



PROJECT STATEMENT

Chennai

Bringing Circularity in Chennai's
Solid Waste Management





Contents

4	1. Introduction
6	2. Context
6	2.1. THE CITY AND ITS WATERBODIES
9	2.2 THE CITY'S WASTE MANAGEMENT SYSTEM
11	2.3. POLICIES AND MANDATES
12	3. Problem Statement
14	4. Project Overview
14	4.1 AN AREA-BASED PILOT: BUILDING NEAR-ZERO WASTE NEIGHBOURHOODS (KASTURBANAGAR, WARD 173-ZONE XIII-ADYAR)
20	4.2. CLEAN WATERSCAPE FOR HEALTHY CITIES
24	4.3. UNDERSTANDING THE RESILIENCE VALUE
25	5.1. INSTITUTIONAL ARRANGEMENTS
25	5. Roadmap for Implementation
29	5.2. IMPLEMENTATION TIMELINE
30	5.3. TENTATIVE BUDGETS

31	6. Key Strategic Recommendations
34	Appendix 1: Case Studies
41	Appendix 2: Project Proposals
48	Appendix 3: Glossary of Terms

Team members

RESILIENT CITIES NETWORK

Katrin Bruebach, Saurabh Gaidhani, Luciana Cardoso, Shweta Nagarkar

CHENNAI RESILIENCE CENTRE

Krishna Mohan Ramchandran

OKAPI RESEARCH AND ADVISORY

Parama Roy, Akshaya Ayyangar

OCEAN CONSERVANCY

Edith Cecchini, Daniel Sebastian Padilla Ochoa, Chever Voltmer, Keri Browder

THE CIRCULATE INITIATIVE

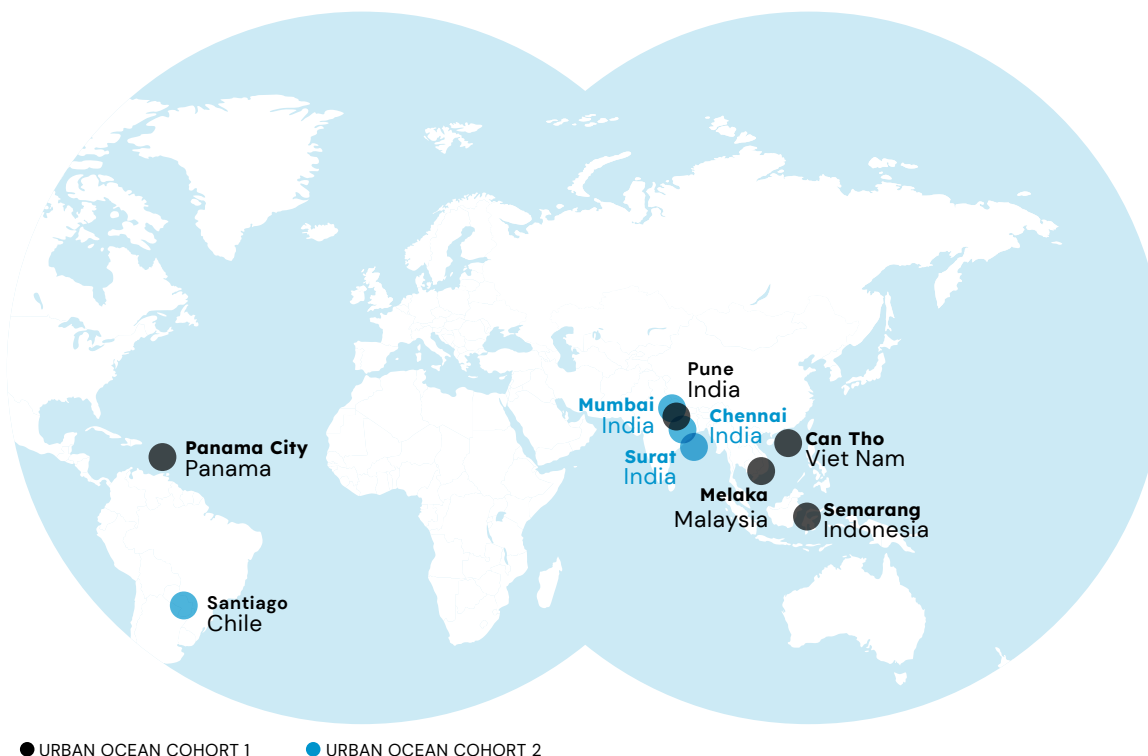
Ellen Martin, Khunapong Khunaraksa, Annerieke Douma



1. Introduction

Overview of the Urban Ocean Challenge

Cities are home to over half of the global population and account for nearly three-quarters of global greenhouse gas (GHG) emissions.¹ 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%.² At the same time, the circular economy offers a USD 4.5 trillion economic opportunity by reducing waste, stimulating innovation, and creating employment by 2030.³ Adding a layer of complexity by including the marine plastic debris challenge can push cities towards rethinking their relationship with the ocean. So, a huge opportunity exists for city governments to implement policies and projects that promote a more resilient and circular waste sector in their cities. Now is the time to set out the path towards a more resilient urban-ocean relationship.



1 Intergovernmental Panel on Climate Change (2021). Report on Climate Change 2021: the Physical Science Basis. Link: <https://www.ipcc.ch/report/ar6/wg1/#FullReport>

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

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

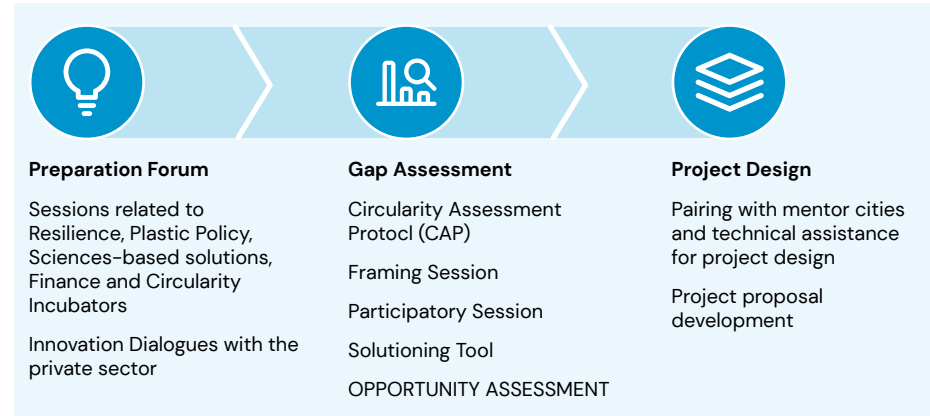


Program Objective

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, to reduce plastic leakage and to protect water bodies and the ocean. Urban Ocean provides the platform for ocean advocates, city leaders and allies 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 impacts. 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 greenhouse gas 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:



The program is jointly led by R-Cities, Ocean Conservancy, The Circulate Initiative and Greater Chennai Corporation, with local partners Chennai Resilience Centre and Okapi Research and Advisory.

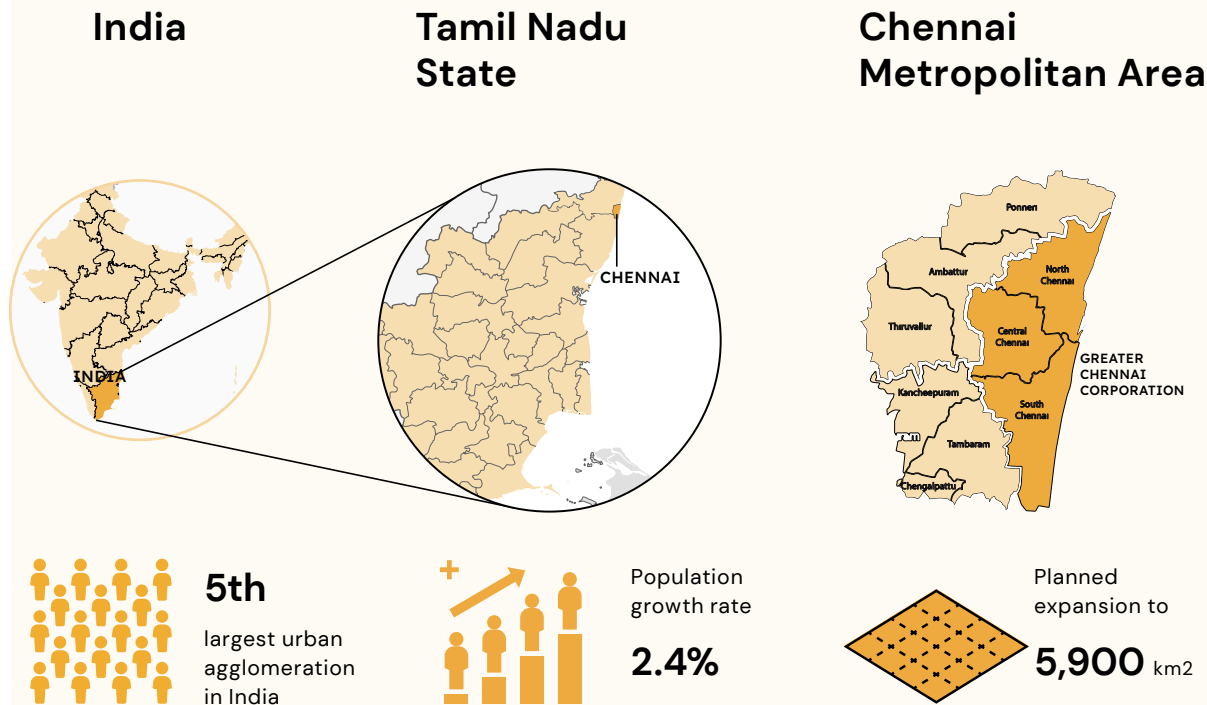
Project Statement

This Project Statement is the result of two years of work and dedication by Chennai City Urban Ocean team and trusted partners to develop specific actions that the city hopes will advance solutions to address plastic waste challenges. The Project Statement is based on the results of a Circularity Assessment Protocol (CAP), a rigorous gap assessment process and several one-on-one interactions and capacity-building sessions that helped the city pinpoint the best opportunities for impact. It outlines the context and the needs of the city on which the project builds. It provides the city's vision and outlines the impact Chennai City is seeking to achieve.



2. Context

FIGURE 1
Map of Chennai City and Metropolitan Area boundaries



Source: Okapi Research and Advisory

2.1. The city and its waterbodies

The city of Chennai, India is the capital of the Southern State of Tamil Nadu along the Bay of Bengal's Coromandel Coast. The Chennai Metropolitan Area (CMA) is the fifth largest urban agglomeration in India, with a population of 11.5 million and a growth rate of ~2.4 percent.⁴ To accommodate its growing population, the city, and the larger Chennai Metropolitan Area boundaries have been redrawn multiple times and occupy 426 km² and 1,189 km² respectively as of 2022 (Fig 1). In October 2022, the Government of Tamil Nadu passed an order to further expand the metropolitan area to 5,904 km².

⁴ UN World Population Prospect: <https://population.un.org/wpp/>



FIGURE 2

Map of the city's three rivers (left) and the Adyar creek as it joins the sea (right)



Source: Chennai Resilience Centre and Okapi Research and Advisory

Chennai holds an important position within the regional and national economy with a GDP of USD 78.6 billion by virtue of its expansive manufacturing sector (specifically automobile and hardware), IT industries, health care, higher education and financial services. Chennai produces 60% of India's automotive exports⁵ and leads the country in the 'software as a service' (SaaS) industry. The rapid urban and economic development, specifically over the past three decades, has revealed the delicate balance on which the communities and environment rest.

Chennai is a coastal city (24.87 km of shoreline) with three rivers flowing into the Bay of Bengal, Adyar (south), Cooum (centre) and Kosasthaliyar (north), a network of canals, including the Buckingham Canal created by the British as a navigation channel running north-south along the coast, and innumerable man-made lakes/erys developed by early rulers for irrigation purposes (Fig 2).

⁵ Resilient Chennai (2019), Chennai City Resilience Strategy, <https://resilientchennai.com/strategy/>



After the December 2015 floods, it was estimated that the Greater Chennai Corporation (GCC) had to clear 1.32 million tons of solid waste from water bodies in the city⁶. Similarly, after heavy rains caused flooding of the Adyar River in 2021, the GCC collected 218 tons of plastic from a single location in the southern part of the city and subsequently cleared more trash from other areas (Omjasvin 2021)⁷. More recently during a waste collection drive in August 2022, around 53kgs of waste was collected from the Elliotts beach in southern Chennai of which more than 50% was plastic⁸. These examples underscore the significance of the waste management problem and its implications with respect to leakage into waterways including the ocean (Fig 3).

The government has been increasingly inclined towards finding innovative solutions to better manage solid waste, including increasing awareness of waste segregation and engaging in several lake and coastal clean-up efforts. To complement the education and removal efforts, the government has introduced fines and ultimatums to waste generators, and invested in infrastructure such as trash booms to prevent waste from entering waterbodies.

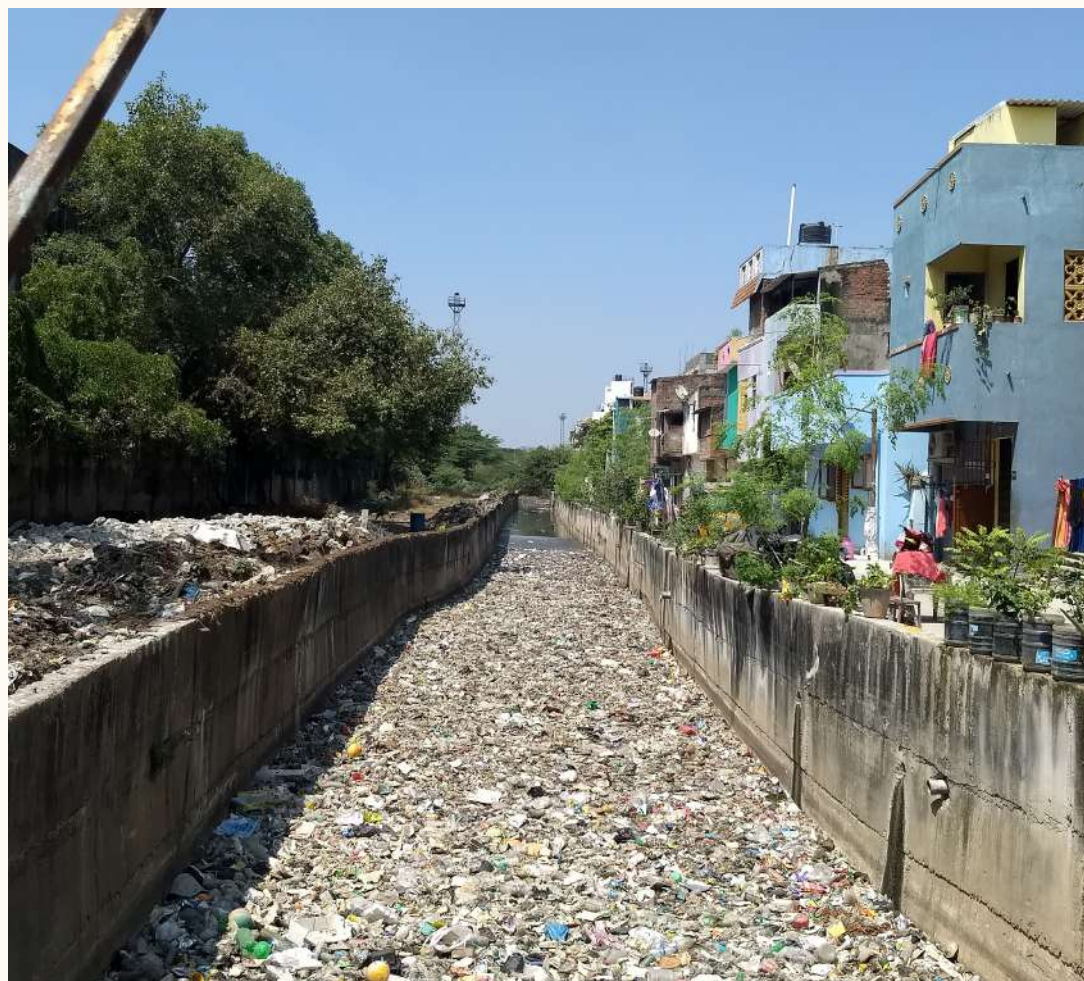
6 Chandrababu, D. (December 30, 2015). Chennai floods: Corporation removes 1.32 lakh tonne of garbage. The Times of India. <https://timesofindia.indiatimes.com/city/chennai/Chennai-floods-Corporation-removes-1-32-lakh-tonne-of-garbage/articleshow/50381980.cms>.

7 Omjasvin, MD (2021). Chennai: Over 200 tonnes of garbage cleared from Broken Bridge. Times of India. <https://timesofindia.indiatimes.com/city/chennai/chennai-over-200-tonnes-of-garbage-cleared-from-broken-bridge/articleshow/88082773.cms>.

8 The Times of India. (Aug 5, 2022). Chennai scientists collect 53kg waste from Elliot's beach, <https://timesofindia.indiatimes.com/city/chennai/chennai-scientists-collect-53-kg-waste-from-elliots-beach/articleshow/93357525.cms>

FIGURE 3

A canal in west Chennai filled with trash



Source: Okapi Research and Advisory



2.2 The city's waste management system

Solid Waste Management in Chennai is mandated by the local government – Greater Chennai Corporation (GCC), under its Department of Health. The city generates 5400 metric tons of waste per day as of 2016) most of which ends up at the city's two dump yards⁹ – Kodungiyur in the north and Perungudi in the south. Chennai has the highest per capita of waste generated in the country – 0.71 kg of solid waste per day¹⁰. A major portion of SWM activities in the city are financed through GCC's yearly budget. For 2022 – 2023, expected overall budgetary expenditure is estimated at 36.13 billion INR¹¹ compared to expected revenue of 28.24 billion INR; , making it a deficit budget. Chennai's budget is significantly lower than Pune – another UO city in India – with a budget of 85.92 billion INR and a population of 3.4 million as opposed to Chennai's 9 million.

GCC has allocated 4.24 billion INR for SWM¹² primarily for buying new bins, setting up new incinerators and bio-methanation plants and, upgrading collection infrastructure. It is interesting to note that GCC is funding SWM projects through other funding sources as well. For instance, bio mining projects in the city's two dump yards are being funded through the Swachh

Bharat Mission funds¹³ while GCC also has contracts with private waste management companies such as Urbaser Sumeet, which costs 4.47 billion INR per year¹⁴. Notably the contract with Urbaser Sumeet is more than the budgetary allocation for SWM.

From October 2020, waste collection in the city has been managed by three entities – GCC in Zones 4, 6 and 8, Ramky Enviro Engineers Pvt. Ltd. in Zones 1-3 and 7 and Urbaser Sumeet in Zones 9 – 15 (fig 5). Evidently, GCC is inclined to privatize waste collection. In the current arrangement, the number of zones managed by private waste contractors has more than doubled since 2018 when GCC was managing 12 of 15 compared to the current scenario where GCC is handling only 3 of the 15 zones.

While much of waste collection has been outsourced, GCC continues to handle processing, treatment and disposal across all zones through 245 wet waste processing facilities such as Micro Composting Centres (MCCs), bio-methanation plants, vermicomposting centres etc. with a total capacity of 1218 tonnes per day and 185 dry waste processing centres which include Material Recovery Facilities (MRFs) and Resource Recovery Centres (RRCs) with a total

capacity of 529 tonnes per day¹⁵. Despite all of this infrastructure, nearly all the waste generated in the city is dumped in the city's two dump yards – Perungudi and Kodungaiyur. The CAP report found low recycling and waste diversion rates were largely due to low rates of at source waste segregation and contamination of recyclables. Both of Chennai's dump yards are nearing full capacity and bio-mining activities are underway to sort and sustainably dispose of legacy waste.

In 2016 SWM Rules were introduced in the country making waste segregation at source mandatory. In 2017, GCC launched an initiative in support of that provision, requiring its workers to collect only biodegradable waste daily and separated recyclable waste weekly. Awareness drives were held in each zone by GCC to support outreach of these new practices (Kumar, 2017). GCC also significantly revised its SWM Key Performance Indicators (KPIs) and contract to engage new private waste management companies to include percentage of waste segregated at source instead of using the tipping fee model which it had used in the past. The city recycles its waste through formal or/and informal systems¹⁶. The informal sector has been helping divert several tonnes of waste from

9 Dump yards – City does not have any landfill by definition and the two main dump yards are often described as landfills.

10 Greater Chennai Corporation (GCC). (2021). City Action Plan. Solid Waste Management Department.

11 Greater Chennai Corporation, https://chennaicorporation.gov.in/gcc/Budget_2022-2023/GLANCE.pdf

12 The New Indian Express (April 9, 2022), Chennai Corporation Budget: Stormwater drains, solid waste management on major focus, <https://www.newindianexpress.com/cities/chennai/2022/apr/09/chennai-corporation-budget-stormwater-drains-solid-waste-management-on-major-focus-2439992.html>

13 Natarajan, A. (April 14, 22). Great Chennai Corporation budget places emphasis on schools and infrastructure, Citizen Matters, <https://chennai.citizenmatters.in/chennai-corporation-budget-mayor-priya-singara-chennai-niirbhaya-swachh-bharat-39771>

14 The Hindu (Oct 1, 2022). CM launches solid waste management project in 7 zones, <https://www.thehindu.com/news/national/tamil-nadu/cm-launches-solid-waste-management-project-in-7-zones/article32736896.ece>

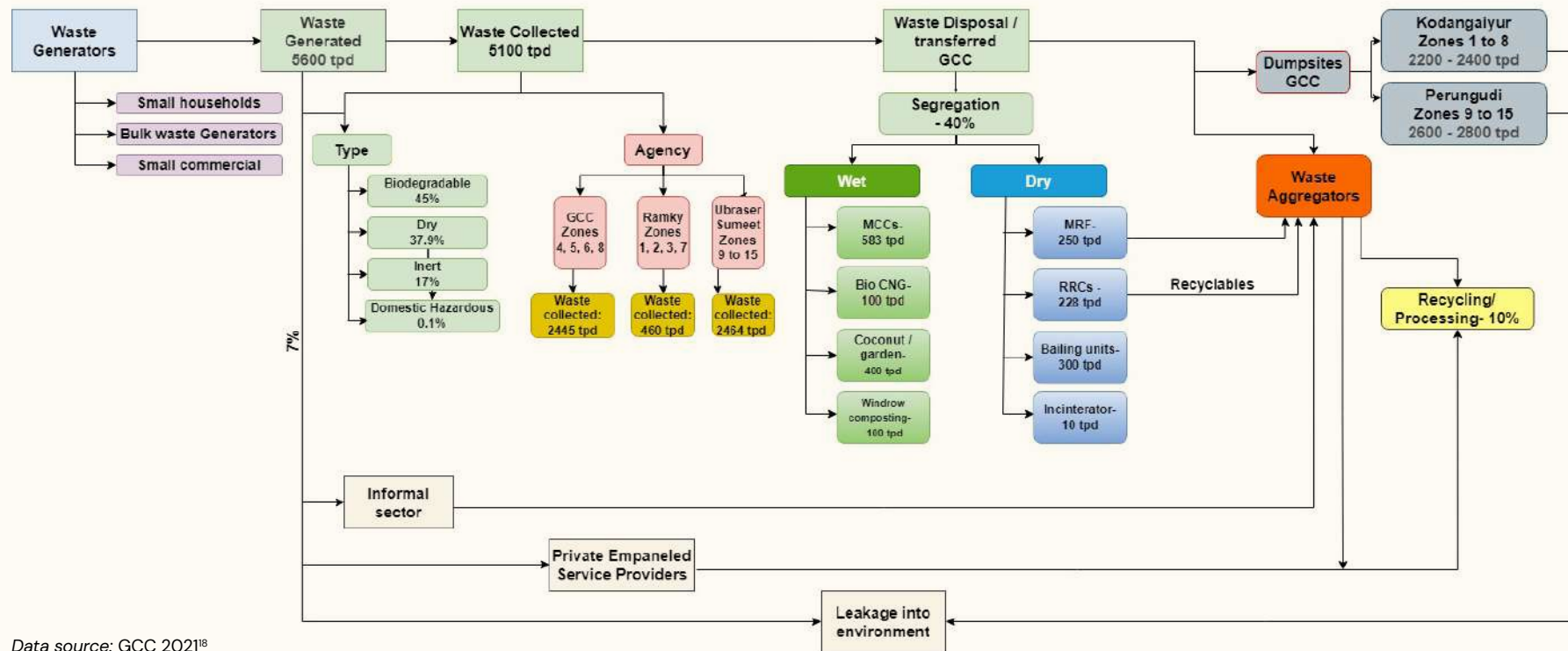
15 Government of Tamil Nadu. (2021). Municipal Administration and Water Supply Department. Policy Note 2021-2022.

16 Circularity Informatics Lab. (2022). Circularity Assessment: Chennai, India. University of Georgia, Athens, GA, USA. https://resilientcitiesnetwork.org/downloadable_resources/UR/SP/2022/Urban-Ocean-CAP-Report-Chennai.pdf



dump yards for decades, especially recycling paper and plastic of different grades (cardboard, soiled cardboard, white paper, soiled paper, pet bottles, etc.), glass and e-waste and divert several tonnes of waste from dump yards. It has been estimated that there are between 80,000-100,000 informal waste collectors within Chennai—and as many as 3,000 within one given area, as they often operate exclusively within a given geographic location within the city — and that they recover about 400 tons of waste per day¹⁷. The following figure illustrates the city’s SWM flow (Fig 4).

FIGURE 4
Chennai's SWM flow



Data source: GCC 2021¹⁸

Figure Source: Okapi Research & Advisory

¹⁷ Aiyavoo, I. (2018). Urban Poverty: Rag Pickers in Chennai City. PESQUISA, Vol.3, Issue-2, ISSN-2456-4052 (online), May 2018.

¹⁸ Greater Chennai Corporation (GCC). (2021). *City Action Plan*. Solid Waste Management Department



2.3. Policies and Mandates

Ocean plastics have not been explicitly dealt with in India's¹⁹ policy paradigm, although recognition of this issue is picking pace. 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."²⁰ In fact the Central Government has undertaken varied efforts including a) initiating studies to gather data on ocean pollution via National Centre for Coastal Research (NCCR) b)organizing workshops on marine plastics, c) developing a framework for a clean ocean mission (Swachhata Sagar), as a component of the "Swachhata Action Plan", through the Ministry of Earth Sciences research institutions, d) notifying a ban on the usage of Identified single-use plastics through the Plastic Waste Management Rules, 2011, and its amendments and notifying the guidelines on Extended Producers Responsibility (EPR) on plastic packaging under the new Plastic Waste Management Rules 2016²¹. All these efforts are directed towards formulation of a national marine litter policy.

Perhaps the most critical policy dealing with plastic

pollution in India is the Plastic Management Rules, 2011 (later amended to PWM Rules 2016) which includes EPR for plastic waste. A specific framework for EPR was first introduced in 2020. Since then, there have been several amendments to the framework with most recent in February 2022 detailing filing processes and targets for brands and manufacturers. The Ministry of Environment, Forests and Climate Change (MoEFCC) has also amended the PWM Rules in August 2021 to include a nation-wide ban on manufacture, import, stocking, distribution, sale and use of identified single use plastics from 1st Jul 2022²².

Apart from legislation, national level bodies also exist to advise on this work such as the National Plastic Waste Management Task Force, the Committee on Urban Solid Waste Management in India²³ and Special Task Forces formed by the MoEFCC across states to enforce the nation-wide single use plastics ban.

At the state-level, Tamil Nadu has prioritised plastic waste management with several policy level interventions. It was one of the first states in India to declare a ban, effective from 1st Jan 2019, on manufacture, sale, stocking, transporting and use of certain single-use plastics including "plastic carry

bags, plastic film for food wrapping, plastic to-go plates, plastic coated teacups and tumblers, water pouches and packets and plastic straws."²⁴ However, the COVID-19 pandemic and subsequent state elections has impacted enforcement of the ban. Indeed, most stakeholders believe that inconsistency in implementation of the ban including levying fines and the prohibitive costs of alternatives have significantly influenced impact. However, initiatives from the state government such as, the creation of a Plastic Waste Management Cell by the Tamil Nadu Pollution Control Board (TNPCB) to ensure enforcement of the plastic ban (interview with TNPCB) and enforcement drives from GCC targeting bulk waste generators suggest that the state and the city are committing to address the plastic challenge²⁵.

GCC has thus welcomed the **Urban Ocean program**, which has helped the city identify gaps in the SWM system that contribute to leakage and presents opportunities that can be leveraged to move the city towards becoming a near zero waste and plastic free environment.

19 Report of the Marine Litter Legislation by the United Nations Environment Program, 2016 (<https://www.unep.org/resources/report/marine-litter-legislation-toolkit-policy-makers>)

20 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-address-plastic-pollution-india-at-unea-122030101116_1.html

21 Ministry of Earth Sciences (Feb 10, 2022). Status of Marine Litter in the Country, <https://pib.gov.in/PressReleaseFramePage.aspx?PRID=1797248>

22 MoEFCC (June 28, 2022). Ban in identified single use plastic items from 1st July 2022, <https://pib.gov.in/PressReleasePage.aspx?PRID=1837518>

23 Aiyavoo, I. (2018). Urban Poverty: Rag Pickers in Chennai City. PESQUISA, Vol.3, Issue-2, ISSN-2456-4052 (online), May 2018.

24 Environment and Forest Department, (Aug 25, 2019), G.O. (Ms) No. 84, Government of Tamil Nadu, https://tnpcb.gov.in/pdf_2018/G.O_84_BanPlastic3718.pdf

25 DT Next. (Oct 13, 2022). Banned plastic seized from 4,888 commercial establishments in Chennai, <https://www.dtnext.in/city/2022/10/13/banned-plastic-seized-from-4888-commercial-establishments-in-chennai>



3. Problem Statement

This section documents the key challenges identified through rigorous primary and secondary research and stakeholder engagements based on which strategic recommendations and actionable project ideas are developed.



Use and Production of Plastics

The SWM Rules 2016, The Plastic Waste Management Rules, 2016, the Framework for Extended Producers Responsibility (EPR) Guidelines first available for public comment in 2020 and included in the 4th amendment of the PWM Rules in 2021 and GCC's SWM Bylaws, 2019. These policies provide a solid ground for restricting use and production of plastic waste. However, implementation and enforcement of these policies remains challenging for multiple reasons: i) The policy is relatively new and continuously evolving with changes in the mandate – as such few have a clear understanding of the policy requirements, ii) Set at the national level, the Framework for EPR Guidelines is meant to be implemented by the Central Pollution Control Board with support from State Pollution Control Boards which would need extra resources to enforce (e.g. TNPCB has only recently created a Plastic Waste Management Cell for this purpose), iii) The responsibility of reporting remains with private companies which is difficult to monitor.



Low Waste Segregation Rates

While the city's SWM Action Plan suggests that on an average waste segregation rate is ~44.6% in the city, during interviews and workshops, most stakeholders have expressed their doubts based on their ground experience that the actual number is much lower (20% - 25%). This is despite the fact that GCC's SWM Bylaws, 2019 has made it mandatory

to segregate wet and dry waste at the household level and contracted waste collectors (i.e. Urbaser Sumeet and Ramky) are required to collect segregated waste. Primary causes behind this low level of waste segregation include lack of awareness/need for behaviour change, lack of incentives to enforce (fines/positive incentives) and lack of trust among citizens that household level waste segregation will ensure proper handling post collection by GCC and private waste collectors.



Low recycling rates

From the data presented in the GCC SWM Action Plan (see fig 4 -SWM Flow Chart), it is evident that nearly all of the waste collected in the city (5100 tpd) goes to the two dump yards (Perungudi – in the South; Kodungaiyur – in the north); Very little is recycled from this public waste collection system, and some leaks into the environment. However, about 7% of the total waste generated goes to informal sector and private waste managers who then redirect it to recycling. Therefore, it can be assumed that the recycling rate in Chennai is likely to be in the range of 10%-12%.



Leakage into the environment

The Urban Ocean Circularity Assessment Protocol (UO-CAP) report²⁶ suggests that litter density in Chennai is low compared to other cities where CAP assessment is undertaken, which shows that the litter

²⁶ Circularity Informatics Lab. (2022). Circularity Assessment: Chennai, India. University of Georgia, Athens, GA, USA.



situation in Chennai is comparatively better as compared to other UO cities. Yet, a substantial percentage of the waste still gets dumped on streets and into waterbodies. This is evident from the amount of waste that is collected during coastal clean-up drives, by trash booms set up along two of Chennai’s rivers, Adyar and Cooum, to catch floating waste from rivers or even post floods. For instance, after heavy rains in 2021, GCC collected 218 tons of plastic from a point near the mouth of the Adyar river²⁷. And, in August 2022, around 53kg of waste was collected from the Elliots beach in southern Chennai during a waste collection drive, of which more than 50% was plastic²⁸ (Fig 8). This leakage into the environment is a threat to public health as well as to the ecosystem health.

conditions, risking the health and safety of pickers, with little to no socio-economic protection. The GCC has provided identity cards and offered some degree of social protection to a limited number of informal waste pickers, specifically those working in the two dumpsites in the city. But there is a need to recognize the informal sector as a resource at hand and to provide a pathway if they choose to be integrated into the formal waste management system. Training and access to socio-economic resources could help empower them to work with dignity and improve their livelihood opportunities.



Inefficiency in processing dry waste

Because of low levels of source segregation, the performance of the MRFs and RRCs also remains constrained. Many of these facilities remain empty or significantly underused as they do not get enough segregated waste to process, while other MCCs and MRFs get mixed material that is beyond their capacity to process, which they ultimately send to the dumpsites. In lieu of a low rate of source segregation, a system of sorting and segregating dry waste needs to be put in place at these facilities so that different dry-waste streams can be disposed of following proper methods. Informal waste pickers, if properly trained, outfitted for, and compensated, could potentially support this effort.



Vulnerabilities of the informal waste workers

The informal waste sector plays a critical role in recycling. However, it remains largely unorganized, and its work is carried out under poor

FIGURE 5
Waste piled up behind a trash boom



Source: Okapi Research and Advisory

²⁷ Omjasvin, MD (2021). Chennai: Over 200 tonnes of garbage cleared from Broken Bridge. Times of India. <https://timesofindia.indiatimes.com/city/chennai/chennai-over-200-tonnes-of-garbage-cleared-from-broken-bridge/articleshow/88082773.cms>.

²⁸ The Times of India. (Aug 5, 2022). Chennai scientists collect 53kg waste from Elliot’s beach, <https://timesofindia.indiatimes.com/city/chennai/chennai-scientists-collect-53-kg-waste-from-elliots-beach/articleshow/93357525.cms>



4. Project Overview

Chennai's project statement is organized to include two pilot projects that can showcase how some challenges discussed above, can be collectively addressed on the ground, by tapping into the strength of collaboration across multiple actors. These pilot projects have been identified based on workshops and individual interactions with key stakeholders/potential partners to discuss requirements, feasibility, challenges etc., of implementing these suggestions.

By leveraging collaborations across active and interested citizens, local officials, private companies and NGOs, Chennai-UO proposes one pilot project focused on creating a near-zero waste neighbourhood to showcase the possibility of what can be achieved through such collaborations. A second pilot is focused on Chennai's valuable waterbodies to strengthen the current system to trap waste using trash booms and further finding ways to better handle this waste post collection.

4.1 An Area-based Pilot: Building Near-Zero Waste Neighbourhoods (Kasturbanagar, Ward 173-Zone XIII-Adyar)

Overview

Background: Chennai city has a well-established decentralized waste management infrastructure network comprising of MCCs, MRFs, and RRCs. While MCCs are believed to function relatively well, management and efficiency of MRFs (which handle dry waste), is problematic. Furthermore, low waste segregation rates at source present a major challenge for proper processing/recycling opportunities, forcing larger quantities of mixed waste to be dumped into the city's two dump yards.

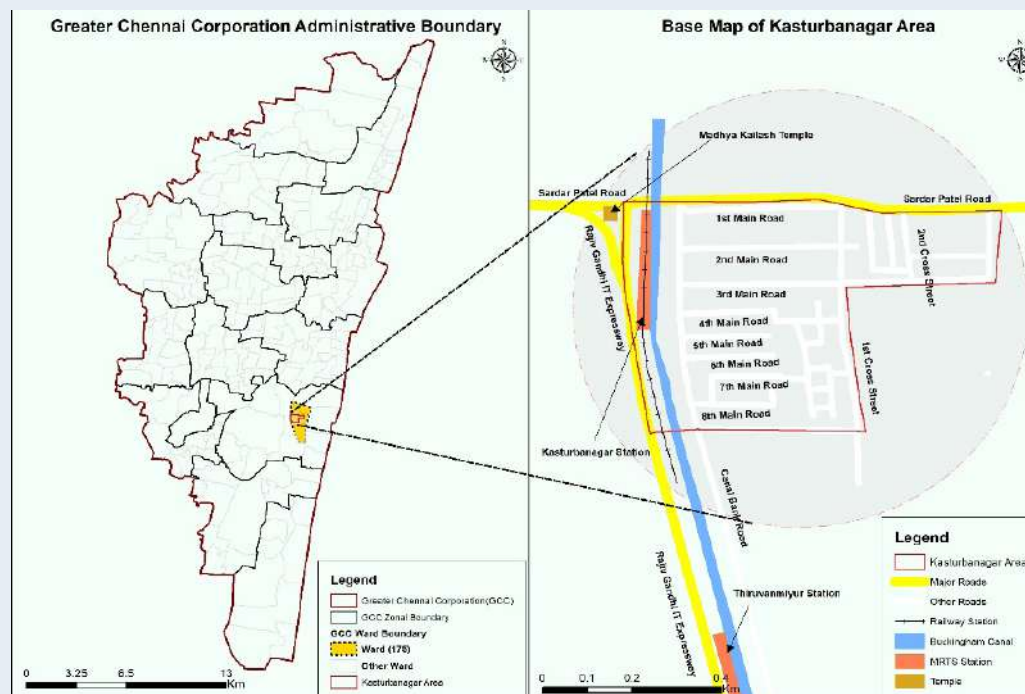
Rationale: Currently, many local resident organizations, private waste management companies, and NGOs are actively involved in implementing innovative methods and processes to improve SWM in the city. Some focus on raising awareness, others on recycling plastics of different types while a few recognize that several streams of inorganic waste such as clothes, fabric, footwear, sanitary waste, etc. are equally problematic and require investment for processing, recycling and reusing. There is huge potential in leveraging these efforts by creating collaborations targeted towards an area. By showcasing how multiple agencies can collectively strengthen SWM at the local level and help an area to become a "near-zero waste" zone, this pilot will inspire other neighbourhoods and the city to take up similar interventions. This proposition is in line with the Draft GCC Climate Change Action Plan's reference to develop a plastic free/garbage free demonstration ward.

Project Idea: This pilot will attempt to reduce the waste derived from a specific area (Kasturba Nagar – Fig 6) to near-zero (i.e. maximum resource recovery), achieve high waste segregation and recycling rates, while leveraging the strengths of collaboration between the local government body, resident group, private waste management companies and informal waste workers. This pilot will involve the following linked, yet independent components: Namely,



- *We Segregate Waste*: an awareness campaign for residents and domestic help (who typically handle household waste) in Kasturba Nagar and nearby Govindarajapuram, a low-income area (from where a lot of the domestic help reside).
- *Lane composting*: a low-cost technology that can be set up at the street side to showcase to residents how food waste can be transformed into compost
- *Waste collaborative*: improving efficiency of a local MRF handling dry waste from Kasturba Nagar and its surrounding (Ward 173) by involving one or more private waste managers and to ensure all that is recyclable is diverted from Perungudi dump yard.
- *Raising Ecowarriors*: a capacity building program targeted for ten schools in Zone XIII to raise awareness and foster sustainable near zero-waste lifestyle amongst students..
- *PadCare*: a program run by Hasirudala Innovations and Wasted 360 Solutions (Wasted) will be implemented to safely divert sanitary waste away from dump yards from Kasturba Nagar schools. This intervention will simultaneously address public health (especially health of waste workers') and environmental sustainability concerns by creating harmless recyclable material from this hazardous waste.
- *Recycle Cloth Bits*: Tailoring shops across Ward 173 (of which Kasturba Nagar is a part) is estimated to produce close to 100 Kgs of cloth waste per week. This cloth waste includes a mix of fabrics which includes polyester as it is one of the most common fabrics used in clothing today. Polyester clothing is essentially plastic, as it is made from synthetic fibers that are derived from a type of polymer. It is crucial to address this waste by creating a linkage between the local tailors and aggregators. so that it is diverted from reaching the dump yards and subsequently the oceans.

FIGURE 6
Map of Kasturba Nagar Area



Source: Okapi Research and Advisory



Actions for Implementation

We Segregate Waste

- A door to door and sustained (at least two years) awareness campaign will be run by local residential welfare association, Residents of Kasturbanagar Association (ROKA), to train residents and domestic help to properly segregate household waste using the '2 bin 1 bag' system in Kasturba Nagar and nearby low-income Govindarajapuram. ROKA representatives will work with Urbaser Sumeet's employees who currently do the door-to-door waste collection. In fact, some ROKA members are already volunteering to help the Urbaser Collection team create awareness and ensure 100% waste segregation in a few streets in the neighbourhood.
- Work with GCC to issue identity cards for the RWA representatives working on this effort, for greater legitimacy.
- A brochure will be created to provide basic understanding of how to segregate waste effectively and will be shared with all households.
- Residents/buildings will be encouraged through recognition for good efforts via certification of achievement.

Lane composting

- Obtain required permissions from GCC/Zonal office
- Set up three lane composters, one each with a capacity of 80kg per day, along three residential streets to compost wet waste from households. The purpose of these composters is to showcase to residents how bio-degradable waste is transformed into compost. These composters can be kept next to the pavement and be accessed by residents to see how wet waste becomes compost. A detailed proposal is provided in Appendix 2.
- Harvesting compost 3 to 4 times during the year and distributing it amongst interested residents, those who contributed waste and the Chennai Urban Farming Initiative.

Waste Collaborative

- One or two private waste management companies like Saahas and Wasted will take up management of a GCC-owned MRF at Kotturpuram, southern Chennai.
- Informal waste workers will be identified and hired to help with sorting and processing at the MRF.
- Informal waste aggregators/scrap shop owners in the area will also be encouraged to become part of the formal system by selling their material to the MRF – this can be incentivized via capacity building

in terms of providing basic infrastructure support (e.g. fire extinguishers) for scrap shop owners.

- Tie up with other private waste management companies handling specific streams of waste such as mattresses, footwear, sanitary waste.

Raising Ecowarriors

- ROKA, AWCEM, and CRC will jointly run a capacity building program in ten local schools to encourage low waste generation, recycling, composting and food growing habits to teach children about closing the food circularity loop by utilizing the waste for healthy food production (Fig 7).

PadCare

- In collaboration with Wasted and Hasiru Dala Innovations, sanitary waste from public and private schools in the Kasturba Nagar/ Adyar area in the area will be collected (Fig 8).
- Informal waste pickers will be employed for collection; Proper safety measures will be put in place to handle this hazardous waste.
- Efforts will be made to build awareness amongst the employed informal waste pickers regarding their work environment safety, available social schemes, etc.
- The waste will be then taken to a central processing center managed by Wasted where it will be



processed to create completely harmless, odourless and sterilized recyclable cellulose and plastic material which can be used as raw material in manufacturing.

Recycle Cloth Bits

- A dedicated team hired by ROKA will interact with the tailors in Ward 173 (approximately 100 tailors) to encourage them to store their cloth waste instead of dumping in the street bins.
- A database on the tailoring shops and quantity of waste generated will be maintained.
- These tailors will then be connected to an interested aggregator who will collect the waste on a weekly basis for further recycling (Fig. 9). A detailed proposal is provided in Appendix 2.

FIGURE 7
Raising awareness about SWM



Source: Chennai Resilience Centre

FIGURE 8
The PadCare collection bin



Source: <https://www.padcarelabs.com/>

FIGURE 9
The project cycle for recycling cloth scraps from Tailor shops



Source: ROKA



Pilot 1: Implementation and Impact

POTENTIAL PARTNERS:

GCC, Urbaser Sumeet, ROKA, CRC, Saahas, Wasted, AWCEM

ENABLING ENVIRONMENT & LOCAL RESOURCES:

Policy: SWM Bylaw 2019

Basic Infrastructure & support from GCC: MRF to be ready by Dec 2022 and GCC willing to hand over to private partner

Potential Partners on Board: **GCC, Urbaser Sumeet, ROKA, CRC, Saahas, Wasted, AWCEM and Okapi**

Neighbourhood characteristics: middle income neighbourhood with an active residential welfare association

EXPECTED IMPACT



Bring Behavioural Change: Sustainable waste management requires long-term and in-grained behavioural change among citizens – through sustained efforts of awareness building, information sharing (through the brochure), showcasing good waste management practices (through lane composters) this pilot project will foster changes in attitudes and values towards more sustainable lifestyle among the citizens.



The Ecowarriors component will target the youth in particular who have the potential to play a vital role in bringing transformative social change.

Maximize Resource Recovery: By encouraging high rates of waste segregation, and diverting some of the key problematic waste material in addition to plastics, this project will ensure maximum resource is recovered through composting and recycling and only as a last resort left-over waste is taken to the landfills. Diverting waste from landfills will have critical implications for Chennai's Climate Change Adaptation plans.



Leverage Collaboration across multiple stakeholders: This pilot will showcase the power of collaboration across different public, private and civic stakeholders in achieving critical SWM goals.



Empower the informal sector workers: Though components like the Waste Collaborative, PadCare, and Cloth Bit Recycling, this pilot will empower informal waste pickers and scrap dealers/recyclers a. by providing them decent job opportunities and related benefits; b. by integrating them into the formal supply chain; c. by contributing to their capacity building,



d, ensuring proper work place protection is available to maintain informal waste workers' health and wellbeing.

Demonstrate a scalable model of a near-zero waste neighbourhood: This project will provide a proof of concept for the City of Chennai to scale – it will provide learnings on what can be achieved when multiple stakeholders work together for the common cause of waste management and reduction, and encourage other actors and neighbourhoods to initiate similar efforts.

RESILIENCE VALUE²⁹

→ The pilot project, through all its interventions, seeks to enhance **collective identity and community support** and, make communities more engaged in SWM and be responsible citizens.

→ *We Segregate Waste, Pad Care and Waste Collaborative* projects will create **diverse livelihoods and employment opportunities** for the informal waste sector. These projects will also increase **safeguards to human life and health** through improved work environments..

²⁹ Based on The Rockefeller Foundation and Arup (2015). City Resilience Framework.



→ *Recycling Cloth Bits* project will help divert cloth, one of the most problematic and least recognised waste types from landfills and waterways, **reducing exposure and impacts** of the local eco-system. It also will result in reduced greenhouse gas emissions through more efficient collection and transportation of waste.

INSPIRATIONS

Several initiatives across the country have inspired this pilot such as:

1. HSR layout's effort to introduce source segregation and sustain it at 100% over the years.
2. Hasiru Dala's efforts to sustainably process and transform a low value waste stream i.e. sanitary napkins whilst also skilling and providing job opportunities to informal waste pickers.
3. Saahas Zero Waste's Social Inclusion programme which involves creating entrepreneurs of informal scrap shop owners and integrating them into the formal SWM system.
4. SwachaGraha – an awareness campaign that Solid Waste Management Round Table (SWMRT) which has sustained for several years that urges citizens to compost and adopt sustainable solid waste practices.

Please look at Appendix 1 for detailed case studies on these projects.

TIMELINE AND BUDGET

Please refer to Section 4.2: Implementation Timeline and Budgets

SDGs





4.2. Clean Waterscape for Healthy Cities

Overview

Background: A clean Chennai is linked to a clean waterscape in the city. Government of Tamil Nadu, GCC, the Water Resources Department and Chennai River Restoration Trust (CRRT) have been putting efforts in place to clean up Chennai waterbodies and restrict further dumping of solid and liquid waste into them. This has involved managed relocation to less precarious sites along the rivers, marking river boundaries, and putting up fences along the banks, using a combination of trash booms and excavators to clean up the rivers and canals, and regular coastal clean-up drives. In fact, since 2017, GCC funded by CRRT has installed trash booms in nine locations along the Cooum river and four locations along the Adyar rivers (Fig 10) at a cost of nearly ₹95 Lakhs³⁰.

In 2018, it was reported that from Cooum alone, 22,000 tonnes of waste material was removed, of which 50–60% was sludge, 10% was plastic material including thermocol, and the remaining comprised of organic waste like water hyacinth and tree branches, as well as discarded household articles³¹. Similarly, between October and December 2018, 300–400 tonnes of trash was collected from minor channels like the Virugambakkam–Arumbakkam Canal and the Otteri Nullah during pre-monsoon maintenance work.

Currently, garbage collected from the waterways is dumped in the Kodungaiyur dump yard as GCC considers it to be “legacy waste”³² which is difficult to segregate as it is wet and degraded.

Rationale: Discussions with multiple stakeholders including GCC, AlphaMers (the company owning and setting up the Trash boom technology), TrashCon (a company with technology to sort mixed waste) and CRRT reveals:

- There are already enough trash booms along Adyar and Cooum rivers and there is no need to add more.
- The existing booms need to be better maintained and regularly monitored, such that the waste is collected more frequently and the sites of the booms do not become eye sores for the local community.
- However, trash booms can be explored to trap trash from other static waterbodies like lakes.
- Focus should be on characterising the waste collected and identifying better methods of handling it post-collection, so that it can be diverted from the dump yard.

Project idea: Clean Waterscape for Healthy Cities

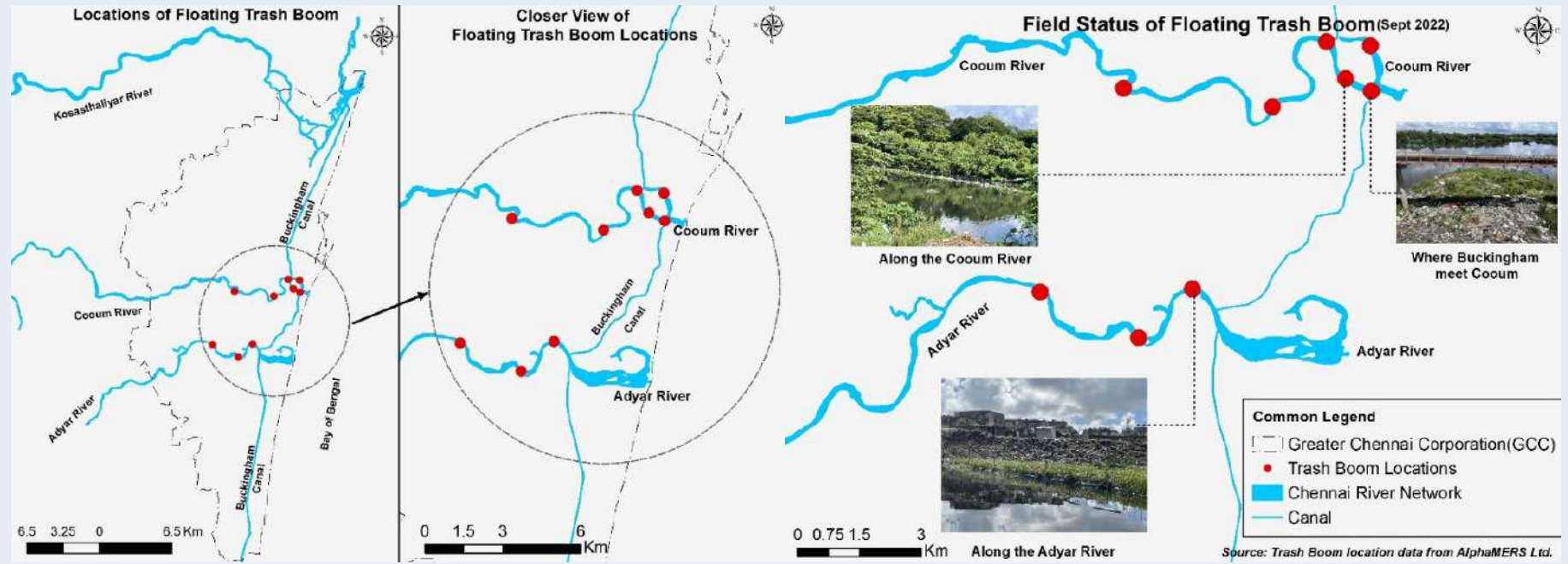
³⁰ Personal communication with Alphamers – the company owning the technology

³¹ Lakshmi & Ramakrishnan, (Jan 29, 2019). A mountain of trash fished out of the Cooum, The Hindu, <https://www.thehindu.com/news/cities/chennai/a-mountain-of-trash-fished-out-of-cooum/article26115438.ece>

³² *Ibid.*



FIGURE 10
Location of Trash booms in the city



Source: Okapi Research and Advisory



Actions for Implementation

- Work with GCC, CRRT, local municipalities and AlphaMers to identify additional water bodies such as lakes and ponds and points in Buckingham canal where trash booms can be put up with clear maintenance plans for removal and processing of waste.
- Engage in research to analyse and characterise the waste getting collected behind the booms to determine the most effective processing methods.
- Once the character of the waste is determined, low-cost technology and informal sector will be engaged to sort and process the waste which is brought to a nearby MRF periodically.
- The segregated waste will then be sent to various recyclers/aggregators with the help of one of the empanelled private waste management companies in-charge like Saahas (while Saahas has the capacity to handle all plastic waste themselves, they will need to collaborate with other companies to identify processes for other inorganic waste).
- Conversations with CRRT and AlphaMers officials and site visits to the trash boom locations reveals a high concentration of Water Hyacinth behind the booms (fig 11) which can be used to make sustainable accessories like bags, boxes, trays, coasters etc. This presents an opportunity to set up a Cottage Industry around Water Hyacinth and CRC

can facilitate the process by identifying interested women from SHGs registered with Tamil Nadu Women’s Development Corporation for National Urban Livelihood Mission (NULM) and trainers who can teach and build their capacity to produce sustainable products from Water Hyacinth, set up their units, market and sell their products.

- All that is non-recyclable can then be sent to incinerators, cement factories, or used for making a plywood alternative called WoWBoard (technology from a company called TrashCon) depending on the volume and nature of the waste. Only as a last resort any remaining waste will be sent to the dump yard.
- A committee comprising of representatives from all the agencies will be in-charge of monitoring and evaluating the system at least for a year – learnings from this process (e.g. input quality, waste type and quantity, challenges, etc.) will be documented by Okapi/CRC so that this model can be adjusted and scaled with required modifications.

FIGURE 11
Water Hyacinth behind a trash boom on the Adyar river



Source: Okapi Research and Advisory



Pilot 2: Implementation and impact

POTENTIAL PARTNERS:

GCC, CRRT, TrashCon, Saahas, Urbaser Sumeet, CRC, Okapi, IITM

ENABLING ENVIRONMENT & LOCAL RESOURCES:

MRFs and trash booms across rivers are in place.

EXPECTED IMPACT



Restrict leakage into urban oceans: Scaling trash booms along rivers, canals and lakes across the city is a tried and tested solution that will a) help keep Chennai waterbodies clean and b) restrict waste leaking into the oceans.



Enhance R&D: This pilot will enable research and development activities by technical partners specifically on a. measuring and characterization of waste collected from Chennai waterways critical for long-term monitoring of project impact and b. finding out cost-effective and sustainable solutions for dealing with this waste post-collection.



Create Job Opportunities: Scaling trash booms is likely to create more jobs for implementation, maintenance, and collection work. Most critically, jobs for the informal waste pickers will be generated in the post collection phase for sorting and drying work.

Informal waste pickers and/or SHG women can also find income source through skill development in recycling and reusing this waste material for producing marketable products.



Strengthen Governance for Proper Maintenance: the pilot proposes creation of a committee for effective maintenance and monitoring of the trash booms. This will ensure that a strong governance mechanism is in place to sustain the positive impact of the project in the long-run.



Demonstrate a city-wide 'waste in water management' plan that can be implemented in other cities

RESILIENCE VALUE

→ **Reduced exposure and fragility** of the local environment, specifically the rivers, lakes and canals and coastal assets by leakage into the Bay of Bengal and the landfills, to improve health of the local eco-system and its ability to provide natural protection.

→ **Creates diverse livelihoods and employment opportunities** for the informal sector by employing them in sorting the collected waste and for women from the community to create sustainable craft objects.

→ Improves **effective leadership and management** in solid waste by forming a committee to monitor and evaluate the waste collection and processing chain.

INSPIRATIONS

Trash barriers are in active use in other Indian cities, helping to stop waste from entering the oceans through rivers and lakes. Appendix 1 has details on how these barriers are being deployed and their impact.

Additionally, Water Hyacinth can play an important role as material for craft making. In Assam, Earth Trust trains young people and women to make craft items such as coasters and bags from dried Water Hyacinth and helps them set up their business and market it. Manufacturing units are set up next to the source i.e. local water bodies. Now the network of producers has grown significantly and their products are available on popular retail stores such as *itokri*.

SDGs



TIMELINE AND BUDGET

Please refer to Section 4.2: Implementation Timeline and Budgets



4.3. Understanding the resilience value

This project has been designed for resilience. Not only will it make the recycling industry in Chennai more robust, innovative and adaptable to the needs of the city, but it will also develop more interconnected systems, so the City of Chennai can be better prepared to overcome the shocks and stresses it faces. Conceptually, this means thinking about this project from three perspectives:

- How the project demonstrates qualities of resilience, such that it can better handle external shocks and stresses.
- How the project contributes to the resilience of the city, considering its direct and indirect impacts.
- How the operation of the project is (positively or negatively) influenced by the resilience of the city environment overall

Beyond the immediate objectives, the transformation sought will include and maximize all the “co-benefits” generated by the project that contribute to the structural, community and/or individual resilience of the citizens of Chennai. For this, the link between recycling industry and the city, the province, the region and even the nation will be considered, including the interdependencies between the existing social, environmental, economic and institutional systems.

The City Resilience Framework identifies seven qualities of resilience that any urban system must incorporate so that it can resist, respond and adapt more quickly to the shocks and stresses it faces. So, this project – understood as a system integrated into the city – is designed considering the following qualities of resilience:

REFLECTIVE	Systems that have mechanisms to continuously evolve and will modify standards or norms based on emerging evidence, learning from past experiences.	The solutions and strategic recommendations are deeply rooted in the city’s past SWM experiences and seek to strengthen existing efforts for wider impact without reinventing the wheel. The near zero pilot project aims to create awareness and greater understanding among communities on their generation of waste and its impact on the environment.
ROBUST	Systems that include well-conceived, constructed, and managed physical assets so they can withstand the impacts of shocks and stresses.	<i>We Collaborate</i> will seek to enhance operational efficiency of an MRF by including systems to deal with shocks and stresses like fire and water logging. The near zero pilot project aims to establish decentralized waste management system in the city, with a potential for scale up in other neighborhoods. This will reduce the waste going into the landfill and advance city’s infrastructure as well as community resilience to tackle rapid urbanization and population influx happening in the city. Tackling waste near it’s source would also reduce transportation, fuel usage and disposal of waste in the landfill which will help reduce the greenhouse gas emissions in the city.
REDUNDANT	Systems that create spare capacity purposely to accommodate disruption, extreme pressure, and surges in demand	Both pilot projects will reduce pressure on the dump yards through setting up of infrastructure and management systems to improve the recycling sector in the city. The near zero pilot project would improve the self-sufficiency of the communities to tackle their own waste, reducing dependency on GCC’s SWM system, improving the quality of urban environment and advancing environmental resilience in the city.
FLEXIBLE	Systems that can change, evolve, and adapt in response to changing circumstances.	The project designed in such a way that they allow for review of impact and course correction to ensure they are sustained over time.
RESOURCEFUL	Systems that can rapidly find different ways to achieve their goals or meet their needs during a shock or under stress.	The projects seek to actively work with the informal sector and citizen-based groups and identify innovative solutions for dealing with waste such as Water Hyacinth.
INCLUSIVE	Systems that emphasize the need for a broad consultation and engagement of communities.	Collaboration of multiple stakeholders including the informal sector and community-based groups are at the core of the Kasturba Nagar Pilot Program. While the Clean Waterscapes for Healthy Cities Pilot will also bring together academia, waste workers and women from low income communities to better manage waste from waterbodies.
INTEGRATED	Systems that promote consistency in decision making and ensure that all investments are mutually supportive to a common objective.	Both pilot projects will work towards the same objective of diverting waste from the dump yards into recycling whilst also improving the urban environment.

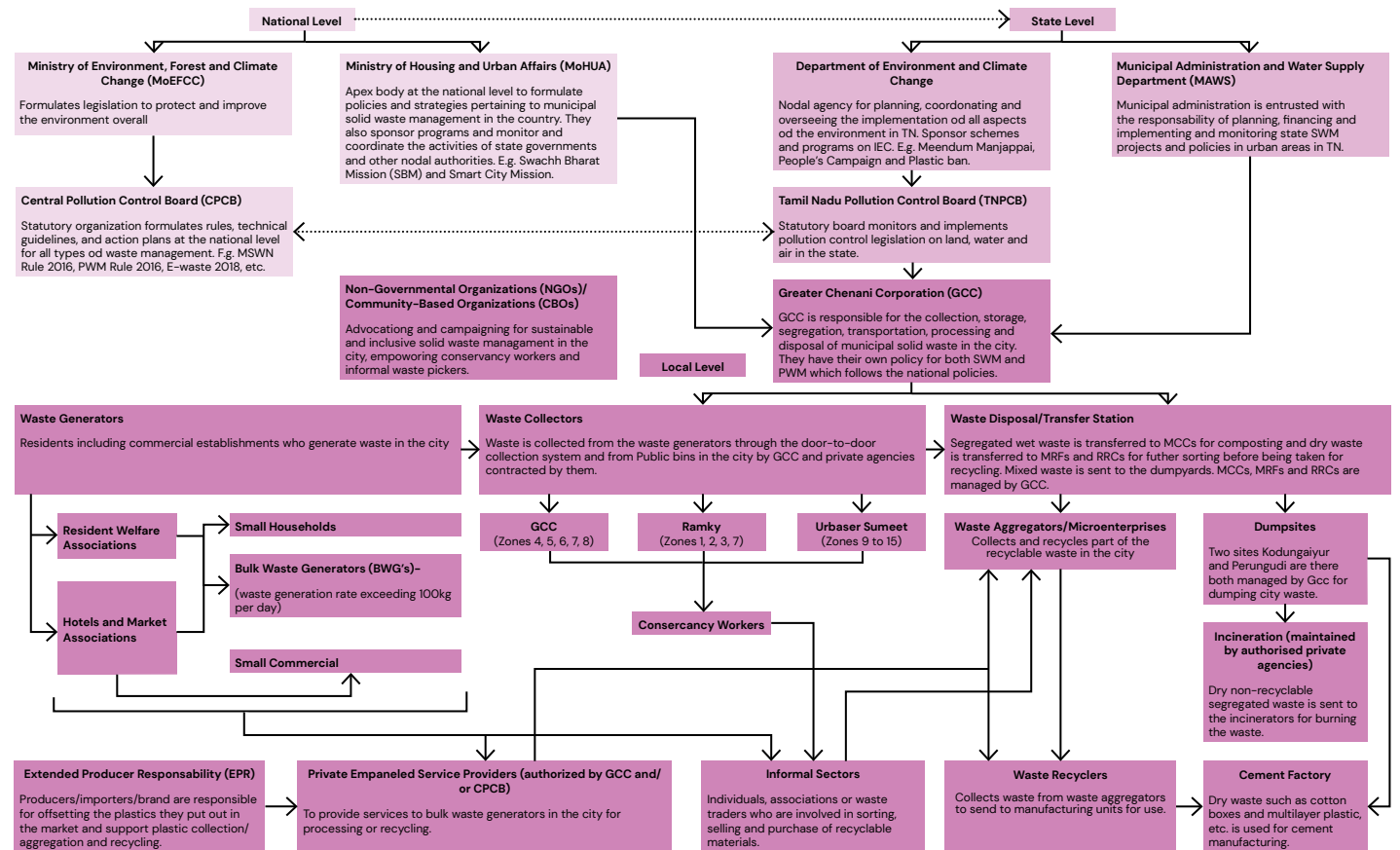


5. Roadmap for Implementation

5.1. Institutional arrangements

The following chart provides a description of the key stakeholders and their mandates in Chennai's SWM system. It discusses the role of national and state level departments and how their policies and programs influence SWM in the city. The chart also includes non-governmental stakeholders such as informal waste pickers, RWAs and waste recyclers who play a critical role in recycling.

FIGURE 12
Stakeholder map



Source: Okapi Research and Advisory



TABLE 1 INSTITUTIONAL ARRANGEMENTS FOR PILOTS

PROJECT IDEA	PLANNING	POSSIBLE FUNDING	IMPLEMENTATION	MONITORING AND EVALUATION	SUSTAINING
An Area-based Pilot: Building Near-Zero Neighbourhoods (Kasturba Nagar, Ward 173-Zone XIII-Adyar)					
<p>We Segregate Waste: a door-to-door and sustained awareness campaign to achieve near 100% waste segregation at source.</p>	<ul style="list-style-type: none"> • ROKA • Okapi • Urbaser Sumeet • GCC 	<ul style="list-style-type: none"> • Government Grant (e.g. LiFE Global call for ideas by Niti Ayog) • CSR • TNGCF 	<ul style="list-style-type: none"> • ROKA 	<ul style="list-style-type: none"> • ROKA • Okapi • CRC 	<ul style="list-style-type: none"> • GCC • Urbaser Sumeet • ROKA/residents
<p>Lane composters: a low-cost technology that can be set up street-side to showcase to residents how food waste can be transformed into compost.</p>	<ul style="list-style-type: none"> • ROKA • Okapi • GCC • Urbaser Sumeet 	<ul style="list-style-type: none"> • Grants, CSR 	<ul style="list-style-type: none"> • ROKA 	<ul style="list-style-type: none"> • Okapi • ROKA 	<ul style="list-style-type: none"> • ROKA/ residents • CRC
<p>Waste collaborative: Corporate EPR funds, private waste management companies, and informal waste pickers will collaborate to manage/recycle dry waste in the local GCC-owned MRF.</p>	<ul style="list-style-type: none"> • Waste Management Company • GCC • ROKA • CRC 	<ul style="list-style-type: none"> • TNGCF • FMCGs (ITC, Coke) 	<ul style="list-style-type: none"> • Waste Management Company • GCC 	<ul style="list-style-type: none"> • Waste Management Company • Okapi / CRC • ROKA • GCC 	<ul style="list-style-type: none"> • Waste Management Company • GCC



PROJECT IDEA	PLANNING	POSSIBLE FUNDING	IMPLEMENTATION	MONITORING AND EVALUATION	SUSTAINING
An Area-based Pilot: Building Near-Zero Neighbourhoods (Kasturba Nagar, Ward 173-Zone XIII-Adyar)					
Raising Ecowarriors: Local RWA and NGOs will run capacity building programs at local schools to encourage sustainable lifestyle.	<ul style="list-style-type: none"> • ROKA • AWCEM • CRC 	<ul style="list-style-type: none"> • CSR 	<ul style="list-style-type: none"> • ROKA • AWCEM 	<ul style="list-style-type: none"> • ROKA • Okapi / CRC 	<ul style="list-style-type: none"> • ROKA • AWCEM • Schools
Padcare: Recycle sanitary napkins collected from schools.	<ul style="list-style-type: none"> • Wasted • ROKA • Schools • Okapi 	<ul style="list-style-type: none"> • CSR • Philanthropic agencies 	<ul style="list-style-type: none"> • Wasted • Schools 	<ul style="list-style-type: none"> • Wasted • Okapi / CRC 	<ul style="list-style-type: none"> • Wasted • Schools
Recycle Cloth Bits: 1100kgs of cloth waste will be diverted from dump yards per week by connecting 100 t ailors in Ward 173 to an aggregator.	<ul style="list-style-type: none"> • ROKA • Okapi • Waste Aggregator 	<ul style="list-style-type: none"> • CSR • Philanthropic agencies 	<ul style="list-style-type: none"> • ROKA • Waste aggregator 	<ul style="list-style-type: none"> • ROKA • Okapi 	<ul style="list-style-type: none"> • ROKA • Waste aggregator • Tailors



PROJECT IDEA	PLANNING	FUNDING	IMPLEMENTATION	MONITORING AND EVALUATION	SUSTAINABILITY
Clean Waterscape for Healthy Cities					
Research: Identify sites; quantify/characterize waste; identify low-cost technology for sorting/processing	<ul style="list-style-type: none"> • Okapi • CRC • Universities like IIT Madras/ Anna University. • AlphaMers 	<ul style="list-style-type: none"> • National or International Research Grants • State Land-Use Board Study Grants • TNGCF 	<ul style="list-style-type: none"> • Universities like IIT Madras/ Anna University • Okapi 	<ul style="list-style-type: none"> • Not applicable 	<ul style="list-style-type: none"> • Not applicable
Set-up: a system of regular collection, sorting, processing, and handing over waste to aggregators and recyclers in a network covering 10 sites.	<ul style="list-style-type: none"> • CRC • CRRT • GCC • AlphaMERS • Waste Management Companies 	<ul style="list-style-type: none"> • GCC • TNGCF 	<ul style="list-style-type: none"> • CRRT • GCC • Waste Management Companies 	<ul style="list-style-type: none"> • CRC / Okapi • GCC • CRRT 	<ul style="list-style-type: none"> • CRC / Okapi • GCC • CRRT • Independent Evaluation Committee
Monitoring and Evaluation (M&E): ensure sustainable management of the trash boom network	<ul style="list-style-type: none"> • CRC / Okapi 	<ul style="list-style-type: none"> • GCC • TNGCF 	<ul style="list-style-type: none"> • CRC / Okapi • GCC • CRRT 	---	<ul style="list-style-type: none"> • CRC / Okapi



5.2. Implementation timeline

TABLE 2 PILOT IMPLEMENTATION TIMELINES

PROJECT: An Area-based Pilot: Building Near-zero Waste Neighborhoods (Kasturba Nagar, Ward 173-Zone XIII-Adyar)

	YEAR 1				YEAR 2			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
We Segregate Waste	active campaign		passive	active campaign		passive	active campaign	
Lane Composter	set up	maintenance						
Waste Collaborative								
Raising Ecowarriors								
PadCare								
Recycle Cloth Bits								

Note: during passive phase the campaign will be slowed down to evaluate impact

PROJECT: A Clean Waterscape for a Healthy City

	YEAR 1				YEAR 2			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Research: Identify sites; quantify/characterize waste; identify low-cost technology for sorting/processing								
Set up: a system of regular collection, sorting, processing, and handing over waste to aggregators and recyclers for a network of 10 sites								
M&E: ensure sustainable management of the trash boom network								



5.3. Tentative budgets

TABLE 3 PILOT IMPLEMENTATION BUDGETS

<i>An Area-based Pilot: Building Near-zero Waste Neighbourhoods (Kasturba Nagar, Ward 173–Zone XIII–Adyar)</i>			
Sub-projects	Budget (INR)	Budget (USD)*	Notes
<i>We Segregate Waste</i>	₹ 1,080,000	\$ 13,185	For a year
<i>Lane Composters</i>	₹ 408,000	\$ 4,981	For 3 lane composters–setup, operation and maintenance for a year
<i>Waste Collaborative</i>	₹ 14,400,000	\$ 175,789	To set up and run an MRF for a year
<i>Raising Ecowarriors</i>	₹ 400,000	\$ 4,883	For one school
<i>PadCare</i>	₹ 150,000	\$ 1,831	For one school
<i>Recycle Cloth Bits</i>	₹ 175,000	\$ 2,136	The budget is drawn to handle 100 Kg of cloth bits per week from 100 tailors in Ward 173.
<i>A Clean Waterscape for a Healthy City</i>			
Sub-projects	Budget (INR)	Budget (USD)*	Notes
Research	₹ 3,000,000	\$ 36,630	For all research components
Implementation	₹ 1,000,000	\$ 12,208	For one trash boom
Monitoring & Evaluation	₹ 3,000,000	\$ 36,630	For one year

*exchange rate: 1USD = 81.9 INR



6. Key Strategic Recommendations

The strategic recommendations call for city-level and medium to long term action by local and state government, corporates, RWAs, NGOs and academia. Multi-sector action is crucial to strengthening the city's waste management system.

1. Strengthen EPR policy and enforcement:

Tamil Nadu Pollution Control Board (TNPCB) is mandated to implement and enforce the plastic ban and EPR plans for those manufacturers and brand owners registered with it³³ in the state. Recently, a Plastic Waste Management Cell has been created at TNPCB for supporting this humungous task. Also, TNPCB and its parent department – Department of Environment, Forests and Climate Change, Government of Tamil Nadu is working with GIZ to define a framework to ensure proper enforcement of EPR. As part of this framework, the following points may be considered:

→ To create greater awareness and accountability, TNPCB should put up plans of companies registered

with them online and provide a link to the Central Pollution Control Board (CPCB) website for plans of companies operating in TN;

→ TNPCB should encourage companies to conduct research on alternative packaging³⁴ and establish systems to take back recyclable and problematic packaging material (PETs and MLPs being the two most common ones) either from municipal Material Recovery Facilities (MRFs) and Resource Recovery Centers (RRCs), or by introducing buy-back schemes or drop-off centers to encourage citizens to deposit recyclables.

→ TNPCB should create more awareness and encourage people to use CPCB's public grievance app which is an established system of citizen monitoring that allows anyone to register a complaint, for instance on littering or use of banned plastics etc. This will then automatically be forwarded to the responsible Urban Local Bodies (ULBs) to take action.

→ TNPCB's Plastic Waste Management Cell should invite companies like ITC, Pepsi Co, Coke, Nestle (top brands that sell most and their packaging material dominate litter items) to partner with them and set up plastic treatment facilities for the city through EPR funding. Alternatively, the Plastic Waste Management Cell could provide a neutral platform for innovators, treatment service providers to engage with plastic packaging producers to increase plastic waste treatment and recycling in the city.

→ To raise general citizen awareness, compliance, and uptake of plastic ban and alternatives, TNPCB could create a dynamic online platform with information on EPR plans of companies in the city, ways in which people could recycle including buy-back schemes, current bans and launch a campaign (similar to and possibly as an extension of the Meendum Manjapai Campaign).

³³ Manufacturers and brand owners operating in more than two states have to register with the CPCB according to the EPR framework.

³⁴ EPR policy does not mandate companies to entirely avoid plastics in product packaging design - however, the most recent EPR guidelines (Feb 2022) states that starting from 2025-26 some percentage of recycled plastics must be used in packaging with a gradual increase in percentage use going up to 2029.



→ Plastic materials are found in products that are difficult to recycle or be recognized as plastic – such as clothes – such as clothes, mattresses, footwear – which leak into the environment and require policy intervention to prevent open dumping. EPR policy framework should also hold companies producing these products responsible and bring them under the purview of the policy.

2. Formalizing and empowering informal waste pickers

Cities across India, notably Pune and Bangalore have managed to integrate informal waste pickers into the formal waste management system (See Appendix 1, for case study on Hasiru Dala and SWaCH Pune). This is critical to establish and strengthen the connection between solid waste management, livelihood and health, and circular economy.

GCC has been issuing ID cards to a limited number of waste pickers in the city's two landfills and to waste pickers across the city. However, the process of formalization of these workers needs much more support and dedicated effort from multiple stakeholders in order to have desired impact on their health and livelihoods. Below we present a 7-point action plan to facilitate this formalization process based on learnings from cities like Pune and Bangalore and discussions with different stakeholders including informal waste pickers of Chennai:

→ Step 1: It is critical to have a thorough understanding of the informal sector though a baseline study

which records data on the number of waste pickers and waste recyclers in the city, the areas they work in, the waste they collect. This data could be analysed to understand how the informal sector functions, their needs and concerns.

→ Step 2: A dedicated and sustained effort is needed to build trust and connect to the informal waste workers. This could be facilitated by an NGO or community leader already working with the community. A part of this interaction should involve raising awareness about the benefits of working within the formal system, and presenting it as a choice to the informal waste workers, who could voluntarily choose (or not choose) to be part of this formalization plan.

→ Step 3: The formalization effort could take the form of an association/union of informal waste pickers in the city or only in the two dump yards in Chennai facilitated by an NGO – It is easier to establish clear terms of engagement between such an association and GCC or even other private waste companies to deliver on specific tasks such as offering fair wage. It is important that the private association / union are purely work-related entities with no political affiliation.

→ Step 4: GCC employs interested informal waste pickers or ties up with the registered association to engage these waste pickers in the formal SWM system. Since, GCC, Ramky and Urbaser already have their pool of conservancy workers, the

additional labour pool of informal waste pickers could be absorbed in sorting and processing work at MRFs, RRCs, MCCs. Also, GCC could make a committed effort to hire from this pool to fill any gaps in the collection system in the future.

→ Step 5: The integration could also happen via private waste management companies – many like Saahas, Waste Win, Wasted etc. are already engaging/employing informal waste workers and/or waste aggregators in specific efforts to empower them to create socially inclusive models. In this effort, EPR funds may be utilized (See Appendix 1 for a Case Study on Saahas Social Inclusion Model).

→ Step 6: Whether hired by GCC or a private agency and via an association or individually, waste pickers should receive formal ID cards that not only legitimize their work, ensure daily wage, but also give them access to daily protections to safeguard them from any work-related hazards and to provide them with social protection schemes (e.g. health and life insurance through Pradhan Mantri Jan Arogya Yojana and Pradhan Mantri Jeevan Jyoti Bima Yojana).



→ Step 7: Additional efforts to train and empower this community (through skill development and training to for instance start small businesses) and their families, especially their children (e.g. facilitating their education) could go a long way in helping this sector to climb the socio-economic ladder. This may be facilitated collaboratively by GCC, NGOs, Private waste management companies, and the corporates.

3. Implement a sustained (6 months to 1 year) city-wide awareness and capacity building campaign to achieve higher waste segregation at source

GCC along with private agencies responsible for door-to-door waste collection could organize such a campaign. To begin with, a training for trainers should be held with existing SWM collection team who could then create awareness for the domestic workers and residents as they collect waste on a day-to-day basis. Active members of local RWAs could also help – these RWA members or the SWM team members who are conducting the program could be provided with special IDs to emphasize their legitimacy to the citizens.

The awareness building sessions should include topics such as identifying different types of waste generated, understanding which waste segregation streams they need to go into, the quality of waste that needs to be maintained while segregating, etc. They may also

include components on current policies and laws related to SWM, existing state of SWM and its flow in the city. It is critical that these awareness sessions are held on a regular basis, at people's doorsteps and sustained for several months so that all flats and households are on board (see Appendix 1 for a Case study on Swaccha Graha Kalika Kendra, Bangalore).

4. Incentivize waste segregation at source

Negative incentives (user fees, penalties, not collecting unsegregated waste, mention on resident WhatsApp groups) and positive incentives (e.g. awards such as cleanest neighbourhood or building) need to be used to bring about citizen behaviour changes over a period. GCC SWM Bylaws before 2019 mandates payment of user fee for all users of SWM services³⁵. However, previous efforts of introducing user fee have faced resistance from the residents³⁶. Strict monitoring and enforcement of fines are also required along with recognizing good efforts by Bulk Waste Generators, RWAs, and others for achieving higher waste segregation rates. These steps are critical to persuading citizens to cooperate on proper waste segregation practices. Without proper waste segregation at source the efficacy of MCCs and MRFs are all compromised.

5. A Green Loupe Database

GCC (possibly in partnership with organisations like Citizen consumer and civic Action Group, Okapi Research and Advisory, Chennai Resilience Centre) could create and maintain an updated database of private waste managers who aggregate and recycle different waste streams – this will be an important resource for interested Chennai residents, commercial establishment, institutions like schools and colleges to identify who could be contacted for diverting particular waste streams.

³⁵ The amount ranges from Rs.10 to Rs.100 per month for residential building based on the built-up size. Similarly for commercial and other establishment it ranges from Rs. 1000 to Rs. 20000 per month.

³⁶ Viswanathan, N. (Dec 24, 2022). Chennai Corporation rolls back garbage collection user fee in light of pandemic, <https://www.newindianexpress.com/cities/chennai/2020/dec/24/chennai-corporation-rolls-back-garbage-collection-user-fee-in-light-of-pandemic-2240551.html>



Appendix 1: Case Studies

Zero Waste Neighbourhood: Hosur-Sarjapur Road (HSR) Layout, Bengaluru³⁷

HSR layout has been successful in implementing a zero-waste neighbourhood initiative. It is located 10km from Bengaluru city centre, in south eastern suburb. The initiative was started in 2012 with residents coming together to initiate the 'HSR Citizen Forum' to address the garbage menace through awareness building. The Forum reached out to 28,000 households through students in schools and colleges. Pamphlets with message of '2bin1bag' were distributed widely and residents were informed not to use trash-bin lining plastic bags. The forum also reached out to elected representatives, sanitation workers, health inspectors, and other officers for support. Their efforts have resulted in high waste segregation levels – 90 percent with waste segregated into wet (organic), dry (recyclables, low/no value inert waste), sanitary waste and e-waste. RWAs in the area are roped-in for regular follow up with residents and sanitation workers who are encouraged not to collect un-segregated waste (Fig 12).

Waste is collected regularly, wet and sanitary waste separately for five days a week, whereas dry waste is collected twice weekly. The wet waste is first taken to transfer point, from there it is transferred to the compactor and sent to Karnataka Compost Development Corporation (KCDC). The dry waste is sent to the ward level Dry Waste Collection Centre (DWCC), where it is sorted, aggregated, and sold off to the recycling industry. They also encourage to setup either home-composting units or deposit wet waste in lane composters (see image above). The sanitation workers collect wet waste from the households. They fill the lane composter with the given wet waste. The temples and schools in the neighbourhood are also involved and asked to compost their waste. Schools have set up gardening clubs, where students regularly compost the organic waste and grow vegetables. All the flower waste generated in temples is composted. The farmers around Bangalore have been sourcing compost from HSR Layout for farming purposes. It is also used for park maintenance and is freely given to residents. The residents have a WhatsApp group for communication, members include residents, city officials, waste collectors and other relevant people. Any issue regarding waste management is passed on to the WhatsApp group and resolved immediately.

HSR layout zero waste community case is successful because of its spirit of volunteerism and residents' attachment to the neighbourhood which is motivational for other neighbourhoods as well. In addition, support from local politicians, government agencies, has also been critical.

³⁷ HSR Citizen Forum. <https://hsrcitizenforum.in/>.

The Logical Indian.2018. The Making of Zero Waste Community In Bengaluru. Retrieved from: <https://thelogicalindian.com/story-feed/awareness/zero-waste-community-bengaluru/?infinitescroll=1>.

Arshreet Singh. 2021. Only poor neighbourhoods of Bengaluru reek of garbage. Retrieved from: <http://theweeklyobserver.in/2021/10/28/only-poor-neighborhoods-of-bengaluru-reek-of-garbage/>.



FIGURE 13

Setting up of lane composting (right) and starting of a kitchen gardening by a resident (left)



Source: HSR Citizen Forum website



Integration of waste pickers into the city solid waste management system: Hasiru Dala, Bengaluru³⁸

Hasiru Dala (started in 2010), a social impact organization works as a member based cooperative model of social enterprise in Bengaluru. The organisation recognises waste pickers as formal ‘green-collar workers’ for streamlined waste collection in the city. They started working in Bengaluru in 2011 with identification of waste pickers and other informal workers in waste management sector in the city. In collaboration with Bruhat Bengaluru Mahanagara Palike (BBMP), the local body who handles waste management, it has issued occupational ID cards to the informal waste workers (see image below). Through this effort more than 6000 waste pickers have been enumerated and given BBMP identity cards (Fig 13). With the cards they get benefits such as social security, health insurance and access to microfinance to empower them to raise their standard of living.

Hasiru Dala also demonstrated operation of Dry Waste Collection Centre (DWCC) –a decentralised centre to aggregate dry waste of the ward, trained waste pickers to manage biogas unit for two years, managed organic composting at ward level, for non-organic waste by integrating waste pickers into the city solid waste management system. The organization is successful in regularising the informal sector in Bengaluru and they are also scaling up this effort in other cities.

³⁸ Hasiru dala-Zero Waste Ward 177, Jai Prakash Nagar Pilot Project 2019-2020. https://hasirudala.in/wp-content/uploads/2020/09/Report_ZeroWaste_Ward177_Jun19-Mar20.pdf.

Hasiru Dala Website: <https://hasirudala.in/>.

NITI Aayog (2020). Integration of informal waste workers: Hasiru Dala- Best Practices in Urban Sectors.

FIGURE 14

Occupational Identity Cards issued to informal waste pickers



Source: Hasiru Dala website



Social Inclusion Model by Sahaas Zero Waste³⁹

Sahaas Zero Waste (SZW) started as a non-profit organization working in the field of waste management in 2001. They later registered as a Pvt Ltd. company in 2013 and carry out their operation in three business verticals- The Zero Waste Program, Extended Producer Responsibility (EPR) and Circle Up. SZW also embraces inclusion of existing informal actors into a formal waste management ecosystem through their social inclusion program (see image below). This is being implemented under EPR framework where SZW assists manufacturers and brand owners of plastic packaging to support reverse logistics/channelization of plastic waste to ensure environmentally sound management of such waste. They developed a comprehensive road map for the social inclusion program. It begins with the selection of an entrepreneur who has the potential and the inclination to be a part of change. They play a role in three focused areas: infrastructure development, capacity building and self-sustaining business model. Informal waste workers will be able to meet the costs of entrepreneurship through incentives for achieving results.

Currently, Sahaas EPR operates in 24 states in India. They also partnered with IKEA Social Entrepreneurship, The Incubation Network (TIN), Vishuddh Recycle Pvt. Ltd, and PepsiCo India Holding Pvt. Ltd. for the Social Inclusion Program. They have enrolled 16 waste entrepreneurs, and the TIN project specifically managed 150+MT of dry waste through which 16 jobs were generated (fig 14). Going forward they will replicate and scale up the social inclusion program beyond plastic waste entrepreneurs to include those working with other type of waste.

FIGURE 15

Informal waste pickers starting a new dry waste collection centre in Jigani, Bengaluru



Source: Sahaas Zero Waste

³⁹ Sahaas Zero Waste website, <https://saahaszerowaste.com/wp-content/uploads/Sahaas-Impact-Report-2022.pdf>, <https://saahaszerowaste.com/>.

Sahaas Zero Waste website: <https://saahaszerowaste.com/>.



SWaCH Pune: Integrating informal waste pickers into formal municipal solid waste management ecosystem⁴⁰

A pilot program implemented by Kagaz Kach Patra Kashtakari Panchayat in 2005 employed 1500 waste pickers to become service providers in Pune for door-to-door collection of waste from households. Following the success of pilot, a fully owned waste pickers' cooperative named SWaCH was formed in 2007. Pune Municipal Corporation (PMC) signed a five-year agreement in 2008 with SWaCH and renewed it in 2016 to decentralize door-to-door collection services for households, shops, offices, and small commercial establishments. Currently, 3,500 waste pickers are part of SWaCH, most of whom are women and under privileged people (lower caste, Dalits). They collect more than 600 tonnes of municipal solid waste per day, about 130 tonnes of this waste is sent for composting and 150 tonnes of it is recycled (Fig 15). This reduces waste that goes to the landfill and PMC saves 15 crores per year in waste handling costs alone. Also, PMC is not paying any members of SWaCH for their collection services, only equipment and management cost are taken care of. PMC has authorised SWaCH members to collect user fee from citizens. In addition, sale of scrap is their other source of income.

SWaCH works like members of the cooperative divided in pairs and are in charge of door-to-door waste collection for 200-250 households (see image below). They receive segregated waste (separated wet or organic waste and dry waste such as plastics, glass, paper, etc.) from households /commercial establishments. Cooperative members further segregate the recyclables to be sold in the recycling market and non-recyclable waste is dropped off at feeder points. SWaCH also started different initiatives like V-Collect (collection of unwanted household material that includes clothes, plastic, paper etc.), E-waste (collection and disposal), V-Compost (creating and maintaining compost pits in

the neighbourhoods) and Nirmalaya Collection (to divert over a hundred tonnes of waste each year from the rivers to the recycling stream), etc.

SWaCH is the success story of how thousands of waste pickers in Pune, India came together to get first and rightful access to recyclable waste. Their conditions were improved, they moved off the landfills, and upgraded their livelihoods, effectively bridging the gap between households and the municipal waste collection service.

FIGURE 16
SWaCH cooperative waste pickers



Source: SWaCH Pune website

⁴⁰ SWaCH Pune website: <https://swachcoop.com/resources/>; WRI: <https://prizeforcities.org/project/swach-pune-seva-sahakari-sanstha>.



Floating Trash Boom to clean rivers and lakes: AlphaMERS⁴¹

AlphaMERS, a Bengaluru firm has developed 'Floating Trash Barriers'⁴² (FTB) to clean waterbodies by trapping solid waste flowing through them. These barriers, made of stainless steel and aluminium to increase its lifespan, use the natural flow of water to trap solid waste. They are laid diagonal to the flow of water (Fig 16) and secured at the banks with concrete anchors and deployed at strategic locations i.e. near roads to facilitate collection of the trapped garbage. The collected trash can be picked up at these collection points by land-based excavators and sent for disposal. The barriers do not require fuel or electricity for its function and can be adjusted to the changing water levels. The barrier design can also be modified according to the local site specifications.

Several Indian cities such as Bengaluru, Puducherry, Chennai and Mysuru have deployed these trash barriers across rivers and/or lakes. For example, a barrier was setup in 'Ulsoor Lake', in Bengaluru as a pilot project in 2015. The garbage entering the lake was being accumulated to one side of the barrier. Around 10 trash barriers have also been deployed along the Musi river in Hyderabad(Fig 17). And in Chennai, several have been deployed on the Adyar and Cooum rivers in 2017, as a result of which 22,000 tons of trash was collected in 2018 (Fig 18).

⁴¹ AlphaMERS website: <https://alphamers.com/>; The Hindu. (2022), Floating trash barrier developed by Bengaluru firm emerges winner in clean waterbody challenge.

⁴² Barriers, also referred as boom

FIGURE 17

A trash barrier across the Musi River in Hyderabad



FIGURE 18

Another trash barrier across the Musi River in Hyderabad



Source: AlphaMers

FIGURE 19

A trash barrier across the Cooum river in Chennai





SwachaGraha -Citizen Awareness Campaign, Bengaluru⁴³

To promote composting across the city in Bengaluru a citizen awareness campaign named 'SwachaGraha' was started in 2016 by Solid Waste Management Round Table (SWMRT)⁴⁴. In the launch year, the campaign was curated with a SwachaGraha anthem and an attractive branding with its invitations to citizens to start a journey with three green spots – COMPOST, GROW, COOK – as a response to the urban pollution crisis. The campaign also featured a website that showed how simple and innovating composting is. The campaign involved encouraging people to take up the 'green spot' challenge to divert wet waste away from landfills by composting at home. They also connected urban compost producers from apartments and gated communities, with farmers in and around Bengaluru through

'SwachaGraha Compost Connect (SGCC).' Under SGCC, verified producers and buyers join a WhatsApp group and every Sunday both parties come together to buy and sell compost.

In addition, SWMRT started a composting learning centre named 'SwachaGraha Kalika Kendra (SGKK)' for kitchen and garden waste composting (Fig 19). This learning centre houses more than 20 home and community composting models with a fully functional biogas plant. The centre also educates visitors on how the compost can be used to grow healthy, chemical free vegetables and greens. SGKK was implemented with support and finance from a local politician, the BBMP and horticulture department. The citizen's awareness campaign is showing positive results due to the involvement of all relevant players with a major step taken by citizens itself.

⁴³ Swachagraha website: <https://www.swachagraha.in/about>; HSR Citizen Forum Website: <https://hsrcitizenforum.in/swachagraha-kalika-kendra>.

⁴⁴ SWMRT is a collective of SWM practitioners working, since 2009, for adoption of sustainable waste management practices by citizens and municipalities, for improving public health, clean air and water, safe food, healthy soil and inclusive livelihoods.

FIGURE 20
Swacha Graha Kalika Kendra (SGKK)



Source: Swachagraha website



Appendix 2: Project Proposals

Proposal for Setting up Lane Composters

RESIDENTS OF KASTURBANAGAR ASSOCIATION, ADYAR, CHENNAI (ROKA)



Rationale:

Residents of ROKA neighbourhood are currently handing over their waste (including organic waste) to the waste collector – i.e. Urbaser Sumeet. Many of them are handing over un-segregated waste or dumping this in the street bins making the working conditions for the waste collectors and low income residents who live and work near the bins, unhygienic and inhumane. The waste collectors and informal waste pickers are obliged to physically segregate the mixed waste to recover high value waste such as PET bottles and metal which can be sold to scrap shops. Therefore, setting up lane composters on the street provides an opportunity for diverting the organic waste away from bins and managing it in a decentralised manner enabling better working conditions and allowing the citizens to understand the impact and value of the waste they generate.



Objectives:

To create a community system for composting that will inspire more middle and upper middle-income residents to responsibly manage some of their organic waste and improve living conditions of low-income residents and working condition of Urbaser Sumeet waste collection drivers in the area.



Solution:

The Lane Composter (Fig 20) is a mobile infrastructure for composting large quantities of organic waste. It can be designed to take up to 30 kgs of organic waste per day. The composters will be kept on the street to allow people to see how organic waste transforms to compost or 'black gold.'

Each lane composting unit needs only 4ft*3ft space and can be set up by the street in a space where pedestrian movement is not hindered. The input for these composters is organic waste including food waste (vegetable peels etc.) and brown waste (dry leaves, paper, small cardboard bits etc.) which will be mixed with inoculum (cow dung slurry, cocopeat infused with microbes, sour butter milk) to enable faster and more effective conversion to compost. Once the composters are set in the designated space, 20% of it is lined with dry leaves, then fresh organic waste is dumped in it, alternated with brown matter (dry leaves, cocopeat, sawdust, small cardboard pieces etc). Once it is filled completely, it is left aside for 45 days after which compost can be harvested.

In terms of day-to-day operations and human resource, the composter will be kept near apartments from where volunteers can oversee its maintenance and



upkeep. The volunteer team will employ one person to ensure that only organic waste is fed into the unit and review ratio of brown to food waste. As such the composters would require one hour's work per day and five hours work at a stretch, once in two months at the time of harvest. The volunteer team will also engage in recording quantitative and qualitative data on the amount of waste diverted and other benefits of the composter to make measure success of the initiative and discern possible impact if scaled up. This will create improved working conditions for low income residents and enhancing social cohesion.

In terms of day-to-day operations and human resources, the composter will be kept near apartments from where volunteers can oversee its maintenance and upkeep. The volunteer team will employ one person to ensure that only organic waste is fed into the unit and to review the ratio of brown to food waste. As such, the composters would require one hour's work every day, and five hours' consecutive work once every two months, at the time of harvest. The volunteer team will also engage in recording quantitative and qualitative data on the amount of waste diverted and other benefits of the composter, in other words improved working conditions for low-income residents and enhanced social cohesion, to measure the success of the initiative and discern the potential impact if it is to be scaled up.

Possible challenges are, that the bio-degradable waste may not 100% bio-degradable and may have some mixture of other kinds of waste, the waste can become lumps and can get too wet. However, these challenges can be overcome by engaging with the waste collector to ensure that only bio-degradable waste is fed into the composter and by constantly visually reviewing the ratio of brown waste (i.e. leaves, paper, sawdust, cocopeat) to food waste. Also, while the composters are full and the waste is composting (i.e. for 45 days), the incoming daily organic waste would have to be sent to the existing waste collection system. However, it is expected that within the course of the year, the project team can showcase success of the initiative to enable GCC to expand the effort to divert larger quantities of organic waste from the dump yards and contribute towards operation and maintenance.



Benefits:

- *Improving living conditions of economically backward people living on Canal Bank Road:* Usually mixed garbage is dumped in street bins near houses/ work places of low-income residents. The lane composter will divert a major part of the organic waste from the bins resulting in cleaner streets and improved living and working conditions by keeping the road free from mixed garbage.
- *Improving working conditions of waste collectors:* Urbaser Sumeet drivers and informal waste pickers are obliged to rummage through mixed waste trying to salvage high value items. If installed, all the organic waste from the bins will be diverted to the Lane Composters, enabling more hygienic working conditions and better quality waste that can be recovered.
- *Decentralized waste processing:* Installing one lane composter will help divert 30 kg of organic waste per day from the Perungudi dump yards and reduce the carbon footprint from waste collection, transporting and dumping by eliminating transport of waste to a feeder station and to the dump yard. The primary output from this produce is good quality compost which is in high demand in the neighbourhood. Additionally, placing these composters by the road will serve as an inspiration and motivate people to see how wet waste can be transformed in to compost which can be used for the neighbourhood plants.
- *Improved community resilience in waste management:* With the lane composters system set up, the community will be self-sufficient to tackle the wet waste generated in the neighborhood themselves, thereby reducing dependency on GCC to collect and dispose of the waste.



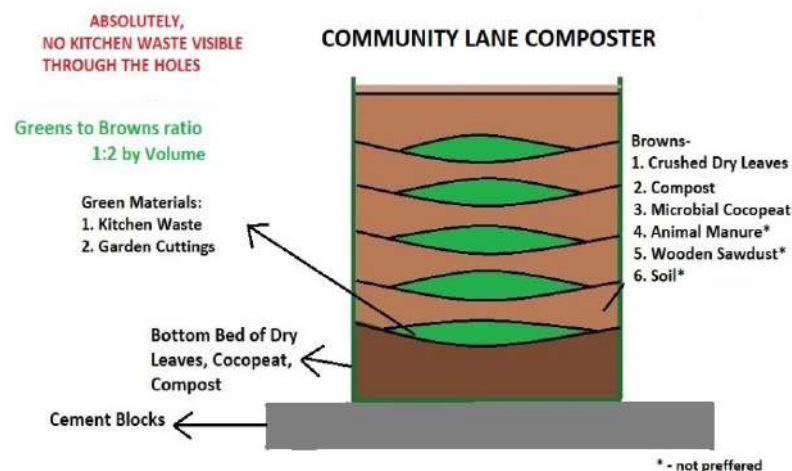
Budget for three lane composters on three streets for a 12 month period

TABLE 4 BUDGET FOR LANE COMPOSTERS

Items	Amount (INR)	Amount (USD)
Lane composter – 3 nos	225,000	2,747
Inoculum – (Harvest once in 4 to 6 months) – for 12 months @ INR 3000 per month)	108,000	1,318
Labour (for 12 months @ INR 5000 per month)	60,000	732
Storage material @ INR 5000 per unit	15,000	183
Total running cost for a year	408,000	4,981

FIGURE 21

Lane composter in a neighbourhood in Bangalore



Source: SWMRT Bangalore and EFI Chennai

'A community that composts together stays together in a clean environment.'



Proposal for managing cloth waste from Ward 173

RESIDENTS OF KASTURBANAGAR ASSOCIATION, ADYAR, CHENNAI (ROKA)



Rationale:

Clothes are a basic necessity that will always be a large and prominent component in the consumer market. While the manufacturing industry continues to produce large quantities of cloth and the consumer continues to rampantly buy and use these products, the environmental impact of the lifecycle of the clothes, many of which are made of synthetic material, especially during manufacture and post usage should not be ignored. As such, textiles are the second largest polluting industry (after plastic). It takes over 200 years for cloth to decompose in a landfill and about 700 years for it to break down in water and soil; and in the meantime, it generates greenhouse gases and leach toxic chemicals and dyes into the groundwater and our soil⁴⁵; 35% of primary plastic that is polluting oceans comes from micro plastics in clothes (Fig 22).

The proposed study site for this project is Ward 173 (Fig 23) which includes parts of Gandhi Nagar, Kasturba Nagar, Indira Nagar and Kamaraj Avenue. ROKA conducted an initial survey of around 65 tailors in Ward 173 to, understand their willingness to be a part of the project, estimate the quantity of cloth bits they dispose and understand the manner of disposal. Nearly 63 tailors expressed their willingness to participate in the project and it was found that around 100kg of waste cloth bits are dumped in street bins in the neighbourhood.



Objective:

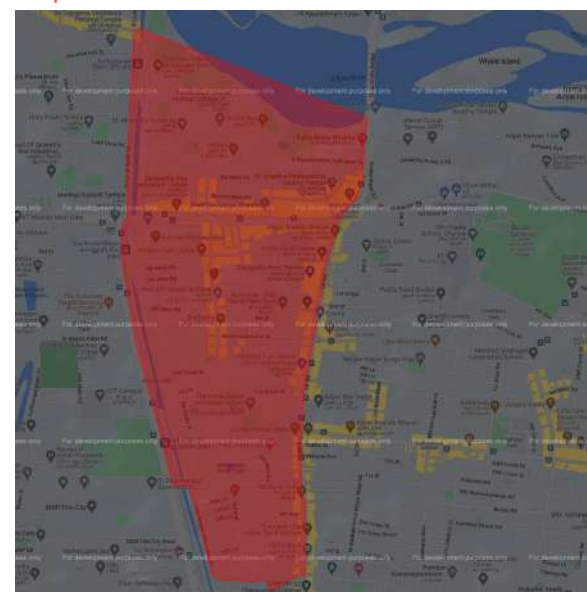
Therefore, the objective of this project is to divert cloth bits from tailors and boutiques in Ward 173 to a waste aggregator who will ultimately channel it to textile manufacturing units through a transparent and systematic system that can be replicated.

⁴⁵ Business Insider India, 2022. Link - <https://www.businessinsider.in/retail/news/impulse-buys-fast-fashion-end-up-in-landfills-and-stay-intact-for-200-years/articleshow/92533424.cms>

FIGURE 22
Cloth waste in a dump yard



FIGURE 23
Map of Ward 173





Solution:

The solution involves setting up project operations unit comprising of ROKA volunteers to advise and oversee operations and two people hired for day-to-day operations and management. The project operations unit performs the following tasks:

- Engage with the tailors and boutiques to register for the project. The team will provide designated bags to the tailors to collect the cloth bits and fix one day of the week for collection. They will also create a database of tailors and boutiques who are part of the project with information such as, name, location, contact details, frequency and quantity of cloth bits generated which will be updated on a weekly basis. The data will be analysed once in every few months to understand impact.
- Identify a waste aggregator who can pick up the cloth bits and coordinate with them for a weekly pick up from registered tailors on designated day.
- Ensuring transparency of the waste collection process by recording details on how much waste is collected weekly and where the waste is stored after pick up and before it is sent for recycling. As such, once the aggregator has a sizeable quantity of cloth bits, it will be sent to the recycler in Coimbatore/Tirupur for recycling once in four months or based on quantity collected (Fig 24).
- Further and most importantly the team will consistently follow up (telephonic or in person) with the tailors to encourage them to be a part of the project and make them understand their positive impact on the environment to sustain their interest and involvement.
- Proving incentives to the most cooperative / enthusiastic tailors and boutiques based on their involvement in the project.

Risks associated with the project are that, the tailors may not be motivated to store the cloth bits, the aggregator might also not have space to store the cloth bits and there may not be a ready demand for the cloth bits. These risks can be overcome by increased and repeated awareness drives and incentivising the tailors, involving a second aggregator to collect the cloth bit and involving more recyclers to take the cloth from the aggregators.

FIGURE 24

Waste collection process for cloth bits



Source: ROKA



Estimated output or target:

Diverting more than 100 kgs of cloth bits per week from 100 tailors in Ward 173. The model can be scaled up to include more tailors to collect cloth bits to the tune of 5 MT in four months which is the minimum economically viable amount for a waste aggregator to be interested in the project.



Benefits:

The project will have the following benefits (Fig. 25):

- Steady diversion of cloth bits from dump sites.
- Creating a system which can be replicated for easy collection of scrap tailoring cloth bits that enables systematic and periodic access of raw material for recyclers which they currently lack.
- Generating awareness among tailors and boutiques on sustainable waste management and changing their behaviour to become more responsible for the waste they generate which can influence more people resulting in a more rigorous system of SWM.

FIGURE 25
Benefits of the project





Budget:

The budget is designed for 100 kg of cloth bits per week from 100 tailors in Ward 173.

TABLE 5 BUDGET FOR THE PROJECT

Description	Amount (INR)	Amount (USD)*
Renewing contact with tailors, repeated awareness and follow up (for 2 people per month)	20,000	244
Material (for a year)	25,000	305
Transport and logistics for weekly collection	10,000	122
Transport and logistics from aggregator to recycler (3 to 4 times a year)	50,000	610
IEC and incentivisation (for a year)	50,000	610
Misc (travel, following up, stationery for the team)	30,000	366
Total Project Cost	175,000	2,136

* exchange rate: 1USD = 81.9 INR

Note: Engagement of the Base Team in Ward 173 until expected results are attained. They can move to continue to work in other wards, as a process of scaling up the project.



Timeline:

Three months for the system to stabilise and start collecting cloth bits. One year –to start sending to the recycler.



Appendix 3: 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.

Vermicomposting: Vermicomposting is a process that relies on earthworms and microorganisms to help stabilize active organic materials and convert them to compost which can be a valuable soil amendment and source of plant nutrients.

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.

Micro composting Centre: A Micro Composting Centre is a facility where wet waste is processed through natural biological processes that can help in breaking the organic waste down into compost. This can be undertaken through various methods, e.g., Aerobic composting which converts organic waste into Compost using air in a humid and warm environment, vermi-composting which decomposes the waste using earthworms etc.

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.

Resource Recovery Centers (RRCs): Resource recovery centers are like MRFs, that receive, separate and prepare recyclables. In the context of Chennai, RRCs are larger MRFs, in scale and occupy more space.

Tipping fee: A tipping fee is a fee that is generally paid to the contractor for collecting, transporting and processing/disposing waste in the city, and is generally based on the weight of the waste.

