last four decades, recording one of the highest growth rates in the country and a 10-fold population rise. It ranks as the eighth-largest city in the country (Census, 2011). As per the Mayor's foundation report, Surat is the fourth fastest growing city globally, with a decadal growth of 55 to 60% in the last four decades.<sup>1</sup> Coupled with this, a spillover of the population into the peripheral areas has also been observed. From time to time, the jurisdictional limits of the Surat Municipal Corporation (SMC) have been extended to include such growth and the city area now extends to just over 461 sq. km.

Surat is recognized as the economic capital of Gujarat. It has a significant contribution to the diamond industry, as 9 out of 10 diamonds in the world are cut and polished there. Surat is also a major hub to produce synthetic fabric and



<sup>1</sup> Resilient Surat (2017). Surat Resilience Strategy. [https://resilientcitiesnetwork.org/downloadable\\_resources/Network/Surat-Resilience-Strategy-English.pdf](https://resilientcitiesnetwork.org/downloadable_resources/Network/Surat-Resilience-Strategy-English.pdf)



fiber, accounting for 40% and 28% of the nation's total, respectively. The city has practically zero unemployment as jobs are easier to secure due to the very fast development of various industries in and around Surat City.<sup>2</sup>

## The city's connection with the waterbodies

Surat is located on the mouth of the river Tapi on as it empties into the Gulf of Khambhat and the Arabian Sea. Surat also forms a large part of the watershed of a smaller river, the Mindhola, which originates near Doswada (Songadh) and meets the Arabian sea. The city also has a number of creeks ('khadis' in Gujarati).

Surat has several water bodies, including lakes, ponds, and canals, which are important for the city's water supply and irrigation needs. However, these water bodies are also facing several challenges, including pollution from industrial and domestic sources. At present, the main source of water for the entire city is the river Tapi. The river's water quality is deteriorating— anthropogenic activities and development along the riverside contribute to large-scale pollution of the river's water.

High tides in the monsoons often inundate habitations along the creeks. The floodplain zone of the Tapi has seen an increase in population and density.<sup>3</sup> With an average

**FIGURE 3**  
Tapi river flowing through the city



**FIGURE 4**  
Flood affected citizens in Surat



Source: TARU India

<sup>2</sup> Surat Municipal Corporation (2023) Surat Municipal Corporation Website, accessed June 2023. <https://www.suratmunicipal.gov.in/TheCity/AboutCity#:~:text=Surat%20has%20practically%20zero%20percent,in%20and%20around%20Surat%20City.>

<sup>3</sup> Bansal, N (2018). Industrial Development and Challenges of Water Pollution in Coastal Areas: The Case of Surat, India. [https://www.researchgate.net/publication/323674256\\_Industrial\\_Development\\_and\\_Challenges\\_of\\_Water\\_Pollution\\_in\\_Coastal\\_Areas\\_The\\_Case\\_of\\_Surat\\_India](https://www.researchgate.net/publication/323674256_Industrial_Development_and_Challenges_of_Water_Pollution_in_Coastal_Areas_The_Case_of_Surat_India)

elevation of 13 meters, Surat is vulnerable to floods. In recent years, the city has seen two major river floods and a creek flood. In August 2006, the city of Surat suffered devastating floods after three consecutive days of rain. Then, an emergency release of water from the upstream Ukai Dam into the Tapi River inundated nearly 80 per cent of the city, leaving two million of its residents trapped in their homes without food or drinking water.<sup>4</sup> The episode was the latest in a series that highlights Surat's geographical vulnerabilities.

## Key shocks and stresses impacting waste management

Surat faces shocks like extreme rainfall, flooding and heat waves. With a rapid increase in population from migration due to increasing industries in the city, the city has witnessed massive urban growth in the recent decades with a lack of focus on the environment and natural resources. This rapid growth coupled with improvement in lifestyles, changing consumption and material use patterns reducing materials recovery has led to stressed waste management systems in the city. Even with solid waste management infrastructure and systems in place, these shocks and stresses affect the city's solid waste management. This has also caused the waterbodies to be vulnerable to pollution due to the illegal dumping of solid waste and sewage.

Eventually, stressed waste management systems cause dumps, unsanitary conditions, waste burning and consequent air pollution, loss of materials that could have been recycled, increased cost of transportation of mixed, difficult-to-recycle waste material, GHG emissions from the landfill, and leakage of plastics and other pollutants into the ocean.




## Building resilience through waste management

Waste management needs to be tackled in an integrated manner with an objective of: reducing waste; segregation of waste for maximizing recovery and managing the existing waste efficiently to reduce leakage in water bodies; promoting sustainable innovations; and impacting livelihoods. Actions towards improved waste management can provide resilient and sustainable solutions that reduce waste pollution and address key stresses in the city, such as improving public health, supporting livelihood and economic development, and reducing environmental degradation in the city.

Surat was the first city in India to prepare a resilience strategy, in April 2017. The Surat Resilience Strategy, 2017 identified that Solid Waste Management (SWM) needs to be decentralized in the city to reduce the load on dumping sites, which are big emitters of greenhouse gases. Its recommendations included:

**FIGURE 5**  
Key shocks and stresses in the city

### SHOCKS

-  Extreme rainfall
-  Flooding
-  Heat waves

### STRESSES

-  Urban growth
-  River pollution
-  Solid waste management
-  Air quality
-  Insufficient regulations and low law enforcement
-  Saltwater intrusion
-  Lack of risk awareness (Sensitivity of the citizens towards the environment)

<sup>4</sup> Centre for Livable Cities (2015) Improving Surat's Flood Resilience. <https://www.clc.gov.sg/docs/default-source/urban-solutions/urb-sol-iss-7-pdfs/case-study-improving-surat-s-flood-resilience.pdfv>

- Innovative measures to create awareness among citizens to not litter;
- Check waste being disposed of in the river during festivals;
- Conduct awareness drives on waste segregation;
- Organize street plays on SWM practices; and
- Implement pilot projects in public buildings or institutions to showcase the ease of SWM and treatment at the community level.

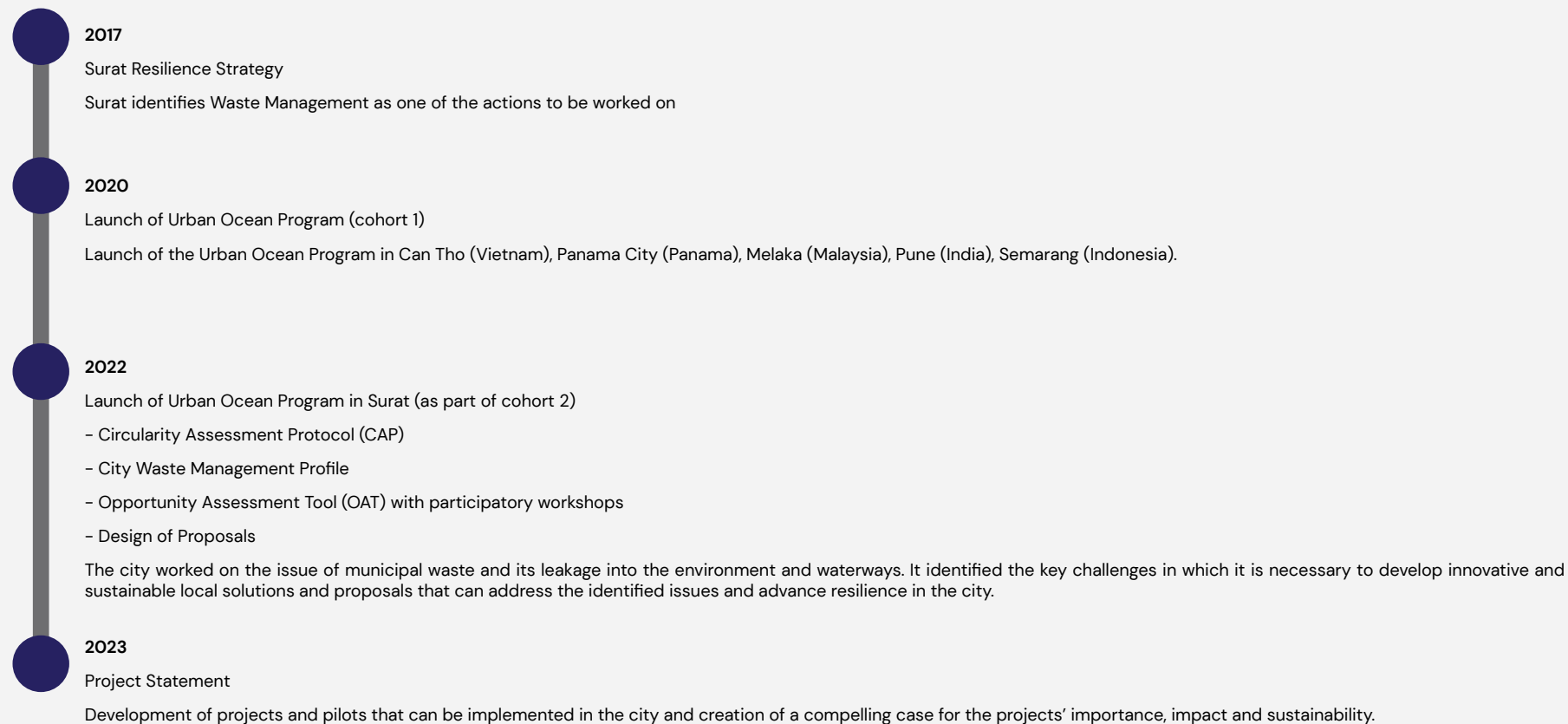
The Urban Ocean program aims to further develop these actions based on rigorous research and stakeholder engagement, define opportunity areas in the city and develop pilot ideas ready to implement. Urban Ocean partners – Resilient Cities Network, Ocean Conservancy, and The Circulate Initiative – will work with Surat Municipal Corporation and Centre for Environment Education in the city to implement the program and collaborate with other relevant local stakeholders and partners.

FIGURE 6  
Surat Municipal Corporation with zones





## Timeline of the Urban Ocean Program in Surat:



# 4. Legal, Policy and Governance

## National and local regulations and guidelines

The management of waste in Surat is governed by a series of rules, regulations and guidelines, monitored by agencies at the National, State and the Local level as below:

	STAKEHOLDER	ROLES AND RESPONSIBILITIES
National level	Ministry of Housing and Urban Affairs  Ministry of Environment, Forests and Climate Change	<p><b>Solid Waste Management Rules, 2016</b></p> <p>The Ministry of Environment, Forests and Climate Change introduced the Solid Waste Management Rules in 2016, which focus on the management of solid waste in urban areas. The rules outline various objectives including identifying suitable sites for waste processing and landfill facilities, enforcing waste segregation at the source, implementing the door-to-door collection of segregated waste, managing construction and demolition waste separately, establishing waste processing facilities and sanitary landfills, and undertaking bioremediation or capping of old dump sites. The implementation of these rules has specific timelines ranging from one to five years, depending on the task at hand. Broadly, the rules aim to improve solid waste management practices across the country and promote sustainable waste disposal methods.<sup>5</sup></p> <p><b>The Swachh Bharat Mission (SBM):</b></p> <p>SBM is a national initiative launched by the Government of India to improve cleanliness and sanitation in cities across the country. The mission covers over 4,000 cities and towns and aims to provide sanitation facilities, including toilets, waste disposal systems, and clean drinking water, to all households. The primary objectives of SBM are to enhance the quality of life in both rural and urban areas, increase sanitation coverage, and implement effective solid waste management practices. The mission also focuses on addressing challenges such as inadequate waste segregation, lack of community awareness about waste management, and the burning of municipal solid waste in various areas.</p>

<sup>5</sup> Ministry of Environment, Forest and Climate Change, Government of India (2016) Solid Waste Management Rules. [https://hspcb.gov.in/content/laws/msw/MSW\\_Rules.pdf](https://hspcb.gov.in/content/laws/msw/MSW_Rules.pdf)



### Plastic Waste Management Rules 2016

The Government of India implemented the Plastic Waste Management Rules in 2016, which placed the responsibility of managing plastic waste on local bodies (cities). These bodies were tasked with establishing infrastructure for segregating, collecting, processing, and disposing of plastic waste. The rules also introduced the concept of Extended Producer Responsibility (EPR), making product manufacturers responsible for collecting and processing their products throughout their life cycles.

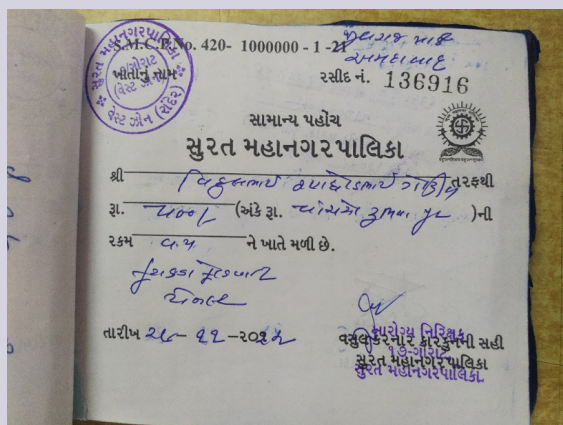
To combat environmental pollution, single-use plastic was banned. As alternatives, products made from coconut shells, like cups, tumblers, and bowls, were promoted, along with cloth bags for carrying groceries and other items.

However, several challenges are associated with plastic waste management. These include the need to set up material recovery facilities at a decentralized level, collect and segregate plastic waste at the household level, and address the toxic effects of plastic through recycling.<sup>6</sup>

<b>City level</b>	Surat Municipal Corporation	<p>Surat has Public Health Bylaws and General Board Resolution No. 1030/2016, dated November 29, 2016, in accordance with the SWM Rules 2016 published at the national level. The bylaws state the roles and responsibilities of the city and waste generators. Including segregation, handling, storage, collection processing and disposal of waste. They also mandate payment of a user fee for all users of SWM services.</p> <p>Along these lines, SMC has issued several local notices, circulars and resolutions related to solid waste management including notification to promote source segregation and onsite treatment of organic waste and notification and enforcement of ban on the use, sale and storage of non-biodegradable plastics bags/plastic products of less than 50 microns thickness, in compliance with the Plastic Waste Management Rules 2016.</p> <p>The bylaws also specify various offences and corresponding penalties for non-compliance. For instance, under offence 60.1 (5), manufacturing plastic without adhering to the prescribed conditions can result in fines ranging from INR 150 to INR 500 (USD 2 – 7) and administrative charges between INR 5,000 and INR 50,000 (USD 60 – 600), depending on the quantity of plastic produced. Similarly, offences related to wholesale distribution, retail sale, and improper handling/sale/ trade/processing of banned plastic also incur fines and charges based on the quantity and type of violation. It is important to note that the rules have been amended over time and, as of 2021, a ban on plastic carrier bags above certain thicknesses has been implemented. Furthermore, the implementation of a ban on single-use plastics and the adoption of Extended Producer Responsibility (EPR) are also underway within the city limits, as per General Board Resolution No. 17/2021, dated March 30, 2021.</p>
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<sup>6</sup> Ministry of Environment, Forest and Climate Change, Government of India. (2016). Plastic Waste Management Rules <https://cpcb.nic.in/rules-4/>

Various offences and the corresponding penalties are applicable for each violation. Offences range from creating public nuisances such as spitting, urinating, and feeding animals or birds, to open defecation and open burning of waste. Violators can face compromise fees, administrative charges, and fines depending on the offence committed. The penalties vary for different categories of offenders, including individuals, contractors/agencies, and owners of animals. The summary also highlights the consequences of non-segregation of solid waste and improper storage of waste in non-designated locations. The penalties differ based on the type of property, be it residential, commercial/institutional, industrial, or others. These rules and penalties aim to ensure proper waste management practices, maintain public health, and promote cleanliness within the specified zones.

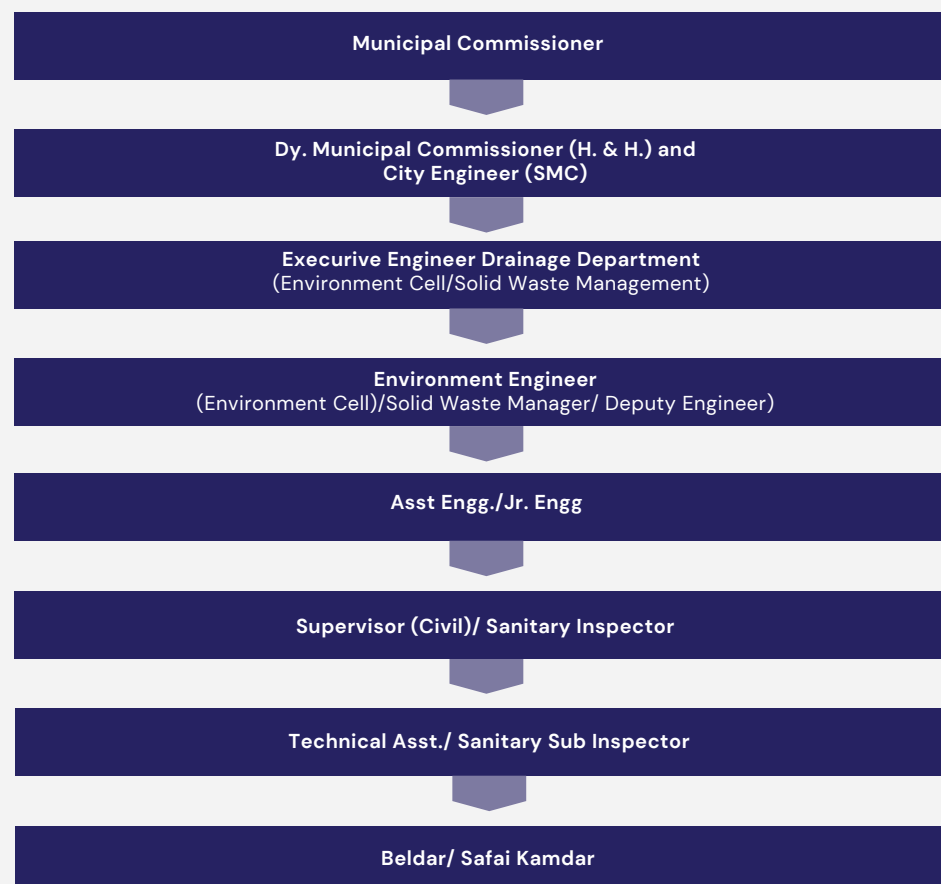


## Governance structure in the city

The organization chart of the Solid Waste Management Department in Surat City is shown in the image below. The city is led by the Municipal Commissioner who oversees all the departments in Surat Municipal Corporations. The second in line after the commissioner is the Deputy (Dy.) Municipal Commissioner and the City Engineer from the Surat Municipal Corporation. The Dy. Municipal Commissioner, Health and Hospitals (H. & H.) is the decision maker for programs and projects related to waste management in the city. Below them is the Executive Engineer, who oversees technical aspects and operations of the Drainage, Environment and Solid Waste Management department. The Environment Engineer, Solid Waste Manager, and Deputy Engineer are responsible for the day-to-day operations of waste management in the city. They are supported by Assistant Engineers (Asst. Engg.) and Junior Engineers (Jr. Engg.) who assist in the implementation of waste management systems. The Civil Supervisor and Sanitary Inspector play a role in supervising and monitoring waste management activities on the ground. Technical Assistants (Asst.) and Sanitary Sub-Inspectors assist with daily operations. Finally, the Beldar and Safai Kamdar (sanitation workers) carry out the manual labor involved in waste collection and disposal. Overall, this hierarchical structure ensures a clear chain of command and coordination within the Solid Waste Management Department of Surat City.

FIGURE 7

Governance Structure of Waste Management in the city



Source: Surat Municipal Corporation, 2023

## Existing Waste Management Projects

SMC has the following projects already planned for waste management projects in the city.

- A centralized waste processing plant of 2,000 TPD capacity under a public-private partnership (PPP) arrangement with resources from the 15th Finance Commission<sup>7</sup>.
- Bio-methanation and incineration plant for collection, treatment and processing of food waste and collection of dead animals, within Surat city limits, and operation and maintenance of the plant.
- Design, engineering, financing, construction, operation and maintenance including transportation for fifteen years of a plant of 100 TPD capacity to process wet waste and convert it to compressed biogas in Surat under Swachh Bharat Mission.
- Expressions of Interest for the establishment, operation and maintenance of decentralized organic waste plants (100 kg to 5 TPD) in Surat under Corporate Social Responsibility (CSR)/ Corporate Environment Responsibility (CER) funding.
- Installation of thirty Reverse Vending Machines for plastic bottles at various locations in Surat City

with service support for three years under CER funding from Dream City.

- Development of a new waste management park including a centralized waste processing plant, and a sanitary landfill cell.
- Procurement of e-vehicles and equipment for door-to-door collection of waste.
- Closure of Khajod landfill site in view of other land uses and commercial developmental projects proposed in this region like the DREAM city and Surat Diamond Bourse.
- Identification of new landfill sites at four locations (Umber, Vankaneda, Kamrej and Olpad) earmarked as sites for refuse disposal in the development plan, ascertaining their suitability as MSW disposal sites, and initiating processes for developing a scientific landfill at Umber village.
- Refill services from a private company, Refillable, to reduce plastic waste from packaging of products.
- 1,200 TPD Waste-to-energy plant as per the Gujarat Waste to Energy Policy – work order issued to M/s. Abellon Clean Energy Pvt. Ltd. The plant will be developed at Bamroli area in Surat by 2024.<sup>8</sup> Two waste-to-energy plants (1,000 TPD and 600 TPD capacity) are proposed by RGE Pvt. Limited

and SMC, for which SMC has allocated space at Khajod landfill site to utilize the legacy waste which has suitable calorific value; however, as the power tariff for such a project has not been finalized by the Gujarat Electricity Regulatory Commission, the project is delayed. It is important to note that waste-to-energy plants have negative consequences because of associated GHG emissions and no reuse and recovery of plastics for recycling. Urban Ocean partners recognize the need for implementable and circular solutions in Surat that hold plastics producers accountable for the full lifecycle of their products, cease the leakage of plastics into the environment, and incentivize reuse.

It is interesting to note that most of the projects planned address waste issues post-collection. Surat has also undertaken several awareness drives for reduce, reuse, recycling of waste, especially under the Swachh Bharat Mission. Sustaining these efforts through effective local collaborations will help the city advance its goals of decentralizing waste management systems, reducing the waste going to landfills and achieving sustainable waste management in the city.

<sup>7</sup> The Finance Commission (FC) is a constitutional body for the purpose of allocation of certain revenue resources between the Union and the State Governments. It was established under Article 280 of the Indian Constitution by the Indian President. It was created to define the financial relations between the Centre and the states. FCs are formed every 5 years in India and 15 such FCs have been formed so far. States receive grants under the FCs which are allocated to the cities for several municipal functions and development works. The Union Government has recently constituted the 16th FC in 2024.

<sup>8</sup> Surat SWM Disclosure by SMC on 01/05/2021 <https://www.suratmunicipal.gov.in/Content/Documents/rtiact/Disclosure/Solid%20Waste%20Management/main.pdf>

# 5. Waste Management in the City

## Overview of City's Waste Management System

Surat has been recognized as a model city for waste management in India, being ranked first nationally, classified as a 5-Star Garbage Free City<sup>9</sup> and Open Defecation Free ++ City<sup>10</sup> in Swachh Sarvekshan 2023 under the Swachh Bharat Mission. These are annual rankings awarded to cities to assess their progress while encouraging them to move towards a better rating thereby improving their cities' overall cleanliness, set by the Government of India. The total waste generation in the city is approximately 2,200–2,800 tons per day (TPD).<sup>11</sup> The city has implemented a comprehensive waste management system that includes initiatives for source segregation, door-to-door collection, transportation, treatment, and disposal.

Source segregation of waste is being practiced in some areas of the city through persistent efforts by city officials and local NGOs, though this still largely remains a challenge. This is also noted in the Surat Urban Ocean Circularity Assessment Protocol (CAP) Report, a key baseline assessment of litter and circularity within the city conducted as part of the Urban Ocean program, where stakeholders highlighted a gap in source segregation. Waste collection coverage is high at more than 95% and covers all zones of the city. Most of these zones have a designated transfer station/material recovery facility where the waste is further sorted and recovered. The remaining waste is generally transported to the final landfill site at Khajod. The site is reaching maximum capacity, and the city has identified a new landfill site and is currently in the process of approvals from the Pollution Control Board.

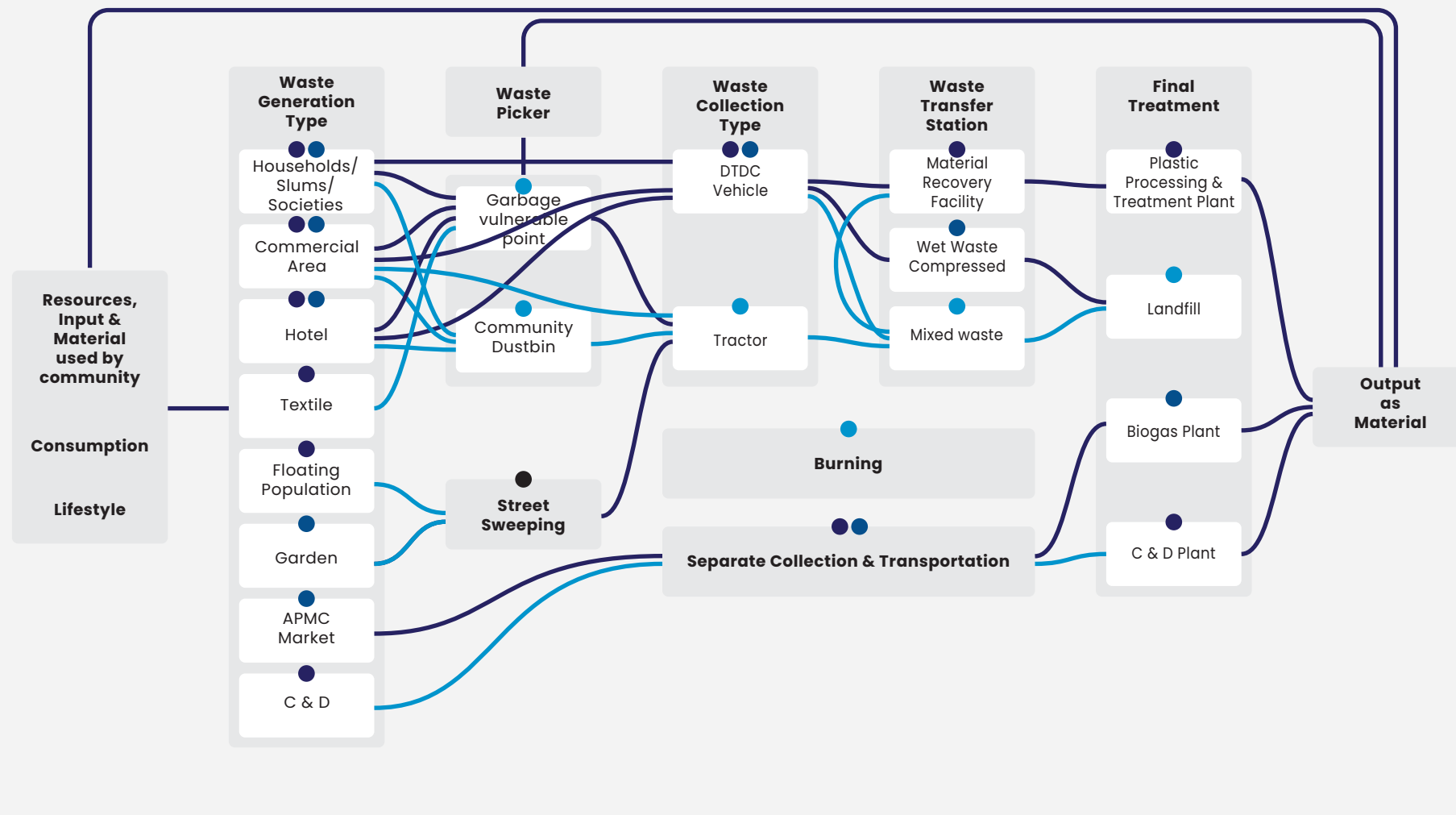
<sup>9</sup> Star rating of Garbage free cities is given to cities as per defined parameters across the solid waste management spectrum and has been designed to both help cities assess their progress while encouraging them to move towards a better rating thereby improving their cities' overall cleanliness and aesthetics, set by the Ministry of Housing and Urban Affairs, Government of India - <https://cpheeo.gov.in/upload/5abcd6c7e3bc8ProtocolforStarRatingofGarbageFreeCities.pdf>

<sup>10</sup> ODF++ declaration is made by cities as per the protocol by Ministry of Housing and Urban Affairs, Government of India, for Open Defecation Free (ODF) cities which includes sustainability aspects including improved access to individual toilets, community and public toilet maintenance, functionality and liquid waste / faecal sludge and septage management - <http://swachhbharaturban.gov.in/writereaddata/SBMODFBook24May20.pdf?id=13j48tn4c0wzu2zr>

<sup>11</sup> ICLEI (2022). Understanding and Strengthening Plastic Waste Management Systems in Jambi and Surat. <https://southasia.iclei.org/news/understanding-and-strengthening-plastic-waste-management-systems-in-jambi-and-surat/>



**FIGURE 8**  
The main sources of waste generation



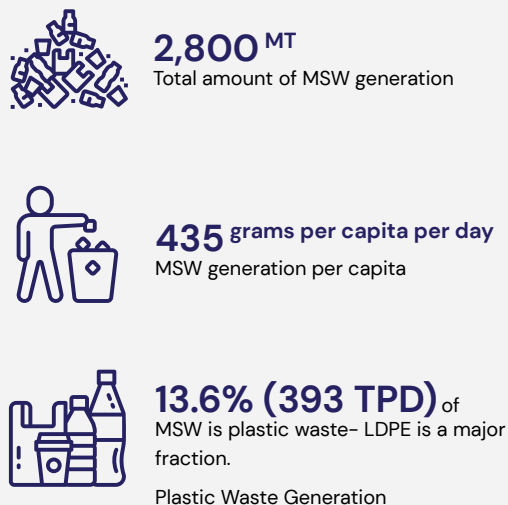
## Waste generation and characterization

The largest proportion of Surat City waste comprises biodegradable waste like food waste and vegetable market waste. Other notable sources of waste include: general recyclable waste, which makes up 11 to 34%; construction and demolition (C&D) waste, which makes up 12 to 17% of waste; and cloth, textiles, and fabric which make up 8 to 11% of waste in the city.

According to a study by ICLEI (2022), organic waste accounts for the largest portion of waste generated, at 1,723 tons per day or 60% of the total. Plastic waste accounts for the second largest portion of waste generated, at 393 tons per day or 14%. Metal waste and glass waste account for relatively smaller portions of waste generated, with 10.4 tons and 10 tons per day, respectively. Paper waste accounts for 215 tons per day or 8% of the waste generated. The remaining waste, approximately 15%, is categorized as "Other".<sup>12</sup>

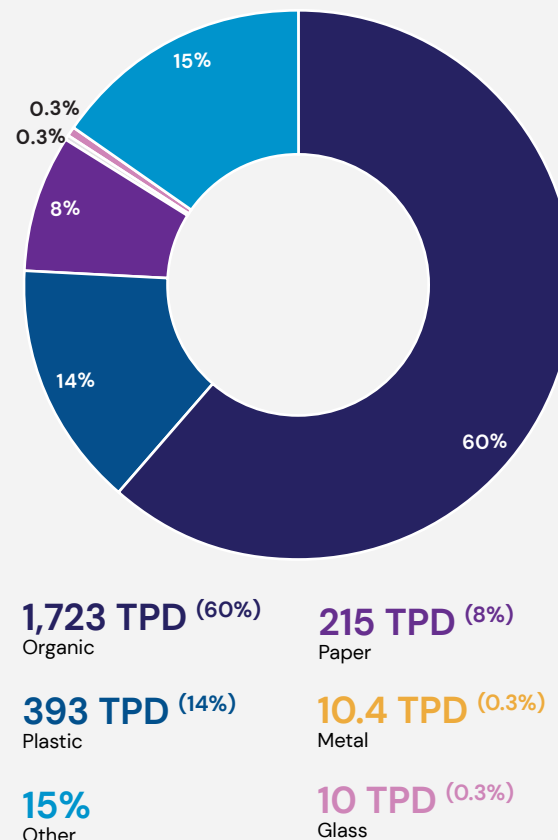
<sup>12</sup> ICLEI (2022). Developing Plastic Waste Free Cities, Baseline Assessment for Surat Municipal Corporation <https://southasia.iclei.org/project/alliance-to-end-plastic-waste-2/>

FIGURE 10  
The main sources of waste generation



Source: ICLEI (April 2022). Developing Plastic Waste Free Cities, Baseline Assessment, SMC.

FIGURE 9  
Waste composition

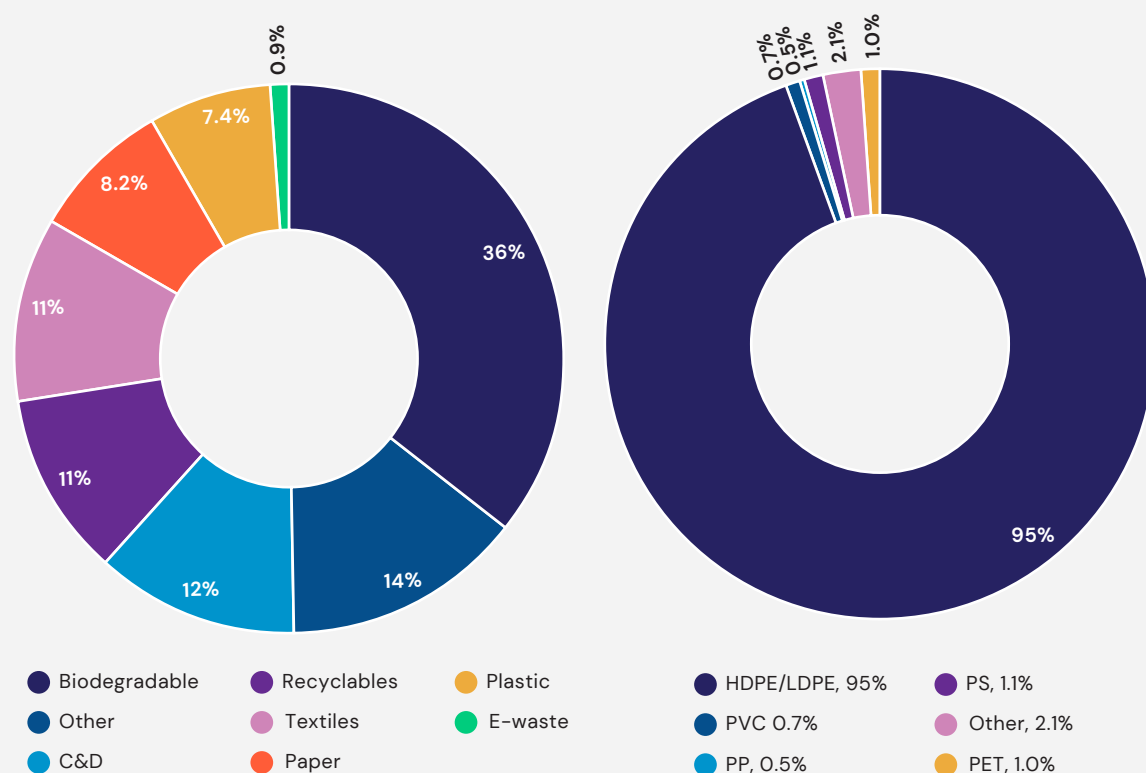


Source: ICLEI (2022) Developing Plastic Waste Free Cities, Baseline Assessment SMC.



FIGURE 11

MSW characterization (left adapted from Suryavanshi, Ahammed, Plastic waste composition in Surat; (right adapted from CPCB )



## Waste collection and transportation

A notable aspect of Surat's waste management system is the well-organized collection and transportation system, which ensures timely and systematic waste removal from residential and commercial areas.

**Door-to-door waste collection** was first introduced in 2004. The city has achieved considerable coverage in door-to-door garbage collection, which now stands at 95%. A smart monitoring system has been set up to enable real-time tracking and efficient management.

The collection system covers over 1.4 million households, covering the municipal corporation area and including villages and towns that have been incorporated within the corporation limits. This primary collection is carried out with 575 dedicated vehicles.

The city has adopted a payment mechanism where the contractors for waste collection are compensated based on the weight of the solid waste brought to the transfer station. Though this mechanism has been effective at increasing waste collection coverage in the city, it also incentivizes more waste collection from households to be transported to the transfer station.

About 6,500 workers are involved in roads cleaning and scraping brushing and street sweeping. Main roads, commercial areas, and public spaces are swept in the evenings. Bridges, flyovers, and Bus Rapid Transit System routes are swept at night by about 1,690 workers and 22 mechanical sweeper machines.

### Underground bins under Smart City Mission

Under the Smart City Mission, Surat Municipal Corporation piloted 43 smart underground dustbins in the city with an automated emptying mechanism. Each bin can hold up to 150 kg of waste and is fitted with sensors that indicate the control room as they get full.

### Waste processing and disposal

Surat's solid waste processing system includes bulk waste processing facilities and material recovery facilities, where some proportion of the waste is sorted and processed for recycling and reuse. Bulk quantities of hazardous and medical waste are handled at specialized waste processing units. Surat has established centralized waste processing centers that utilize techniques for waste treatment and energy recovery. However, it is to be noted that currently the system is primarily oriented towards collection and transport of waste, and retrieval of materials at bulk processing facilities, rather than neighborhood level or smaller scale facilities.

Waste received through closed vehicles is directly deposited into closed containers without requiring any additional handling or exposure. This streamlined process minimizes the risk of contamination and promotes a more effective waste transfer and transport system. However, the primary waste collection at the household level still includes handling of waste by helpers on the vehicles.

**FIGURE 13**  
Waste collection from households



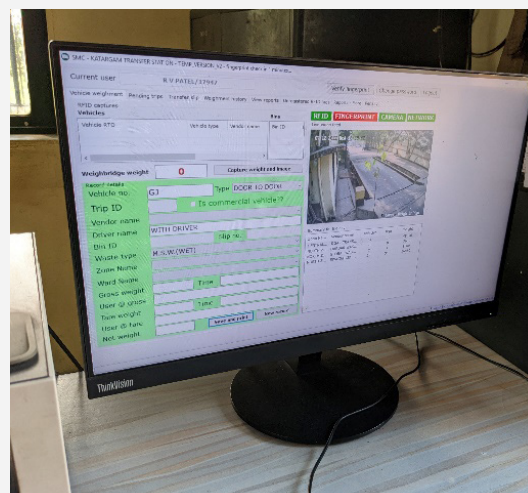
**FIGURE 12**  
Underground bins in Surat



Source: ThebetterIndia.com



**FIGURE 14**  
Transportation of waste to processing facilities



SMC established Material Recovery Facilities (MRFs) at all the Secondary Refusal Transfer Stations in September 2018, to efficiently manage waste collection and disposal. Currently, there are eight operational MRFs, with three of them equipped with mechanized facilities. These centers are estimated to help recover about 180 tons of recyclable materials per day. Some MRFs have adequate space to store and sort recyclables, and conveyor belts to retrieve recyclables, while space management and working conditions at some MRFs have scope for improvement.

These stations serve as crucial hubs where all types of waste, including from door-to-door collection, container lifting, and sweeping activities, are consolidated. Upon reaching these transfer stations, the waste is then loaded onto secondary transportation vehicles specifically designated for transferring it to the final disposal site.

#### Organic waste management

An organic waste processing plant with a capacity of 1 TPD has been started at Anjana transfer station. Letters of Intent have been awarded for seven mobile processing vans. MobiTrash, a private waste collection and processing service for organic waste has started their operation in Surat City with one van. A policy regarding installation of Organic Waste Converters (electrical) (OWC) units in residential complexes has been formulated by SMC vide Std. Comm. Res. No.

2050/2016, dt. 22/12/2016. At least 43 such OWC units have been installed at several vegetable and meat markets. Home composting at individual household level has also been promoted.

#### C&D waste management

A public-private partnership initiative with a Special Purpose Vehicle<sup>19</sup> named Surat Precast Green Pvt. Ltd. has been set up with a 20-year concession period for a 100 TPD plant for processing construction and demolition waste. SMC has provided a three-acre plot for this plant on rent at Kosad, a neighborhood in the north zone of the city.

Construction waste materials such as sand, block, paver block etc. are processed here. The agency charges a collection fee directly to the waste generators. Waste is collected and transported using vehicles with GPS for efficient monitoring. SMC has made it compulsory to utilize 20% recycled products in all public construction projects as per the guidelines of Swachh Bharat Mission. The plant was commissioned in February 2019 with a capacity of 300 TPD. A toll-free number for C&D waste collection is also provided to the public.

#### Dumpsite remediation

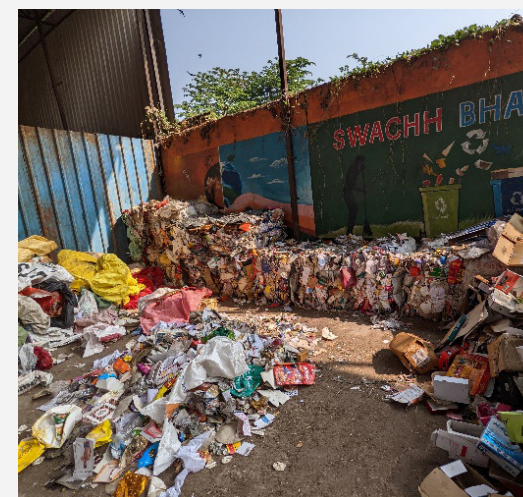
Surat is working towards dumpsite remediation, taking measures to rehabilitate and restore former landfill sites to minimize their environmental impact and promote

<sup>19</sup> A Special Purpose Vehicle or an SPV is a limited company incorporated under the Companies Act, 2013 at the city-level, headed by a full time CEO and have nominees of Central Government, State Government and ULB on its Board. The role of SPVs are diverse, they are generally formed to fast-track and plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate development projects.

sustainable land use practices.

From 2001 to 2018, approximately 2,500,000 lakh metric tons of solid waste generated from Surat was dumped in an open space of about 612,000 sq. meters at Khajod disposal site<sup>20</sup>. The work related to the scientific closure/capping of open dumped waste carried out by Surat Municipal Corporation at an approximate cost of INR 600 million (USD 7 million). About 85 acres of the disposal site has been capped and a garden developed in 2018–2019.

**FIGURE 15**  
Underground bins in Surat



<sup>20</sup> Surat Municipal Corporation and Gujarat Pollution Control Board (2022) Joint Report on Status of Compliance of Solid Waste Management Rules presented to the National Green Tribunal. [https://greentribunal.gov.in/sites/default/files/news\\_updates/Joint%20Report%20in%20OA%20No.81-2014%20\(page%20nos.1688-1852\).pdf](https://greentribunal.gov.in/sites/default/files/news_updates/Joint%20Report%20in%20OA%20No.81-2014%20(page%20nos.1688-1852).pdf)



**FIGURE 16**  
Bioremediation at Khajod disposal site



**FIGURE 17**  
Plastic waste management facility in Bhatar



## Recycling of Waste

### Centralized plastic processing facility

SMC has partnered with Eco Vision Resources LLP for plastic waste management on a public-private partnership (PPP) Build-Own-Operate contract model with a concession period of 20 years to set up a common plastic waste management center. SMC has provided two acres of land in Bhatar at a token rent for the project. The processing plant commenced operations in June 2017. About 75 tons of plastic per day are sourced from MRFs, and plastic aggregators in the city. Some of the aggregated plastic is converted into granules, fine shredded chips or pyrolysis oil at this facility itself, while some proportion is sold for further processing, and co-processing (as fuel). It is important to note that chemical processing and recycling of plastics have negative consequences because of associated GHG emissions. Urban Ocean partners recognize the need for implementable and circular solutions in Surat that hold plastics producers accountable for the full lifecycle of their products, cease the leakage of plastics into the environment, and incentivize reuse.

SMC does not pay a fee to the agency, and nor does the agency pay any royalty to SMC. To facilitate the collection of plastic waste, the agency has also introduced a toll-free number for residents. This plastic waste facility serves as a platform for aggregators, sanitation workers, buyers of recyclables (granules, chips, pyrolysis oil) and the packaging industry to facilitate waste recycling.

### Plastic waste collection centers

Eight plastic waste collection centers have been set up, one in each zone, with funding from the Surat Diamond Research and Mercantile (DREAM) City<sup>21</sup> CSR/ CER initiative,. Citizens can call the toll-free number and arrange for their plastic waste to be collected. The waste collected is sent to the centralized Plastic Waste Processing Facility.

### Safai Anudaan scheme

Surat is implementing the Safai Anudaan (cleanliness grants) scheme, which incentivizes citizens to actively participate in waste management practices by offering financial rewards for proper waste segregation and disposal. The scheme mainly encourages residential and non-residential complexes to take charge of maintaining cleanliness in their premises and deploying their own cleaning staff and equipment. The Anudaan scheme works as a catalyst between these complexes and the civic body to maintain the internal cleanliness of their premises. SMC provides grants as per 25% of the overall layout area of these complexes.<sup>22</sup>

The Anudaan scheme is available with a minimum of INR 1,600 (20 USD) and a maximum INR 4,200 (50 USD) paid to these societies by SMC per month if they avail to this scheme. Surprise inspections are undertaken by

SMC and payment cuts are made for defaulters.

A study (Basu & Khanna, 2017) showed that 865 residential complexes were registered under the Anudaan Scheme in 2016, with a majority of these complexes in the East zone of the city, which is also one of the densest zones in the city, followed by North and West zones, enabling services to about 19% of the population. Case studies in the same study showed that the scheme helped meet about 40% of the expenses for waste management, and that the citizens also appreciated the intangible benefits of having a direct connection and interaction with SMC officials. In some cases, at the initiative of residents, other civic issues and initiatives were also discussed at the neighborhood level. While these are very positive impacts, the study pointed out that the participation from residential areas and societies who may actually be requiring financial assistance such as low-income settlements has been much lower, especially in zones with high slum population.

The Anudaan scheme has the potential to enhance civic participation in SWM. Greater efforts for awareness and enabling participation, especially from slums and low-income areas are recommended.<sup>23</sup>

### Integration of waste pickers

At the MRF center, 150 workers are engaged to recover material such as plastic waste, glass, cardboard and paper, rubber, C&D waste, industrial textile waste, e-waste, toys and other dry waste. SMC started the "Rag-Pickers Shramjeevi Arthik Yojana" under the Swachh Bharat Mission and around 400 waste pickers have been integrated into the collection and sorting process.

<sup>21</sup> The Government of Gujarat has planned a Diamond Research and Mercantile (DREAM) City at Surat, a smart city initiative in southern Surat, adjacent to the village of Khajod. Surat has a strong diamond and textile industry along with a booming industrial port area, and is growing very fast, resulting in a large demand for commercial and residential space. DREAM city is formed with the vision to cater to this demand.

<sup>22</sup> Surat SWM Disclosure by SMC on 01/05/2021 <https://www.suratmunicipal.gov.in/Content/Documents/rtiact/Disclosure/Solid%20Waste%20Management/main.pdf>

<sup>23</sup> Basu, A.M. et. al. (2020) Participation for whom? A study of Anudan Scheme for Solid Waste Management in Surat. <https://www.aiilsg.org/pdf/Local-Government-Quarterly-Jan-Mar2020.pdf>

# 6. Key Findings and Opportunities

Surat Municipal Corporation has been recognized as a model city for managing waste in India, being ranked first under the Swachh Bharat Mission cleanliness survey 2023. These are annual rankings awarded to cities to assess their progress while encouraging them to move towards a better rating thereby improving their cities' overall cleanliness, set by the Government of India. The city has implemented a comprehensive waste management system that includes door-to-door collection, transportation, treatment, and disposal. However, the city has seen the rapid increase in population and new areas being incorporated into the city jurisdiction, the presence of manufacturing industries attracting labor and increased vulnerabilities to shocks like flooding. In light of these changes, Surat must adopt measures that the city can benefit from in the long run, relating to sustainable waste practices, improved efficiency and resource recovery, compliance and strengthening of regulations, thereby taking a step towards a circular economy.

This section presents the key findings and opportunities to expand and enhance waste management solutions in Surat.



## Lack of awareness among citizens

A general perception among citizens in the city is that waste management is the responsibility of the city officials. This perception needs a shift as sustainable and circular waste management systems in cities can be advanced through active community engagement. This is also highlighted in the CAP report which states that many efforts to address waste management and pollution prevention in Surat have been focused on downstream targets and the city could benefit from increased efforts at waste reduction and diversion.

## Improve civic Awareness and Engagement

There is a need to improve awareness among citizens for responsible behavior in waste production and consumption. These efforts might include campaigns encouraging replacing single-use plastic with reusable alternatives or buying goods in bulk, as well as sustained education efforts around waste segregation and sustainable waste management practices.





## Low waste segregation

Most efforts to address waste management and pollution prevention in Surat have been focused on waste collection and disposal; the city has a well-organized door-to-door collection system. However, there is need for increased efforts to strengthen source segregation and systems for segregated handling of waste.

## Improve source segregation of waste

SMC is already working with certain NGOs through a behavior change campaign to achieve 100% source segregation. Source segregation helps improve the quantity and quality of recycling material recovered. This strategy could be replicated and scaled up across the city. Through a well-designed awareness campaign, citizens' and other stakeholders' participation, and with the help of a dedicated team, sustainable source segregation can be achieved.



## Plastic producers in the city

Surat is known for its manufacturing industry, with large scale industries and manufacturing in the city. It is also home to numerous plastic manufacturers, who produce a wide range of plastic products including packaging materials, consumer goods, and industrial products.

## Leverage local plastic producers to take back plastic waste

Given the expected growth of these plastic producers in the city, there is an opportunity for engagement with local plastic manufacturers and businesses to reduce plastic leakage in Surat such as through buy-back schemes and incentives to reuse and recycle plastic.



## Need for stakeholder collaborations

Waste management is largely undertaken by the municipal corporation though the city could benefit from stakeholder collaborations and partnerships which can complement these services. Some insights from waste practitioners in Surat in stakeholder interviews undertaken during the Surat CAP process highlighted how effective Pune's waste management system is. There may be an opportunity to share and learn best practices like sanitary waste segregation, collection and processing from cities through city networks or collaborations.

## Promote circular entrepreneurs and businesses

Enterprises to handle collection, composting and urban gardening such as self-help groups, waste pickers' collectives and youth enterprises have emerged in Indian cities such as Bengaluru and Pune. Surat has also made efforts around flower waste and tender coconut shells. Other special waste which can be processed to make products could be identified, such as garden waste, and textile waste. Such enterprises may be promoted and scaled up in Surat through various strategies including green enterprises financing and support schemes, and technical, entrepreneurial capacity building as needed, shared and popularized through exhibitions and trade fairs. There are various opportunities for stakeholder groups to work together towards a larger goal of sustainable waste management in Surat.



## Increasing concern of textile waste

The textile industry is a major contributor to the development of Surat City which is also a cause of large amount of textile waste generated in the city. There is an opportunity to strengthen the mechanisms for the collection, handling and recovery of pre-consumer textile waste, especially cut pieces (below c.2 meters) called “chhindi”. It is challenging for the systems of SMC, the CPCB and other government agencies to address the large quantity of textile waste.

## Facilitate the informal sector to manage chhindi textile waste

The total generation of chhindi textile waste in the city is about 150 tons per day. Some of the cut pieces are reused but a large proportion is left for municipal waste collection. The informal sector is highly involved in the recycling of textile waste. Helping the informal sector to enhance their services while strengthening their livelihoods may be explored.



## Inadequate basic facilities for workers

Surat has made notable efforts in setting up of infrastructure to handle the waste generation in the city, though a lot can be done for safety and improving working conditions of workers deployed in these locations, to ensure that they are provided with necessary support and resources.

## Improve working conditions in collection and recyclables recovery

Basic facilities/infrastructure could be improved for the workers at the ward or zone level and workers at the transfer stations. These may include adequate supply of safety equipment, facilities such as hand washing areas, safe drinking water, seating and resting areas, eating places etc. Improvements could also be made in provision of insurance, benefits related to education and other welfare issues, such as working hours, holidays, minimum wages etc. This could apply for contract, informal workers and as applicable for formal workers.



## High usage of low value plastic waste

Surat has a vibrant street food culture, which leads to a wide use of single-use plastic cutlery across the city. Single use plastic is also still used in commercial uses despite efforts to reduce such usage, especially after the ban on single-use plastic.

## Plan targeted efforts to reduce low value plastic leakage

Efforts could be strengthened through a Litter-free Surat Campaign, vendor participation, incentives, and enforcement. Special efforts to reach the migrant population may also be needed. Awareness campaigns on existing buy-back initiatives available to consumers such as Sumul Dairy milk bags can be undertaken with the communities, which may be valuable for the success of such measures.

Multi-layer and low value flexible plastic needs to be quantified for Surat and possible EPR support needs to be strengthened, which will take care of the waste generated and will also support the waste pickers who collect it. Such an initiative would be well aligned with the national EPR rules which have mandated category-wise annual EPR targets and for which action plans need to be developed. The roles of SMC and other stakeholders may be clarified and streamlined to help strengthen the implementation of EPR.



## Waste burning

In the old city and more than 300 slums areas, the collection vehicles can't reach households due to narrow lanes, leading to inefficient collection. This causes chronic spots of accumulated waste and waste burning. Surat Air Quality Report has mentioned that the composition of municipal solid waste burned varies across the city. For example, low socio-economic status areas have the highest amount of compostable waste burned, whereas higher income areas show more recyclable solid waste being burned.

## Identify and address key causes of waste burning

SMC has already made efforts for awareness and levied fines for waste burning. Mapping complaints of waste dumping and waste burning may help identify locations to improve collection services and focus on chronic spots in the city. Collection by smaller vehicles like pushcarts may be introduced/streamlined for efficient and effective collection in these dense urban areas.

# 7. Glossary of Terms

**Bio-methanation** Bio-mining entails digging out the legacy waste and sorting it into different categories to be recycled or used in co-processing. According to the Central

**C&D Waste** Construction and demolition waste

**CAP** Circularity Assessment Protocol. Assessment protocol developed by the University of Georgia to identify and analyze waste streams, particularly plastics

**CER** Corporate Environment Responsibility

**CPCB** Central Pollution Control Board of India

**CSR** Corporate Social Responsibility

**DREAM** City Diamond Research and Mercantile City, a smart city initiative in southern Surat, planned by Government of Gujarat to cater to the spatial needs of growing diamond and textile industries in the city

**Dry Waste** Dry waste comprises of things like paper, glass, plastic, cardboard, Styrofoam, rubber, metal, food packaging material, etc

**EPR** Extended Producer Responsibility

**ILO** International Labour Organization

**INR** Indian Rupee

**LLP** Limited Liability Partnership

**LDPE** Low Density Polyethylene

**MRFs** Material Recovery Facilities. A materials recovery facility receives, separates, and prepares recyclables to be sold to an end buyer. An MRF uses a combination of equipment, machines, and manual labor to separate and prepare the materials

**MSW** Municipal Solid Waste. Waste that originates in homes and establishments such as commercial establishments, hotels and educational establishments

**OC** Ocean Conservancy

**OWC** Organic Waste Converters

**PPP** Public-Private partnership

**R-Cities** Resilient Cities Network

**SBM** Swachh Bharat Mission

**SMC** Surat Municipal Corporation

**SVNIT** Sardar Vallabhbhai National Institute of Technology, Surat

**Swachh Sarvekshan** Swachh Sarvekshan, conducted by Government of India since 2016, is the world's largest urban sanitation and cleanliness survey. The primary goal of Swachh Sarvekshan is to encourage large scale citizen participation and create awareness amongst all sections of society about the importance of working together towards making towns and cities better places to reside in.

**SWM** Solid Waste Management

**TCI** The Circulate Initiative

**TPD** Tons per day

**UHCRC** Urban Health and Climate Resilience Center of Excellence

**Wet Waste** Wet waste typically refers to organic waste usually generated through kitchens in households and commercial eating establishments. This can include food



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