

# Project Opportunities to Accelerate Clean, Healthy Cities and Seas

CITY OPPORTUNITY BOOKLET



# Contents

**01** About  
Urban Ocean

**02** City  
Maps

**03** Why Urban Waste  
Management  
Systems?  
Why Now?

**04** A New Era For  
Partnerships

- Confirming The Needs Of Cities And Identifying Project Opportunities
  - Partnering With Urban Ocean
- How To Read The Opportunities
- Adaptive And Inclusive Waste Management Model

**05** City Opportunity  
Statements

- Enhancing Can Tho's River Waste Management and Recycling Facilities
- Clean River and Coastal Area for a Smoke-Free City of Melaka
- Enhance the recovery of recyclable material in Panama City
- Supporting Transformations in Recovery of Energy and Materials Initiative (STREAMS)
- Adaptive and Inclusive Waste Management Model

# About Urban Ocean

Scientists estimate that approximately 11 million metric tons of plastic flow into the ocean from land annually.<sup>1</sup> Most of it comes from regions of the world where economic growth has outpaced infrastructure development. Cities are central to creating the plastic pollution challenges and its corresponding solutions. Urban Ocean is a unique initiative jointly implemented by The Circulate Initiative, Ocean Conservancy, and Resilient Cities Network (R-Cities) to end ocean plastic pollution and build more resilient communities. It brings together city governments, civil society actors, leading academics, financial institutions, and private sector leaders to develop, share and scale solutions to the ocean plastic problem that cut across silos and achieve multiple co-benefits to strengthen city resilience. Urban Ocean is a capacity-building and project accelerator program designed with cities for cities. The program is based on a network that leverages peer-to-peer learning, champions circular economy principles and builds awareness on pollution in urban areas. It assesses risks and vulnerabilities of urban waste management systems, and ultimately supports cities to identify and develop project opportunities. These opportunities, highlighted in this document, are designed to address the interrelated challenges of ocean plastics and urban resilience, by leveraging the unique possibilities of a well-managed urban waste management system, which can generate tremendous health, environmental, economic, and social benefits to the population. At the same time, the program trajectory was curated to mainstream circular economy principles into municipal practices, prioritizing the advancement of opportunities that go beyond traditional waste management practices towards rethinking how materials are designed and enter markets. There is an opportunity now to set the path towards a more resilient urban-ocean relationship.



The R-Cities is the world's leading urban resilience network. R-Cities builds on over ten years of investment in resilience from the Rockefeller Foundation and the former 100 Resilient Cities program, consisting of member cities and Chief Resilience Officers (CROs). We bring together global knowledge, practice, partnership, and funding to empower our cities. We help our member cities build a safer, more equitable, and sustainable future for all their residents. Our demand-driven approach allows us to deliver impact through engaging our network, implementing programs in cities, and mobilizing investment. We are a city-led, regionally-driven, partner-based, and impact-driven organization.



Ocean Conservancy is working to protect the ocean from today's greatest global challenges. Together with our partners, we create science-based solutions for a healthy ocean and the wildlife and communities that depend on it. Since the formation of the International Coastal Cleanup in 1986, Ocean Conservancy has mobilized millions of volunteers to remove trash from beaches and waterways around the world while pioneering upstream solutions to the growing ocean plastics crisis. Ocean Conservancy invests in cutting-edge scientific research, implements on-the-ground projects, and works with conservationists, scientists, governments, the private sector, and members of the public to change the plastics paradigm.



The Circulate Initiative is a non-profit organization committed to solving the ocean plastic pollution challenge by supporting the incubation of circular, inclusive, and investible waste management, and recycling systems in South and Southeast Asia. We achieve this by collaborating with key stakeholders across the sector, and by producing insights to support and accelerate investment and scale across the value chain.

<sup>1</sup> Plastic Waste Inputs from Land into the Ocean (2015). Jambeck et al. Access here: <https://science.sciencemag.org/content/347/6223/768>

**● MENTOR CITIES**

are selected because of their proven track record implementing circular economy strategies, and because of their work in the fight against river and ocean plastic. Pune is both a learning city and a mentor city due to its breadth of community-led engagement experience.

**● LEARNING CITIES**

are selected because of their commitment to improving waste management and creating circular systems as part of resilience-building efforts, and because of their outsized potential to provide solutions in regions with high waste leakage rates.

**Panama City**

Panama

**Vejle**

Denmark

**Chennai\***

India

**Melaka**

Malaysia

**Rotterdam**

The Netherlands

**Milan**

Italy

**Pune**

India

**Can Tho**

Vietnam

**Christchurch**

New Zealand

**Semarang**

Indonesia

\* Chennai was welcomed as an additional city to the first cohort in August 2021 and it is working through an accelerated program order

# Why Urban Waste Management Systems?

## Why Now?

Cities are home to over half of the global population and account for nearly three-quarters of global greenhouse gas emissions<sup>2</sup>. The COVID-19 pandemic could push between 71 to 100 million people into extreme poverty, of which 30% will reside in urban centers<sup>3</sup>. No climate or social target will be met without a deep transformation of urban centers towards a more inclusive, sustainable and, ultimately, resilient path. Approaching the urban waste management system through a resilience lens exemplifies the complex, interrelated ramifications for social, economic, and environmental indicators. For instance, it is estimated that the waste management sector alone has the potential to create 45 million jobs globally and reduce 15–20% of GHG emissions<sup>4</sup>. Adding a layer of complexity by including the marine plastic debris challenge can push cities towards rethinking their relationship with the ocean. Thus, it presents a huge opportunity for city governments to implement policies and projects that promote a more resilient and circular waste sector in their cities.

The majority of plastic in the ocean comes from rapidly urbanizing cities, particularly those along rivers and coastal areas in the Global South. Stakeholders often underestimate the negative impacts, intersections, and the trickle-down challenges of mismanaged waste in urban areas (e.g. flooding, disease, air pollution, livelihoods of informal waste workers, tourism sector, food security, etc.). An inadequate waste management system contributes to degradation of the urban ecosystem and adds to marine pollution. It also deepens inequalities and vulnerabilities of urban communities and economies while exacerbating the risks from shocks and stresses the city faces. More than a quarter of our network cities indicate that inadequate sanitation systems negatively impacts their resilience. Furthermore, the COVID-19 pandemic has increased plastic pollution due to an increased use of delivery packaging and personal protective equipment. In turn, this increase in pollution will have a knock-on effect on biodiversity, public health, and lead to more blocked waterways, further intensifying flooding risk.

Cities generally have a mandate for owning, building, maintaining, and providing water, sanitation, and waste management systems, so they are a natural partner to develop solutions. At the same time, cities have an opportunity to champion circular and resilient practices within the waste management system and lead the global transformation towards carbon zero societies and economies. Approaching waste management from a resilience perspective – understood as the capacity of a city's systems, businesses,

institutions, communities, and individuals to survive, adapt, and grow no matter what chronic stresses and acute shocks they experience – can support decision-makers in purposefully designing solutions that tackle multiple problems at the same time. In addition, cities are also key actors in other areas critical for solving the marine plastic waste problem, including citizen education and awareness. Amid the COVID-19 pandemic, some cities have prompted their citizens, businesses, and governments to find alternative materials, improve electronic waste collection, and strengthen the recycling industry to tackle multiple problems (e.g. livelihoods, public health, etc.).

Research shows that the circular economy offers a \$4.5 trillion economic opportunity by reducing waste, stimulating innovation and creating employment. It can create a net increase of six million jobs and cut global greenhouse gas emissions by 39%, benefiting industries, sectors, and lives by 2030<sup>5</sup>.

At its core, the Urban Ocean program was created to bring urban and ocean practitioners closer together, speaking the same language, and finding diverse and holistic ways to connect (or reconnect) these centers of production, consumption and population to the water that is sometime right on their “front porch” – analyzing, educating, and devising for solutions that focus on. In this context, the following opportunities have been identified by city stakeholders, in close collaboration with the Urban Ocean program, as high-impact solutions for multiple challenges. These opportunities have been carefully analyzed and prioritized to address the marine plastic debris issue while building equitable, sustainable, and resilient cities.

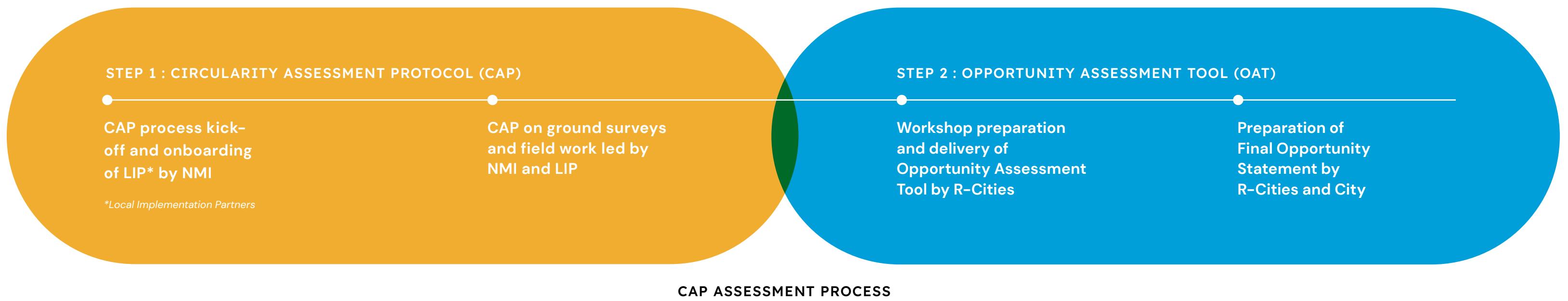
<sup>2</sup> IPCC Report on Climate Change 2021: the Physical Science Basis

<sup>3</sup> World Bank (2020). Link: <https://blogs.worldbank.org/developmenttalk/new-poor-are-different-who-they-are-and-why-it-matters>

<sup>4</sup> International Labour Organization (2018) World Employment Social Outlook; Eunomia (2015) The potential Contribution of Waste Management to a Low Carbon Economy

<sup>5</sup> WRI, 2021. Link: <https://www.wri.org/insights/5-opportunities-circular-economy>

# A New Era for Partnerships



## Confirming the needs of cities and identifying project opportunities

Through the first stage of the program, the Urban Ocean Gap Assessment, cities researched risks and vulnerabilities within their waste management systems that lead to plastic leaking into the municipal environment and beyond. The cities and the Urban Ocean team then analyzed these shortcomings and identified opportunities that would allow them to address the shortcomings by rethinking waste management through circular economy and resilience principles using complementary tools and approaches:

1. **The Circularity Assessment Protocol (CAP)**, which was developed and deployed by the University of Georgia's New Materials Institute (NMI) and the Circularity Informatics Lab led by Dr. Jenna Jambeck. The CAP is a

hub and spoke model that provides a snapshot of a city's circularity to provide data for local, regional, or national decision-making to reduce the leakage of waste (e.g., single-use plastic) into the environment and increase circular materials management. It city-specific data on plastic usage and materials flow.

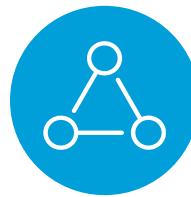
2. **The Opportunity Assessment Tool** developed and delivered by the Resilient Cities Network allows cities to apply resilience principles and systems-thinking to urban challenges including waste management in order to identify new, innovative resilience solutions that allow cities to deliver critical urban services in a more sustainable, inclusive, efficient, and resilient manner. It supports cities in prioritizing key actions

that can address the interrelated challenges of urban development, climate change, poverty and ocean plastic, while generating multiple co-benefits.

In a second stage, the cities developed these project opportunities to increase their resilience value and create a solid roadmap for implementation. The Urban Ocean team believes that investments targeted towards any one of these opportunities can help the cities develop better projects that can shift the trajectory of a city and directly improve lives today and for generations to come. However, cities cannot do this alone. There is a need to break down silo-driven development and co-design interventions that leverage multi-stakeholder partnerships.

# Partnering with Urban Ocean

Urban Ocean offers multiple opportunities to partner:



## ENGAGE WITH US AT THE MULTI-CITY PROGRAMMATIC LEVEL

Urban Ocean is looking for new partnerships to strengthen and expand its global footprint as a leader on promoting resilient solutions to urban challenges that reduce waste leakage into our ocean. New partnerships will support R-Cities network member cities in the coming phase, with potential to scale activities beyond the network.



## ENGAGING AT THE MUNICIPAL PROJECT LEVEL

Urban Ocean program cities are now seeking partnerships to further develop, finance, implement and operationalise their identified opportunities. This document presents five opportunity sets developed for and with the five Urban Ocean Learning Cities. Each of these opportunity sets may contain three to five individual initiatives, actions or project ideas that were prioritised by the Cities and are perceived as critical to strengthen the waste management system, build urban resilience and reduce plastic leakage in each city. We hope to mobilise different levels of assistance including early-stage project preparation, mid-project preparation, and implementation, across a spectrum of policy, infrastructure (blue, green, and gray) and research.

In April 2022, the Urban Ocean team will organize the Urban Ocean Accelerator Summit, a virtual event that brings cities and partners together to exchange knowledge and allows the cities to present their project ideas to potential partners and funders.

If you are interested in supporting Urban Ocean or would like to be part of the development of a specific opportunity, please do not hesitate to reach out to us.

No matter your organization's mission, level of investment, timeline to participate, or geographic area of interest, we are interested in hearing from you!

If you are interested in supporting any of these initiatives' development, please reach out to

### Keri Browder

Cities Project Director at Ocean Conservancy  
[kbrowder@oceanconservancy.org](mailto:kbrowder@oceanconservancy.org)

### Saurabh Gaidhani

Programs Lead at Resilient Cities Network  
[sgaidhani@resilientcitiesnetwork.org](mailto:sgaidhani@resilientcitiesnetwork.org)

Additional information may be made available upon request.

# How to Read the Opportunities

- 1 Can Tho**  
Enhancing Can Tho's River Waste Management and Recycling Facilities
- 2 Melaka**  
Creating Clean River and Coastal Areas and Enhancing City's Recycling Infrastructure
- 3 Panama City**  
Enhance the recovery of recyclable material in Panama City
- 4 Pune**  
Supporting Transformations in Recovery of Energy and Materials Initiative (STREAMS)
- 5 Semarang**  
Adaptive and Inclusive Waste Management Model

Each opportunity is divided into 4 main components:

## 1 City Context and Challenges

It includes key information gathered during the Gap Assessment phase of the Urban Ocean program (e.g. geography, demographics, priorities, and resilience challenges for its waste management system, etc.). The opportunity set was identified during this phase of the program with the aim to address the most pressing concerns raised. The CAP used a standardized diagnostic tool, which consists of seven spokes to guide the assessment. Thus, the graphic included illustrates the main spokes that the opportunity aims to address.

Circularity spokes- the model developed by the Circularity Informatics Lab at the University of Georgia consists of seven spokes:

- Inputs**  
 what products are sold in the community and where do they originate?
- Communities**  
 what conversations are happening and what are the stakeholders' attitudes and perceptions?
- Product design**  
 what materials, formats, and innovations are found in products, particularly packaging?
- Uses**  
 what are the community trends around use and reuse of product types?
- Collection**  
 how much and what types of waste are generated? How much is collected and what infrastructure exists?
- End of Cycle**  
 how is waste disposed? What is the fate of waste once it is properly discarded? How is it treated?
- Leakage**  
 what waste ends up in the environment? How and why is it getting there?



## Translating the challenges into opportunities

### Building on the Urban Ocean Gap Assessment

- TRANSLATING CHALLENGES**
  - The amount of domestic solid waste generated in 2016 was on average 930 tons/day and is expected to reach 2,000 tons/day in 2030.
  - The city council classifies waste generally only as "burnable" or "non-burnable waste", overlooking possibilities for recycling, composting etc. The applied classification has limited the growth of the recycling industry.
  - Largely unregulated and informal service for recyclables collection.
  - Leakage in Can Tho is more related to illegal dumping methods than littering, which generate numerous health and environmental risks.
  - Even though trash collection devices are being piloted in the Hau and the Can Tho rivers, the city struggles to segregate, clean, and treat the waste.
  - Transfer stations in the city are not able to cope with the amounts of waste arriving, running out of garbage storage space. There is an urgent need to rehabilitate and upgrade transfer stations that are often poorly sited, designed, or operated.
  - The city also lacks an integrated, sustainable management approach for addressing waste after it reaches water bodies, acknowledging the challenges of the waste-water.



City context

Challenges identified

Potential opportunities

## 2 Opportunity Overview

It includes a brief description of the overarching opportunity set and key information about the individual initiative(s) and project intervention(s) within the opportunity set.

**Opportunity overview**

**City map**

**Enhancing Can Tho's River Waste Management and Recycling Facilities**

**Opportunity Overview**

In January 2022, the revised Law on Environmental Protection (LEP) 2020 came into effect. The law highlights the responsibility of ministries and localities to integrate circular economy principles into their development plans, waste management, and waste recycling. Conscious of growing marine pollution, Vietnam has also launched a national campaign for the management of marine plastic litter to reduce the amount of ocean's marine plastic debris by 2030. By then, the country strives to eliminate single-use plastics and non-biodegradable plastic bags from all commercial sectors. In the same period, the most pressing issue should be free of plastic litter. The government has also demonstrated a strong commitment to sustainable development and tackling climate change at the Conference of Parties (COP26) with its commitment to achieving net-zero carbon emissions by 2050. However, building a circular economy requires more than just facilitating a recycling culture and infrastructure. It signifies a hierarchical transformation in distribution and consumption at all levels - production, businesses, consumers, eco-industrial parks, and cities, regions, and the country. Cities have a major role to play if the government wants to achieve its targets and Can Tho is committed to meeting its responsibilities in improving and facilitating waste management and recycling. The new legal framework will establish a broader classification of waste, increase the demands for new standards and create opportunities for the recycling industry to grow in the city. To guide this growth and guarantee that it will yield multiple benefits including sustainable economic development, the municipality has developed several solutions that reduce waste leakage into rivers as well as enhances collection and treatment of river waste. For this purpose, the city has been working closely with Song Long (responsible for dredging the Mekong River Conservancy and partners) and along the river and its tributaries in Nam Dinh province. In order to strengthen this existing collection system, the city needs to develop an effective institutional system and business cases to support waste segregation and collection, as well as a treatment facility for trash collected from these rivers and segregated waste collected from households.

**Opportunity owner**  
Department of Natural Resources and Environment (DONRE)

**Estimated timeline**  
12-18 months

**Technical studies available**

- Circularity Assessment Protocol, Can Tho (2020)
- Data collection survey on waste reduction and waste-to-energy in Viet Nam (2022)

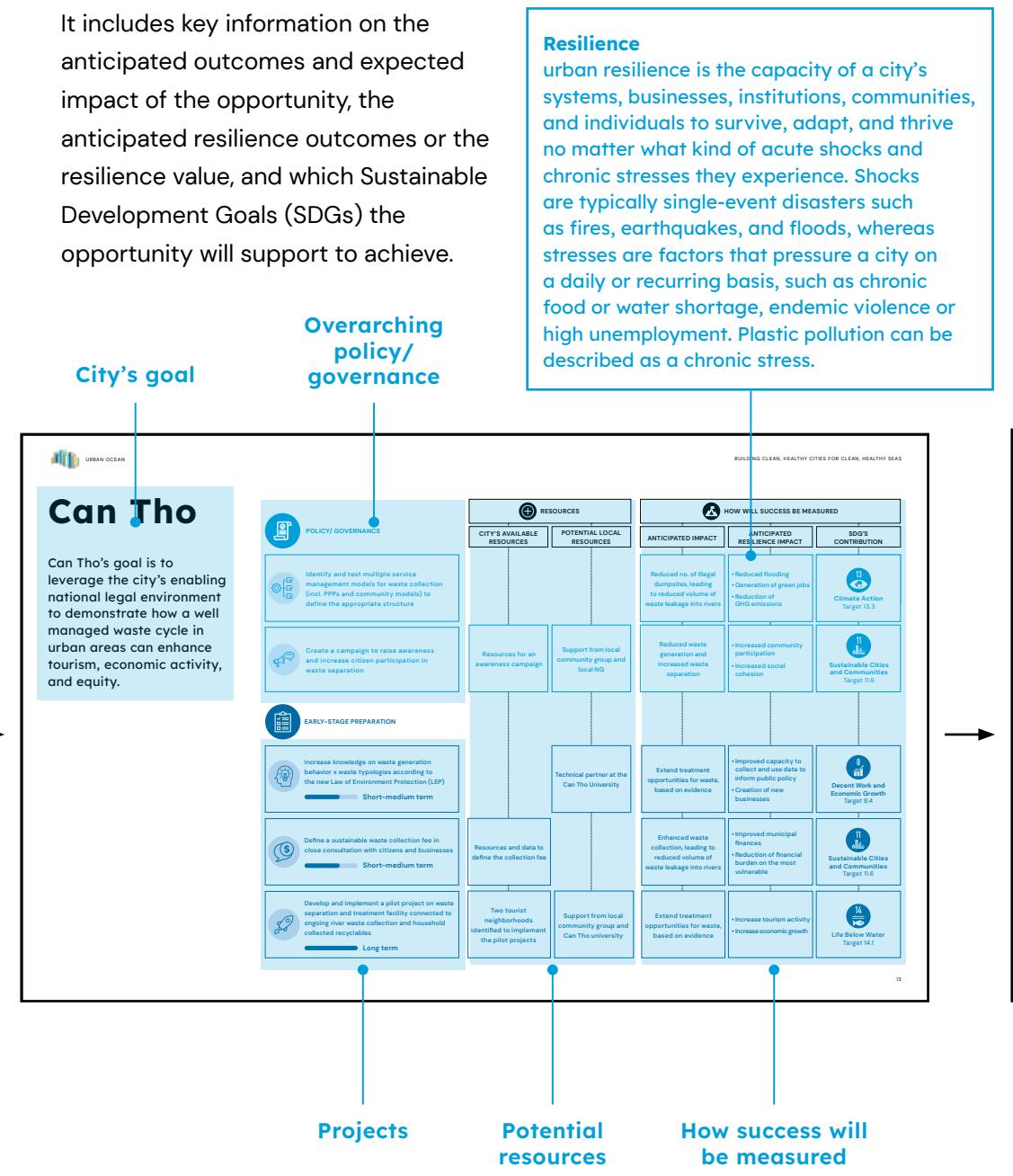
**City contact**  
Department of Natural Resources and Environment (DONRE)

**Email**  
xxxx@urbanoceanc.org

**Opportunity information**

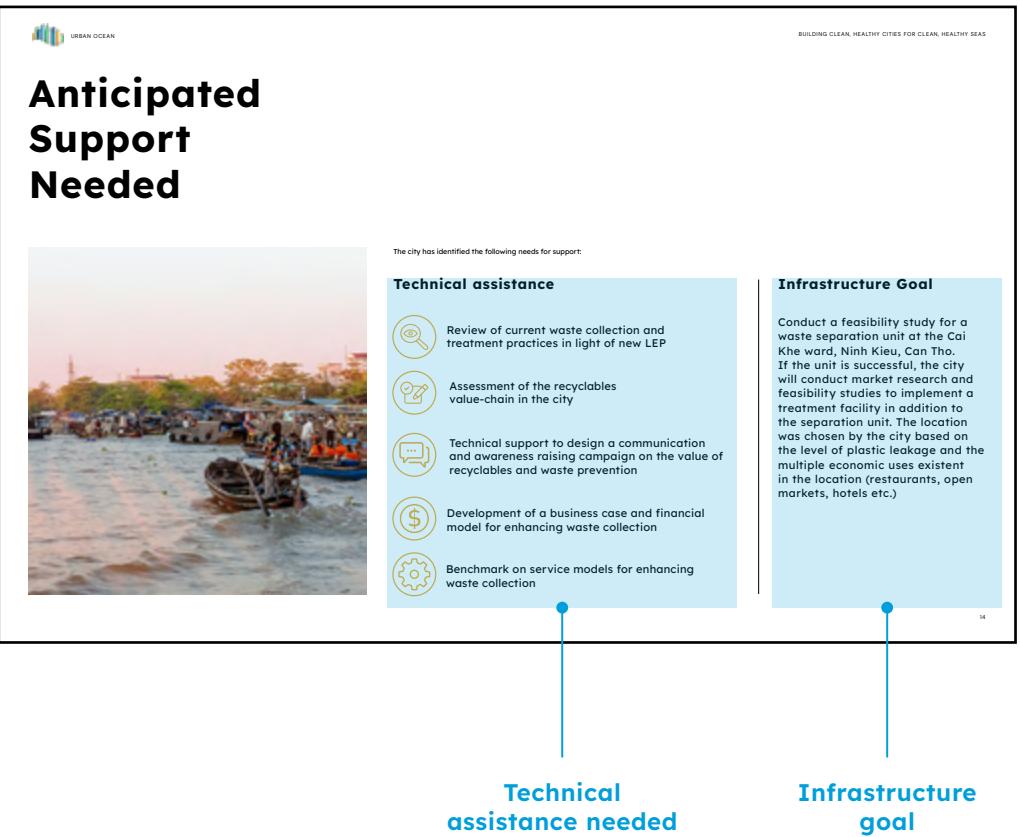
## 3 Anticipated Impact

It includes key information on the anticipated outcomes and expected impact of the opportunity, the anticipated resilience outcomes or the resilience value, and which Sustainable Development Goals (SDGs) the opportunity will support to achieve.



## 4 Anticipated Support Needed

It includes several actions in need of technical assistance and/or funding.





# Can Tho Vietnam

ENHANCING CAN THO'S RIVER WASTE  
MANAGEMENT AND RECYCLING FACILITIES

# City Context

Can Tho is the largest city in the flat Vietnamese Mekong Delta region, situated on the left bank of the Hay Giang River and 145 km southwest of Ho Chi Minh City. It has a population of approximately 1.25 million people spread over five urban districts and four rural ones. The city is famous for its waters and rice, and is facing enormous challenges today because of economic modernization and industrialization, urban growth and development, as well as climate change. Its once productive agricultural currently struggles with anthropogenic changes, flooding, contamination, and displacement of farmers. To address these challenges, the city has been combining high-tech solutions for agricultural practices, becoming a hub for agricultural innovation in the region. Along with the positive development, the city faces challenges due to population growth, which increases the requirement for solid waste management. As for the city's water, it is famous for its river and canal system. This water system plays a major role in local people's lives and the city's economy, particularly regarding commercial activities and transportation routes. At the same time, Can Tho city faces substantial water and climate change challenges ranging from chronic seasonal flooding in the rainy season, which is further exacerbated by inadequate waste disposal, to dry season droughts as well as water pollution and salinization.

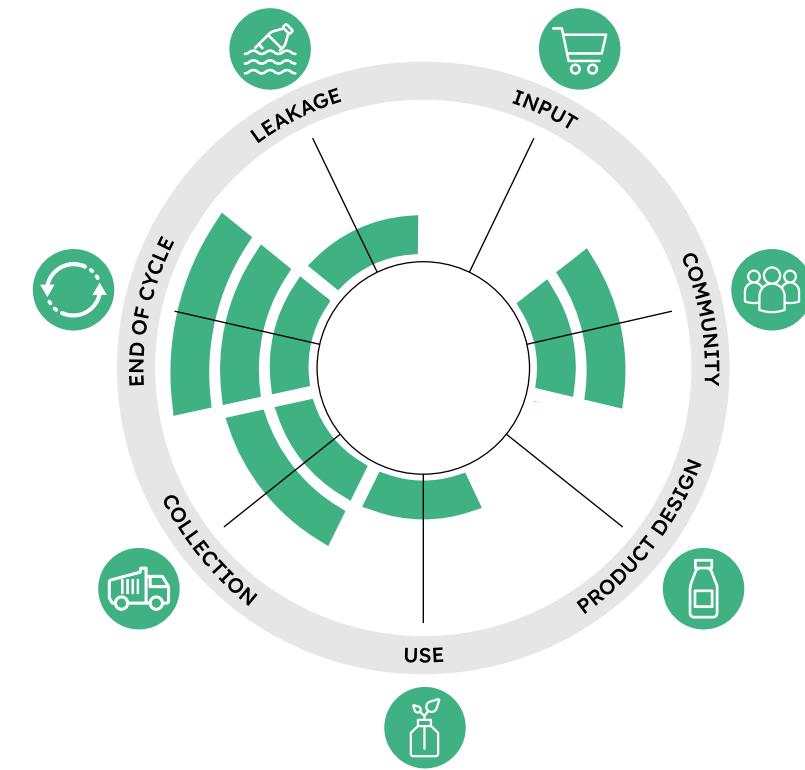
# Translating the Challenges into Opportunities

## Building on the Urban Ocean Gap Assessment

### TRANSLATING CHALLENGES

-  On average, 930 tons/day of domestic solid waste generated in 2016; it is expected to reach 2,000 tons/day in 2030.
-  The city council classifies waste only as "burnable", "non-burnable waste" or "hazardous waste" to facilitate the work of the incineration plant, overlooking possibilities for recycling, composting etc.
-  Largely unregulated and informal service for recyclables collection.
-  Leakage of waste into rivers in Can Tho originates mostly from illegal dumping methods than littering.
-  Trash collection devices are being piloted in the Hau and the Can Tho rivers, but the city struggles to segregate, clean, and treat the captured materials.
-  Transfer stations in the city are unable to cope with the amounts of waste arriving, running out of garbage storage space. There is an urgent need to rehabilitate and upgrade transfer stations that are often poorly situated, designed, or operated.

### INTO OPPORTUNITIES



# Enhancing Can Tho's River Waste Management and Recycling Facilities

## OPPORTUNITY OWNER

Department of Natural Resources and Environment (DONRE)

## ESTIMATED TIMELINE

12-18 months

## TECHNICAL STUDIES AVAILABLE

- Circularity Assessment Protocol, Can Tho (2020)
- Data collection survey on waste reduction and waste to-energy in Viet Nam (2021)

## CITY CONTACT

Department of Natural Resources and Environment (DONRE)

## EMAIL

[tantai@cantho.gov.vn](mailto:tantai@cantho.gov.vn)

## Opportunity Overview

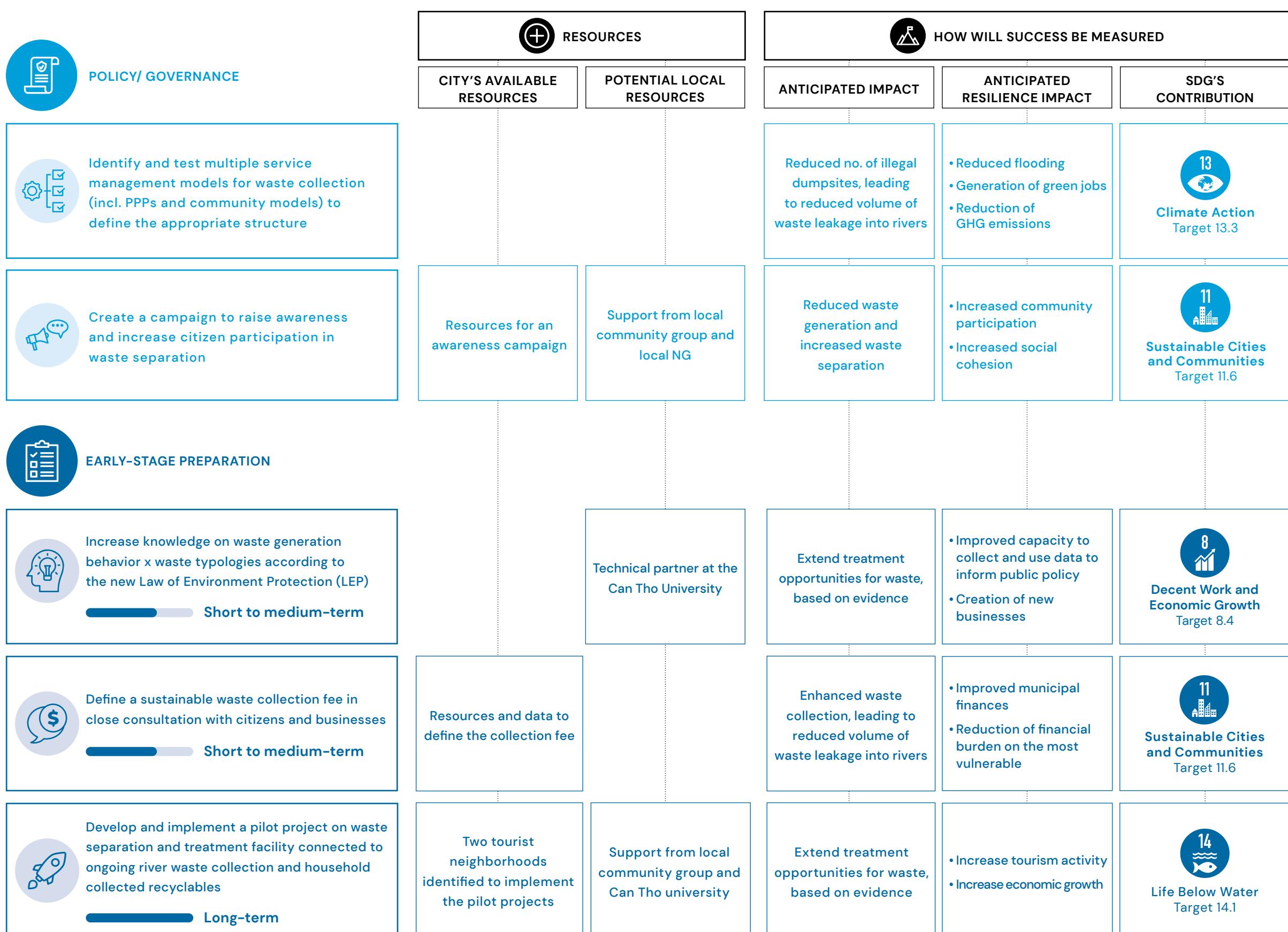
In January 2022, the revised Law on Environmental Protection (LEP) 2020 came into effect. The law highlights the responsibilities of ministries and localities to integrate circular economy in planning strategies, development plans, waste management, and waste recycling. Conscious of growing marine pollution, Vietnam has also launched a national action plan for the management of marine plastic litter, aiming to reduce 75% of Vietnam's marine plastic debris by 2030. By then, the country strives to eliminate single-use plastics and non-biodegradable plastic bags from all coastal tourism areas. At the same time, protected marine areas should be free of plastic litter. The government has also demonstrated a strong dedication to sustainable development and tackling climate change at the Conference of the Parties (COP26) with its commitment to achieving net-zero carbon emissions by 2050. However, building a circular economy requires more than just facilitating recycling and reuse practices. It specifies a hierarchical transformation in distribution and consumption at all levels – production, businesses, consumers, eco-industrial parks, and cities, regions, and the country.

Cities have a major role to play if the government wants to achieve its targets and Can Tho is committed to moving forward with increased efforts in improving and facilitating waste management and recycling. The new legal framework will establish a broader classification of waste, increase the demand for new solutions and create an enabling environment for the recycling industry to grow in the city. To guide this growth and guarantee that it will yield multiple benefits including sustainable economic development, the municipality is looking for integrated solutions that reduce waste leakage into rivers as well as enhances collection and treatment of river waste. For the past few years, the city has been testing trash traps in Song Hong (including in collaboration with Ocean Conservancy and partners) and along the river and its tributaries in Nam Dinh province. In order to strengthen this existing collection system, the city aims to develop an appropriate institutional structure and business concept to support waste segregation and collection, as well as a treatment facility for trash collected from these rivers and segregated waste collected from households.



# Can Tho's Opportunity Outline

Can Tho's goal is to leverage the city's enabling national legal environment to demonstrate how a well managed waste cycle in urban areas can enhance tourism, economic activity, and equity.



# Anticipated Support Needed



## Technical Assistance



Review of current waste collection and treatment practices in light of new LEP, including:

- Characterization of urban household waste generation
- Assessment of the recyclables value-chain in the city
- Assessment of waste collection and treatment infrastructure available



Technical assistance to design a communication and awareness raising campaign to promote the value of recyclables and prevent waste generation



Technical assistance to define an equitable waste collection fee



Efficiency assessment and benchmarking on waste collection service (includes management models, as well legal and regulatory frameworks)

## Infrastructure Goal



Conduct a feasibility study for a waste separation unit located at the Cai Khe ward, Ninh Kieu, in Can Tho. The location was chosen by the city based on the level of plastic leakage in the region and the multiple economic uses existent in the location, which attract many tourists (restaurants, open markets, hotels etc.)

If the unit is successfully implemented, the city will conduct market research and feasibility studies to implement a treatment facility in addition to the separation unit.



# Melaka Malaysia

CREATING CLEAN RIVER AND COASTAL AREAS AND  
ENHANCING CITY'S RECYCLING INFRASTRUCTURE

# City Context

The city of Melaka has historically been a key South-East Asian trading settlement, a multi-cultural city. Melaka State has a population of approximately 910,000 inhabitants (2017) and is divided into three districts (Melaka Tengah, Alor Gajah and Jasin) and four municipalities (Alor Gajah Municipal Council, Hang Tuah Jaya Municipal Council, Jasin District Council and Melaka Historic City Council). It is a major tourist destination in the country, inscribed on the UNESCO World Heritage Sites list in 2008 for its unique architecture, culture, and townscape. This resulted in increased tourism, as well as an economic boom, which created challenges in terms of preservation and distribution of economic development. As for its urbanization process, the city has been expanding in area much more rapidly than it is expanding in population, mostly because of the land reclamation process along the coast and the sprawling developments into the city suburbs.

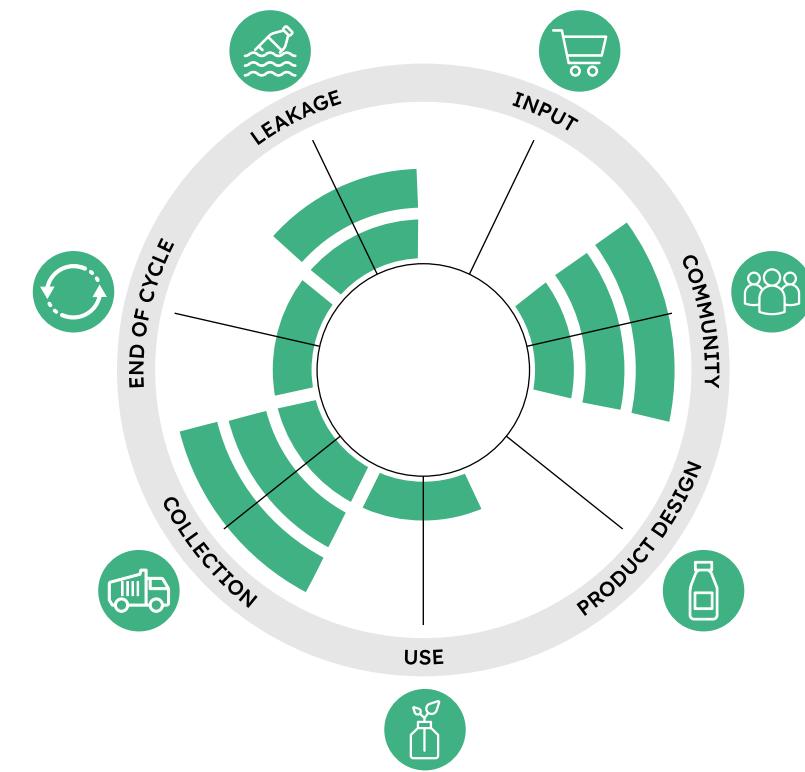
# Translating the Challenges into Opportunities

## Building on the Urban Ocean Gap Assessment

### TRANSLATING CHALLENGES

-  Melaka State's solid waste generation is below the national average at around 1,000 tons/day.
-  There is a high percentage of tobacco/cigarette litter, which requires proper disposal.
-  The relationship between the city and its water bodies is complex. For instance, the main river running through the city's center is categorized as mildly polluted despite the cleaning and beautification works in recent years.
-  The aging and poorly maintained drainage system and the design flaws in the irrigation systems creates significant flood risk across the city. Exacerbated by the litter generation, flood risk is particularly acute in the World Heritage Site.
-  The main causes for the city's water pollution include upstream tributaries, agricultural activities, sewage, and the discharge of untreated wastewater.
-  Even though increased tourist activity has led to increased littering rates, the municipality has one of the lowest plastic waste leakage rates in the state.
-  The city's capacity to promote good governance schemes and integrated planning has been highlighted as necessary steps towards achieving its circular and resilience goals. For instance, land reclamation projects have largely increased environmental degradation, and river beautification works have not achieved its cleaning targets.

### INTO OPPORTUNITIES



# Creating Clean River and Coastal Areas and Enhancing City's Recycling Infrastructure

## OPPORTUNITY OWNER

- Melaka River Coastal Development Corporation
- Melaka City Council

## ESTIMATED TIMELINE

15 months

## TECHNICAL STUDIES AVAILABLE

Circularity Assessment Protocol, Melaka

## CITY CONTACT

Zuhaila Zubel, Chief Resilience Officer

## EMAIL

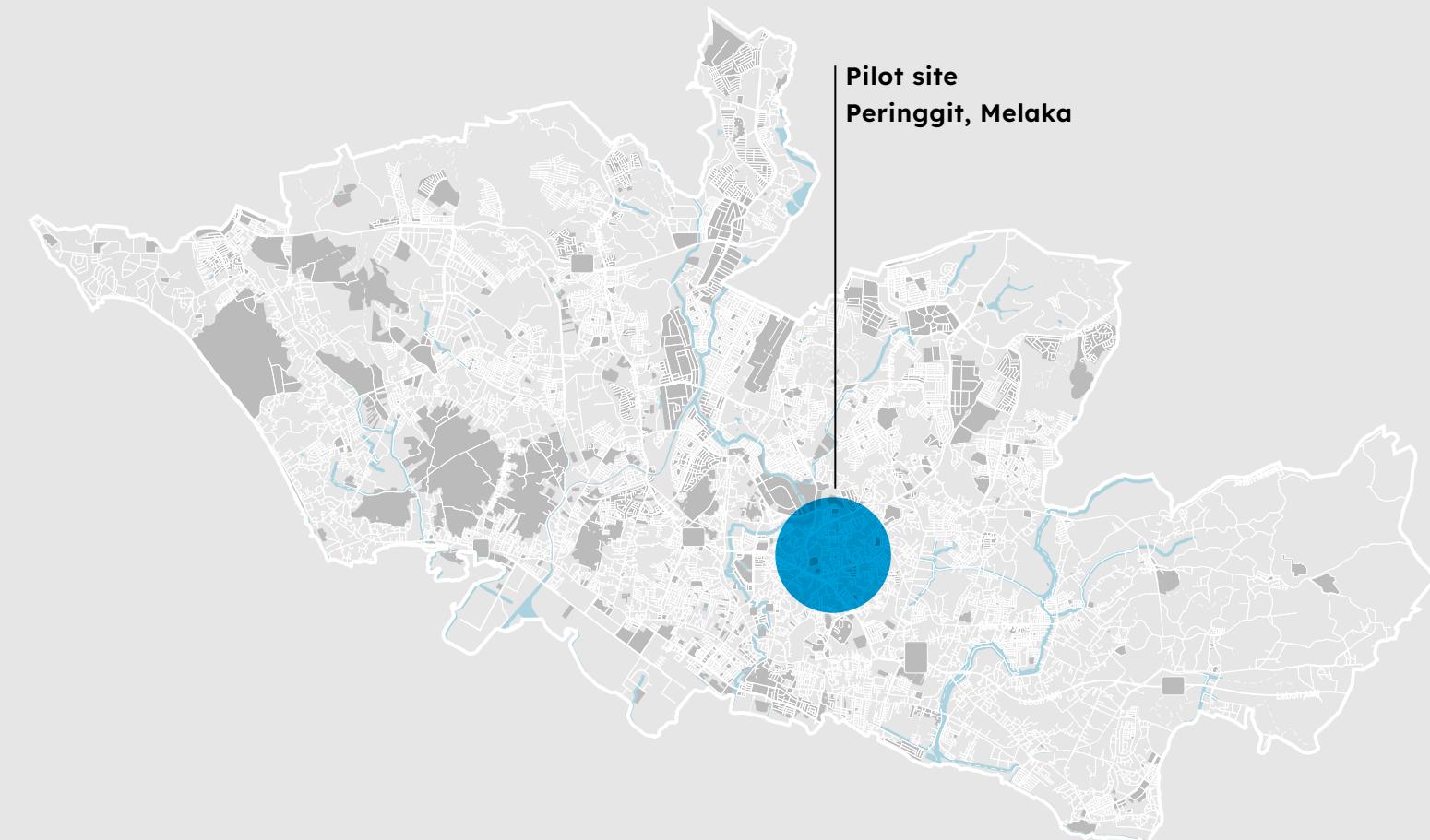
[zuhaila700@gmail.com](mailto:zuhaila700@gmail.com)

## Opportunity Overview

Different levels of government in Malaysia and Melaka have shown leadership in promoting urban resilience and sustainability, particularly by engaging in strategic planning initiatives. For instance, Malaysia has made ambitious commitments to reduce its GHG emissions by 45% by 2030 relative to 2005 (UNFCCC 2015); and the Melaka Green City Action Plan, developed in partnership with the Asian Development Bank in 2014, highlighted the goal of becoming a zero-waste state and reducing waste-related GHG emissions. In addition, the government is committed to collecting and analyzing data to inform public policy, as Melaka State is one of few states in the country to publish its GHG emissions inventory.

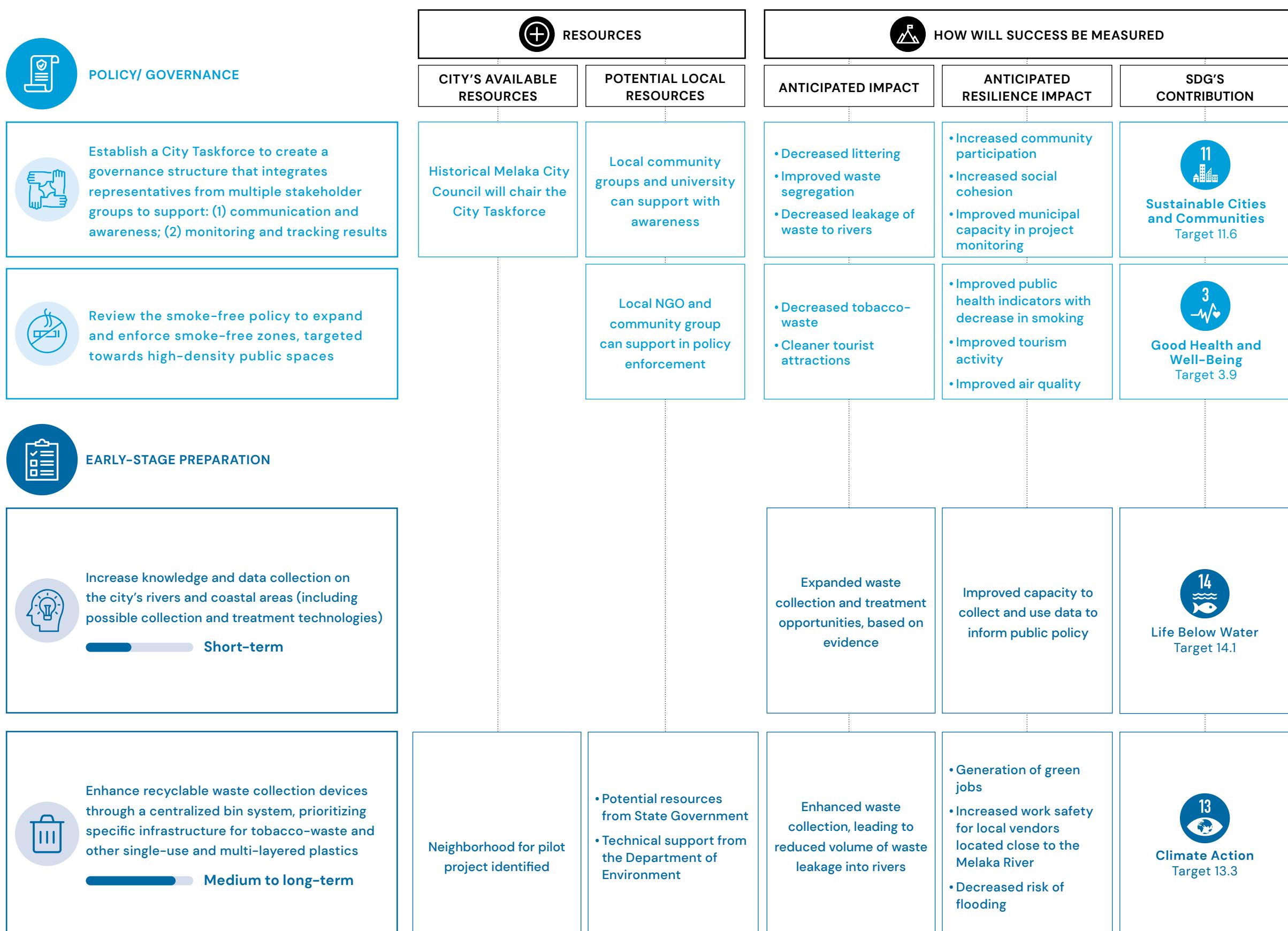
This initiative will contribute to achieving the city's goals for resilience and sustainability by addressing the gap between planning and implementation for waste management in the city. The city will be able to equitably target the necessary waste collection infrastructure design, operational and maintenance investments needed by promoting integrated planning and smart governance practices. It will focus on collecting the necessary data, reviewing existing laws and policies, and coordinating with different stakeholders to raise awareness to the waste challenge and monitor its impact. As the legal and regulatory framework for household waste segregation and illegal dumping is already in place, the city will target efforts towards enforcement and educational activities; on the other hand, the smoke-free legal and regulatory framework could be reviewed to address the interrelated challenges of tobacco to public health, economic activity, and waste generation.

The challenge of single-use plastics, particularly tobacco waste, was defined as the best entry point for the city to review its regulations and test technologies for collection and treatment of plastic waste. The opportunity identifies four areas of intervention:



# Melaka's Opportunity Outline

Melaka's goal is to prioritize single-use and multi-layered plastics as entry points for improving waste management in the city, tracking and demonstrating tangible results for public health, the natural environment, and economic growth.



# Anticipated Support Needed



## Technical Assistance



Review possible interventions for improving coastal and river cleanliness

- Evaluate efficiency of existing technology
- Upgrade and increase the loading capacity of grease traps from local vendors
- Evaluate capacity, efficiency, and affordability of new technology



Technical assistance to establish the City Taskforce



Technical assistance to conduct legal and institutional review to expand smoke-free areas



Technical assistance on communication campaign to raise awareness on the waste challenges and reduce waste generation

## Infrastructure Goal



Feasibility study and seed money to implement centralized recycling bin system for waste collection, focusing on single-use plastic, particularly tobacco waste, and multi-layered plastic.



Procurement of technologies for single-use and multi-layered plastic collection and treatment.



# Panama City Panama

ENHANCE THE RECOVERY OF RECYCLABLE  
MATERIAL IN PANAMA CITY

# City Context

Panama City is the capital and most populous city of Panama with more than 1.5 million people currently living within its boundaries, which includes the District of Panama and San Miguelito District. The city is located on the Pacific entrance of the Panama Canal on the Gulf of Panama and has nine rivers that run through it and feed into the Pacific Ocean. The unique geography of the country has determined its vocation as a transit country and strategic interoceanic hub. This vocation has led the city to take on an international role, promoting a friendly environment for businesses, banking, and tourism.

Like many cities in Latin America and the Caribbean (LAC), Panama City is defined by its contrasts. For instance, one out of two homes in the District of Panama are informal. The history of the city is closely related to migration waves – both international and internal migration – and land use change which has shaped much of the unplanned and rapid urbanization process in the city. The growth pattern of the city has also been determined by changes in its ecosystem, particularly in its water resources. The city developed on floodplains which led to the loss of riverbanks, deforestation of natural habitats, and the formation of hazard zones for the population.

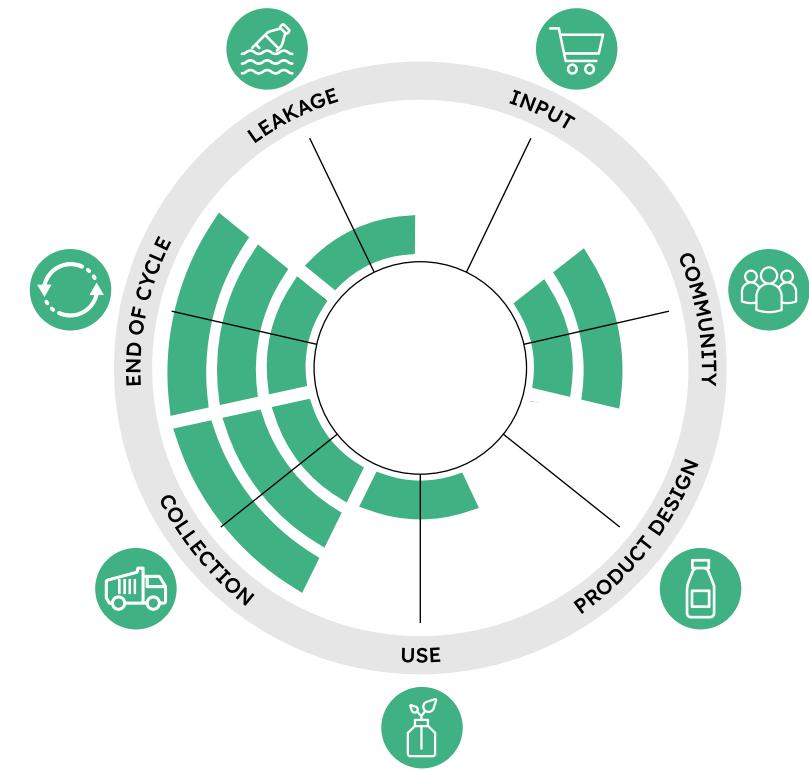
# Translating the Challenges into Opportunities

## Building on the Urban Ocean Gap Assessment

### TRANSLATING CHALLENGES

-  Solid waste generation per capita in Panama is estimated to be about 1.2 kg/person/day, which is one of the highest in the region – higher than the global average of 0.74 kg/person/day as well as the regional LAC average of 0.99 kg/person/day.
-  The District of Panama generates 38% of the country's waste, of which only 57.8% is collected; the remaining 42.2%, around 960 tons of waste, is improperly disposed, leaking into rivers.
-  The city's recycling industry is fragile. Waste collected in Panama City is rarely segregated at the source; rather, all waste is diverted together into landfills.
-  There is a general perception amongst citizens that even segregated waste ends up in the main landfill of the city – Cerro Patacón, which had a recent landslide accident in June 2021. Similarly, waste collected from rivers also mostly ends up at the same landfill.
-  The city lacks sufficient recycling infrastructure such as sorting or recovery facilities for all waste streams.
-  The city has identified a mismatch between social projects that support segregation and collection of recyclable waste in rivers or in households, and processing or adding value to the collected waste.

### INTO OPPORTUNITIES



# Enhance the Recovery of Recyclable Material in Panama City

## OPPORTUNITY OWNER

Municipality of Panama (District of Panama)

## ESTIMATED TIMELINE

18 months

## TECHNICAL STUDIES AVAILABLE

- Characterization of the discharge of macro-plastics and other post-consumer floating solid waste in the Bay of Panama by the Matías Hernández River. (Marea Verde)
- Integral Study of Flood Mitigation Actions in the Juan Díaz Basin (IADB)
- Circularity Assessment Protocol Report (NMI)
- Trash Trap Test Report in Juan Diaz River - Panama. (Marea Verde)
- Pre-feasibility study treatment plant 2018

## CITY CONTACT

Marcos Marengo, Chief Resilience Officer

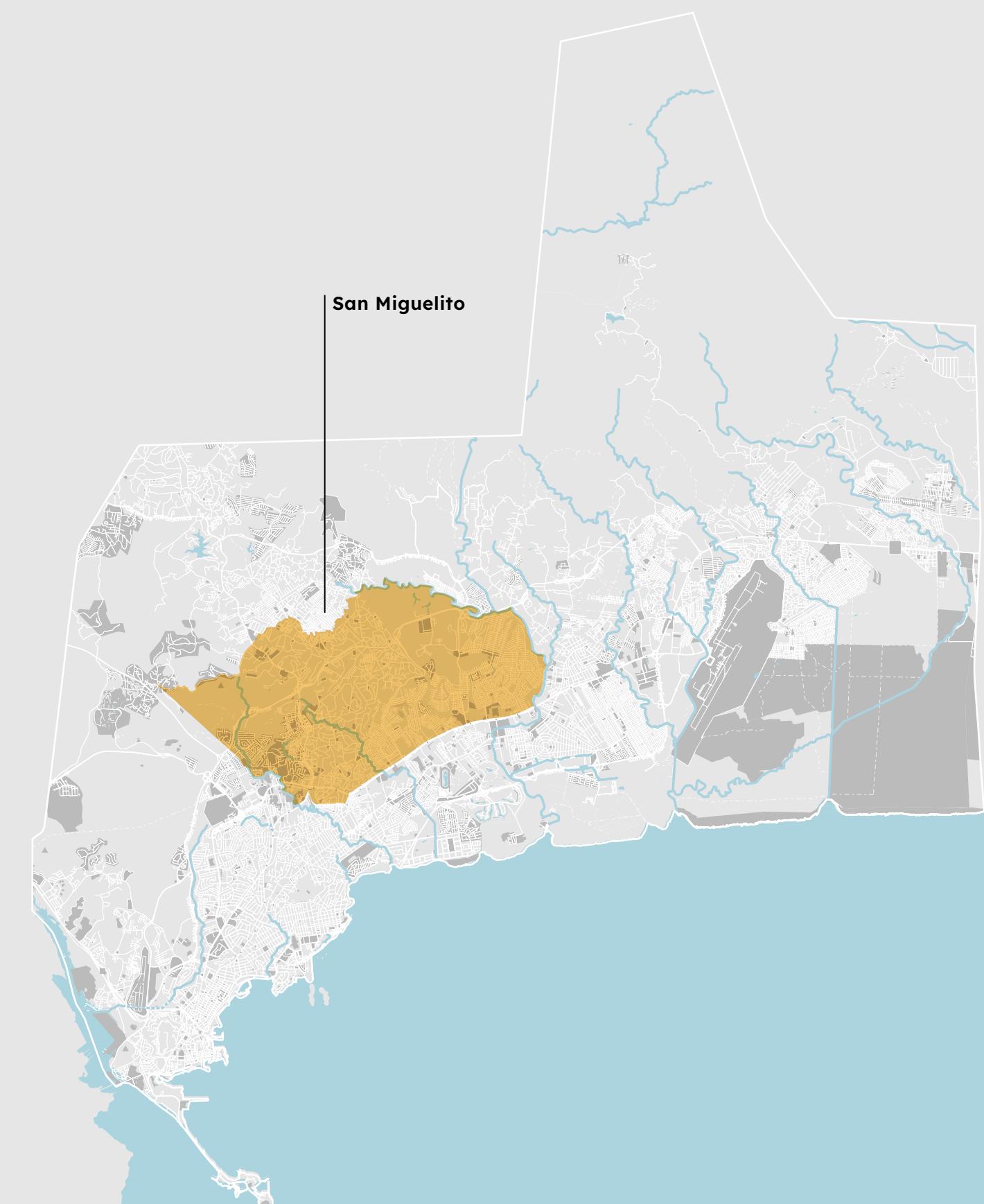
## EMAIL

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## Opportunity Overview

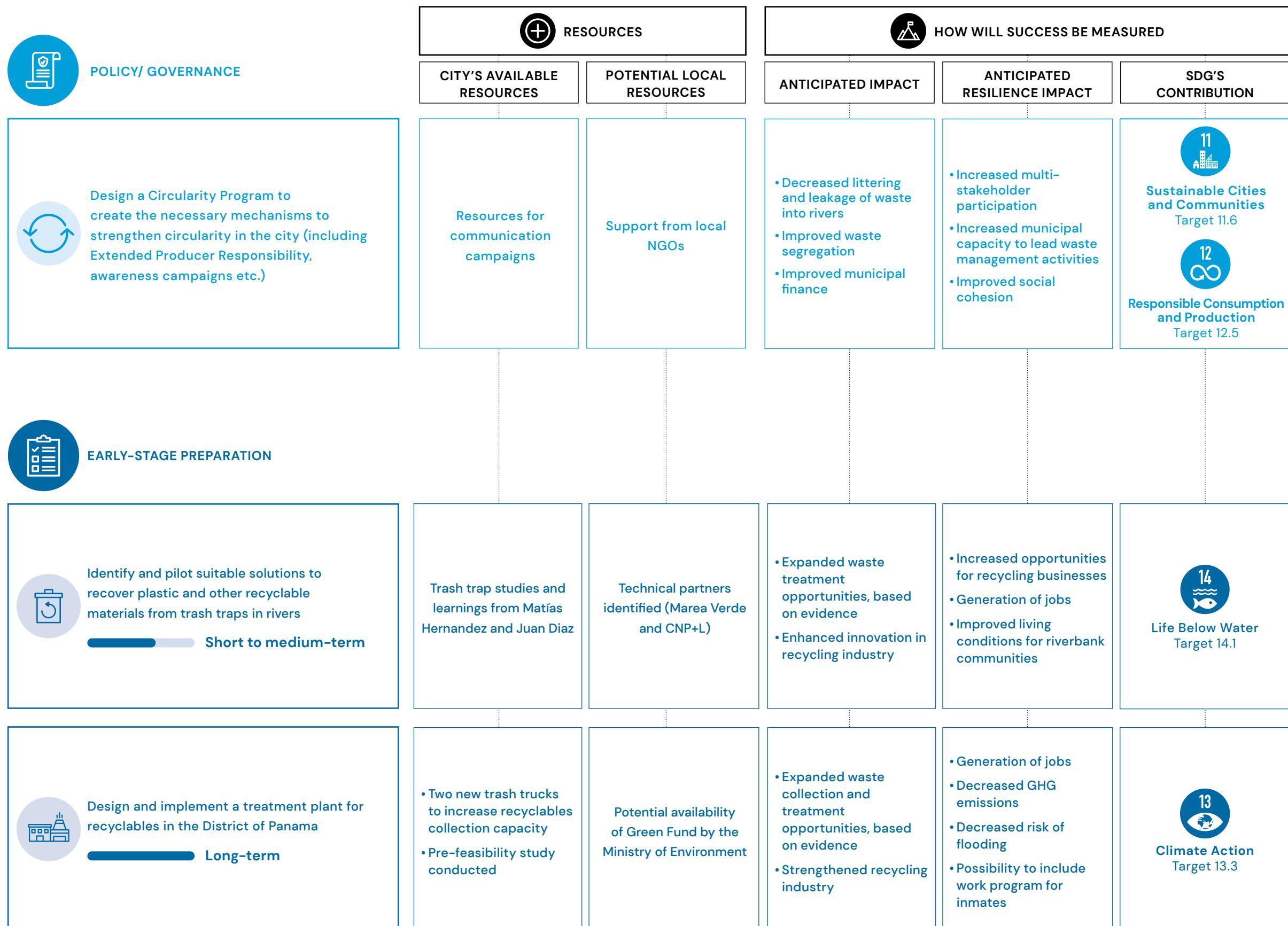
Panama has been recently formulating a National Marine Debris Action Plan (PANBM) to reduce the amount of marine litter in the country. This process has prompted various regulations, plans, and programs at the national and local levels to improve waste management and foster circularity. For instance, national and local governments adopted measures to promote the use of reusable bags, to establish a zero-waste policy, and to progressively reduce and replace single-use plastic. In this context, this initiative aims at reducing waste generation by strengthening the recycling industry in Panama City. The city has recognized the need to strengthen its practices towards a circular economy that are context and process-oriented, including collaborating with different stakeholders (e.g. working closely together with informal and private recyclers, to guarantee their social inclusion, financial sustainability, etc.), creating awareness-raising campaigns, reviewing its legal and regulatory framework, particularly towards Extended Producer Responsibility policies etc. The city recognizes the need to invest in technology and infrastructure to actively transform its recycling industry into a more sustainable, equitable and robust one. In particular, the city needs a treatment plant for different waste streams. As this is a long-term investment, the city aims to leverage short-term projects to demonstrate the value of the recycling industry to the city.

In partnership with multiple stakeholders, including NGOs, national authorities, and the private sector, the city has been testing different business models and technologies for collecting recyclable waste from households, from green points, and from polluted rivers. These experiences have demonstrated a gap between the collection and treatment of materials, highlighting the need for the city to promote and enforce actions that enable treatment, recycling, and recovery of recyclable materials. Thus, searching for innovative mitigation solutions to recover plastic waste from the two most polluted rivers in the city: Matías Hernández and Juan Díaz, which have received trash trap investments, will allow the city to test technological solutions that trigger multiple co-benefits. According to Marea Verde, the trash traps located in the first river have collected around 70 tons of waste over the period of approximately one year and a half, 46.7% being plastic bottles and disposable containers. If recycled, this material collected from rivers can also serve as part of the awareness-raising campaign to the problem of littering, to incentivize businesses to think about new solutions and to educate the population about the value of materials. The Opportunity identifies 3 areas of intervention:



# Panama City's Opportunity Outline

Panama city's goal is to balance short-term actions that demonstrate the value of recycled material with longer term structural solutions to strengthen the recycling industry in the city to promote green jobs and equity.



# Anticipated Support Needed



## Technical Assistance

-  Evaluate new patterns of behavior in waste generation and segregation in light of COVID-19 pandemic
-  Evaluate and compare technologies for river solid waste collection and treatment
-  Develop a business case for river solid waste treatment to be replicated in different rivers
-  Technical assistance for strategically scale up of collection devices in rivers
-  Technical assistance to link EPR mechanisms to increase efficiency of waste management practices
-  Technical support to develop targeted awareness campaigns and educational activities that will reduce the generation of waste

## Infrastructure Goal

-  Treatment Plant design and implementation
  - Update feasibility study on recyclable treatment plant
  - Recycling industry procurement best practices
  - Cost savings opportunities for recycling industry
  - Implementation
-  Seed investment to test innovative treatment solutions for plastics from rivers



# Pune India

SUPPORTING TRANSFORMATIONS IN  
RECOVERY OF ENERGY AND MATERIALS  
INITIATIVE (STREAMS)

# City Context

Pune is the seventh most populous and ninth largest city in India, with five million inhabitants in 2021. It is an important cultural and industrial city in the Indian state of Maharashtra, with an economic development fueled by the knowledge economy, IT, manufacturing, and a fertile hinterland. The city faces multiple challenges, particularly in terms of poverty, lack of basic services and unplanned growth. The Pune Municipal Corporation has exhibited strong financial performance, enhancing Pune's creditworthiness. It also has a clear mandate to manage the entire waste management cycle within municipal boundaries, which facilitates operations and creates a partnership enabling environment.

In addition, informal workers in some sectors, including waste workers, have self-organized leading to some redistribution of wealth and greater negotiating power for these social groups. The Solid Waste Collection and Handling (SWaCH) model, a worker-owned cooperative is regarded as a best practice worldwide for improving waste pickers' livelihoods and managing more than 80% of waste collection and segregation management in the city.

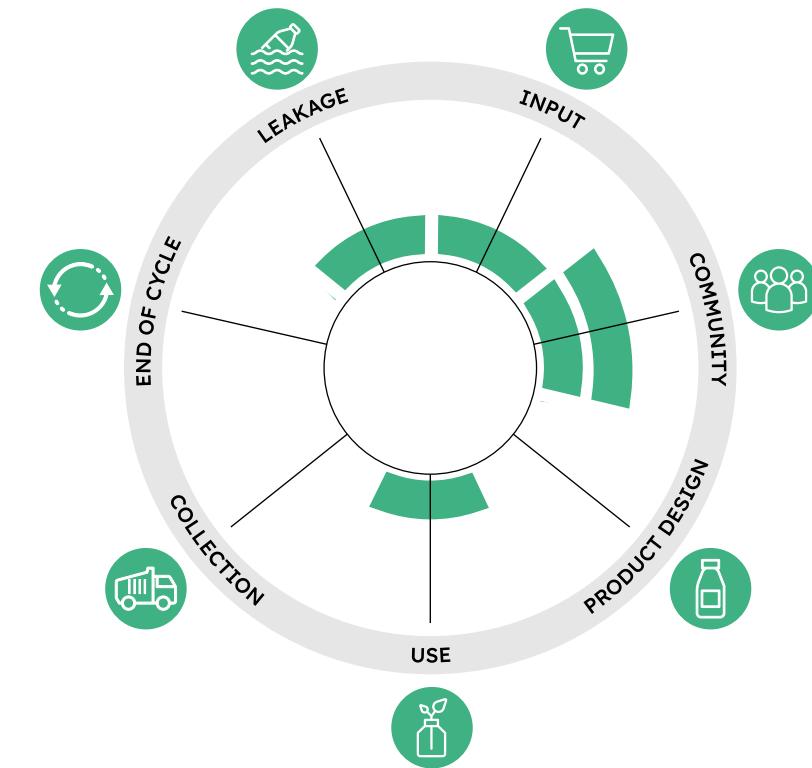
# Translating the Challenges into Opportunities

## Building on the Urban Ocean Gap Assessment

### TRANSLATING CHALLENGES

-  The city generates on average 2,100 metric tons of waste daily, which is amongst the highest in India.
-  Collection coverage and the high levels of informality in the recycling industry are major challenges.
-  Upstream settlements in the city with limited access to services and rapidly urbanizing areas are particularly impacted by inadequate waste management practices.
-  As the municipal limits have recently been expanded to include 23 more villages, a comprehensive waste management service, including collection, is still being set up in these new urban areas.
-  Since 2021, Pune has 50 solid waste processing plants, but it is estimated that they operate between 50–75% of their installed capacity. There are serious capacity and efficiency challenges of existing treatment facilities.
-  The city is investing in technologies to treat different waste streams, particularly sanitary waste, but the waste segregation percentage is still very low.

### INTO OPPORTUNITIES



# Supporting Transformations in Recovery of Energy and Materials Initiative (STREAMS)

**OPPORTUNITY OWNER**  
Pune Municipal Corporation (PMC)

**ESTIMATED TIMELINE**  
24 months

**TECHNICAL STUDIES AVAILABLE**

- Circularity Assessment Protocol, Pune
- Pune's Municipal Solid Waste Strategy

**CITY CONTACT**  
Mr. Sanket Jadhav, Solid Waste Management Department

**EMAIL**  
[jeswmmech@gmail.com](mailto:jeswmmech@gmail.com)

## Opportunity Overview

In January 2022, the revised Law on Environmental Protection (LEP) 2020 came into effect. The law highlights the responsibilities of ministries and localities to integrate circular economy in planning strategies, development plans, waste management, and waste recycling. Conscious of growing marine pollution, Vietnam has also launched a national action plan for the management of marine plastic litter, aiming to reduce 75% of Vietnam's marine plastic debris by 2030. By then, the country strives to eliminate single-use plastics and non-biodegradable plastic bags from all coastal tourism areas. At the same time, protected marine areas should be free of plastic litter. The government has also demonstrated a strong dedication to sustainable development and tackling climate change at the Conference of the Parties (COP26) with its commitment to achieving net-zero carbon emissions by 2050. However, building a circular economy requires more than just facilitating recycling and reuse practices. It specifies a hierarchical transformation in distribution and consumption at all levels – production, businesses, consumers, eco-industrial parks, and cities, regions, and the country.

Cities have a major role to play if the government wants to achieve its targets and Can Tho is committed to moving forward with increased efforts in improving and facilitating waste management and recycling. The new legal framework will establish a broader classification of waste, increase the demand for new solutions and create an enabling environment for the recycling industry to grow in the city. To guide this growth and guarantee that it will yield multiple benefits including sustainable economic development, the municipality is looking for integrated solutions that reduce waste leakage into rivers as well as enhances collection and treatment of river waste. For the past few years, the city has been testing trash traps in Song Hong (including in collaboration with Ocean Conservancy and partners) and along the river and its tributaries in Nam Dinh province. In order to strengthen this existing collection system, the city aims to develop an appropriate institutional structure and business concept to support waste segregation and collection, as well as a treatment facility for trash collected from these rivers and segregated waste collected from households.



# Pune's Opportunity Outline

Pune's goal is to leverage its exemplary cooperative model for waste pickers to review and update the city's current waste management practices for each waste stream and correct potential duplications, bottlenecks, or missed opportunities to improve equitable economic growth and food security.

POLICY/ GOVERNANCE	RESOURCES		HOW WILL SUCCESS BE MEASURED		
	CITY'S AVAILABLE RESOURCES	POTENTIAL LOCAL RESOURCES	ANTICIPATED IMPACT	ANTICIPATED RESILIENCE IMPACT	SDG'S CONTRIBUTION
 <p>Create a litter-free city campaign to promote information, education, and communication mechanisms about littering to improve integrated waste management</p>			<ul style="list-style-type: none"> <li>Reduced littering and leakage of waste into rivers</li> </ul>	<ul style="list-style-type: none"> <li>Increased community participation</li> <li>Increased social cohesion</li> </ul>	 <p>Sustainable Cities and Communities Target 11.6</p>
 <p>Formalization of informal recyclers through the incorporation of workers in a cooperative-based model under the SWaCH model</p>	<p>PMC / SWaCH contract renewed</p>	<p>Kabadiwala Connect model for reference</p>	<ul style="list-style-type: none"> <li>Improved work security</li> <li>Improved waste collection</li> </ul>	<ul style="list-style-type: none"> <li>Improved job security and livelihoods of waste pickers</li> </ul>	 <p>Decent Work and Economic Growth Target 8.4</p>
EARLY-STAGE PREPARATION					
	 <p>Improve the collection and treatment of organic waste by reviewing the functioning of biogas plants and the status of garden waste generation and composting</p>	<p>PMC has invited bids for a Garden Waste Collection on Call service</p>	<ul style="list-style-type: none"> <li>Participation of Pune in the Harit Program by the Maharashtra Urban Development Department</li> <li>Resident Societies and Developers can provide CSR funds to organic treatment</li> </ul>	<ul style="list-style-type: none"> <li>Decreased food waste</li> </ul>	<ul style="list-style-type: none"> <li>Improved food security</li> <li>Improved efficiency of municipal infrastructure</li> <li>Increased innovation of organic waste treatment</li> <li>Reduction in GHG emissions</li> </ul>
 <p>Improve the collection and treatment of multi-layered plastics by promoting Extended Producer Responsibility (EPR) mechanisms and finding alternatives for food delivery packaging</p>			<ul style="list-style-type: none"> <li>Decreased volume of plastic packaging, leading to reduced volume of waste leakage into rivers</li> </ul>	<ul style="list-style-type: none"> <li>Increased innovation on alternative packaging</li> <li>Creation of new businesses</li> <li>Decreased risk of flooding</li> </ul>	 <p>Climate Action Target 13.3</p>
 <p>Improve the collection and treatment of sanitary waste by improving segregation, training collectors, designing appropriate waste vehicles and exploring collaborations through EPR</p>	<p>Unit to recover Super Absorbent Polymers (SAP) from sanitary waste being planned</p>		<ul style="list-style-type: none"> <li>Decreased volume of sanitary waste</li> </ul>	<ul style="list-style-type: none"> <li>Reduction in GHG emissions</li> <li>Improved job security</li> </ul>	 <p>Climate Action Target 13.3</p>
 <p>Improve the collection and treatment of e-waste by assessing challenges and opportunities</p>			<ul style="list-style-type: none"> <li>Decreased volume of e-waste</li> </ul>	<ul style="list-style-type: none"> <li>Decreased risk of mismanagement of hazardous waste</li> <li>Improved job security</li> <li>Improved public health</li> </ul>	 <p>Climate Action Target 13.3</p>

# Anticipated Support Needed



## Technical Assistance

-  Assessment of organic, plastic, sanitary, and electronic waste streams to evaluate challenges and opportunities.
-  Evaluate efficiency and capacity of operating treatment facilities, particularly the 25 decentralized biogas plants.
-  Evaluate garden waste capacity, management, and environmental assessment.
-  Technical assistance to link EPR mechanisms to increase the efficiency of waste management practices.
-  Technical support to document, formalize and digitalize informal recyclers.
-  Technical support to set up an Information, Education and Communication department within the PMC to lead campaigns.

## Infrastructure Goal

-  Seed investment to pilot composting initiatives.
-  Feasibility study to upgrade biogas plant and biochar production.
-  Seed Investment to create alternative food delivery packaging.
-  Feasibility study and procurement of specialized transport vehicles for specialized waste streams (such as sanitary waste).



# Semarang Indonesia

ADAPTIVE AND INCLUSIVE WASTE  
MANAGEMENT MODEL

# City Context

Indonesia is one of the largest archipelago countries in the world, and the second-largest marine plastic debris producer. Semarang is the capital of the Central Java Province and the fifth largest city in Indonesia, with a population of more than 1.8 million people in 2017, of which at least 5% are considered poor. The city has been undergoing an economic transition in the past decades from an industrially based economy to services and trade – particularly impacting the built-environment and the labor force in the city. As a coastal and port city, Semarang faces various challenges such as landslides, flooding, erosion, and sea-level rise, which are further exacerbated by an inadequate waste management system and threatens to aggravate other shocks and stresses the city faces. The Indonesian Government Regulation N° 81 of 2012 mandates that the community, as producers of waste, is also responsible for waste management. This had led the city to pursue various community-based waste management models and practices, including the waste banks, which are widely recognized as successful solutions. It has also led the city to prioritize partnership building and decentralization of operation, which should be attractive for partners.

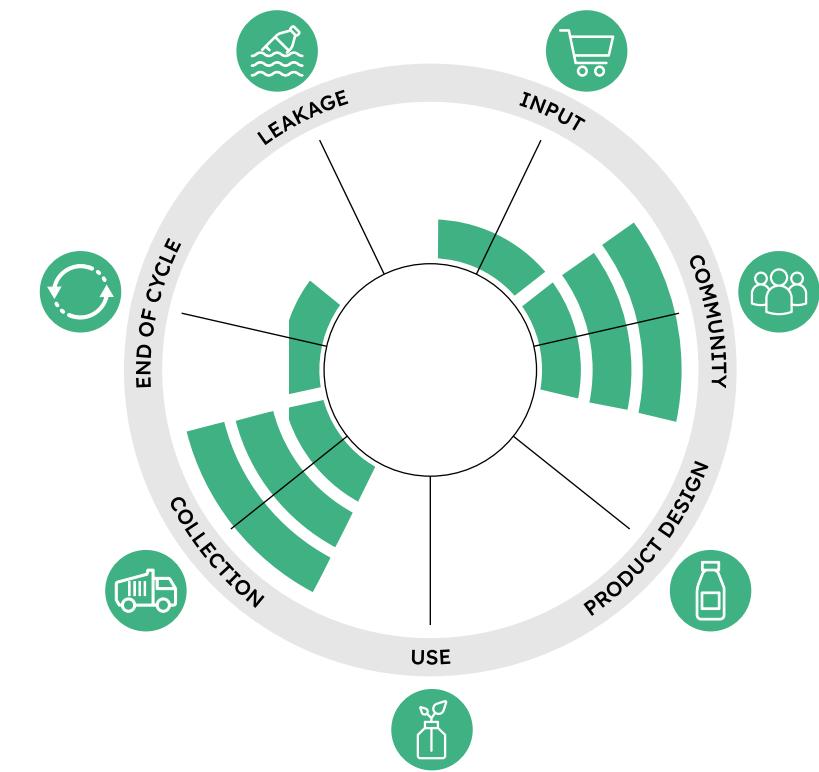
# Translating the Challenges into Opportunities

## Building on the Urban Ocean Gap Assessment

### TRANSLATING CHALLENGES

-  The city would require an average of 950,000 m<sup>3</sup> of landfilling per year to maintain the current level of waste generation, but the city's main landfill (TPA Jatibarang) is already at full capacity.
-  The city pushed regulations to foster 3R practices and reduce single-use plastics, but it lacks enforcement and cohesion.
-  There is a general lack of awareness on waste generation and low rates of segregation at source.
-  Waste collection is limited, particularly in upstream households, and it relies largely on informal waste pickers.
-  The city lacks an overarching integrated collection system as it is currently very fragmented.

### INTO OPPORTUNITIES



# Adaptive and Inclusive Waste Management Model

## OPPORTUNITY OWNER

City Development Planning Board (BAPPEDA) & Department of Environment (DLH)

## ESTIMATED TIMELINE

12 months

## TECHNICAL STUDIES AVAILABLE

- Circularity Assessment Protocol, Semarang (2021)
- Kiat - PwC Waste Stream Study (2019)
- The role of waste banks in the reduction of solid waste sent to landfill in Semarang, Central Java, Indonesia (2019)

## CITY CONTACT

Luthfi Eko Nugroho, Chief Resilience Officer

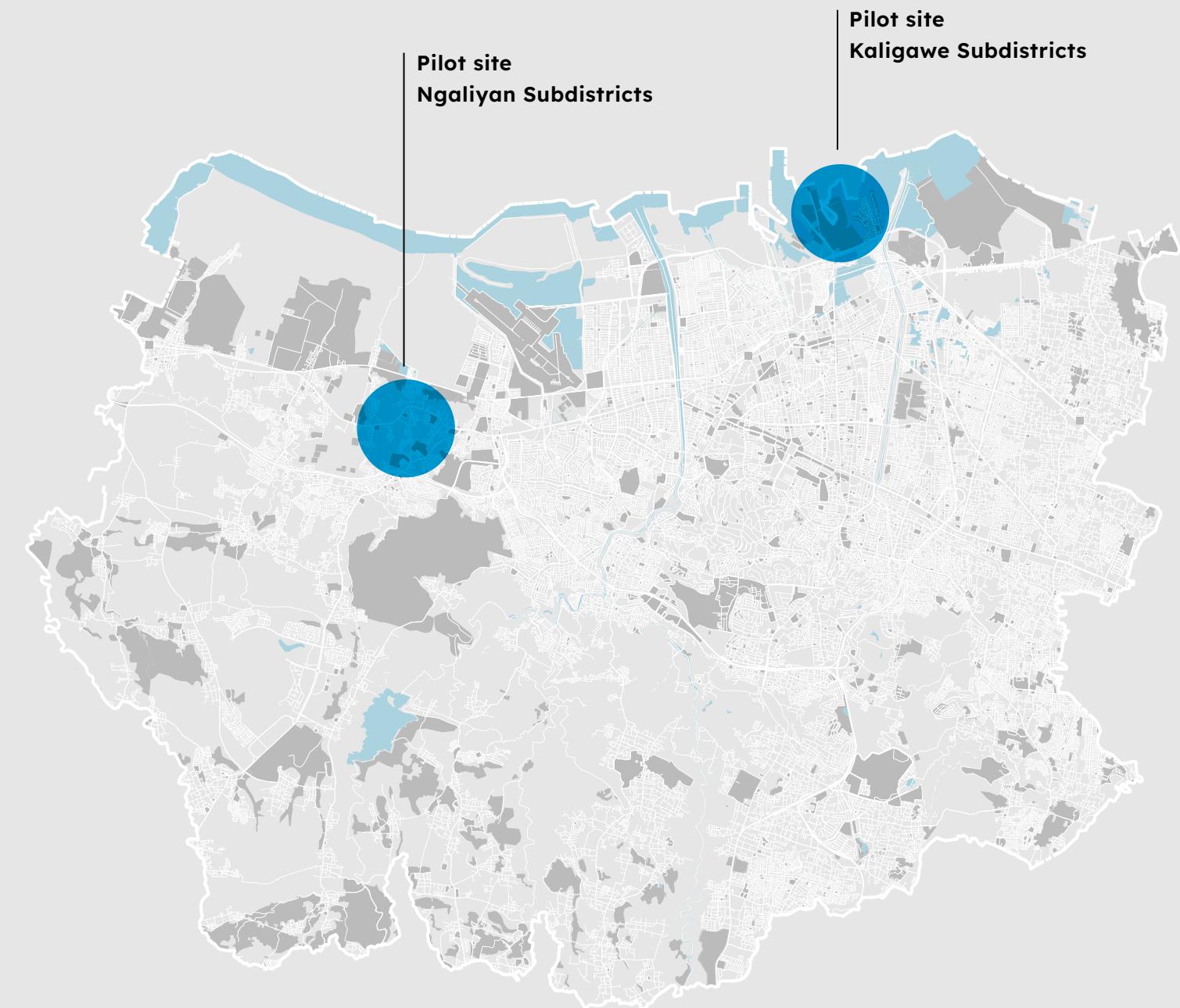
## EMAIL

[mluthfi83@gmail.com](mailto:mluthfi83@gmail.com)

## Opportunity Overview

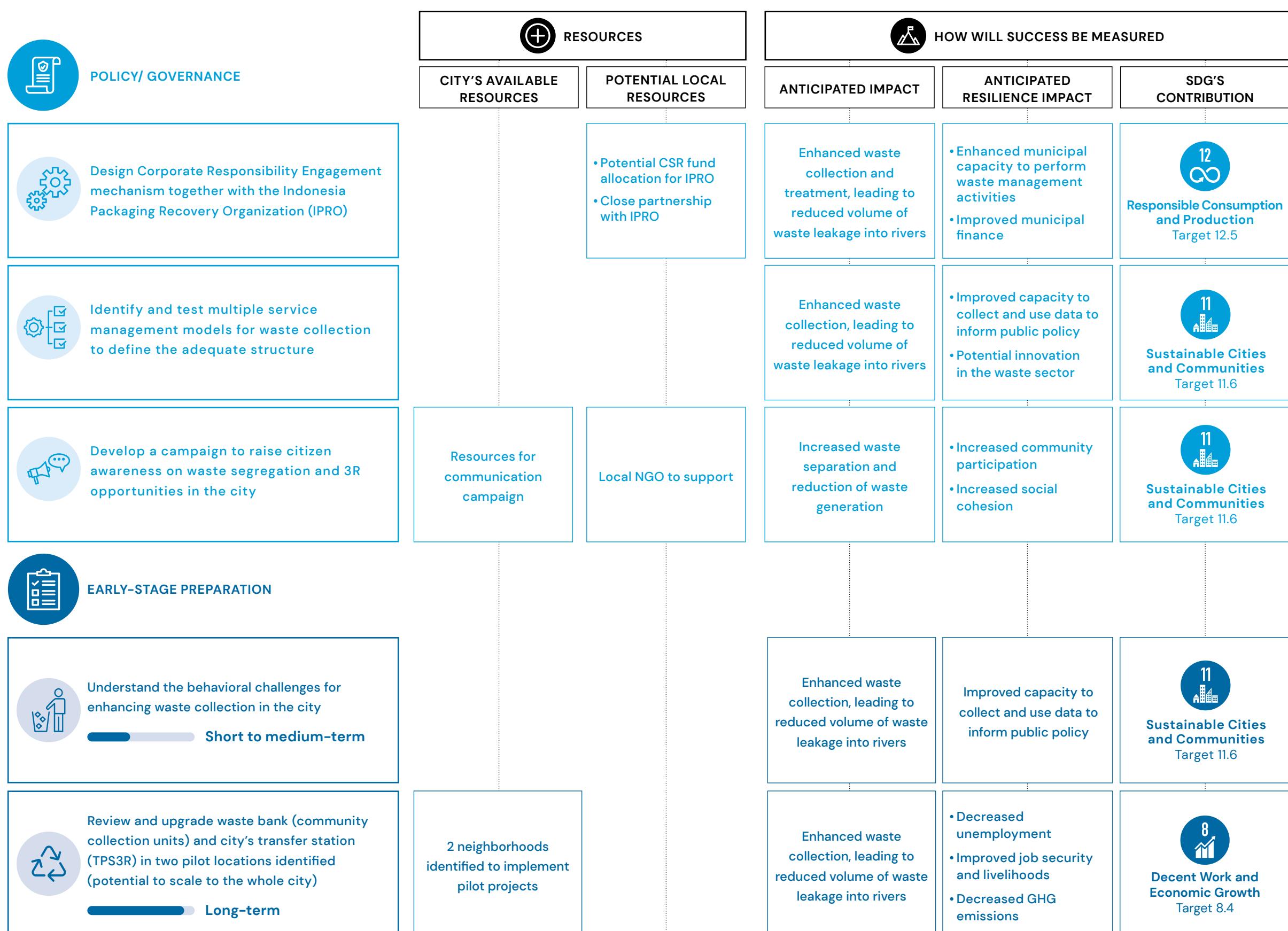
Semarang's ambitions for 2025 are aligned with the National Action Plan for Handling Marine Debris for 2018-2025, which committed to reduce by 30% the waste generation and create capacity to process and treat 70% of the solid waste generated. In addition, the city aims to have 100% of its population accessing waste management services. These ambitious targets won't be met without ambitious actions. Therefore, the city is committed to enabling projects that strengthen the resilience and circular practices in the waste management system of the city. Semarang has various neighborhood-level waste management models which respond to different challenges in its broader waste management system.

The project aims to leverage these existing models to create more integrated and innovative sub-district level waste management practices. In turn, this will generate economies of scale and, potentially, generate efficiency, as well as environmental and economic gains to the city. As the city recognizes the unique role the informal sector and communities have been playing in strengthening waste management practices, it will work closely together with these groups to leverage their knowledge and promote wider social co-benefits to the population. In this sense, this initiative could potentially generate jobs and support the city in overcoming its high unemployment rate which is currently fueled by the economic fallout from the pandemic. The opportunity identifies five areas of intervention:

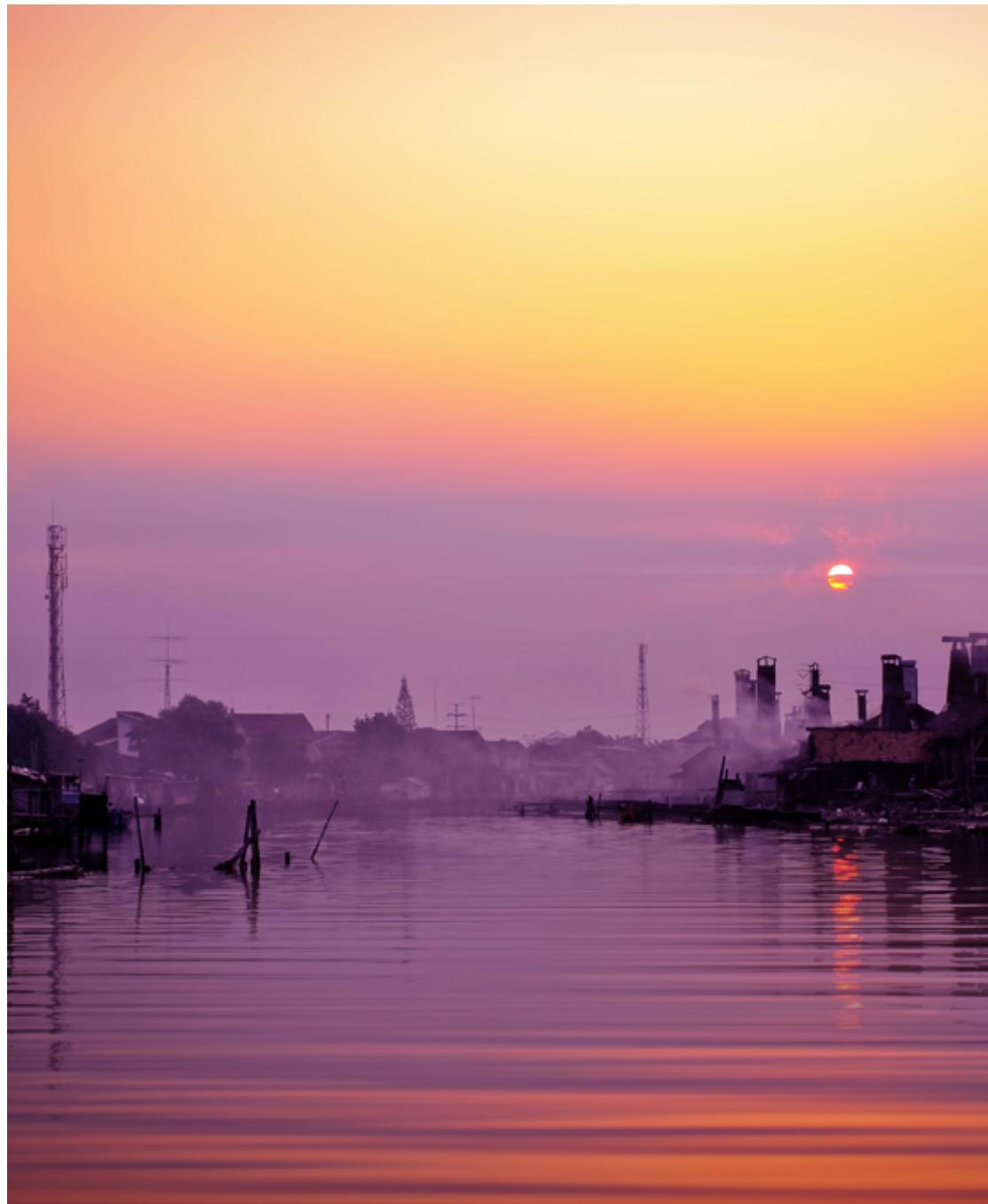


# Semarang's Opportunity Outline

The city's goal is to leverage the community-based waste management models to incrementally strengthen waste collection in the city, while empowering multiple stakeholders to increase equitable economic growth.



# Anticipated Support Needed



## Technical Assistance



Evaluate how to enhance waste collection at the neighborhood level, focusing on behavioral, financial, and institutional challenges to advance integrated waste collection.



Technical assistance to draft and enact CSR & EPR policies.



Technical assistance on communication campaign to raise awareness on the waste challenges and reduce the generation of waste.



Efficiency assessment and benchmarking on waste collection service (includes management models, as well legal and regulatory frameworks).



Develop a business case for integrated service model for waste management.

## Infrastructure Goal



Design a plan and develop feasibility studies to upgrade the city's transfer stations (TPS3R) and the waste banks located at two neighborhoods (Ngaliyan and Kaligawe).



Design a waste collection scale-up approach to all neighborhoods in the city.

If you are interested in supporting any of these initiatives' development, please reach out to

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Cities Project Director at Ocean Conservancy

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Additional information may be made available upon request.

