



Project Statement Surat

**Advancing Zero Waste Circular
Solutions in the City of Surat**



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1. Introduction

Overview of the Urban Ocean® Challenge

Cities are home to about 56% of the world's population – 4.4 billion inhabitants,¹ accounting for nearly three-quarters of global greenhouse gas (GHG) emissions.² Neither climate nor social targets will be met without a deep transformation of urban centers towards a more inclusive, sustainable and, ultimately, resilient path. Approaching urban waste management systems through a resilience lens reveals the complex, interrelated ramifications for social, economic, and environmental indicators. It is estimated that the waste management sector alone has the potential to create 45 million jobs globally and reduce GHG emissions by 15 to 20%.³ At the same time, the circular economy offers a USD 4.5 trillion economic opportunity by reducing waste, stimulating innovation, and creating employment by 2030.⁴

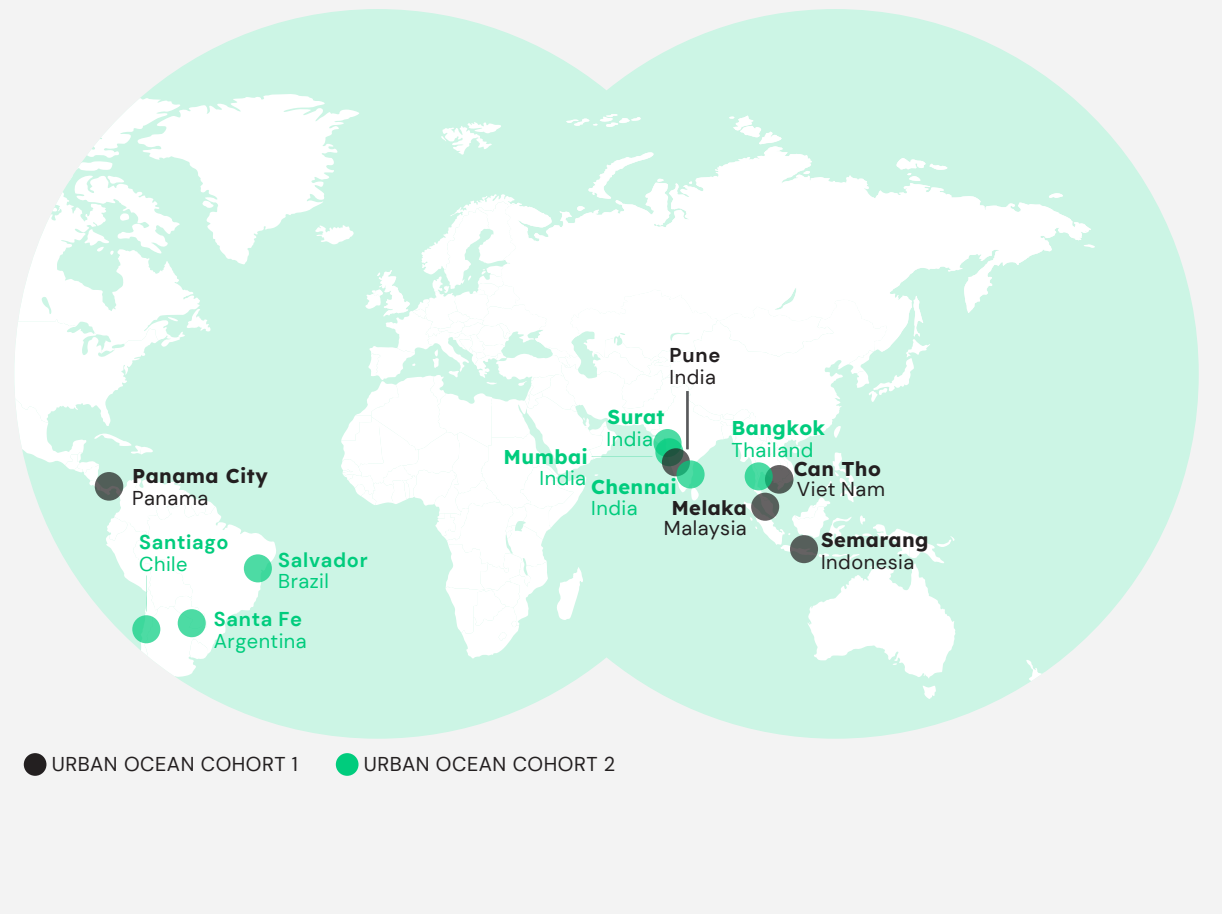
¹ World Bank, 2023 – <https://www.worldbank.org/en/topic/urbandevelopment/overview>

² Intergovernmental Panel on Climate Change (2021). Report on Climate Change 2021: The Physical Science Basis. Link: <https://www.ipcc.ch/report/ar6/wgl/#FullReport>

³ International Labour Organization (2018). World Employment Social Outlook; Eunomia (2015). The potential Contribution of Waste Management to a Low Carbon Economy

⁴ WRI (2021). 5 Opportunities of a Circular Economy. Link: <https://www.wri.org/insights/5-opportunities-circular-economy>

FIGURE 1
Urban Ocean cities map



Adding a layer of complexity by including the marine plastic debris challenge can push cities towards rethinking their relationship with the ocean. An 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.

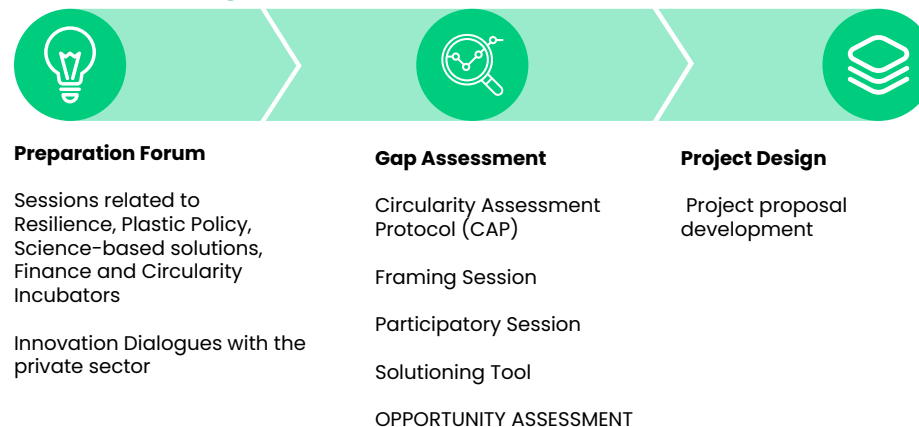
Program Objective

The Urban Ocean program aims to work with city leaders to bring new ideas, partners, and resources together to solve interrelated resilience challenges related to waste management, reduce plastic leakage and protect water bodies and the ocean. Urban Ocean provides the platform for ocean advocates and city leaders to join forces with other allies to develop comprehensive solutions that meet the needs and priorities of governments, cities, communities and other actors to create real and lasting impact. The program demonstrates how actions to improve waste management and recycling can provide resilient and sustainable solutions that reduce ocean plastic pollution and address key city priorities, such as improving public health, supporting economic development, and reducing GHG emissions. Furthermore, Urban Ocean provides cities with the opportunity to showcase leadership and share knowledge and experience across the Resilient Cities Network (R-Cities) community and beyond.

Program Approach

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. It supports cities to develop strategies and projects designed to address the interrelated challenges of ocean plastics and community resilience. The program approach in cities is shown in the following graphic:

FIGURE 2
Urban Ocean program approach



The program is jointly led by Resilient Cities Network, Ocean Conservancy, and The Circulate Initiative. In Surat, Urban Ocean partnered with Surat Municipal Corporation, and with local partner Centre for Environment Education (CEE).

Project Statement

This Project Statement is a testament to Surat City's commitment towards preserving its water bodies and reducing plastic waste. The Surat City team, along with its trusted partners, has worked tirelessly for a year to develop specific actions to address the plastic waste challenges faced by the city. The project statement is based on a rigorous gap assessment process and capacity-building sessions that helped the city to identify the best opportunities for impact and to formulate data-driven, multipronged approaches to tackle the issue locally.

The statement provides an overview of the context and needs of the city, highlighting the urgency of the issue and the importance of taking immediate action. It also outlines Surat City's vision for the project and the impact it aims to achieve. By implementing the proposed actions, Surat City hopes to significantly reduce the amount of plastic waste entering its water bodies and create a cleaner, healthier environment for its residents and visitors.

FIGURE 3
Consultations with diverse stakeholders in the city



2. Context

Surat City and its Water Bodies

Surat is located on the western coast of India, on the banks of the Tapi river in the state of Gujarat. The current population of Surat is more than 8 million according to most recent estimates and the city is the economic capital of Gujarat as about 40% of India's total manmade fabric production comes from Surat and 90% of the world's diamonds are cut and polished in Surat. Today, the city has one of the highest levels of proposed investment in India, and almost zero unemployment.⁵ As one of the fastest growing cities in India, Surat has seen unprecedented growth in the last four decades, recording one of the highest growth rates in the country and a ten-fold population rise. It now ranks as the eighth largest city in the country.⁶ Coupled with this, a spillover of population into the peripheral areas has also been observed.

As per the Surat Urban Ocean Circularity Assessment Protocol (CAP) report, a key baseline assessment of

waste and circularity within the city conducted as part of the Urban Ocean program, Western India including the state of Gujarat, is the nation's regional leader in the plastics industry, contributing to 61% of India's plastic production⁷ and home to numerous plastic manufacturers, who produce a wide range of plastic products including packaging materials, consumer goods, and industrial products. Several reports also note the high amount of plastic waste generation, including a report by the Central Pollution Control Board⁸ which states that Western Indian states of Maharashtra and Gujarat also have the highest plastic waste generation in India at 13% and 12% respectively.

There are several reasons for this high level of plastic waste, including urbanization, changing lifestyles, increased plastic production, and the rapid growth in population. From time to time, the jurisdictional limits of the Surat Municipal Corporation (SMC) have been extended. Before 1961, Surat comprised an area of 8 km²; by 2009 it had expanded to 326.5 km². In 2020, the city expanded its boundaries again and the area of

the city now stands at 462 km².

Surat is considered a model city for good governance as well as for providing effective service delivery in comparison with many other Indian cities. Surat also has the advantages of efficient city administration, strong political consensus, and sufficient municipal finances.

Surat is a port city. The city has a long history of maritime trade and commerce, with the Arabian Sea located to its west. The Arabian Sea is part of the Indian Ocean and is home to a diverse range of marine life, including whales, dolphins, and sharks. Surat is connected to the sea by the river Tapi, located near the river mouth as it empties into the Gulf of Khambhat and the Arabian Sea. The city also has several creeks ('khadis' in Gujarati). The nearest commercial-grade port infrastructure is at Hazira, located at the mouth of the Tapi.

The following map⁹ shows the location of Surat and its proximity to the Arabian Sea:

⁵ Surat Resilience Strategy, 2017 - https://resilientcitiesnetwork.org/downloadable_resources/Network/Surat-Resilience-Strategy-English.pdf

⁶ Census of India, 2011

⁷ Plastindia Foundation, Plastics Industry Status Report - India - 2021-22 & 1H 2022-23 Update. 2023.

⁸ Annual report 2019-20 on Implementation of Plastic Waste Management Rules, 2016, Central Pollution Control Board - https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2019-20_PWM.pdf

⁹ Map Source: Dhonde, Bhavesh & Patel, Chetan. (2021). ASSESSING THE IMPACTS OF CITY SPRAWL ON URBAN FREIGHT TRANSPORT IN DEVELOPING COUNTRIES. Architecture and Engineering. 6. 52-62. 10.23968/2500-0055-2021-6-2-52-62.

FIGURE 4
Location of Surat in context of the state of Gujarat

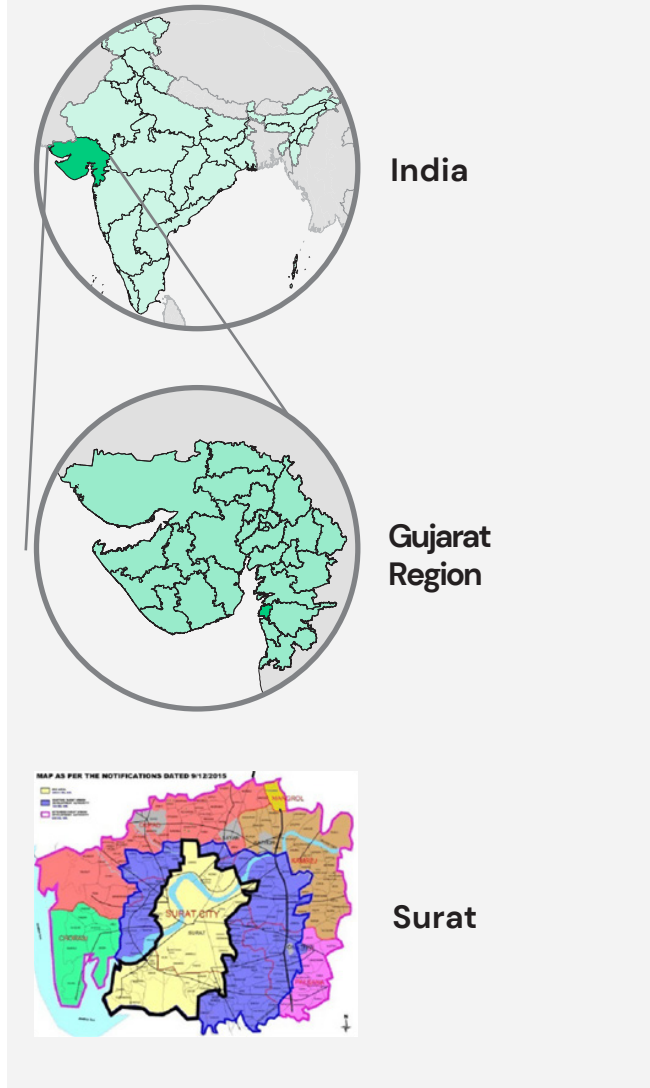
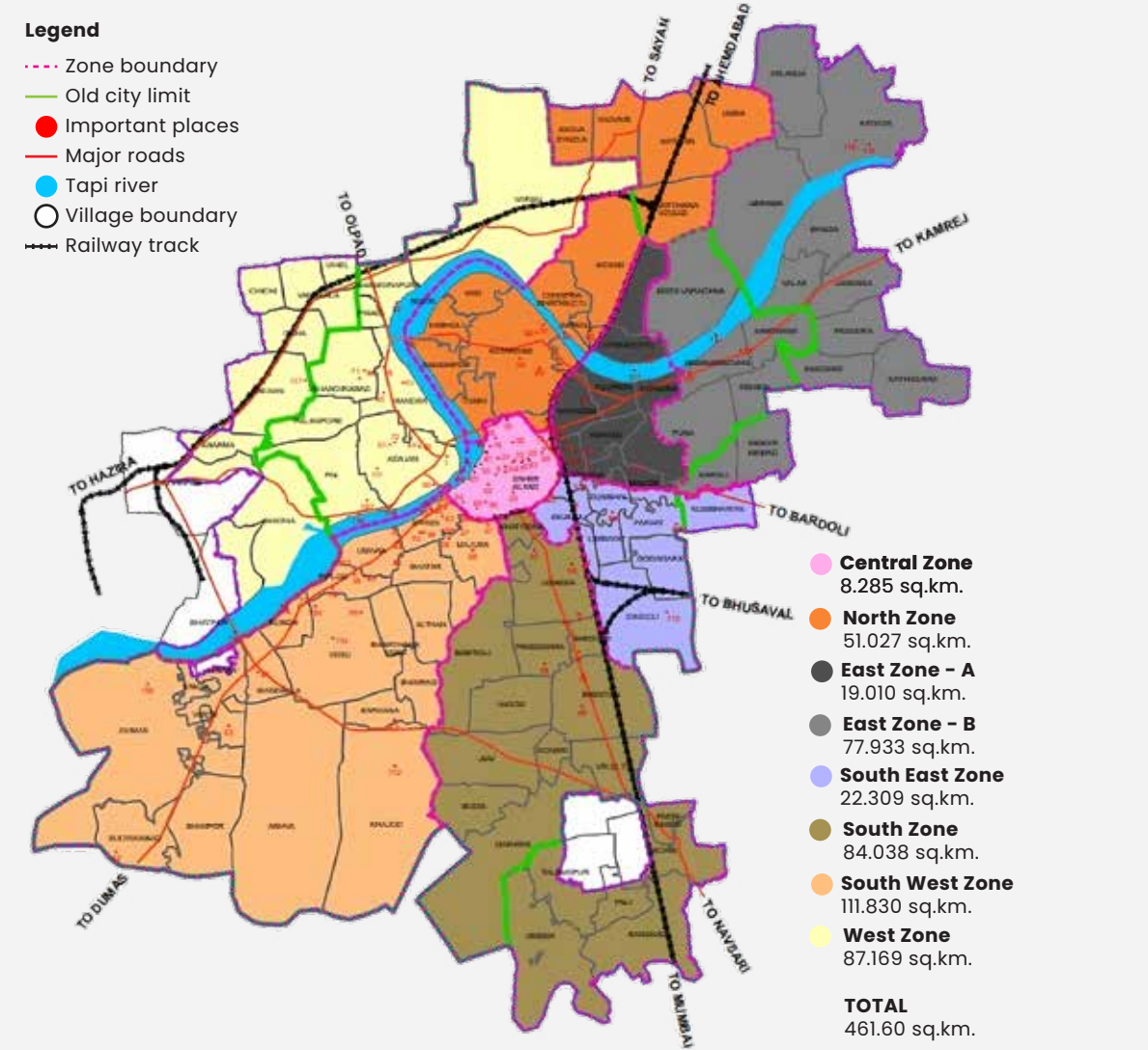


FIGURE 5
Surat and the Tapi river



These water bodies are important for the city's water supply and irrigation needs. However, they face several challenges, including pollution from industrial and domestic sources.¹⁰ In 1994, Surat was the center of a plague outbreak. Surat faced losses in its key businesses, including diamond cutting. Poor waste management, implicated in the plague outbreak, is reported to have caused Surat an estimated loss of USD 1 billion in terms of exports and 40 to 60% of its anticipated tourism.¹¹ After the outbreak, the city authorities undertook one of the most massive clean-up operations in recent times and revamped the entire administration of the city.

Along with water pollution issues, Surat is vulnerable to floods. The coastal areas of the city are vulnerable to the effects of climate change, such as sea-level rise and increased frequency of extreme weather events. In recent years, the city has seen two major river floods and a creek flood. High tides in the monsoons often inundate habitations along the creeks. The floodplain zone of the Tapi river has also seen an increase in population and density¹² making these communities

vulnerable to increasing frequency and intensity of floods.

To address these vulnerabilities, SMC has undertaken several initiatives to improve the quality of the city's water bodies. These include setting up sewage treatment plants, constructing wetlands for water treatment, and promoting the use of eco-friendly idols during religious festivals to prevent pollution of water bodies. SMC has also developed a coastal zone management plan and is implementing measures such as mangrove restoration, beach cleaning, and construction of seawalls.¹³

The City's Waste Management System

Surat Municipal Corporation has been recognized as a model city for waste management in India, classified as a 5-Star Garbage Free City¹⁴ and ODF++ City¹⁵ in Swachh Sarvekshan 2020 under the Swachh Bharat Mission. The city generates approximately 2,200–2,800 tons of waste per day (TPD)¹⁶ and collects and processes

more than 95% of the waste generated. 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 expected to be undertaken by residents prior to collection and 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 CAP report where stakeholders highlighted a gap in who is seen as responsible for ensuring education, suggesting that there may be opportunity for clarifying and strengthening roles related to awareness and education around solid waste management (SWM).

Most of these zones have a designated transfer station/material recovery facility where the waste is further sorted and recovered. Waste burning is a significant issue in the city with concerns on releasing GHGs from open burning. Several companies are contracted by SMC for door-to-door collection. SMC has also

¹⁰ This information about Surat city has been widely reported in various online sources and media outlets, including news articles, official websites, and research papers

¹¹ Christine Furedy, Urban Studies, Calumet College, York University

¹² Bansal, N (2018). Industrial Development and Challenges of Water Pollution in Coastal Areas: The Case of Surat, India. Available from: https://www.researchgate.net/publication/323674256_Industrial_Development_and_Challenges_of_Water_Pollution_in_Coastal_Areas_The_Case_of_Surat_India [accessed Jun 07 2023].

¹³ "Coastal Zone Management Plan (CZMP) for Surat City" by Surat Municipal Corporation - <https://www.suratmunicipal.gov.in/Download/pdf/MPR/Surat-CZMP-Final.pdf>

¹⁴ 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>

¹⁵ 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=13j48tn4c0wzu2r>

¹⁶ ICLEI (2022). Baseline Assessment: Surat Municipal Corporation. Presentation.

established multiple facilities to process waste, including composting plants, bio methanation plants, and a waste-to-energy plant. The remaining waste is generally transported to the final landfill sites at the Khajod landfill site. 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.

Surat is witnessing a gradual increase in waste recycling in recent years. SMC has entrusted the work of plastic waste management to Eco Vision Environmental Resources LLP through a Public Private Partnership (PPP) model for 20 years, to manage a dedicated plastic waste management center at Bhatar which recycles around 30 metric tons of plastic waste daily. Segregated valuable plastic waste is collected from households and streets with the help of NGOs, waste pickers, plastic collection centers, etc. Non-segregated plastic waste collected by door-to-door vehicles is transported to eight secondary transfer stations for further segregation in Material Recovery Facilities (MRFs). Plastic pellets are produced from the processing of plastic waste. Surat Municipal Corporation has started utilizing plastic waste for construction of roads, a practice that requires further study regarding the release of potential microplastics. Approximately 22 km of road was constructed with plastic waste material in 2020. Twenty tons of pellets are produced daily from waste plastic. These pellets are then sold back to the producers at prices ranging from INR 15–50/kg (USD 0.1–0.6/kg) depending on the

FIGURE 6
Pollution in and around water bodies



Source: Centre for Environment and Education, 8 Sept 2022

FIGURE 7
Door-to-door waste collection in the city



Source: Resilient Cities Network, 2023

FIGURE 8
Material Recovery Facility in Bhatar area



Source: Resilient Cities Network, 2023

quality. They are used as raw material for various plastic products such as furniture, pipes, benches, tiles, etc. Though the amount of recycled plastic is small, the facility has the potential to scale up with increased supply of segregated plastic, reducing plastic waste ending up in landfills and improving resource recovery.

There are several organic waste converters in the city and organic waste is separately collected by a company called Bio Fics. Additionally, construction and demolition (C&D) debris is handled by a private company that processes 300 tons per day.

Surat has launched a few campaigns, like the Safai Anudaan Scheme, for citizens to take charge of maintaining cleanliness in premises by deploying its own cleaning staff and equipment. The Anudaan scheme works as a catalyst between these complexes and SMC to maintain the internal cleanliness of the premises. The city has incentivized citizens to participate in the process. Under this scheme, payments at a fixed rate are made to residential and non-residential complexes. The minimum amount payable to residential/non-residential complexes is INR 1,200 (USD 15) per month. Complexes are required to arrange for sweepers and cleaning equipment on their own while the SMC pays for consumable items such as insecticides. The city has also piloted innovative technologies, such as RFID-enabled waste collection bins under the Smart Cities Mission by Government of India to streamline the collection and transportation

process. The city's waste management system has also received international recognition, with the World Bank highlighting it as a best practice model for waste management in developing countries.¹⁷

¹⁷ Surat Municipal Corporation (2022). About SMC. Retrieved from <https://www.suratmunicipal.gov.in/About-SMC>

FIGURE 9
Plastic waste collection from residential areas in the city



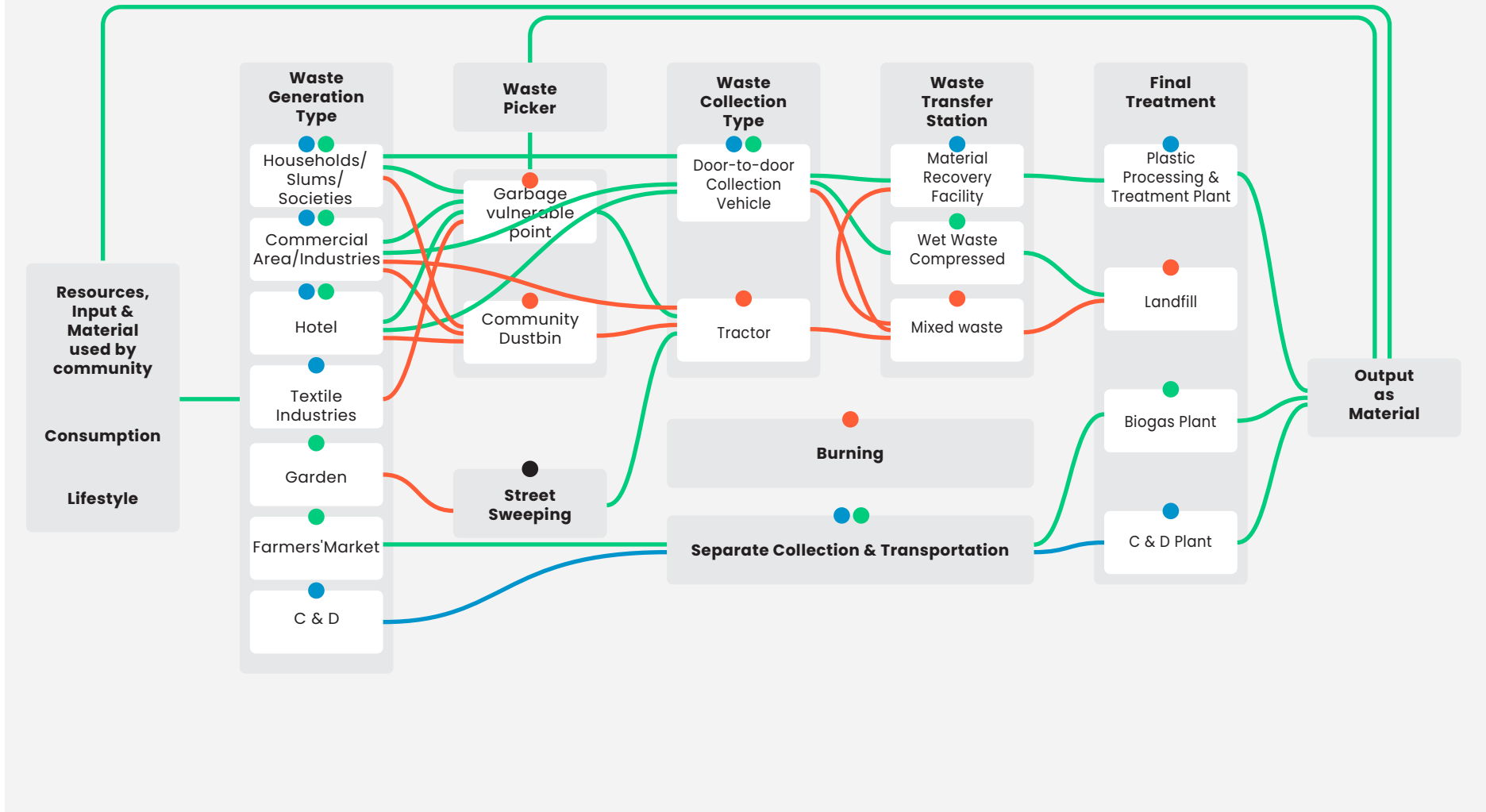
Source: Resilient Cities Network, 2023

FIGURE 10
Plastic waste management center in Surat run by Eco Vision LLP



Source: Report by SMC submitted to NGT, 2022

FIGURE 11
Waste Management System of Surat



Policies and Mandates

India has various legislation to address waste management, including some specifically targeting plastic waste. The primary legislation for waste management is the Solid Waste Management Rules, 2016, by the Ministry of Environment, Forest and Climate Change (MoEFCC), under which local bodies like SMC have a mandate for implementation. Additionally, the state of Gujarat, where Surat is located, has introduced its own regulations related to plastic waste management. Some key legislation regarding waste management is presented below:

Solid Waste Management Rules, 2016: The MoEFCC introduced the Solid Waste Management Rules in 2016, which focus on the scientific management of solid waste in urban areas. The rules outline various objectives and activities for effective waste management. These include enforcing waste segregation at the source, implementing the door-to-door collection of segregated waste, managing C&D waste separately, identifying suitable sites for waste processing and landfill facilities, establishing waste processing facilities and sanitary landfills, and undertaking bioremediation or capping of old dump sites. The rules aim to improve solid waste management practices across the country and promote sustainable waste disposal methods.¹⁸

Plastic Waste Management Rules, 2016: The Plastic Waste Management Rules were introduced by the MoEFCC at the national level in 2011, amended and enforced in 2016. These rules aim to regulate the manufacture, usage, and disposal of plastic materials and provide the statutory framework for plastic waste management in the country. The rules also lay down responsibilities for various stakeholders, including manufacturers, local bodies, and waste generators. Though ocean plastics are not yet covered in the country's policy, in 2020 the Environment Secretary, Leena Nandan, said at the fifth session of the United Nations Environment Assembly that "India is committed to address plastic pollution including marine plastic pollution to reduce the adverse impacts on terrestrial and aquatic ecosystems and human well-being."¹⁹ In line with this, the central government has undertaken various efforts including data gathering on ocean pollution via the National Centre for Coastal Research (NCCR), and has launched a campaign for clean oceans called the Swachh Sagar/Surakshit Sagar for improving ocean health through collective action, as well as EPR framework and single-use plastic ban as stated below.

Extended Producer Responsibility (EPR): EPR is a critical component of the Plastic Waste Management Rules, 2016. It holds producers, importers, and brand

owners responsible for collecting and managing the plastic waste they generate. They are required to set up systems for collecting and recycling plastic waste and establish mechanisms to ensure proper disposal. The EPR framework was introduced in 2020 and since then, there have been several amendments to the framework, including as recently as February 2022, detailing filing processes and targets for brands and manufacturers.

Ban on Single-Use Plastics: The MoEFCC amended the Plastic Waste Management Rules in August 2021 to include a nationwide ban on the manufacture, import, stocking, distribution, sale and use of identified single-use plastics from 01 July 2022.²⁰ In line with this, the Gujarat government has introduced a ban on plastic products such as plastic bags, cups, plates, and cutlery to reduce plastic waste generation.

Swachh Bharat Mission: The Swachh Bharat (Clean India) Mission is a nationwide cleanliness campaign launched by the Government of India, with an aim to make the country clean and free of open-defecation. As part of this mission, waste management, including plastic waste, is a significant focus. The campaign emphasizes the importance of appropriate waste disposal and segregation practices.

¹⁸ Solid Waste Management Rules, 2016, https://hspcb.gov.in/content/laws/msw/MSW_Rules.pdf

¹⁹ Press Trust of India. (March 1, 2022). India is committed to address plastic pollution: India at UNEA, https://www.business-standard.com/article/economy-policy/india-is-committed-to-addressplastic-pollution-india-at-unea-122030101116_1.html

²⁰ Ministry of Environment, Forest and Climate Change, 2022 - <https://pib.gov.in/PressReleasePage.aspx?PRID=1837518>

City-level notifications: Surat Municipal Corporation has issued several local notices, circulars and resolutions related to solid waste management, including:

- Notification to promote at-source segregation and onsite treatment of organic waste, with support from SMC for different categories of residential societies to set up organic waste converters (OWCs).
- Notification and enforcement of the ban on the use, sale and storage of non-biodegradable plastic bags/plastic products of less than 50 microns thickness, in compliance with the Plastic Waste Management Rules 2016.

Bylaw on violations and penalties by SMC: Various offenses and the corresponding applicable penalties for each violation are described in the SMC Plastic Health Bylaws.²¹ The offenses include non-segregation of solid waste, improper storage of waste in non-designated locations, creating public nuisances such as spitting, urinating, and feeding animals or birds, open defecation and open burning of waste. Violators are to be imposed with fines depending on the offense committed. The penalties vary for different categories of offenders, including individuals, contractors/agencies, and owners of animals. The penalties differ based on the type of property, be it residential, commercial/institutional, industrial, or other. These rules and penalties aim to ensure proper waste management practices, maintain public health, and promote cleanliness within the specified zones.

²¹ Public Health Bylaws Gen. Board Resolution No.1030/2016 Dt. 29-11-2016 on Plastic Waste Management Rules Violation <https://www.suratmunicipal.gov.in/CleanSurat/Documents/ResolutionsAndNotifications/NotificationSpotFinesForNonSegreLittering.pdf>

FIGURE 12

Public Notice by SMC requesting all urban residents to process wet/kitchen waste by home composting and obtain guidance from ward offices



3. Problem Statement

This section documents the key challenges in the city of Surat as identified through stakeholder consultations as well as primary and secondary research. These in turn guided the recommendations and actionable pilot ideas.

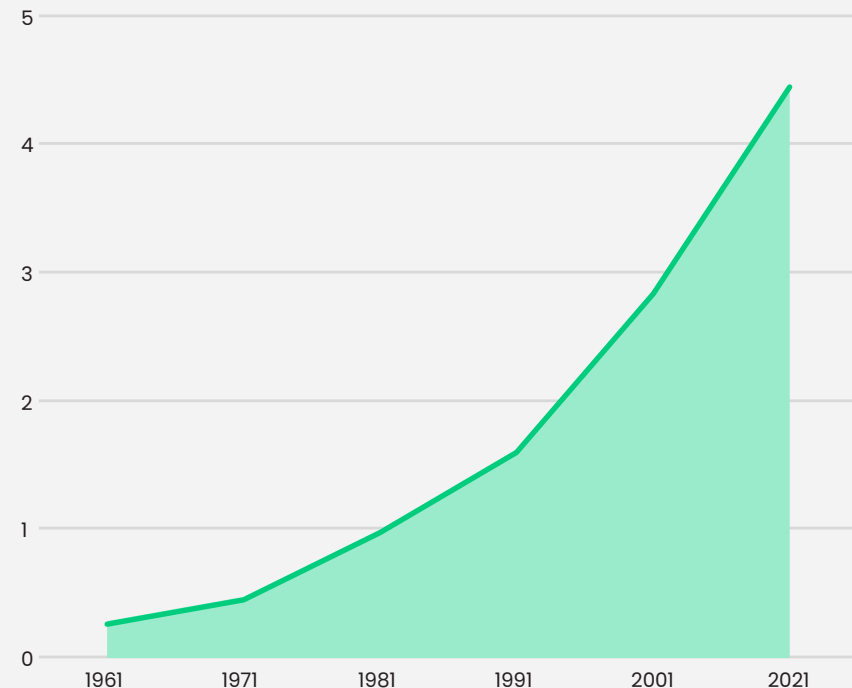
1. Growth due to migration and expansion of city limits: Though Surat has extensive management systems for municipal waste, the city has seen an unprecedented growth in the last four decades, recording one of the highest growth rates in the country and population rise due to urbanization and migration. The city has almost zero unemployment²² due to very fast development of various industries and businesses in and around Surat. As seen in the figure below, the census of Surat over the years has seen very high growth as the city has been attracting people to move close to their workplaces.

Along with the concentration of industries and associated residential developments, Surat Municipal Corporation has also expanded its city limits in the year 2020 leading to an addition of more than 170,000 in population and around 135 km² of land coming under the authority of SMC.²³ This trend of migration coupled with growth has outpaced the city’s services resulting in an increase in waste generation, litter, and demand for more land and resources and additional pressure on the existing systems. This has created an additional demand for effective collection, transportation, and processing of waste.

2. Low waste segregation rates: There are national and city level regulations in place, and several efforts are being undertaken by the city, such as the Clean Surat campaign which leads public awareness campaigns with banners, street plays, media and social network marketing, incentivization prizes, and encouragement from NGOs and private organizations for public participation. Even with these efforts, waste

FIGURE 13
Population growth in Surat

Population of SMC (in million)



Source: Surat Urban Development Authority, 2017

²² Surat Municipal Corporation 2023 - <https://www.suratmunicipal.gov.in/TheCity/Introduction>

²³ Surat Municipal Corporation 2020 - <https://www.suratmunicipal.gov.in/TheCity/City/StmI>

segregation in the city remains a challenge given a lack of awareness of the need for behavior change and general perception of residents that SMC should be responsible for all aspects of waste management. This is also noted from stakeholder interviews in the CAP report stating the need for additional education efforts to demonstrate the interconnectedness of environmental and human health which can translate these efforts into action by citizens. The city is also experiencing an influx of migrant communities who may not be aware of the rules or practices around waste consumption and management.

3. Changing material use and consumption patterns: This is another key concern for the city. Continued and increased use of single-use plastics, increase in use of products that come packaged in multi-layered plastic packaging, and demand for convenience products are further stressing solid waste management in the city. Macro-level socio-economic conditions that devalue materials cause the accumulation of waste material stocks that could otherwise be brought back into material flows and recycled (e.g. plastics, including fabrics, sanitary waste, etc.). Though the city has launched several initiatives to promote cleanliness and hygiene in people’s day-to-day lives and reduce consumption of single-use items (e.g. awareness drives, engagement activities with citizens and imposing fines on shops and street vendors providing single-use plastic) this still remains a challenge for the city.

FIGURE 14
Outreach material for waste segregation and consumption



Source: NDTV India, 2018



4. Increase in extreme weather events: The frequency and intensity of events such as floods and heat waves have multiplied over the years. Surat faces risks of both sea level rise and flooding. Floods in 2006 and 2016 covered almost the entire city and affected nearly two-thirds of the Surat population.²⁴ Such events create further difficulties in the daily operations of waste management in the city with workers engaged in door-to-door collection and other aspects of waste management being impacted by these conditions. As per the City Vulnerability Assessment Report by Asian City Climate Change Resilience Network,²⁵ climate change scenarios for Surat all indicate an increase in rainfall, with monsoons dominated by heavy spells of rain interspersed with longer dry spells. This could potentially increase the frequency of floods. Surat’s climate change risk profile also includes sea level rise, water scarcity and temperature rise. With the floodplains becoming narrower because of new developments and sea level rise, inundation levels are likely to increase.

²⁴ Surat Urban Development Authority Development Plan, 2035 - <https://www.sudaonline.org/wp-content/uploads/2017/03/SUDA-DP-2035-report-final-22.02.2017.pdf>
²⁵ Asian City Climate Change Resilience Network, City Vulnerability Assessment Report: Indore and Surat, TARU, 2010 - https://www.ctc-n.org/sites/www.ctc-n.org/files/resources/indore_surat_vulnerability_and_risk_assessment_report.pdf

FIGURE 15
 Surat City Resilience Strategy, 2017



5. Open dumping and burning of waste in the environment: Waste dumping and burning in open and low-lying areas is common in the city, exacerbating flooding, leakage of plastics and other pollutants into the ocean and emission of pollutants in the environment. SMC has responded to open burning and has imposed heavy penalties on any individual, government cleaning staff member or private organization, if they are caught burning leftover garbage in the streets. Even with this imposition, waste burning is still very prevalent in the city.

The Surat City Resilience Strategy, ²⁶2017 presented the objective of “implementing community-level SWM practices using innovative measures” under the goal of “innovative urbanism tactics for balanced ecosystem”. Specifically, the strategy identified that SWM needs to be decentralized in the city to reduce the load on dumping sites and sanitary landfills, which are big emitters of greenhouse gases. To decentralize the SWM, the following measures would be taken up:

- 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.

Effective solid waste management can significantly reduce the amount of waste that ends up in landfills or dumps in low lying areas and water bodies, or is burnt in open-air settings, releasing harmful pollutants into the environment. Communities can help minimize the release of GHGs, toxic chemicals, and particulate matter that contribute to air pollution and waste dumps that cause leakages of plastics and other materials into the ocean.

Improving source segregation is the basis of good waste management, enhancing recycling and circular economy. Effective door-to-door collection from all municipal waste generators, transport of segregated materials for further sorting, materials recovery and processing at the appropriate scale, and safe management of rejects is crucial for avoiding pollution and health risks, safeguarding terrestrial and aquatic ecosystems, preventing emissions, and promoting circular economy. By adopting or participating in reuse and recycle processes, the city can transform waste materials into valuable resources and enhance livelihoods. Provision of different services related to waste materials management and resource recovery can also contribute to income generation for service providers.

The Urban Ocean initiative in Surat builds on the goal identified in the Resilience Strategy for innovative urbanism and balanced ecosystem. It takes forward the city’s commitment to the objective of decentralized solid waste management, to reduce the waste being transported to the landfill site and avoid greenhouse gas emissions.

²⁶ Surat City Resilience Strategy developed in 2017 under 100 Resilient Cities Program by Rockefeller Foundation - https://resilientcitiesnetwork.org/downloadable_resources/Network/Surat-Resilience-Strategy-English.pdf

FIGURE 16
Garbage accumulation along the road and burning of waste



Source: Centre for Environment Education, 2022

4. Project Overview

This project statement is designed to incorporate various initiatives that address the challenges listed above. These initiatives have been identified through workshops and discussions with key stakeholders in the city to determine their requirements, feasibility, and potential challenges.

The proposal includes four pilot projects for Surat.

1. The first pilot project, **Rochak**, aims to strengthen solid waste management awareness and education in public schools in Surat. Social and behavioral changes in society are often difficult to achieve, as these changes require sustained efforts. Formation of appropriate behavior and practices needs to start early, be sustained through the schooling years and reiterated through information, education and communication materials at regular intervals so that students and future citizens imbibe the content and form appropriate habits.

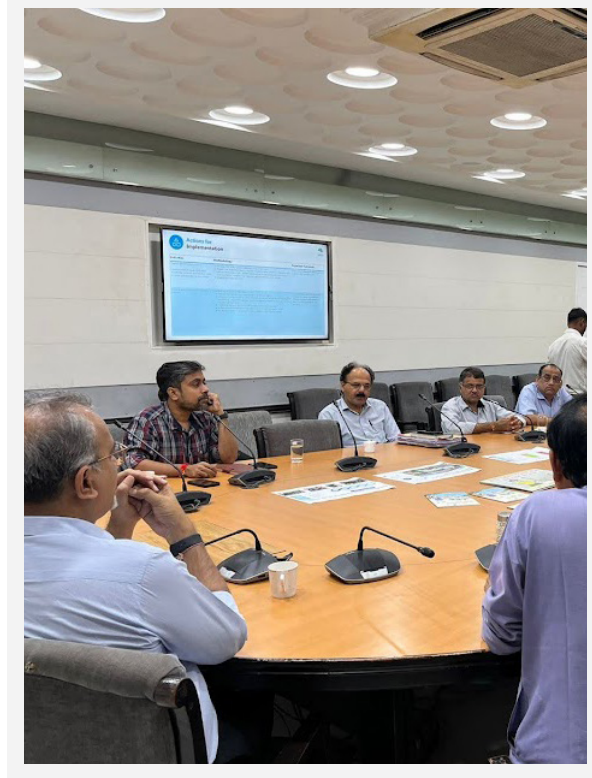
2. The second pilot project proposes the establishment of a **Sampurna** ('total/entire') (Zero Waste) Zone in Surat focusing on waste generation. This initiative aims to create a neighborhood waste management system that minimizes waste generation and maximizes recycling and recovery. This is to be achieved through collaborative efforts of local city officials, private companies, and NGOs, supporting active citizens.

3. A pilot project **Samman** ('Dignity') for Sanitary Waste Management is proposed. While the eventual solution for sanitary waste is re-usable sanitary products (such as reusable napkins and menstrual cups), it is recognized that sanitary waste disposal is a challenge and may remain so until re-usable sanitary products are widely adopted. PadCare, a start-up based in Pune provides a solution for material recovery and recycling by safe processing of sanitary waste. This pilot project aims to introduce PadCare's services to a few pilot locations, including commercial complexes, institutes and schools.

4. Additionally, **Surekh (Surat Rechakra) Manthan Manch** (Surat Circularity Forum) is proposed as a platform for key stakeholders like NGOs, civil society organizations, practitioners, and private sector organizations. The goal is to collaborate and drive initiatives that promote a circular economy, provide inspiration to communities and citizens to use resources efficiently, minimize waste generation, and explore recycling opportunities. The forum will support and encourage circular initiatives by start-ups/businesses/organizations to promote innovations in circular businesses in Surat through mentoring and promoting collaboration and will programmatically function as part of SMC's ongoing Resilience Strategy.

These initiatives will help initiate a transformation in Surat towards fostering a circular economy mind-set in the city and developing local practices and physical systems for the same.

FIGURE 17
Solutioning workshop with city officials



Rochak: Strengthening Waste Education in Schools

INTRODUCTION AND RATIONALE

The pilot project aims to inspire and empower the next generation of Surat’s citizens to contribute to a cleaner and greener Surat. The possibility of such an education program was suggested by the Municipal Commissioner during the opportunity assessment stage and discussed with the Nagar Prathamik Shikshan Samiti (municipal school board) Chairperson and other officers in February 2023. Surat has 327 public schools imparting elementary education to the children of the city. These schools are managed by this Nagar Prathamik Shikshan Samiti of Surat. With a total enrollment of about 172,000 students, these schools present a valuable opportunity to craft refined behavioral change for circular economy and responsible waste management in the communities and future citizens.

With the objective of understanding the current scenario of waste management in schools, a detailed needs–assessment was undertaken in seven selected schools, across the city. The process involved ground assessment of the school campus, observation of WASH infrastructure and practices and discussion with teachers and principals. It was noted that though schools had separate bins for collection of wet and dry waste, waste segregation was not in practice. Only one of the schools reported separate collection of sanitary waste by van; the rest either disposed sanitary waste with other waste or students took it back home, given the stigma related to it. Some teachers expressed a need for compost pits for recycling of wet waste and use of compost to nurture their gardens. Schools reported minimization of plastic usage in their campus with use of steel plates for mid–day meals. Also, some schools have a practice of not allowing the use of plastic/tetra pack by students on campus. Schools reported the support of local organizations like the Rotary Club, Swadhyay Parivar, Agastya Foundation, etc. for supporting awareness activities on waste management, WASH, environment conservation and other themes, though there were no structured capacity building activities undertaken.

FIGURE 18
Needs–assessment in SMC schools



Based on the assessment and observations in the schools and discussions with key stakeholders, an education initiative, Rochak, is proposed. The word Rochak was derived by re-ordering the Gujarati word – “ka-cha-ro” (waste) – thus creating a meaning that waste is interesting and can be reusable and recyclable.



VISION

The vision of this education program is to create the next generation of environmentally conscious citizens who understand the importance of responsible waste management through action-based learning. The program aims to empower students to become change agents, with the knowledge, commitment and potential to meet the challenges of waste management and drive behavioral change by expanding it to their families and communities.



METHODOLOGY

The proposed education program is geared towards educating school students through actionable practices in waste management and is aimed to be eventually integrated into the curriculum of Surat municipal schools. The program would consist of interactive and engaging activities and lessons that would help students understand the solid waste

management challenges faced by Surat and the importance of waste segregation, recycling, and composting. The students will also be encouraged to regularly work on activities for sustainable solutions in the school, home and community. With the Education Board and the SMC SWM Department, an effort will be made to develop these schools as models for reduce, reuse, recycle and sustainable waste management at public sector owned assets.

These activities are already being tested in two schools in the city, engaging with the students and teachers, and have produced the following learnings:

- ➔ Students and teachers are interested in learning about sustainable waste practices and showed willingness to incorporate these practices in their daily life.
- ➔ Engagement activities led to students being aware of type of waste, how waste can be segregated and ways in which plastic waste can be reduced.
- ➔ Separate bins for the different kinds of waste are already set up in school premises, and the teachers make sure the right bins are used.
- ➔ Student committees (already active in schools for other extra-curricular work) have been involved to run and sustain these activities in the longer run with the help of teachers monitoring the activities.
- ➔ Interest has been expressed from the Education inspector of SMC to scale these activities in more schools in the city.

FIGURE 19
Waste Segregation Demonstration with students of SMC



Proposed coverage: Scaling up to 50 more schools across Surat Municipal Corporation

Proposed timeline: One year

Actions for Implementation

ACTIVITY:

Prepare benchmarking criteria and conduct a baseline study –including Knowledge, Attitude and Practice (KAP) on waste management at the schools

METHODOLOGY

- Develop KAP study questionnaire and conduct KAP test. Conduct before and after surveys to assess knowledge and behavior change among students as well as quantity of waste generated in the schools.
- Prepare the assessment report (through secondary data collection, interviews with school stakeholders, SMC, primary observations in the school premises, photo documentation, infrastructure mapping) and present the scope of work
- Finalize the scope with SMC

EXPECTED OUTCOMES:

Clear understanding of school-specific practices and requirements

ACTIVITY:

Develop and implement school-specific activities

METHODOLOGY

- Develop modules and Information, Education, and Communication (IEC) materials
- Train Bal Sansads²⁷ (student committees) and Eco-clubs (students as change agents)
- Behavior Change Communication: Thematic sessions on waste management: sustainable waste management; reduce, reuse, recycle; segregation; composting; impacts of improper waste management; personal hygiene; menstrual hygiene management.
- Engagement of non-teaching staff on safe and hygienic practices
- Publish change/impact stories to scale up the pilot in public schools in Surat
- Project review by the Program Coordination Committee comprising members from CEE and SMC Education Department

EXPECTED OUTCOMES:

Improved KAP on waste management amongst students and teachers in schools and associated service providers

²⁷ The Bal Sansad is an elected body of the school which identifies issues, initiates problem-solving approaches and drives impactful changes in their school.

ACTIVITY:

Augment/repair/retrofit school infrastructure

METHODOLOGY

→ Undertake augmentation/repair/retrofitting of school infrastructure for improved waste management as per requirements, available budget and community contributions

EXPECTED OUTCOMES:

Improved facilities for waste management in the schools

ACTIVITY:

Link dry waste segregation to collection and recycling

METHODOLOGY

→ Coordinate with SMC to collect the dry segregated waste separately and send it to the plastic waste management facility in Bhatar post collection for further recycling

EXPECTED OUTCOMES:

→ Recycling of segregated waste

→ The school can demonstrate the use of furniture/products from recycled plastic on school premises (learning by showing value out of waste) which can strengthen understanding and motivate students to segregate waste.

Expected Impact

The program aims to foster a sense of environmental stewardship in students and create a positive impact on students' and teachers' environmental knowledge, attitudes and behavior. It is expected that the students share these learnings with their parents and peers which can lead to improved waste practices in their homes and communities. Segregation of waste will also improve recycling and composting resulting in less waste going to landfill. Schools can further use recycled furniture/products on school premises to demonstrate end use from the waste that the students segregate. Schools play a vital role in shaping attitudes. Teaching children how to deal with waste properly will demonstrate less waste production, clean surroundings, recycling and composting, building an alternate sustainable lifestyle.

The program intends to reach c.16,000 students turning them into agents of change. Training of Trainers for c.400 teachers will lead to creating a resource pool for taking this to more schools across the city. The School Management Committee of these 50 schools will serve as a node to enhance awareness of SWM among the community. This pilot will demonstrate a flexible, replicable, and scalable model for public schools for SWM, which can be further taken up by Nagar Prathamik Shikshan Samiti to all the schools and the District Education Department to all other schools in Surat. Alignment with Swachh Bharat Mission, and the Swachh Vidyalaya Puraskar (Cleanliness awards for schools) and the linkages with the school curriculum will foster a collaborative approach involving the school, parents, community, and the government, to achieve a wider impact.

TYPE

Expected Direct Beneficiaries

IMPACT

- Schools play a vital role in shaping the attitudes of children; the regular activities undertaken in schools will demonstrate responsible consumption, improvement in waste segregation, benefits of recycling and composting and building an alternative sustainable lifestyle.
- The pilot will lead to a strong understanding and knowledge in students on good waste practices and create a positive impact on students' and teachers' attitudes and behavior.
- The pilot aims to reach c.16,000 students and c.400 teachers in at least 50 schools with improved waste management behaviors.
- It will create c.50 model schools in SMC actively participating in issues relating to Solid Waste Management.
- To sustain this in the longer run, the capacity building modules are expected to be incorporated into the school curriculum so that newer generations of students also benefit from the learnings which in turn would benefit the city and its environment.

TYPE

Expected Indirect Beneficiaries

IMPACT

- It is expected that the students share these learnings with their parents and peers which can lead to improved waste practices in their homes and communities.
- Around 16,000 households (c.65,000 individuals) of students, teachers and line department staff will have an understanding about responsible waste practices.
- Improvement in segregation of waste will also improve recycling and composting resulting in less quantity of waste going to landfill.

Potential partners for implementation

The key stakeholders in this project are the students, teachers, school administration, SMC Education Department and Solid Waste Management team under the Health Department.

- Nagar Prathamik Shikshan Samiti will be the key partner and will facilitate implementation through administrative support like issuing permissions and notifications as needed, and securing support from functionaries/trustees of these schools.
- SMC's Health Department will be a partner in the facilitation of post collection and recycling processes.
- There are selected foundations and philanthropists already supporting several public schools in Surat. These can be leveraged in scaling up the pilot.
- The Centre for Environment Education (CEE) will facilitate and implement the project activities at the school level.

Budget

The estimated budget for the Rochak project implementation in 50 schools in Surat is INR 89,69,400 (USD 109,263). The detailed budget is presented in the Appendix.

Resilience value of the project

SMC has 327 public schools imparting elementary education in the city. These schools are managed by Nagar Prathamik Shikshan Samiti Surat. With a total enrollment of about 172,000 students, schools are an important stakeholder in the city. The school initiative has the potential to reach over 16,000 households (c.60,000 individuals) through the students in a year, and will enhance inclusivity in the city by ensuring that schools are well-served for waste collection.

Schools play a vital role in shaping the attitudes of children. The regular activities undertaken in schools will demonstrate responsible consumption, improvement in waste segregation, benefits of recycling and composting and building an alternative sustainable lifestyle. It is expected that the students share these learnings in their homes thereby reaching a wider audience in the city. The initiative will help make the city robust, by reducing environmental vulnerability by preventing waste leakage into water bodies and creation of huge landfills, enhancing the health and natural protection of the local ecosystem and improving the recovery of recyclable materials. Rochak would strengthen self-reflection among Surat students and their families/communities as they learn about sustainable waste practices like recycling and composting, empowering them to actively participate in waste reduction efforts and be responsible citizens. Such outreach will complement the overall IEC campaigns for Swachh Bharat. Skills and understanding about circular economy developed in students will contribute to resourcefulness in the next generation of the city.

Sampurna – a Zero Waste Zone pilot focusing on waste segregation

INTRODUCTION AND RATIONALE

The city generates about 2,800²⁸ tons of municipal solid waste every day and its management is a major challenge for the city authorities. Waste collected from households through door-to-door collection vehicles is brought to the transfer stations located in each administrative zone in the city.²⁹ Transfer stations have MRFs (Material Recovery Facility) where a small proportion of the dry waste is further segregated into various categories and sent to the recyclers. The remaining waste (wet waste and other mixed waste) is transported to the landfill site at Khajod.

The existing system in Surat needs improvements in terms of source segregation and decentralized waste treatment/management for organic and inorganic waste (recyclables) which can reduce municipal waste transportation significantly (thereby reducing carbon emissions in transportation) and avoid environmental degradation, ground and surface water contamination, air pollution and health hazards for its citizens.

Source segregation is key to improving further

processing and material recovery from waste. One administrative zone in the city would be selected as a pilot to establish such a 'Zero Waste' model where all households segregate their waste into at least three categories (organic, inorganic, and hazardous waste) and as far as possible the waste generated is managed near the source of generation (in a decentralized way). This model can further be replicated in other zones in Surat City. Currently, local grass root level organizations such as Innovate4India are undertaking similar efforts with SMC in the Citylight ward of Surat. These efforts have demonstrated that with participation from housing societies, waste collectors and citizens, source segregation can be achieved. For the implementation of this pilot project, these existing collaborations and ecosystems within SMC have a huge potential and can be leveraged so that waste segregation is scaled up in the city to maximize resource recovery and advance circular economy in the city.

BACKGROUND

A relatively small pilot on similar lines for promoting source segregation and improving door-to-door collection is already carried out by the city through Innovate4India in the Citylight ward over the 12 months from August 2022. With concentrated efforts, Citylight became the first ward in Surat to achieve source segregation, with 90% waste segregation at the source using two dustbins for approximately 20,000

households. Innovate4India collaborated with the Surat Municipal Corporation ward officials and a dedicated special force consisting of 34 individuals (6 Sanitary Inspectors and 28 Sanitary Inspector Interns) to conduct Information, Education, and Communication (IEC) and Behavior Change Communication (BCC) activities in the ward. Following a five day model (see figure 16) developed by EcoSattva, a local NGO, Innovate4India conducted pilot programs in around thirty five apartment complexes and subsequently provided on-the-ground training for the special force in March 2022.

The remarkable achievement of 90% source segregation in just six months was accomplished without any additional funds from SMC. The success was realized by utilizing the existing manpower and resources of SMC. Additionally, the project involved the engagement of approximately 1,500–2,000 volunteers. Together, the efforts led to the collection of seven Tons Per Day (TPD) of wet waste and four TPD of dry waste in a segregated manner, which was then directed to the Bhatar Material Recovery Facility (MRF). The initiative at Citylight ward has shown that with a structured approach, focusing on behavior change communication and systematizing collection and transport, it is possible to greatly improve the waste management system.

²⁸ ICLEI (April 2022). Developing Plastic Waste Free Cities, Baseline Assessment, SMC.

²⁹ Surat was divided into 8 main zones, some of which have been further divided into two for administrative convenience and as city limits expanded.

ZERO WASTE VISION

The Vision of the **Sampurna** Project is to establish and implement best practices for managing Municipal Solid Waste (MSW) in a selected zone. The suggested zone for the pilot may be either the Citylight ward itself extending to more areas or South Zone B (local area name - Sachin).

The project aims to achieve the following objectives in the pilot zone: around 85% source segregation for residential commercial and institutional waste. Additionally, the project seeks to eliminate Garbage Vulnerable Points (GVPs)/open dumping spots associated with C&D waste as well as other waste types. The project aims to achieve over 80% resource recovery. To facilitate data-driven decision making by authorities, a Data Dashboard will be implemented throughout the waste management value chain.

METHODOLOGY

The BOTRAM methodology³⁰ developed by Ecosattva is a comprehensive approach to solid waste management (SWM) that involves the stages of Baseline, Onboarding & Orientation, Training, Resource Recovery, Awareness, and Monitoring & Maintenance. For the Baseline Review, extensive research is conducted to understand the current SWM context, identify vulnerable points, evaluate existing practices, and assess available resources. The second stage of Onboarding & Orientation aims to align all stakeholders

³⁰ BOTRAM (ecosattva.in)

FIGURE 20
Five day model adopted from Ecosattva by Innovate4India



with the project's vision, present the baseline report, and develop a plan to streamline infrastructure and resources. Training includes certified training modules for sanitation workers and optimization of waste collection routes. Resource Recovery focuses on optimizing material recovery facilities and integrating informal waste pickers. The fifth stage of Awareness Campaigns aims at diverse activities to promote source segregation and engage the public. The final stage is Monitoring & Maintenance, putting in place data collection, and troubleshooting to sustain effective SWM processes. Overall, the methodology aims to achieve data-driven decision making, upskill workers, raise public awareness, and maintain efficient waste management practices.

ACTION PLAN

Based on stakeholder consultations and preliminary assessment, South Zone B will be selected for this pilot. Following a successful pilot, the city will incrementally scale up to other zones in the city. South Zone B covers an area of 40 km² and consists of 11 wards. It accommodates approximately 125,000 households and includes 10 commercial complexes in each ward, with around 50 shops per complex. The zone has a migrant population of about 30%, mainly engaged in factories and in various informal occupations. The scrap business is one of the major business activities in the zone; it has about 100 scrap dealers. Total daily waste generation is about 120 tons per day. The diverse character of the ward, in terms of population, makes it an ideal zone to test the pilot. Learnings from this zone and the Citylight ward will help SMC in scaling up these efforts in other zones of the city.

ACTIVITY:

Baseline Assessment of the zone

METHODOLOGY

Field Visit, Survey, Observation

EXPECTED OUTCOMES:

- Mapping of GVPs of C&D and other waste
- Zone-specific characterization of SWM needs in different neighborhoods, commercial areas, eateries, banquets, parks, institutions
- Mapping of primary collection routes, MRFs and secondary transport

ACTIVITY:

Onboarding & Orientation with SMC officials and zone workers

METHODOLOGY

Training, Orientation, Activities, Games, Sessions, Workshop

EXPECTED OUTCOMES:

- Needs-assessment review with local leadership
- Visioning workshops for vision statement campaign identity
- Preparation of draft SWM protocols for the zone

ACTIVITY:

Training and participatory sessions for maximizing waste segregation at source

METHODOLOGY

- Interactive workshops
- Field Visit, Survey, Observation

EXPECTED OUTCOMES:

- Onboarding and enhanced understanding among all on-ground staff (SMC, contractors and waste collectors)
- Suggestions gathered for optimizing collection and improving efficiency

ACTIVITY:

Resource Recovery

METHODOLOGY

- Advocacy, Meeting, Follow-up with the officials
- Joint Meetings with contractors and officials for waste collection and linking the zone to the nearest MRF
- Setting up the PadCare* collection system for sanitary waste

EXPECTED OUTCOMES:

- Permissions secured to use MRFs. The waste from MRFs can be linked to the plastic waste management facility for recycling.
 - Alignment with contractors for waste collection and processing
 - Maximum recyclables recovered from MRFs
 - Sanitary waste collected by PadCare and further processed to create reusable products
-

ACTIVITY:

Frequent awareness activities with communities

METHODOLOGY

Demonstration, Door-to-Door Visit, Community Events, Focus Group Discussions,

EXPECTED OUTCOMES:

- Doorstep awareness implemented for Source Segregation (five-day model)
- Reasons for garbage accumulation points addressed and remediating these areas
- Engagement activities to encourage residents' participation

ACTIVITY:

Monitoring

METHODOLOGY

Documentation, Monitoring

EXPECTED OUTCOMES:

Monthly reports on segregation and resource recovery

ACTIVITY:

Leveraging the SMC circularity forum to showcase efforts**

METHODOLOGY

Interaction with SMC officials and other relevant local stakeholders

EXPECTED OUTCOMES:

Efforts undertaken in the zone will be showcased in the forum for buy-in from relevant stakeholders and collaboration with local businesses who are working on circular solutions in the city

**More details in section 4.3 – Pilot Samman – page 35*

***More details in section 4.4 – Pilot Surekh Manthan Manch – page 37*

Surat has several material recovery facilities and a dedicated plastic waste collection and recovery center, all of which sort the collected waste from the city. Though areas like Citylight have achieved substantial segregation, a large portion of the city remains largely untapped and a lot of waste is still collected in mixed form. This leads to contamination of potentially recyclable materials including plastics. Segregation of waste at source is crucial to clean recoverables and maximizing resource recovery.

The goal is to achieve 85% source segregation in different waste categories (Wet/organic waste, Dry waste and sanitary waste) for domestic, commercial, and institutional waste. Other objectives include gradual elimination of GVPs, meeting safety standards set by Swachh Survekshan (an annual survey of cleanliness, hygiene and sanitation in villages, cities and towns across India undertaken by the national government) and ensuring that informal sector waste workers are skilled and integrated into the waste management system, improving efficiency and livelihoods. Moreover, efforts will be made to raise awareness about the Swachhata App (an app for residents' engagement under Swachh Survekshan) and strengthen communication between residents and Solid Waste Management service providers through ward-level WhatsApp groups.

Additionally, the target is to maximize resource recovery linking with the existing MRFs and establish a monitoring framework for aspects such as waste quantity and quality, material recovery performance, training outcomes, and the quality of waste segregation behavior change. Follow ups and securing permissions with SMC officials will be undertaken to send the segregated waste to the nearest MRF facility to recover valuables and send them for further processing/recycling. Plastic waste will be collected and sent to the Bhatar facility wherein the plastics can then further be sorted, and where feasible, recycled.

Sanitary waste will be safely diverted away from the landfill and collected by PadCare wherein it will be further processed to be converted into useable items. This will help address the health of waste workers and environmental sustainability concerns by creating recycled products from this recovered waste. Further, collaborating with local entrepreneurs, businesses interested in/already working for circular solutions would be sought out leveraging the Surat Circularity Forum.

Potential Partners for Implementation

- Solid Waste Management Department of SMC
- Ward level administration
- Innovate4India and local partners
- PadCare

Budget and Timeline

The detailed timeline and estimated budget are presented in the Appendix.

Resilience Value

The ward level pilot will strengthen reflectiveness in SMC's systems, contractors, service providers and the public with its focus on awareness, training and capacity building, and monitoring systems which will cyclically improve waste management services. It will enhance flexibility in the SWM municipal service by demonstrating an appropriate level and scale of waste management. As it is focused on achieving high source segregation, material recovery and reduced transportation of waste to landfill, it will enhance resourcefulness. As the pilot will work to improve waste collection, it will promote inclusivity in municipal service provision by covering under-served areas, and by integrating informal waste pickers into the waste collection system and improving their work conditions. The aim is to help reduce leakage of plastics into waterways and the ocean, and to reduce transport costs and emissions from the transport and burning of waste. In turn, this will help reduce pollution of air, water and soil from improper waste disposal and improve public and environmental health. These outcomes will enhance the robustness of the city's physical environment.

Samman – a pilot for sanitary waste management

BACKGROUND

There is no separate management of sanitary waste in Surat. While the eventual solution for sanitary waste is re-usable sanitary products (such as reusable napkins and menstrual cups), in the meantime sanitary waste disposal is a challenge in the city, as sanitary waste (napkins, diapers), from households, institutions, and offices ends up at transfer stations and landfill while also creating unhygienic conditions for waste workers due to improper disposal at source (not wrapped or marked). Additionally, uncollected sanitary waste can end up in the open environment and water bodies, blocking drains and posing risks that can have direct health impacts on the residents. Appropriate sanitary waste management is essential to minimize risks of improper handling as well as environmental pollution.

In line with regulations, apart from organic (wet) and inorganic (dry) waste, sanitary waste should be disposed in a wrapping paper (ideally marked with a red dot for identification) as instructed by the local authorities and placed in the bin meant for dry waste or non-biodegradable waste, to be handed over separately to the waste collector. In Pune, a Red Dot program is implemented for sanitary waste. Such a system can also be explored by the city in Surat. The

collection vehicle should also have a facility for the separate collection of sanitary waste. Though there are some vehicles from SMC where such separate bins are seen, it is still not a general practice in the city. The recycling system set up by PadCare in Pune may be explored for applicability in Surat.

PROJECT IDEA

PadCare, a start-up based in Pune, provides a solution for material recovery and recycling by safe processing of sanitary waste. A pilot project for Sanitary Waste Management, Samman, aims to introduce PadCare's services to a few pilot locations in Surat, including commercial complexes, institutes and schools. This pilot project is proposed to:

- Enhance awareness about re-usable sanitary products (such as reusable napkins and menstrual cups);
- Promote safe disposal of used sanitary products by wrapping and marking (such as with a red dot), or in special bins to be provided in schools, campuses and offices;
- Set up a system to collect sanitary waste and transport it to a material recovery facility for disinfection and recovery of cellulose and plastic.

PadCare, a start-up based in Pune provides a solution for material recovery and recycling by safe processing of sanitary waste. PadCare creates harmless and sterilized outputs out of used sanitary pads. These

outputs further produce commodities such as paper and paver blocks. The Samman pilot project aims to introduce PadCare's services to a few pilot locations, including commercial complexes, institutes and schools. It will run in conjunction with the Rochak and Sampurna pilots and will be targeted in these pilot areas. The education and outreach activities already planned in the two pilots will promote re-usable sanitary products, and good practices for separate disposal of single-use sanitary products. A system for collection of this sanitary waste will be set up by PadCare in collaboration with SMC.

FIGURE 21
SWM Collection vehicle with a separate sanitary waste bin



Actions proposed to establish the sanitary waste management system, are:

- Sanitary waste collection bins will be placed in selected schools under the Rochak pilot and segregation of sanitary waste will be promoted in the schools and zone under the Sampurna pilot.
- Potential location for setup at the new Diamond Bourse in Surat,³¹ set to be inaugurated by end of 2023, can be explored for setting up the treatment facility with a possibility to cross subsidize the cost for schools.
- The waste collection frontline staff and collection agencies will be oriented to creating a channel for sanitary waste.

PadCare is expected to set up a collection system and transport the sanitary waste to a material recovery facility. Initially, the waste will be taken to PadCare’s only existing MRF in Maharashtra (Mumbai or Pune). Though eventually PadCare may explore, with SMC and the Gujarat Pollution Control Board, setting up MRF in Surat itself. More information about PadCare, and technical specifications of the MRF, is presented in the appendix.

Budget

Estimated budget for sanitary waste management of 50 schools and 5 commercial complexes is presented in the appendix.

Resilience Value

The project will enhance resilience in Surat through the awareness and education efforts around sanitary waste management, contributing to reflectiveness in society. It will enhance inclusivity by addressing the needs and providing appropriate solution for sanitary waste disposal for girls and women. Setting up

³¹ <https://edition.cnn.com/style/india-largest-office-building-surat-diamond-bourse/index.html>

a dedicated system for collection of sanitary waste will contribute to improved work conditions through safe handling of waste for waste workers. The recovery of materials from sanitary waste will contribute to resource recovery and enhancing circularity in the waste cycle. This will also lead to reduction of pollution by avoidance of sanitary waste burning and dumping at the landfill contributing to the robustness of the city’s physical environment.

FIGURE 22

The PadCare Process (source: Padcarelabs.com)



Surekh Manthan Manch (Surat Circularity Forum)

INTRODUCTION

The current waste management system in Surat is geared towards the collection and transport of waste whereas the level of source segregation is low. Materials recovery and processing are carried out at large facilities. The recovery of materials is done at transfer stations manually by sifting through deposited wastes in a limited time. Limited source segregation, workspace, human resource, and time, also limits material recovery. Composting is not extensively practiced. Conversations with municipal officials and studies of citizens' perceptions reveal that there is a culture of cleanliness and a civic expectation that the municipal corporation will take care of the waste. The current waste management system responds to this culture and perception, and the physical, financial and contractual elements are arranged to transport waste rather than to reduce waste and recover materials.

However, the context of the urban municipal waste management system has changed over time. The physical limits of land available for waste containment are apparent, financial resources for waste management are limited, and the national regulations and guidelines seek to change local systems towards waste reduction, materials recovery, and recycling, and minimizing the transport to landfill. It is important to recognize these

drivers and initiate a conscious change in the local systems for waste management.

While supportive legislation, enforcement, and technology are available, the power of awareness, perception, values and culture should also be harnessed for the desired system transformation. Towards this, it is proposed to create an ongoing circularity forum – **Surekh (Surat ReCharkha/recycling) Manthan Manch** – that promotes the ethos of wise and careful resource use, material reuse and recycling, care for waste workers, and seeking to model formal municipal systems towards a circular economy.

APPROACH

The proposed approach is as follows:

Formation of the forum

The Surat Climate Change Trust (SCCT) was formed by the Asian Cities Climate Change Resilience Network and supported by the Rockefeller Foundation to engage in policy advocacy regarding urbanization and climate change, to assess urban growth scenarios and to advise local government on sustainable habitat development. SCCT has representatives from institutions including the Centre for Social Studies (CSS), Sardar Vallabhbhai National Institute of Technology (SVNIT), Irrigation Department, Gujarat State Disaster Management Authority (GSDMA), academic institutions and technical experts from the city. The trust also hosts sub-forums like the Urban Health and Climate Resilience Center as the health-related climate change project to conduct quality research in the area of urban health and climate change resilience.

The Surat Circularity Forum can be a sub-group within the SCCT, guided by the vision for a circular economy in Surat. The forum may be multi-stakeholder and may incrementally engage individuals and entities that agree with the need for systems-change towards a circular economy. The forum can be chaired by the Deputy Municipal Commissioner and members may include municipal officials of the Health and SWM departments, the Surat Chief Resilience Officer, civil society organizations, academic institutions, community groups, private sector organizations, etc.

The forum would meet to share experiences and review the state of waste management and elements of the circular economy in the city, consider which activities to support that will enable systems-change in different ways, and work out how best to enable such activities. The aim would be regular engagement with key stakeholders to find local solutions in the city. The forum will also act as a catalyst to engage with private investors, businesses and local industries to mobilize private sector funding to invest in sustainable infrastructure and systems investments to help in transitioning the city of Surat towards a circular economy.

The forum will run as a complementary activity with the other proposed activities, such as the Rochak school initiative, and the zone-level pilot project. In addition, it is proposed to initiate outreach activities by (or on behalf of) the forum to enhance awareness about the concepts and practices supporting circular economy, and their relevance to Surat.

Outreach activities

The outreach activities proposed are:

1. Collaborations and partnerships

- Create a system for collaborations and participatory action leveraging the existing partnerships formed by SMC through SCCT; this can help identify and meet the circular economy goals for the city and contribute to the outcomes.
- Engagement with corporates, private businesses, local industries for mobilizing funding as well as incentivizing and creating a pathway for businesses to participate in and provide circular solutions for the city.
- Engagement with local political leadership (community leaders/elected representatives) who can reach out to the communities and promote circular activities.
- Engagement with different community groups like self-help groups, youth, corporate groups and residents' associations, enabling them to take up their own initiatives at the individual and community level to promote circular economy.

2. Capacity building

- Plan a series of thematic sessions, workshops and events for sharing best practices, technologies, and innovations. for stakeholders under the forum, to identify common challenges and draw lessons to suit the city's needs.
- Engagement with SMC and its contracted entities involved in IEC for waste management services, to align the messaging to the concepts of circular economy and capacity building for the same.

3. Policy advocacy - Engagement with the government at various levels to support initiatives for the circular economy, including:

- Advocacy to strengthen EPR systems, such as through a workshop with officials, experts and entities involved in the EPR ecosystem.
- Develop proposals to improve work conditions and material recovery at MRFs, through detailed site studies.
- Develop a scheme of incentives that help evolve the current arrangements towards material recovery.
- Pilot projects at neighborhoods willing to set up localized composting and small-scale scrap recovery, etc.

4. Knowledge sharing and awareness

- Prepare information material like infographics and videos describing the why and how of circular economy, related to the local context.
- Develop materials to disseminate print and social media content, especially, case studies of good practices, interviews with practitioners and experts, and create a media campaign for the same.

Monitoring and review

The monitoring and review are expected to focus on these components:

- Outreach activities of the forum, to keep track of the scope and extent of activities taken up, their effectiveness, learnings, and outcomes.
- Learning and reflection from the Rochak school program and Sampurna zone pilot.
- Specific studies, including surveys and focus group discussions, to be commissioned regularly, perhaps through tie-ups with academic institutes and through internships, to understand public perceptions and practices about waste management and circular economy.

Timeframe

Two years to begin with, and continuation of the forum with voluntary time contributions, making use of complementary activities and convergence opportunities, and resources raised by the forum itself depending on the needs.

Budget

The estimated budget for the forum is presented in the appendix.

Resilience value

- The proposed forum will initiate, expand and deepen the public dialogue and deliberation on the city's health, with special reference to waste management, contributing to self-reflection among key stakeholders in Surat.
- The forum is conceived based on the recognition that a cultural and societal shift towards circular economy is essential for improving resilience, as it will enhance resourcefulness by aiding a shift to waste segregation and material recovery, saving public funds, and promoting livelihoods related to recycling as well as making communities more engaged and responsible towards the waste they are generating.
- The forum will advance flexibility and redundancy by introducing decentralized, modular systems for waste management, inclusivity by aiming to improve waste services in under-served areas, and robustness by reducing plastic leakage and pollution in the city.

5. Roadmap for Implementation

A roadmap for implementation of the proposed projects is provided in the table below:

Projects	Planning	Possible Funding	Implementation	Monitoring and Evaluation	Sustainability
Rochak: to strengthen SWM awareness and education in public schools in Surat	<ul style="list-style-type: none"> • CEE • Education Dept, SMC 	<ul style="list-style-type: none"> • CSR • Philanthropic agencies 	<ul style="list-style-type: none"> • CEE 	<ul style="list-style-type: none"> • CEE • Education Dept., Health Dept. SMC 	<ul style="list-style-type: none"> • CEE • SMC Education Dept, Health Dept
Sampurna: A Zero Waste Zone pilot focusing on waste segregation to create a neighborhood waste management system to improve waste recycling and recovery	<ul style="list-style-type: none"> • CEE • Innovate4India 	<ul style="list-style-type: none"> • CSR • Philanthropic agencies 	<ul style="list-style-type: none"> • Innovate4India • PadCare 	<ul style="list-style-type: none"> • SMC • CEE 	<ul style="list-style-type: none"> • SMC • SUDA • CEE • Innovate4India
Samman: Sanitary waste management through safe collection, recovery and safe processing of sanitary waste	<ul style="list-style-type: none"> • Surat Diamond Bourse • PadCare • CEE 	<ul style="list-style-type: none"> • Surat Diamond Bourse • CSR • Philanthropic agencies 	<ul style="list-style-type: none"> • PadCare • SMC • SDB Diamond Bourse 	<ul style="list-style-type: none"> • CEE • Innovate4India 	<ul style="list-style-type: none"> • SMC
Surekh Manthan Manch: A platform for key stakeholders to collaborate and drive initiatives that promote a circular economy	<ul style="list-style-type: none"> • CRO, CEE • Local NGOs • Community groups 	<ul style="list-style-type: none"> • CSR • Philanthropic agencies • Voluntary time contributions 	<ul style="list-style-type: none"> • Local NGOs • CRO • CEE 	<ul style="list-style-type: none"> • CRO • CEE • Innovate4India 	<ul style="list-style-type: none"> • SMC

6. Strategic Mid- & Long-term Recommendations

Several opportunities to strengthen municipal waste management in Surat were identified based on the primary and secondary assessment, stakeholders workshop, stakeholder interviews and focus group discussions in the city.

These engagements aimed to gather insights and feedback from key stakeholders to further develop and enhance strategic recommendations for the cities to advance resilient waste management solutions. Recommendations included strengthening Extended Producer Responsibility (EPR), promoting waste segregation, conducting community campaigns, supporting the informal waste sector, and incentivizing home composting. The discussions also addressed the importance of regulating waste burning, tackling tobacco and textile waste challenges, and fostering partnerships with citizens and educational institutes.

The outcomes from these discussions contributed to shaping the strategic recommendations for mid- and long-term waste management improvement in Surat, presented below. The pilot projects presented in the previous section refer to some of these recommendations.

1. Strengthening public engagement and awareness on waste management

The strong municipal service provision system put in place by SMC has generated trust among citizens that SMC will take care of waste collection and management. While this trust is a great asset, the changed context and paradigm of waste management from collection and disposal to reduce, recover, reuse, recycle, and minimize transport to landfills now creates the need for extensive public engagement and outreach to transform societal expectations and behavior related to waste management. SMC has appointed one contractor in each of the nine city zones, who is responsible for most waste management services including daily door-to-door collection, secondary collection from society gates, collecting sweeping waste, clearing GVPs in the zone, etc. These contractors also have the responsibility for public awareness and outreach about solid waste management and source segregation. There is an opportunity to strengthen public education and outreach on SWM. This may include:

→ A comprehensive strategy for IEC at the city scale.

- An assessment of the capability of each contractor to implement IEC as, historically, their scope of work has been the logistics of waste collection and transport, and not IEC.
- Preparation of certain uniform assets and collaterals for awareness and public outreach at the city level; detailing out the IEC needs for each locality with the contractors, including communication kit, activities, source segregation poster/kit, home composting kit, etc.
- Capacity building of contractors, for locale-specific strategies and communication tools.
- Training modules for SMC staff and different segments of the SWM service providers like waste pickers, door-to-door collection staff, campaigners, and other members of the zonal IEC team.
- Special initiatives with schools to enhance understanding of waste reduction, recycling and appropriate management; introduce good practices at all the schools; and reach households through home and community-oriented student projects.

The assessment should include whether the contractors have the adequate skill set to do the awareness and IEC activities, such as those regarding waste reduction strategies, home composting awareness, etc. These will be necessary and can enhance the improvement in source segregation. It would be helpful to map the needs of each zone and build targeted strategies by including key concerns of the city such as waste burning, tobacco litter, and the use of single-use plastic to improve collection and segregation, as well as reduction efforts.

Surat has a vibrant street food culture, which also leads to the wide use of single-use plastic cutlery across the city despite efforts to reduce such usage, especially after the ban on single-use plastic. 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. During the CAP assessment, it was found that tobacco packaging is the major litter item on the street. Opportunities to combine health campaigns with litter reduction efforts to address high amounts of tobacco-related litter may be designed and implemented as part of the IEC initiative.

(This recommendation is partially included in the Sampurna pilot project for a zone-level pilot; the Rochak pilot, for outreach to schools; and the Surekh Manthan Manch, all presented in the previous section.)

2. Door-to-door waste collection improvement and addressing waste burning in informal and old city residential zones

In the old city areas and slums (about 334 pockets³²), the collection vehicles are unable to reach households due to narrow lanes, leading to inefficient collection. This further causes open dumping, waste burning, and leakage of waste in the water bodies, rivers and environment. The Surat Air Quality Report presents information on the variation in the composition of municipal solid waste that is burned in different parts of the city. For example, areas with lower-income populations have the highest amount of compostable waste burned, whereas higher-income areas show more recyclable solid waste being burned.

A pilot project may be developed, perhaps with a community-based organization to provide SWM collection services using push carts or hand carts in slum localities. Further, feeder points can be designated on the main road, from where the contractor vehicle can provide secondary collection. Taking inspiration from Can Tho, Vietnam, smaller vehicles for narrow roads, appropriate PPE uniforms and equipment to the on-field workers can be provided. Mapping complaints of waste dumping and waste burning may help identify spots to improve collection services and focus on chronic spots. This can help introduce/streamline door-to-door collection as slums have narrow lanes that the standard motorized collection vehicles cannot

reach.

3. Chhindi (textile/fabric) waste

About 150 tons per day of textile/fabric cut pieces (below roughly two meters in length) called *chhindi* are generated from the textile industry in Surat. Some of the cut pieces are reused, but a large proportion (c.75 tons) is left for municipal waste collection. There is an opportunity to strengthen mechanisms for the collection, handling and recovery/scientific disposal of 100% of pre-consumer textile waste. The informal sector is highly involved in the recycling of textile waste and in cleaning plastics. Engaging with the informal sector to enhance their services while strengthening their livelihoods may be explored.

4. EPR policy enforcement and implementation

EPR support and compliance in the city needs to be strengthened, which will address 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-wide annual EPR targets and for which action plans need to be developed. <https://eprplastic.cpcb.gov.in/#/plastic/home>. The roles of SMC and other stakeholders may be clarified and streamlined to help strengthen the implementation of EPR at the city level.

Companies like Surat District Cooperative Milk Producers Ltd. (SUMUL) dairy are collecting plastic milk pouches and sending them for recycling under

³² Information provided under RTI, https://drive.google.com/file/d/1EYaEv4jeH2xIEYt5UfWWaPLXdyIwPVAI/view?usp=drive_link

their EPR in collaboration with SMC and Eco Vision. Around 150,000 such plastic pouches are being collected daily. Similarly, in 2020, Surat collected waste fabrics from textile markets to reduce the cost of bags and prevent waste. Approximately 120,000 bags were prepared and sold by Self Help Groups leveraging the textile industry of Surat.³³ Given that Surat is a major city in manufacturing plastics, strict enforcement of EPR for these local industries will help in a substantial reduction of material leakage and help in keeping the materials within the manufacturing cycle. Such efforts need to be amplified, replicated and scaled throughout the city, to reduce textile waste going to the landfills and bring in environmentally friendly alternatives to single-use plastics.

The city's plastic waste management facility is addressing the concern of plastic waste in the city. However it would be essential for the city to segregate plastic waste and enforce EPR so that the plant is ensured sufficient input, as well as the output being reused by the local manufacturers. Also, it would be crucial to track the data and insights from the functioning of this plant if the city plans to replicate another such facility in the future.

In alignment with the national regulation in India, a range of considerations are needed at the local level to advance sustainable solutions for waste management. Institutional mechanisms need to be strengthened for compliance and establishing linkages between industries and recyclers for collection and processing.

³³ Surat Municipal Corporation, 2020

The Surat Circularity Forum can be leveraged for this. Surat being a major city for the production, recycling, and trading of plastics, such institutional and ecosystem building initiatives will help enhance the capacities of the local government, businesses and industries, NGOs, and community groups to plan and manage in an integrated manner.

5. Promote decentralized organic waste management

Surat has a considerable number of bulk waste generators (BWGs), that is establishments generating more than 100 kg of waste every day. But very few are processing their waste on-site. As per the Solid Waste Management Rules, 2016, BWGs and residential welfare associations are supposed to process their waste within their premises. There is an opportunity to promote on-site composting as it gives an opportunity to reduce the cost of transportation and processing of waste at the central level. The savings in transportation may be offered as an incentive to bulk waste generators to set up composting facilities within their premises. An existing incentive scheme promotes on-site wet waste management (by composting), and SMC had provided a subsidy for the installation of electrical organic waste composters (OWCs). However, OWCs have not been successful, and the equipment is in disrepair in many housing complexes. The scheme may be reviewed and strengthened with appropriate simple and easy-to-maintain technologies for effective on-site organic waste treatment.

(This recommendation is partially included in the Sampurna pilot project in one zone, presented in the previous section).

6. Promote green jobs and enterprises in circular economy and solid waste management

Local enterprises to handle collection, composting, and recycling such as self-help groups, waste pickers' collectives, and youth enterprises have emerged in cities such as Bengaluru and Pune. Surat also has efforts around collection and composting of flower waste from temples and tender coconut shells. Specific local waste streams such as flowers/temple waste, coconut waste, fabric waste, etc. which can be processed to make products could be identified. Local enterprises which work in recycling may be promoted and scaled up in Surat through various strategies including Green Enterprise financing and support schemes, and technical, entrepreneurial capacity-building as needed.

In addition, as the concept of green jobs also pertains to work conditions, the basic facilities/infrastructure could be improved for the workers at the ward level and at transfer stations. This may include providing facilities such as hand washing areas, safe drinking water, seating and resting areas, eating places, insurance, benefits related to education and other welfare, defined working hours, holidays, and minimum wages for waste workers.

7. Appendix: Details for proposed projects

Appendix 1 – Rochak: Budget for implementation in 50 schools in Surat

No.	Description	Unit Cost INR	No. of Units	Total INR	Total USD
1	Benchmarking study and Detailed Project Report preparation	5,000	50	250,000	3,045
2	SWM related infrastructure augmentation cost	50,000	50	2,500,000	30,454
3	Project material (IEC design and development)	25,000	50	1,250,000	15,227
4	Training of teachers	1,500	50	75,000	914
5	Community engagement workshops	10,000	50	500,000	6,091
6	Project staff	140,000	12	1,680,000	20,465
7	Technical expert	150,000	1	150,000	1,827
8	Project staff travel	12,500	12	150,000	1,827
9	Project coordination cost	75,000	12	900,000	10,964
10	Project management staff salary	10,000	12	120,000	1,462
11	Travel – senior and management staff	25,000	6	150,000	1,827
12	Project review meetings	5,000	12	60,000	731
13	Research/Monitoring & Evaluation/Reporting and documentation (MIS Person)	20,000	12	240,000	2,924

14	Staff training and capacity building	25,000	4	100,000	1,218
15	Stationery	10,000	12	120,000	1,462
16	Communication	5,000	12	60,000	731
17	Overhead Cost at 8%			664,400	8,094
Total Project Cost				8,969,400	109,263

Appendix 2 – Sampurna: Details on the BOTRAM methodology

Baseline Review: This stage involves comprehensive data-driven research where Innovate4India team conducts field visits to:

- Understand the status of solid waste management (SWM) in the area.
- Identify and document Garbage Vulnerable Points (GVPs) in the area.
- Evaluate and map existing SWM practices.
- Assess available resources such as land, equipment, human resources, community influencers, and dry waste management facilities.
- All these details are captured using a web-based BOTRAM application, which guides the planning exercises and decision making throughout the project.

Onboarding & Orientation: This step focuses on bringing together the central leadership of SMC, residents, and other stakeholders from the pilot zone to establish a common goal. Key objectives include:

- Presenting the baseline report.
- Aligning all stakeholders with the project's vision.
- Developing a plan to streamline existing infrastructure and resources per the project's vision.
- Avoiding duplication of efforts.
- This process ensures alignment between leadership, the project team, and all stakeholders.

Training: This step consists of two important components:

- Conducting National Skill Development Corporation³⁴ (NSDC)-certified training modules for both formal and informal sanitation workers who provide doorstep collection, transportation, and material recovery services. The training modules cover collection staff, supervisory staff, and management staff based on the finalized SWM scope from the onboarding stage.
- Optimizing waste collection vehicle routes to align with the project's vision and goals.
- Creating micro-plans for street sweeping staff.
- The training aims to upskill and motivate sanitation workers, while a dedicated team focuses on raising awareness and driving behavior change among citizens.

³⁴ NSDC is a not-for-profit public limited company set up by Ministry of Finance. NSDC aims to promote skill development by catalyzing creation of large, quality and for-profit vocational institutions. Further, the organisation provides funding to build scalable and profitable vocational training initiatives. - <https://nsdcindia.org/>

Resource Recovery: In this step, we optimize material recovery facilities by:

- Identifying destinations for each segregated waste stream and establishing basic processes.
- Integrating informal waste pickers into the waste recovery process following Swachh Survekshan guidelines.
- Assisting implementation of efficient material recovery practices.
- Managing waste-related data using our web-based application.
- The outcomes include data-driven decision making in waste management, formalizing the role of informal waste workers, and achieving a recovery rate of over 80%, diverting waste from landfills.

Awareness Campaigns: This step involves implementing diverse Information, Education, and Communication activities with a focus on source segregation:

- Distributing stickers, conducting demos, introducing local mascots, and creating jingles to promote source segregation.
- Creating a citizen movement for cleanliness and engaging stakeholders such as educational institutions, self-help groups, youth groups, community leaders, and influencers.
- The awareness campaigns aim to foster effective SWM, garner media support, and increase awareness among the public.

Monitoring & Maintenance: In this step, we continuously monitor the effectiveness of established processes through:

- Daily digital and in-person spot monitoring to ensure sustained collection and segregation levels.
- Periodic data collection to establish trends and make projections.
- Providing real-time data through dashboards or applications.
- Offering troubleshooting and maintenance support as required.
- The outcomes include continuous data capture and feedback for local authorities and the ability to customize on-ground modifications based on real-time information.

Appendix 3 – Sampurna: Action plan for the pilot

Key Activity	Outcomes	One-year timeline											
		M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12
Baseline Assessment	Mapping waste accumulation points; characterization of SWM needs in different neighborhoods, commercial areas, eateries, banquets, parks, institutions; Mapping of primary collection routes, MRFs and secondary transport; needs-assessment review with the local leadership	█											
Onboarding & Orientation	Needs-assessment review with the local leadership	█											
	Visioning workshops for vision statement campaign identity; preparation of draft SWM protocols for the zone	█											
Training and Route Mapping	Onboarding and enhanced understanding among all on-ground staff (SMC, contractors and waste collectors)		█	█									
	Suggestions for optimizing collection and improving efficiency (as needed)		█										
Resource Recovery	Permissions to use MRFs	█	█										
	Implementing efficiencies		█	█	█	█	█	█	█	█	█	█	█
	Alignment with contractors for wet waste and hazardous waste collection and processing								█	█	█	█	█

Awareness Campaign	Doorstep awareness implemented for Source Segregation (five-day model)	[Green bar]					[Grey bar]
	Reasons for garbage accumulation points addressed and remediating these areas	[Green bar]					[Grey bar]
	Events for residents' participation	[Green bar]	[Grey bar]	[Green bar]	[Grey bar]	[Green bar]	[Grey bar]
Monitoring & Maintenance	Monthly reports on segregation and resource recovery.	[Green bar]					

Appendix 4 – Sampurna: Budget for the pilot

No.	Particular	Amount in INR	Amount in INR	Amount in USD
1	Human Resources 30 Campaigners * 19,000/month * 12 months	68,40,000		
	Supervisor 3 Team Leaders * 30,000/month * 13 months	11,70,000		
	Tech Manager 1 Tech Manager * 30,000/month * 13 months	3,90,000		
	Program Manager 90,000 Per month * 14 months	12,60,000	96,60,000	115,900
2	IEC Material:			
	Handouts	125,000		
	Posters	4,000		
	Banners	250,000		
	Certificates	10,000		
	Misc.	11,000	4,00,000	4800
3	Events			
	1,000/event * 300 events in a year	300,000	3,00,000	3,600
4	Consultancy Charges			
	1 Consultant * 500,000/month * 14 months	700,000	7,00,000	8,400
	TOTAL		1,10,60,000	132,700

Appendix 5 – Samman: Information about PadCare technology and tentative budget

PadCare Labs has developed and launched the world's first sustainable Menstrual Hygiene Management as a Service (MHAAS) solution. The solution includes:

- PadCare Vend – an instant, ever-available, and convenient pad vending machine to ensure a culture of safe and hygienic menstrual practices.
- PadCare bin – a front-end sensor-based mechanism safe collection unit that provides at-source collection while maintaining women's health, hygiene, and privacy.

At the core is a technology to recycle absorbent products. With the vending machine and the bin, PadCare provides a comprehensive menstrual hygiene management solution that completes the loop of the menstrual hygiene economy by generating harmless, recyclable output out of soiled pads.

The PadCare team is led by young engineers on a journey to bring about positive and significant changes in the sanitary waste disposal system with a broader vision of safeguarding women, waste-pickers, and the environment. PadCare creates harmless and sterilized output out of used sanitary pads. These outputs further produce commodities such as paper, paver blocks etc.

PadCare is an automated hygiene management system that generates harmless, recyclable output out of used sanitary napkins. Through multi-step mechanics, it breaks down absorbent sanitary waste into two by-products – cellulose and plastic. Once the waste is processed in the Central Processing Unit, which goes through a fully mechanized process to finally be broken down into two by-products – pulp and plastic. These can be utilized in the paper-packaging industry, chemical, and agriculture industries. The processing of sanitary napkins involves disintegration, disinfection, decolorization, deodorization, disintegration, and drying.

Budget for implementation

Budget of sanitary waste management at 50 schools and 5 commercial complexes

No.	Description for 50 Schools	Amount in INR	Amount in USD
1	Vending Machine & Padcare Bin for 50 Schools	17,50,000	21,044
2	Survey, Impact Analysis & Awareness session	8,50,000	10,221
3	Service Cost and Livelihood generation for service Executive	8,40,000	10,101
Total		34,40,000	41,370 (rounded)

No.	Description for 5 Complexes	Amount in INR	Amount in USD
1	Vending Machine & PadCare Bin for 5 complexes	2,00,000	2,405
2	Survey, Impact Analysis & Awareness session	82,500	992
3	Service Cost and Livelihood generation for service Executive	4,20,000	5,050
Total		7,02,500	8,450 (rounded)

Budget estimate to set up a sanitary waste material recovery facility in Surat

No.	Description	Amount in INR	Amount in USD
1	PadCare's recycling unit cost	85,00,000	102,216
2	Effluent Treatment Plant	15,00,000	18,038
	Construction and power	25,00,000	30,063
Total		1,25,00,000	150,320 (rounded)

**Based on certain assumptions and subject to changes on a case-to-case basis*

Appendix 6 – Budget for Surat Circularity Forum

Description	Total INR	Total USD
Outreach material development	5,00,000	6,000
Meetings, workshops, and events	5,00,000	6,000
Studies	5,00,000	6,000
Coordination and support	5,00,000	6,000
Total	20,00,000	24,000

Appendix 7 – Budgets summary for proposed projects

No.	Description	Total (INR)	Total (USD)
1	Rochak: Implementation in 50 schools in Surat	89,69,400	109,260
2	Sampurna: A Zero Waste Zone Pilot	1,10,60,000	132,700
3	Samman: Sanitary Waste Management		
	Implementation in 50 Schools	34,40,000	41,370
	Implementation in 5 Commercial Complexes	7,02,500	8,450
	Set up a sanitary waste material recovery facility in Surat	1,25,00,000	150,320
4	Surat Circularity Forum	20,00,000	24,000
	Total	3,86,71,900	466,100

Appendix 8 – Glossary of Terms

Wet Waste: Wet waste typically refers to organic waste usually generated through kitchens in households and commercial eating establishments. This can include food leftovers, vegetable peels, fruits, etc. These are basically biodegradable organic waste that can also be composted.

Dry Waste: Dry waste comprises of things like paper, glass, plastic, cardboard, styrofoam, rubber, metal, food packaging material, etc.

Sanitary Waste: The Solid Waste Management Rules, 2016 by the Government of India classifies sanitary waste as used sanitary napkins, diapers, condoms, tampons, and incontinence sheets.

Material Recovery Facilities (MRFs): 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.

Bio-mining: 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 Pollution Control Board (CPCB) of India's guidelines, "Biomining is the scientific process of excavation, treatment, segregation and gainful utilization of aged municipal solid waste lying in dumpsites typically referred to as legacy waste."

Bio-methanation: Bio-methanation is a process by which organic material is microbiologically converted under anaerobic conditions (absence of oxygen) to biogas.

Organic Waste Converters: Organic waste converters are machines that are used to convert organic waste like food material, vegetables, meat, leaves, fruits, flowers waste into compost.

