



PROJECT STATEMENT

Melaka

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



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Team members

OCEAN CONSERVANCY

Keri Browder, Chever Voltmer

R-CITIES

Katrin Bruebach, Luciana Cardoso, Saurabh Gaidhani, Nini Purwajati, Alvaro Soldevilla

THE CIRCULATE INITIATIVE

Ellen Martin

CIRCULARITY INFORMATICS LAB, UNIVERSITY OF GEORGIA

Jenna Jambeck, Amy Brooks, Sheridan Finder, Taylor Maddalene, Jenni Mathis, Quinn O'Brien, Madison Werner, Kathryn Younblood

TEAM MELAKA

TPr.Zuhaila binti Ahmad Zubel

TOWN PLANNING DEPARTMENT

Ms. Norliah binti Abd. RahmanMr. Zulikhram bin ZulibrahimMs. Nurul Fitrah binti Jaafar

ENVIRONMENTAL DEPARTMENT

Mr. Noramirul Nizam bin KamisMr. Khairul Anam bin MoktarMr. Mohd Badrol bin Kamaruddin

UNIVERSITI KEBANGSAAN MALAYSIA

Dr. Azlan bin Abas

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Introduction

● URBAN OCEAN MENTOR CITIES

● URBAN OCEAN LEARNING CITIES

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



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) emissions¹. The Covid-19 pandemic could push between 71 and 100 million people into extreme poverty, of which 30 percent will reside in urban centers². No climate nor social target 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 percent³. At the same time, the circular economy offers a \$4.5 trillion economic opportunity by reducing waste, stimulating innovation, and creating employment by 2030⁴. 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.



Program Objective

The Urban Ocean program aims to work with city leaders to bring new ideas, partners, and resources together to solve interrelated problems around waste management. It provides the opportunity for ocean advocates and city leaders to join forces with other allies to develop comprehensive solutions that meet the needs and priorities of communities and other actors to create real, lasting impact. The program demonstrates how actions to improve waste management and recycling can provide resilient, sustainable solutions that not only reduce ocean plastic pollution but also address key city priorities, such as improving public health, supporting economic development and reducing greenhouse gas emissions. Furthermore, Urban Ocean provides a platform for cities to showcase leadership and share knowledge and experiences across the Resilient Cities Network community and beyond.

Project Statement

This document presents an initiative to improve waste management in Melaka (Malaysia), generating positive environmental, social and economic impact. It serves as a tool to guide the complex process of implementing a holistic waste management approach at the city level.

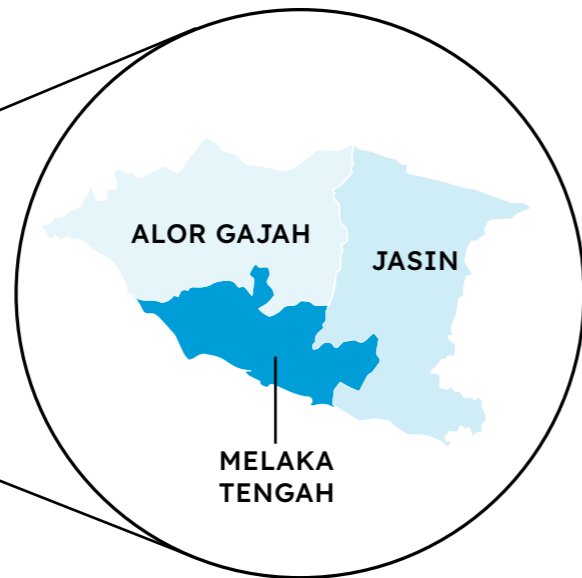
Context

City Context

Peninsular Malaysia



Melaka State is subdivided into 3 districts



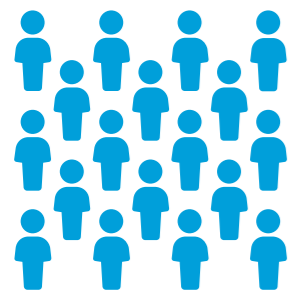
Melaka City



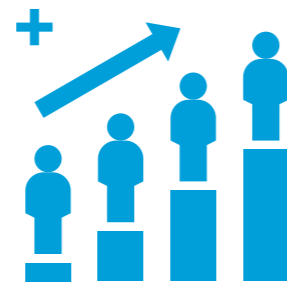
Melaka City is the capital of the state of Melaka, located on the coast in southwestern Peninsular Malaysia and opposite the island of Sumatra. Melaka State is subdivided into four municipalities (Melaka Historic City Council, Alor Gajah Municipal Council, Jasin Municipal Council and Hang Tuah Jaya Municipal Council).

The Melaka River flows from Alor Gajah across central Melaka before joining the Melaka Straits. This is one of the busiest shipping routes in the world, in a strategic location connecting China and India. The length of the Melaka River is about 39.0 km; its catchment area is 608 km². Melaka City is also located on both sides of the Melaka River near its estuary on the Straits of Melaka. Melaka City has an area of 270.39 km² and lies approximately 152 km from Malaysia's capital city, Kuala Lumpur.

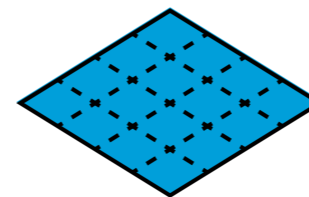
The city of Melaka has historically been a key trading settlement in South-East Asia and a multi-cultural city. It is a major tourist destination within Malaysia, designated as a UNESCO World Heritage Site in 2008 for its unique architecture, culture and townscape. This resulted in increased tourism and an economic boom, along with challenges in terms of environmental preservation and the 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 suburbs.



The population of Melaka State is estimated to be over **930,000**

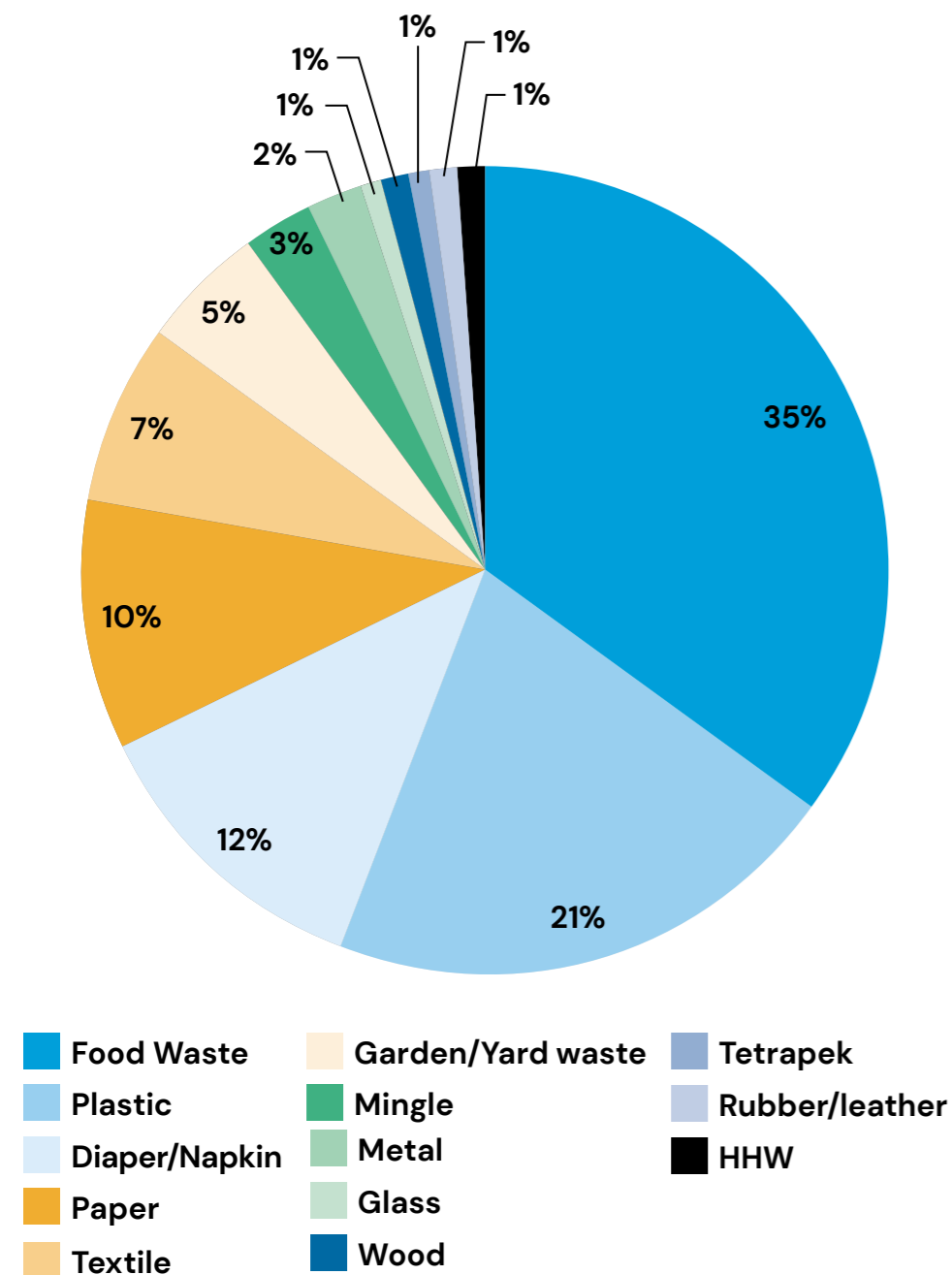


Population average annual growth rate of **1%**



493
people
per square kilometre⁵

The City's Waste Management System



Solid waste composition in MBMB 2020

Melaka State generates about 1,480 tons of solid waste per day⁶, equal to approximately 0.75 kg of solid waste per capita per day. It is estimated that this number comprises around 670-1000 tons of waste from households and 400-700 tons of waste from commercial and industrial premises. The rapid population growth and increasing tourism in Melaka have contributed to the rise in the city's waste generation. There is limited data on collection efficiency, but during the Urban Ocean gap assessment, an average of six bins per km² was identified, with two of the nine transect areas having no public bins. There was also no documentation of public recycling bins available in any of the nine transect areas. In addition, even though 70-80 percent of the waste disposed in the landfill could potentially be recycled/treated, it is estimated that only around 10 percent of the waste collected is recycled and treated⁷.

In Malaysia, the National Solid Waste Management Plan (JPSPN) was established under the Solid Waste Management and Public Cleansing Act 2007 (Act 672), passed by Parliament on 17 July 2007 and added to the gazette on 30 August 2007, to integrate the solid waste management system at the national level. The Act gives the Federal Government executive power to perform responsibilities on solid waste management and public cleaning.

Prior to JPSPN, the function of PSP was initially located under the Environmental Health Engineering Division and the Project Implementation Division, Local Government Department (JKT), KPKT. After Act 672 and Act 673 were approved, this function was transferred to JPSPN and the Solid Waste Management and Public Cleansing Corporation (PPSPPA).

Services related to waste collection and public cleaning are delivered based on the appointed concession holders' and/or local authorities' jurisdictions. In Melaka, the waste collection service is provided by the private concession holder SWM Environment Sdn Bhd, and SWCorp is the solid waste management enforcement agency. There are regulations at the state level that apply to all local jurisdictions, such as the taxes/

fees for waste management and public cleaning, which are not based on high, middle, or lower-income categories.

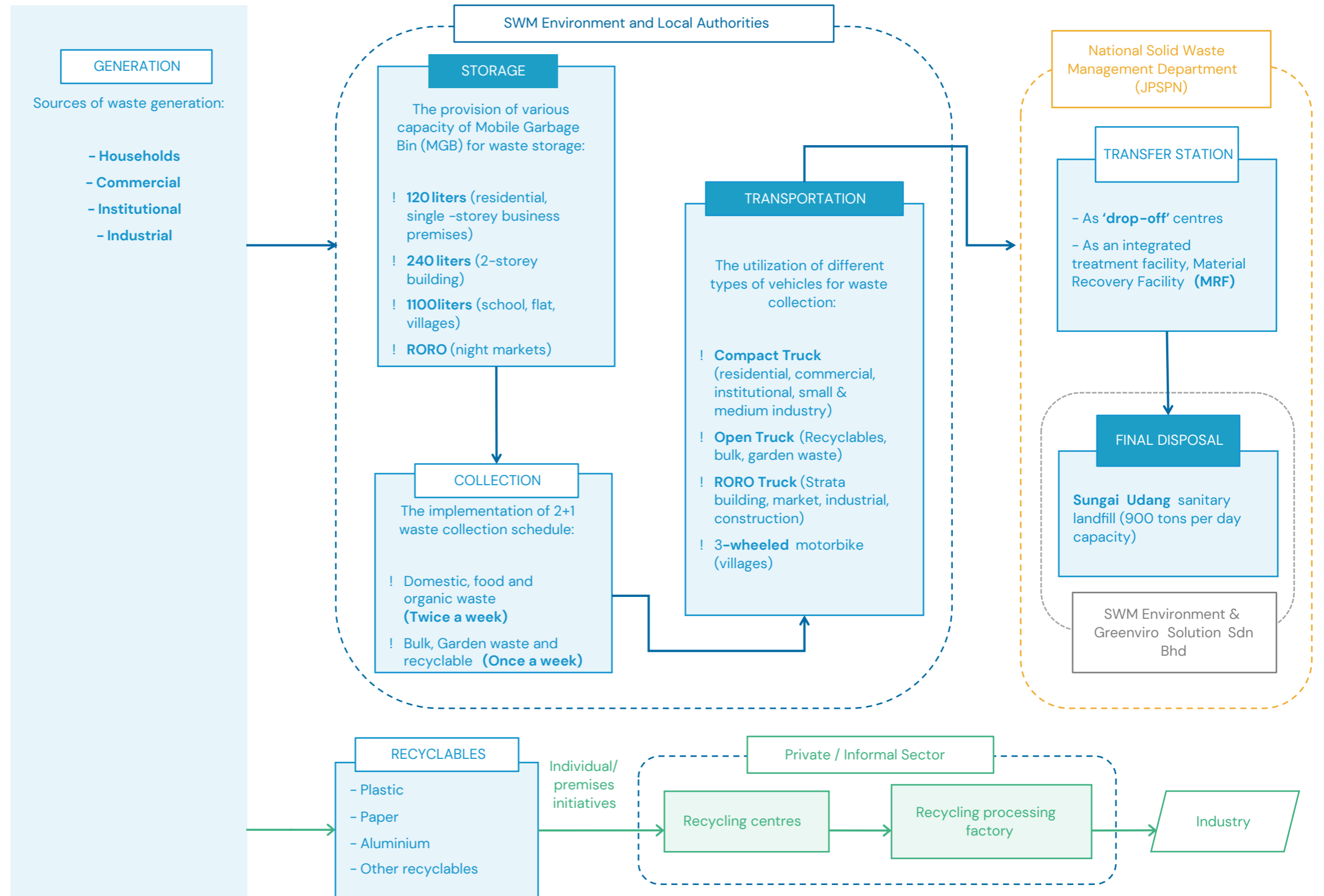
Throughout Melaka State, household and organic waste must be placed in "wheelie" bins provided by SWM and placed at the curb on collection days. SWM Environment implements a "2+1" solid waste collection schedule: food and organic waste are collected twice per week, while recyclable materials, bulky items and garden waste are collected once per week. Most of the waste is then transported to the landfill in Sungai Udang, Melaka. There is an infrastructure gap: the waste management infrastructure, including transfer and sorting stations, is limited. Authorities have been trying to introduce recycling and composting as the main methods to divert waste away from the landfill through the SWM Environment, which also promotes educational campaigns and creates awareness-raising activities to foster reduce-reuse-recycle practices.

Additional waste streams, such as clinical waste, toxic waste, and electronic waste (e-waste) have specialized waste management systems. For instance, clinical waste is collected from various jurisdictions and private health centres in the southern region and disposed of through incineration. There is further hazardous waste, particularly from petroleum exploration, production, refining and distribution, which receive specialized treatment. Citizens can send their e-waste to dedicated collection centres. The solid waste concession holders/local authorities manage these e-waste collection centres.⁸

In the Melaka Historic City Council (MBMB) jurisdiction area, 193,797.97 tons of waste were generated in 2020. The most common form of waste was food/organic waste at approximately 35 percent, followed by plastic (21 percent). Diapers/napkins and paper/cardboard represented 12 and 10 percent, respectively. Garden waste was at 5 percent, mingle 3 percent and metals 2 percent, while glass, wood, TetraPakTM, rubber/leather and HHW each represented 1 percent of the waste (see Figure on the left).

WASTE FLOW CHART

This waste flow chart illustrates the waste management system in Melaka, depicting the steps of the process and the main actors involved.



Project Justification



The Solid Waste Management and Public Cleansing Act (Act 672 – 1 September 2011), promotes systemic, coordinated and efficient solid waste management practices in Malaysia. Moreover, different levels of government in Malaysia and Melaka have shown leadership in promoting urban resilience and sustainability, particularly in waste management, by engaging in strategic planning initiatives. For instance, Malaysia has made ambitious commitments to reduce its GHG emissions by 45 percent by 2030 relative to 2005⁹. At the local level, Melaka State has increased its ambitions and projects on the ground towards improving its waste management system to comply with national regulations. In 2014, the Melaka State Government, in partnership with the Asian Development Bank, published the Melaka Green City Action Plan, which aimed to put Melaka on the path to becoming a “zero-waste” state and reduce 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.

The Local governments must play a major role if the Government of Malaysia is to achieve its targets, and Melaka Historic City Council is committed to moving forward with increased efforts in improving waste management. This initiative will contribute to achieving Melaka’s goals for resilience and sustainability by addressing the gap between planning and implementation for waste management. The city will be able to target the necessary waste collection infrastructure design, operational and maintenance investments needed by promoting integrated planning and smart governance practices. To guide this, the

urban transformation will give multiple benefits, including sustainable economic development. Melaka City Council is looking for integrated solutions that reduce illegal dumping, while addressing challenges to public health, economic development and environmental degradation. Melaka City Council is consciously targeting the waste streams that pose the biggest challenges, namely tobacco waste and multilayered film, so it can drive a transformation in the value chain of materials and address the compound risks associated with these products. To properly steer this work, the municipality counts on strong commitment and capacity:

- The city has successfully implemented different programs to promote integrated waste management and raise awareness of the waste generation challenge, including restrictions on single-use plastic bags, a waste-segregation-at-source program and a waste collection schedule program.
- Melaka has undergone an extensive planning process to guide its urban growth in a more sustainable and “greener” way.
- It is estimated that 18.73 million tourists visit Melaka per year. As a tourism hub, the city is well-positioned to make use of its tourism sector to promote cleanliness in the city. Building the resilience of this tourism industry is a necessary step towards improving the quality of life for residents. The cleanliness of the city has a direct impact on tourism.

Challenges



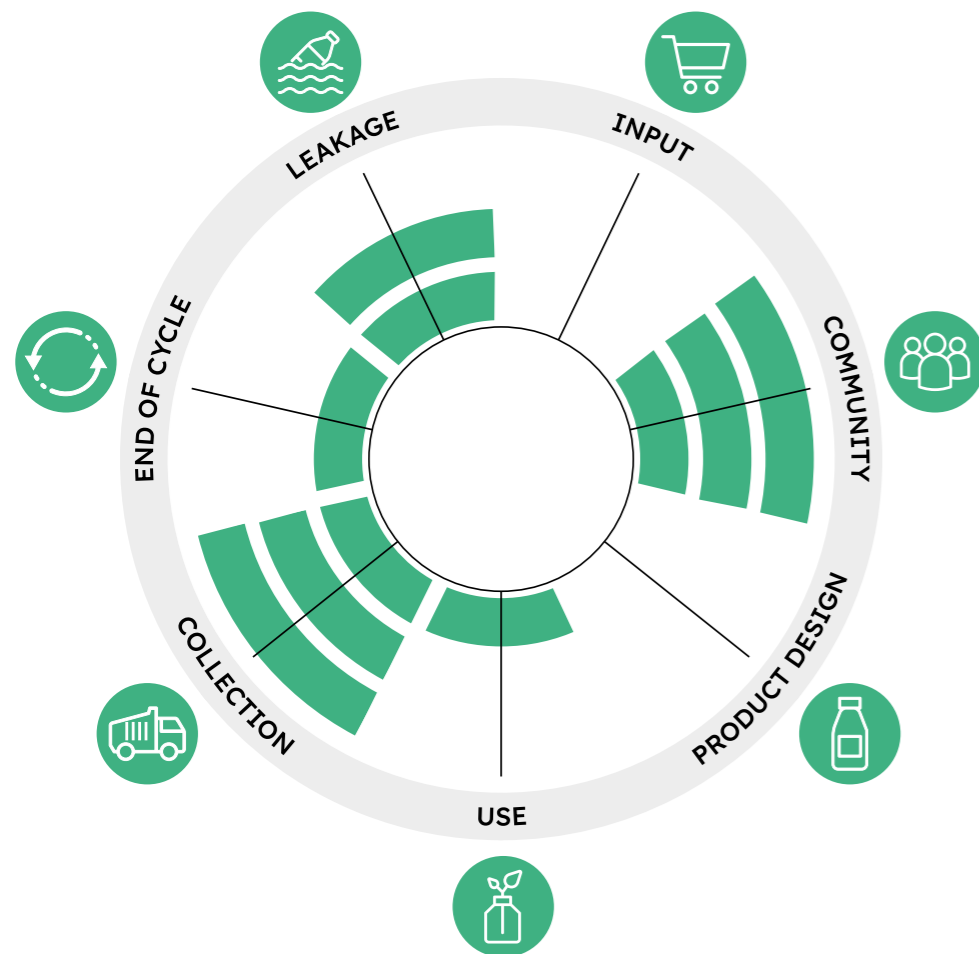
Through the Urban Ocean gap assessment, the city has been able to identify its main challenges and prioritize them to come up with opportunities that yield multiple benefits in the city.

- **Cleaning of rivers and coastal areas.** The city struggles with finding suitable technology to clean and monitor the water quality of its waterbodies because of its size, touristic value, depth, lack of mandate, and so on. The main causes of the city's water pollution include upstream tributaries, agricultural activities, sewage and the discharge of untreated wastewater. The main river running through the city's center is classified as mildly polluted despite the cleaning and beautification work in recent years. The river is a major natural and economic resource in the city, but there is a lack of integration and coordination in solutions to address this problem.

- **Flood risk.** The aging, poorly maintained drainage system and the design flaws in the irrigation systems create significant flood risk across the city. Exacerbated by litter generation, flood risk is particularly acute in the World Heritage Site.
- **Waste management system.** Currently, waste collection in the city is not integrated because there is a gap in its management division. Multilevel governance factors often duplicate efforts or have gaps in terms of mandates. This challenge has also been acknowledged in other sectors, particularly in terms of the land reclamation process, where a lack of integrated planning and governance has been identified as crucial for the setbacks to implementation.
- **Recycling infrastructure and disposal of packaging (food & tobacco) waste.** The city has acknowledged smoking as a challenge that impacts not only waste management, but also public health and tourism.

- ◊ The smoking zones policy was determined to try to face this challenge, but the results were not as significant as expected. Some of the challenges include lack of basic social infrastructure and equipment in these areas, limited authority, and poorly defined places.
- ◊ Compared to other waste streams, tobacco/ cigarettes and food waste represent a relatively high percentage of total waste..
- **Stakeholder involvement.** It was highlighted by stakeholders that there is a major challenge in terms of engaging figures towards improving waste management. The main challenge identified was community, industry and business awareness to perform segregation at source.

Opportunities



During the Urban Ocean gap assessment, the city led participatory workshops to identify the main opportunities for improving the waste management sector in the city, while building resilient societies and economies.

Clean river and coastal areas

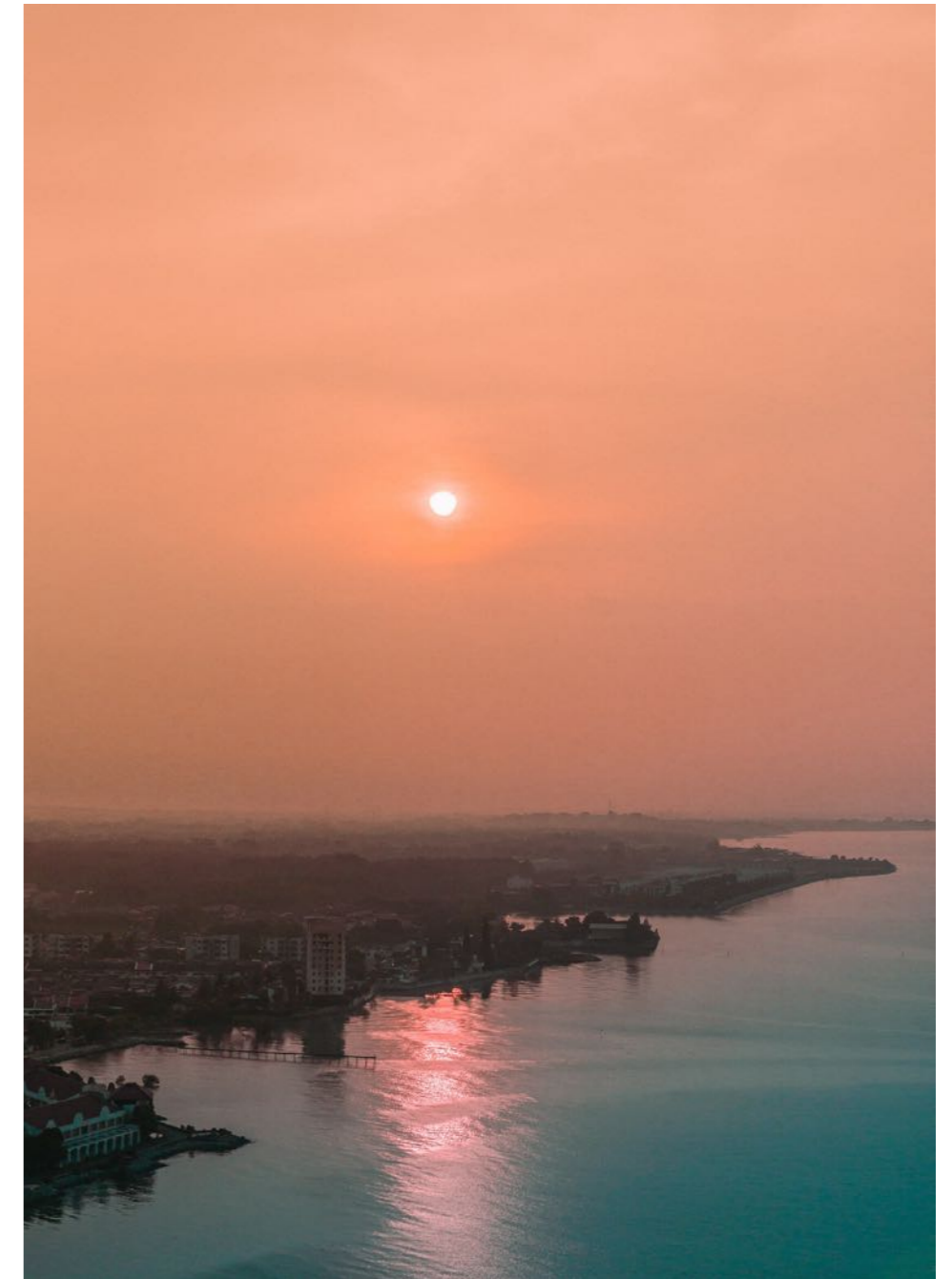
Even though increased tourist activity has led to increased littering rates, the municipality had one of the lowest plastic waste leakage rates in the state. There is an opportunity to use its low plastic leakage rate to improve the quality and cleanliness of its waterbodies. This includes searching for more suitable technology and improving the governance scheme and educational activities.

Review smoke-free/litter-free policy and enhance waste collection and recycling equipment

As food packaging and tobacco waste were identified as one of the largest waste streams in the city, they can be used as an entry point to find suitable technologies and service models for waste collection as a whole. The city identified tobacco waste and multilayered plastic packaging as significant entry points.

Establish a city taskforce

Since stakeholder involvement and governance were identified as issues, the municipality has understood the necessity to establish more engaging mechanisms that define roles and responsibilities, while extending participation.



Translating the Opportunities into a Project



The project below has been designed not only to address the identified challenges, but also to make use of the touristic environment to improve the quality of the natural and built environment and foster economic development. 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. The community is identified as the key enabler in this project,

guaranteeing that communities are empowered to understand the risks, act and monitor activities being developed towards the success of this project. One of the pillars of the city's indication as a UNESCO World Heritage Site status is its multicultural aspect, so leveraging the community's diversity and long history with water is a necessary condition for a more sustainable relationship between the city and its waterbodies.

The project is built on the city's extensive experience in building partnerships, investing in new technology, supporting pilots to increase community awareness and creating policies to address current challenges. 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. For instance, the restriction on single-use plastics has expanded to several stores, restaurants, pharmacies and so on, demonstrating the capacity of public policy. However, it is not clear how enforcement measures are being implemented, nor is the possibility of including economic incentives or disincentives within the regulatory framework.

This project takes one step further in looking for integrated solutions that will help the city achieve its goals while building overall resilience in the city. Because tobacco waste was identified as a significant waste stream, there is an opportunity for the smoke-free legal and regulatory framework to be reviewed to address the interrelated challenges tobacco presents to public health, economic activity and waste generation. The challenge of single-use plastics, particularly tobacco waste and multilayered film, was defined as the best entry point for the city to review its regulations and test technologies for collection and treatment of plastic waste.

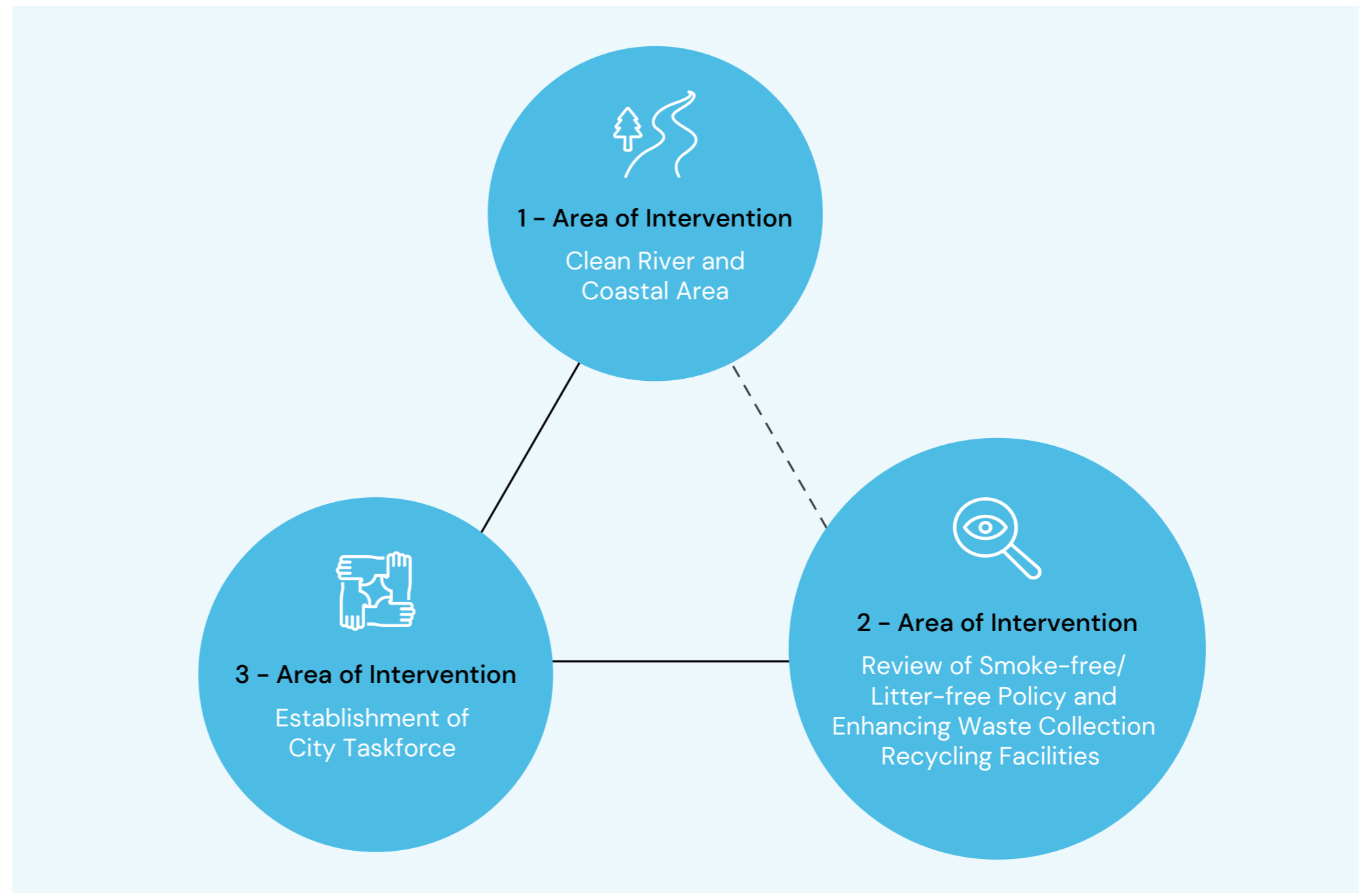
Goal

Melaka City is a tourism-oriented city and the tourism sector makes a major contribution to Melaka's local economy. A systematic waste management system will strengthen the circular economy and create job opportunities by encouraging community involvement as the key enabler to avoid waste leakage, reduce GHG emissions and create a strong tourism sector in Melaka.



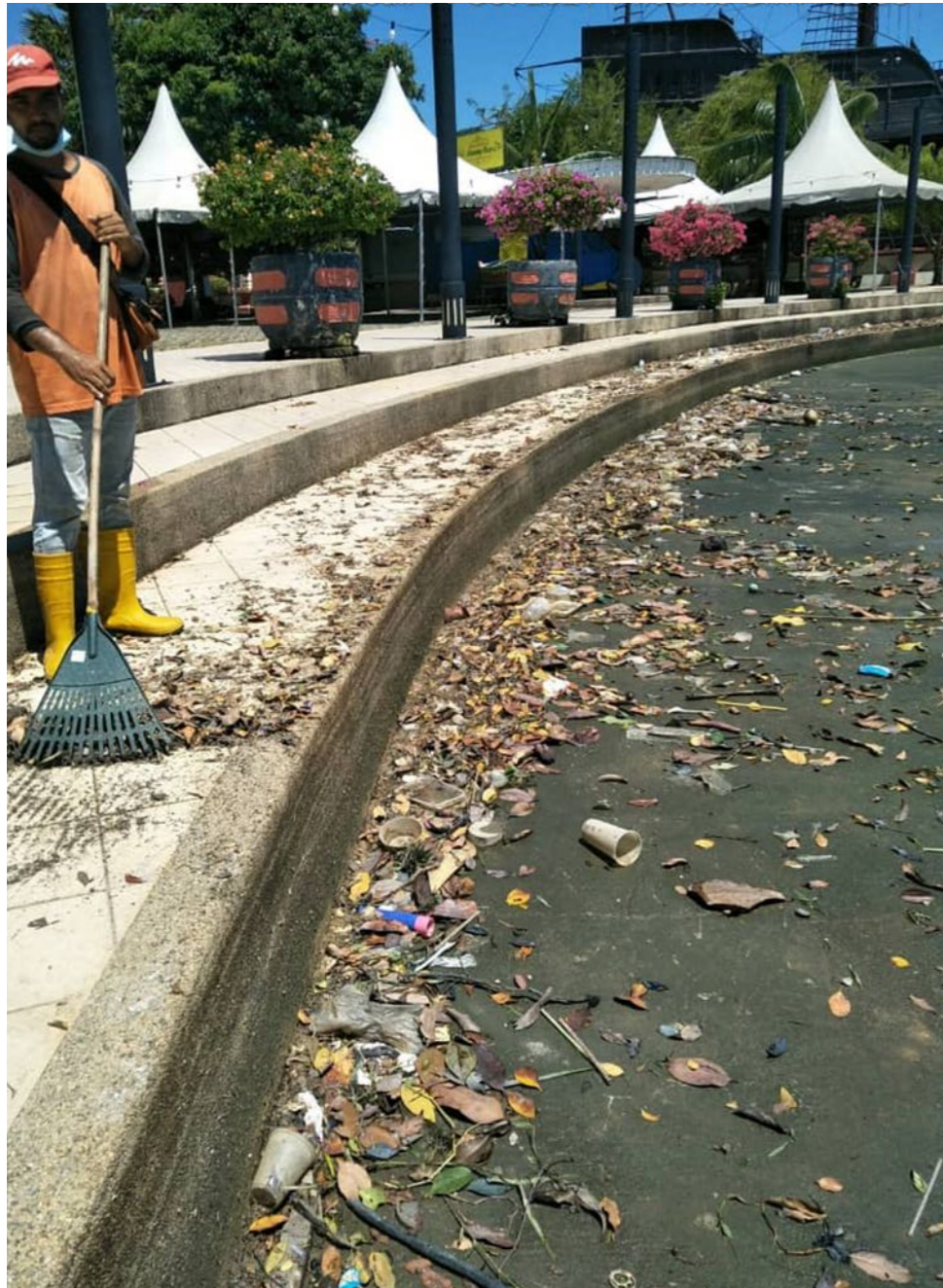
Project Description

This ambitious project aims to address the challenges identified above in terms of waste management and river cleaning from various perspectives; strengthening community empowerment; and the tourism industry. Figure N show how the actions targeted to each of the three opportunities are connected. The actions for opportunity 1 (Clean river and coastal areas) and opportunity 2 (Review smoke-free/litter-free policy and enhance waste-collection and recycling equipment) are indirectly connected, while the actions for both opportunities 1 and 2 are directly connected to those for opportunity 3 (Establish a city taskforce). In summary, the effectiveness of a smoke-free zone policy and adequate provision of recycling equipment will indirectly help maintain the cleanliness of the river and coastal area. Meanwhile, establishing a city taskforce will directly contribute to implementing actions for opportunities 1 and 2.



Targeted actions for three identified opportunities

1 - Clean River and Coastal Areas



OVERVIEW

This initiative aims to explore potential interventions to improve the cleanliness of rivers and coastal areas. The Melaka River runs through roughly the center of the state, from north to south, and has become one of the main tourist attractions in the city. The local authorities would like to deploy customized technological water management solutions which also enhances city's solid waste management practices. The city will take multiple steps to address the growing pressure on water resources, improve water conservation and prevent waste from entering water systems.

ENABLING ENVIRONMENT & LOCAL RESOURCES

- Zero-waste program
- Grease trap
- Melaka no-plastic-bag program
- Waste separation-at-source program
- Door-to-door awareness action
- Waste bins

EXPECTED IMPACT

This project is expected to improve the cleanliness of rivers and coastal areas, particularly by:



Supporting the treatment of 17,039 tons of waste monthly.



Reducing the flood risk, which will benefit over a half a million people in the city.



Pioneering waste management technology and enhancing innovation in the waste sector.

SDG



Life Below Water

Target 14.1

By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution



Sustainable Cities and Communities

Target 11.3

By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlements planning and management in all countries

RESILIENCE VALUE

- This project is expected to enhance the tourism industry in the city, strengthening local economic development. Not only will it improve the water quality in the river, which is a tourist attraction, but it will improve the quality of the small businesses surrounding the river.
- This project will advance the city's capability to become a hub of innovation in waste management technology.

ACTIVITIES FOR IMPLEMENTATION



Improve the litter-trapping efficiency of grease traps and trash traps.



Upgrade and increase the loading capacity of grease traps from each of the vendors.



Enhance waste management technology and prevent waste from entering water bodies, for example using netting trash traps.



Procure advanced technologies, such as garbage suction ships, from developed markets/cities (if available) and prioritize technology transfer along with the procurement process.



Collaborate among key stakeholders, including government, the private sector, citizens and NGOs to enforce relevant laws.



Fund R&D&C, promotion, awareness programmes and collaboration with local universities, the private sector and NGOs.



The government needs to take various initiatives to clean up coastal areas, including collecting garbage every week or doing regular coastal cleaning to improve the sustainability of marine life.



Enhance educational promotion and awareness programmes and enhance clean rivers and coastal areas, for instance through the Eco-schools program.

2 - Review the Smoke-free/Litter-free Policy and Enhance Waste Collection and Recycling Equipment



OVERVIEW

Melaka City has unique opportunities to improve its existing waste collection infrastructure and recycling facilities, while addressing long-lasting challenges in the city, such as the high prevalence of smoking. The city would like to tackle its littering problem, particularly concerning tobacco/cigarette waste, food packaging and single-use plastics, by increasing its trash collection bins and implementing a policy regulating smoking zones/places in the city. This area of intervention is divided in two:

- Review the smoke-free policy and create a litter-free policy to expand and enforce smoke-free zones, targeted towards high-density public spaces.

- Enhance recyclable waste collection devices through a centralized bin system, prioritizing specific infrastructure for tobacco waste and other single-use and multilayered plastic.

The city would also like to capitalize on its waste segregation-at-source policy, which encourages recycling practices to attract better recycling facilities in Melaka, focused on multilayered plastics and tobacco-product waste. The success of both these actions will also depend on collaboration between local government, NGOs, stakeholders and communities, all playing their role in improving compliance and support in enhancing existing infrastructure.

ENABLING ENVIRONMENT & LOCAL RESOURCES

- Provision of recycling bins at tourist attractions and planned/residential areas.
- Eco-schools program
- Zero-waste program
- Waste separation-at-source program
- Melaka Without Polystyrene program
- Melaka No- Plastic Bags program
- Melaka Smoke-free program
- KITARecycle

EXPECTED IMPACT

This project is expected to enhance waste management in the city, particularly by:



Supporting the treatment of 17,039 tons of waste monthly



Reducing the flood risk, which will benefit over a half a million people in the city.



Improving the capacity to create public policy that yields multiple benefits, focusing on the interdependencies between public health, economic development, waste management and tourism.

SDG



Good Health and Well-Being

Target 3.9
By 2030, substantially reduce the number of deaths and illness from hazardous chemicals and air, water, and soil pollution and contamination



Climate Action

Target 13.3
Improve education, awareness-raising, and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning

RESILIENCE VALUE

- This project is expected to enhance the tourism industry in the city, strengthening local economic development. Not only will it improve the water quality in the river, which is a tourist attraction, but it will improve the quality of the small businesses surrounding the river.
- This project will advance the city's capability to become a hub of innovation in waste management technology.

ACTIVITIES FOR IMPLEMENTATION



Review and upgrade Melaka's smoke-free policy and create a litter-free policy in key city zones such as heritage areas, tourist spots and high-intensity public places.



Enforcement of Melaka's smoke-free and litter-free policies and regulation of smoking zone designation with proper collection infrastructure.



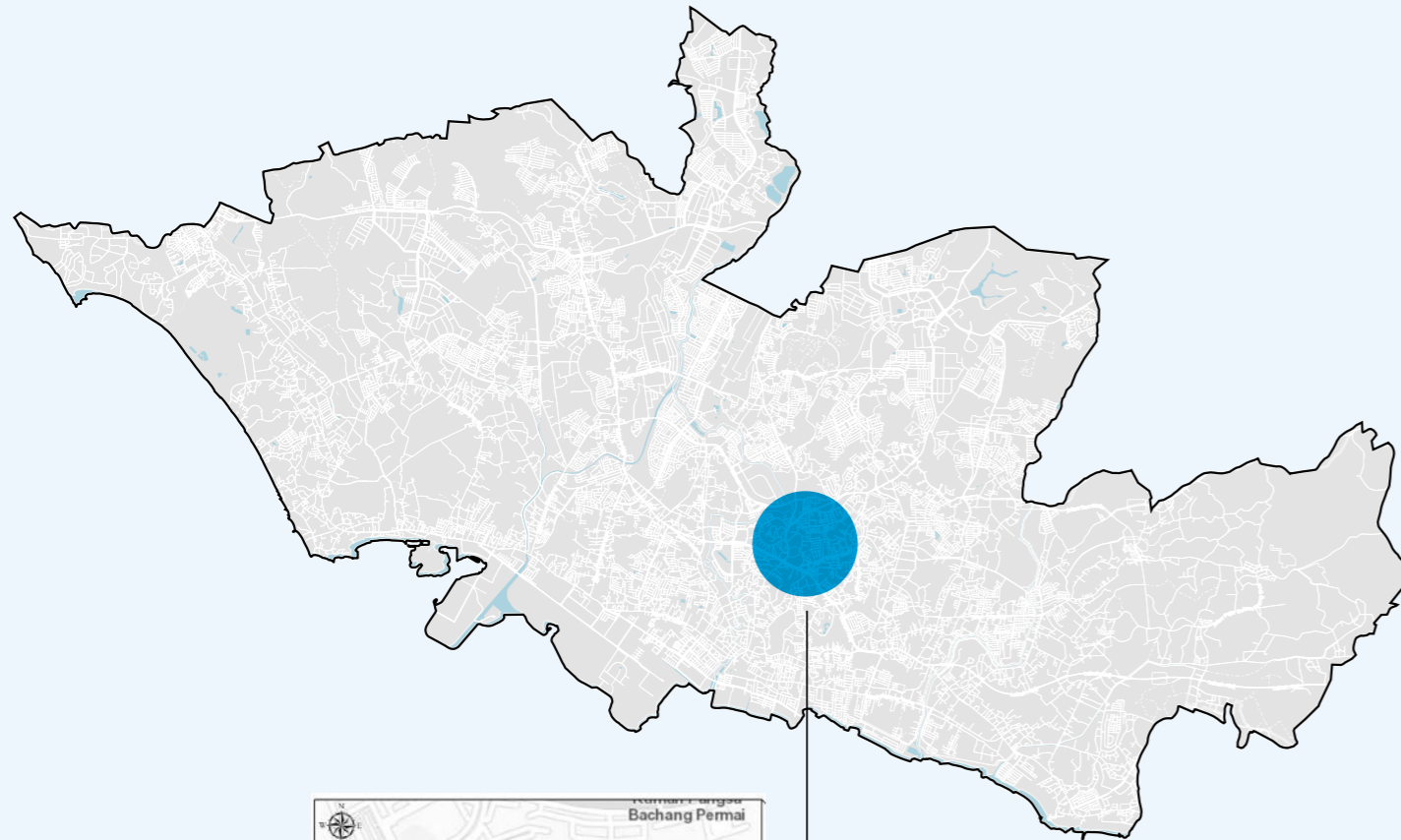
Implementation of a centralized recycling-bin system, particularly in residential areas such as Peringgiti (the project's pilot site).



Review and achieve efficient management of recyclables collection.



Engage citizens and community groups to help/support the city's smoke-free and litter-free policies' compliance and waste segregation initiatives.



**Pilot site
Peringgit, Melaka**

Map of Pilot Site (Peringgit, Melaka)

PILOT SITE



Photo of Case Study (Peringgit, Melaka)

The pilot site for these initiatives will be Peringgit, located at Melaka Tengah, which will soon be announced as the Melaka Low Carbon City. Figure X shows the map of Peringgit, Melaka. This site was selected for the pilot site for several reasons, including:

1. Its strategic location near the Sungei. Melaka.
2. The systematic, well-structured residential housing.

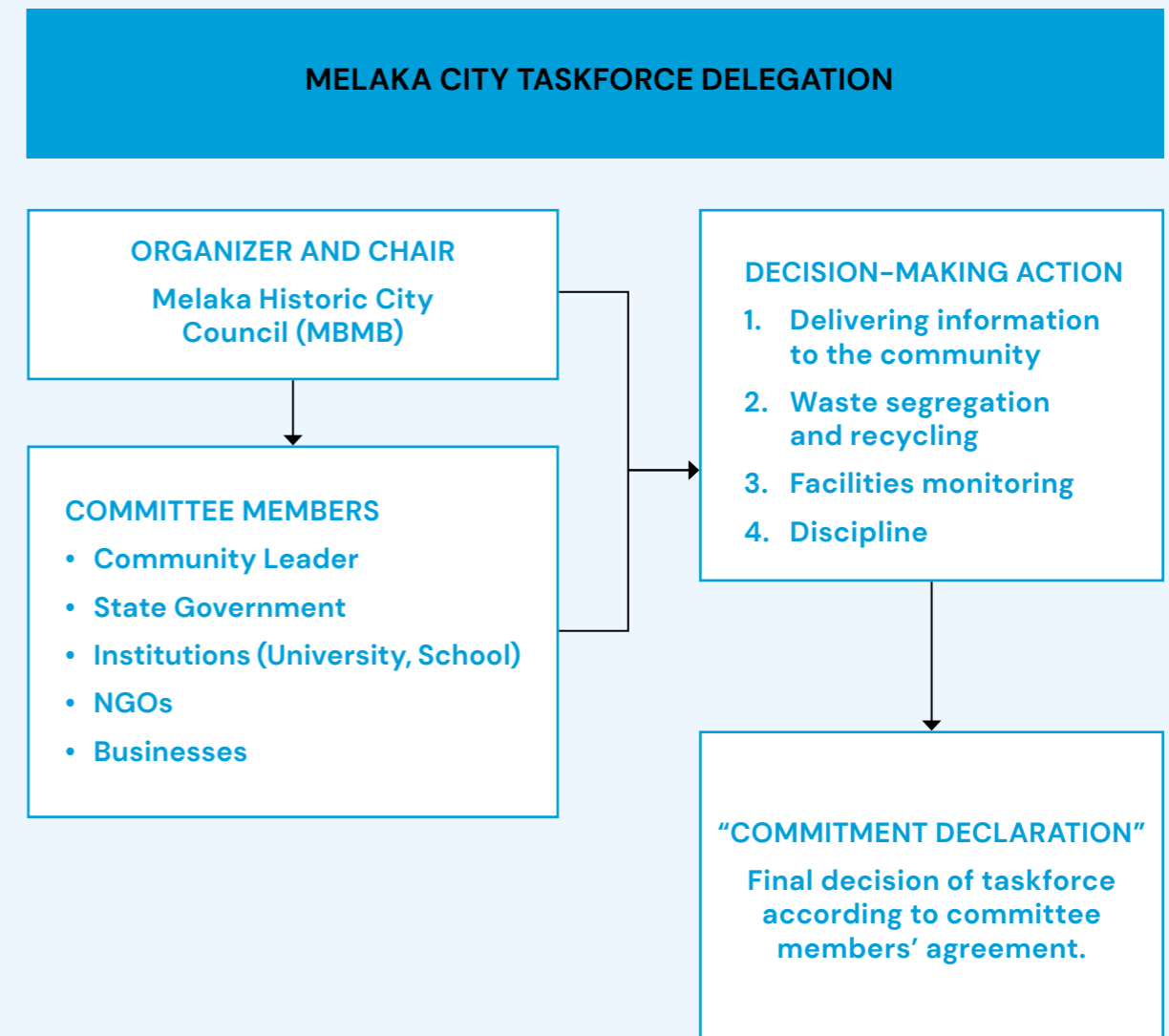
3. The good, clear structure of the local committee. Peringgit is also located near to the official residence of the Chief Minister of Melaka. Examples of attractive spots in the Peringgit neighborhood are the Melaka Heritage Institute, Toh Puan Zurina Foundation Complex, the Art Brigade Office, etc.

3 - Establish a City Taskforce

OVERVIEW

Melaka will establish a city taskforce that can communicate across levels, from the community to the public authorities. The Melaka City Taskforce Delegation will have the structure on the right.

The Melaka Historic City Council (MBMB) will chair the Melaka city task force, consisting of Council Members for their respective areas. MBMB's role is to set up the delegation by inviting community representatives, government, educational institutions, NGOs and businesses. The taskforce delegation will discuss all waste management cycle-related communication, citizen awareness and education programs for Melaka city.



EXISTING WORK AND LOCAL RESOURCES

Melaka Green Practices Certification

(www.adb.org/sites/default/files/related/41571/imt-gt-green-city-action-plan-melaka-april-2014.pdf)

EXPECTED IMPACT

This project is expected to enhance waste management in the city, particularly by:



Increased community participation.



Increased social cohesion.



Improved municipal capacity in project monitoring.

SDG



Sustainable Cities and Communities

Target 11.3

By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlements planning and management in all countries

RESILIENCE VALUE

Improve data sharing, systematic coordination and collaboration between public agencies, plastic production industry figures and citizens. Increase access to waste management data, statistics and efforts towards green development.

ACTIVITIES FOR IMPLEMENTATION

There are four current initiatives that should be discussed under the City Taskforce

- (1) Delivery of information to the community.
- (2) Waste segregation and recycling.
- (3) Facilities monitoring.
- (4) Discipline.

In particular, the city taskforce will focus on:



Educating the community to get involved in waste segregation at source, recycling and other actions.



Empowering public involvement in waste segregation at source.



Running awareness campaigns on recycling and the smoke-free and litter-free policies.



Raising awareness about clean rivers and coastal areas.



Monitoring community compliance with waste segregation at source.



Monitoring the behavior towards conserving river water and coastal areas.



Creating data observatory.



Coordinating with federal and state agencies to share knowledge and data.

Further Understanding the Resilience Value

This initiative has been designed to be a resilient project. Not only will it transform the waste management cycle in Melaka, making it more robust, innovative and adaptable to the needs of the city, but it will also develop more interconnected systems, so Melaka becomes better-prepared to survive and thrive from the shocks and stresses it faces. Conceptually, this means thinking about this project from three perspectives:

- How the project itself demonstrates qualities of resilience, so that the city is in a better position to 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 in general.

Beyond the immediate objectives to be achieved, the transformation sought will include and maximize all those “co-benefits” generated by the project that contribute to the structural, community and/or individual resilience of the citizens of Melaka City. For this, the link between the waste management system and the city, 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:

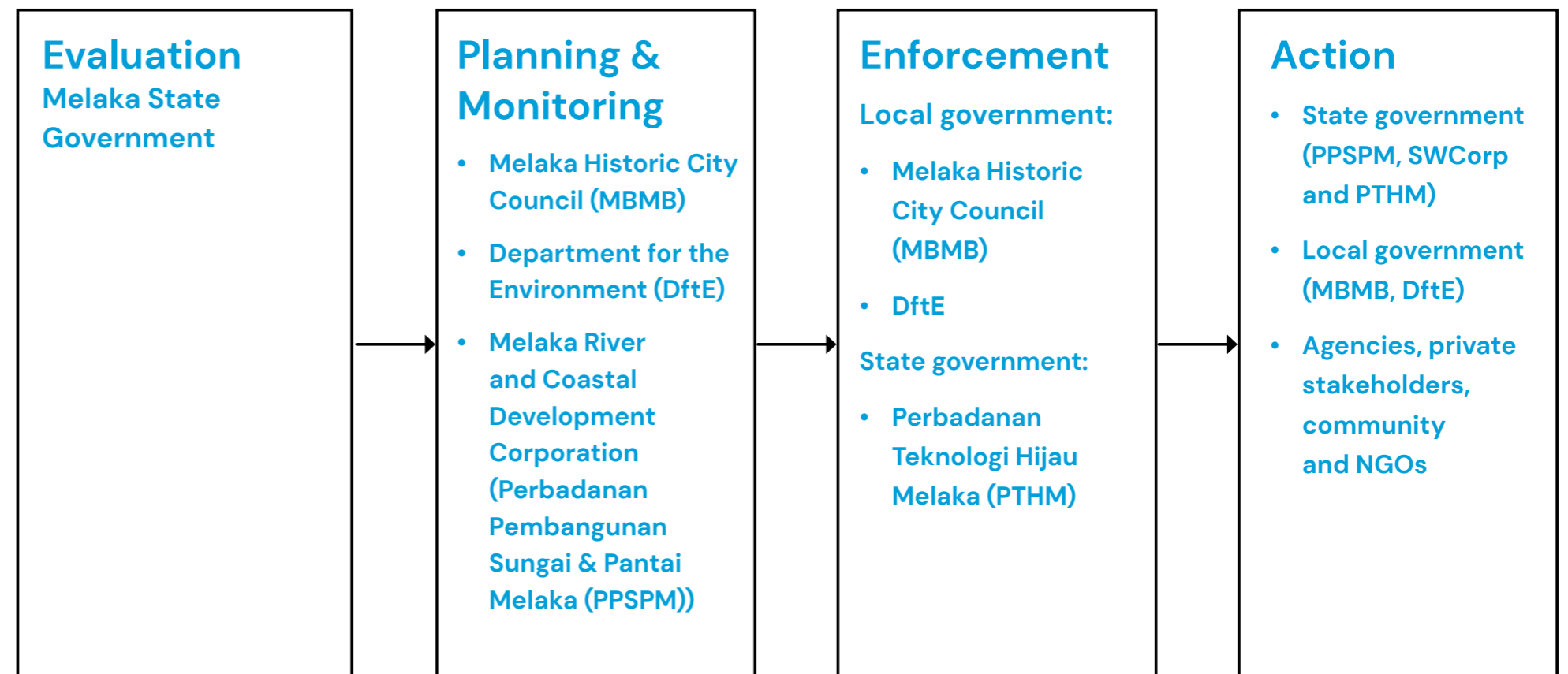
REFLECTIVE	Systems that have mechanisms to continuously evolve and will modify standards or norms based on emerging evidence, learning from past experiences.	Under the city taskforce, municipal capacity will be created to monitor, track and evaluate results from all components of the project. Data will be collected and analysed.
ROBUST	Systems that include well-conceived, constructed, and managed physical assets so they can withstand the impacts of shocks and stresses.	The design and selection of sites for the collection infrastructure will take into account its capacity to address multiple challenges and withstand shocks and stresses. The pilot location is the “net-zero district”, a place in the city that will drive innovation in terms of infrastructure designed to reach net-zero GHG emissions.
REDUNDANT	Systems that create spare capacity purposely to accommodate disruption, extreme pressure, and surges in demand	<ul style="list-style-type: none"> • The project is designed to create incentives for businesses and the private sector to also invest in waste management infrastructure.
FLEXIBLE	Systems that can change, evolve, and adapt in response to changing circumstances.	The city taskforce is being designed to accommodate different stakeholders and their evolving roles in waste management in the city.
RESOURCEFUL	Systems that can rapidly find different ways to achieve their goals or meet their needs during a shock or under stress.	Increasing the capacity to monitor project implementation and environmental indicators provides essential information for the city to rapidly find solutions.
INCLUSIVE	Systems that emphasize the need for a broad consultation and engagement of communities.	The city taskforce is designed to be inclusive of different stakeholders.
INTEGRATED	Systems that promote consistency in decision-making and ensure that all investments are mutually supportive to a common objective.	The project is built to integrate coordination among agencies and projects, guaranteeing that solutions are not implemented independently.

Roadmap for Implementation

Institutional Arrangements

The state government plays an important role in evaluating the current situation of the river and coastal area. Next, the Melaka Historic City Council (MBMB), Department of Environment (DftE), and Melaka River and Coastal Development Corporation (PPSPM) will work together to plan and monitor the clean-river and coastal-area program. Then, enforcement will be under the state government (PTHM) and local government (MBMB, DftE). The program's implementation will involve cooperation between the state government (PPSPM, SWCorp, PTHM), local government (MBMB, DftE), agencies, private stakeholders, community members and NGOs (see Figure on the right).

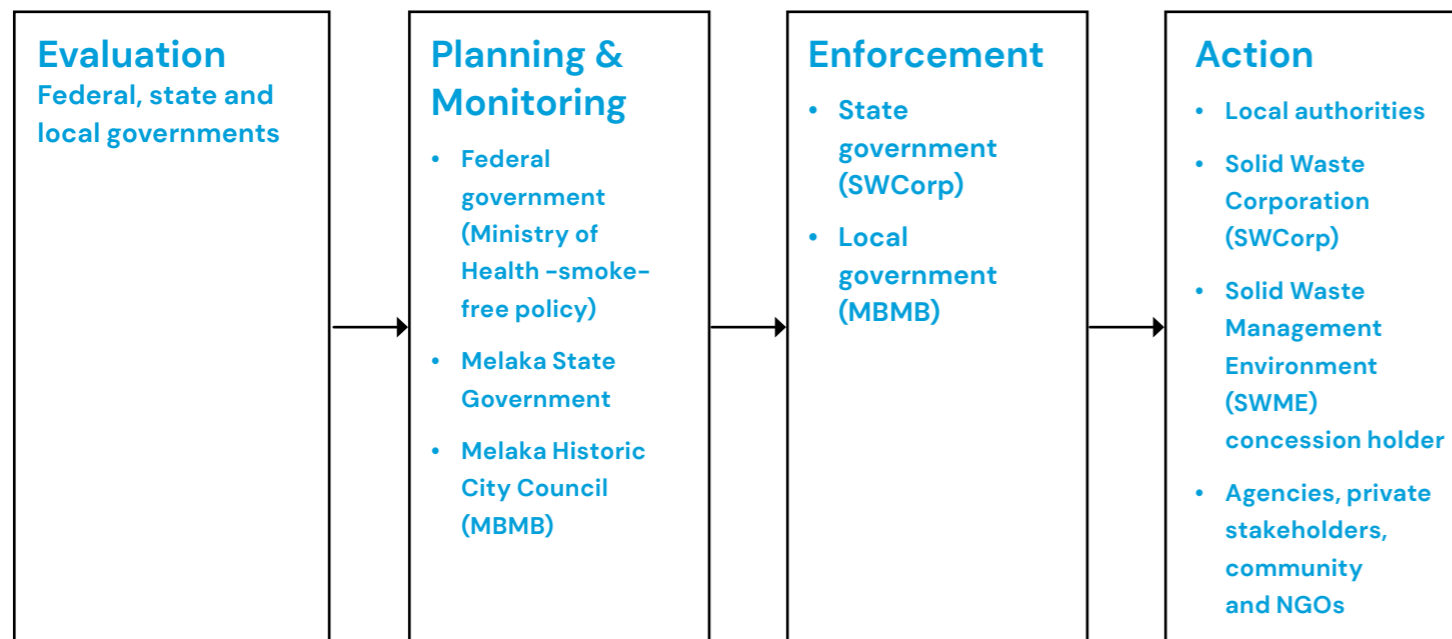
Clean River and Coastal Areas



Review the Smoke-free and Litter-free Policies and Enhance Waste Collection and Recycling Equipment

The federal, state and local governments will carry out evaluation by assessing feedback on the implemented smoke-free/litter-free policies and the current provision of waste collection and recycling facilities. Next, the state and local governments will start to plan and monitor the smoke-free/litter-free policy and associated programs and to enhance the waste management facilities. Then, the Melaka State Solid

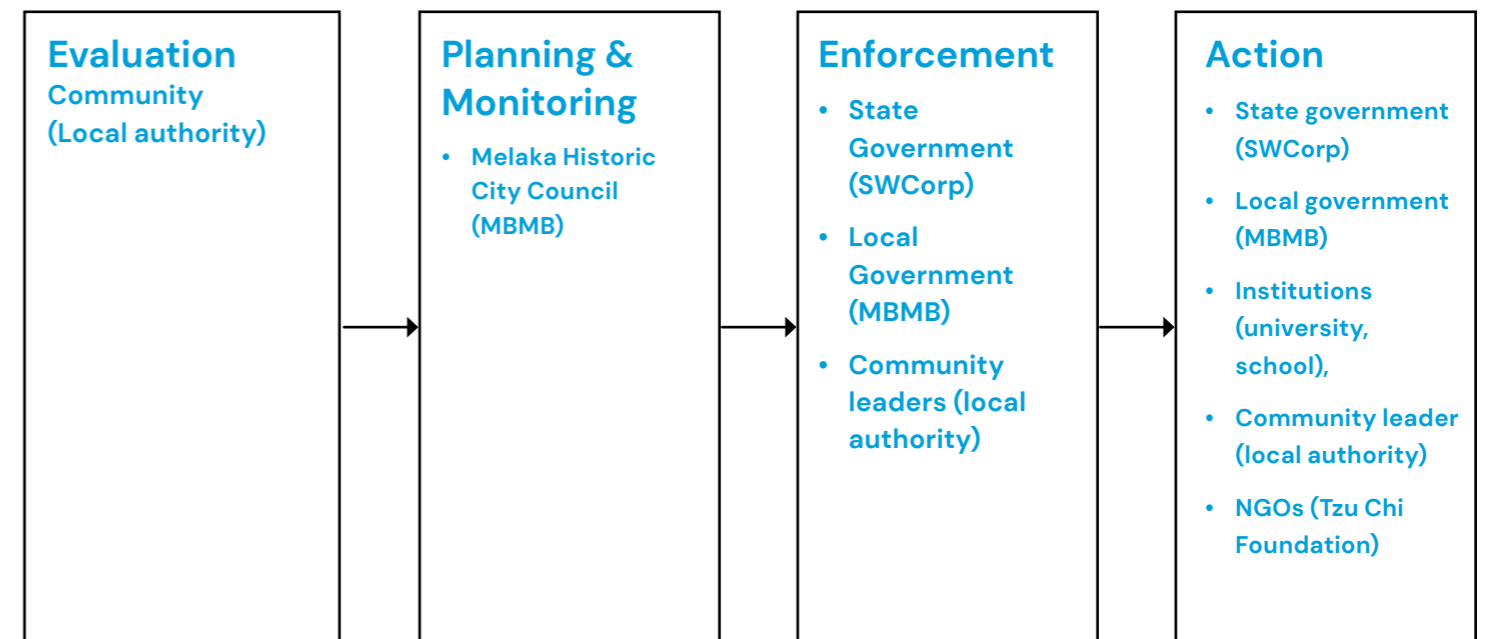
Waste Management and Public Cleansing Corporation (SWCorp) and Melaka Historic City Council (MBMB) will enforce the policy and program. Lastly, the state government (SWCorp), local government (MBMB), stakeholders (SWME, etc.), agencies, community members and NGOs will be involved in the implementation of the policy and program (see Figure below).



Establish a City Taskforce

The local community will play a part in evaluating the taskforce. The main goal of the taskforce is to encourage community engagement in waste segregation management. The Melaka Historic City Council (MBMB) will monitor the taskforce, comprising Council Members for their respective areas. Enforcement will be ensured by the state government (SWCorp),

local government (MBMB) and local authorities (State Assembly members – DUN/ADUN). Taskforce implementation is under the responsibility of a coalition composed of state government (SWCorp), local government (MBMB), institutions (university, school), community leaders (local authority – DUN/ADUN), and NGOs (Tzu Chi Foundation and others.).



Implementation Timeline

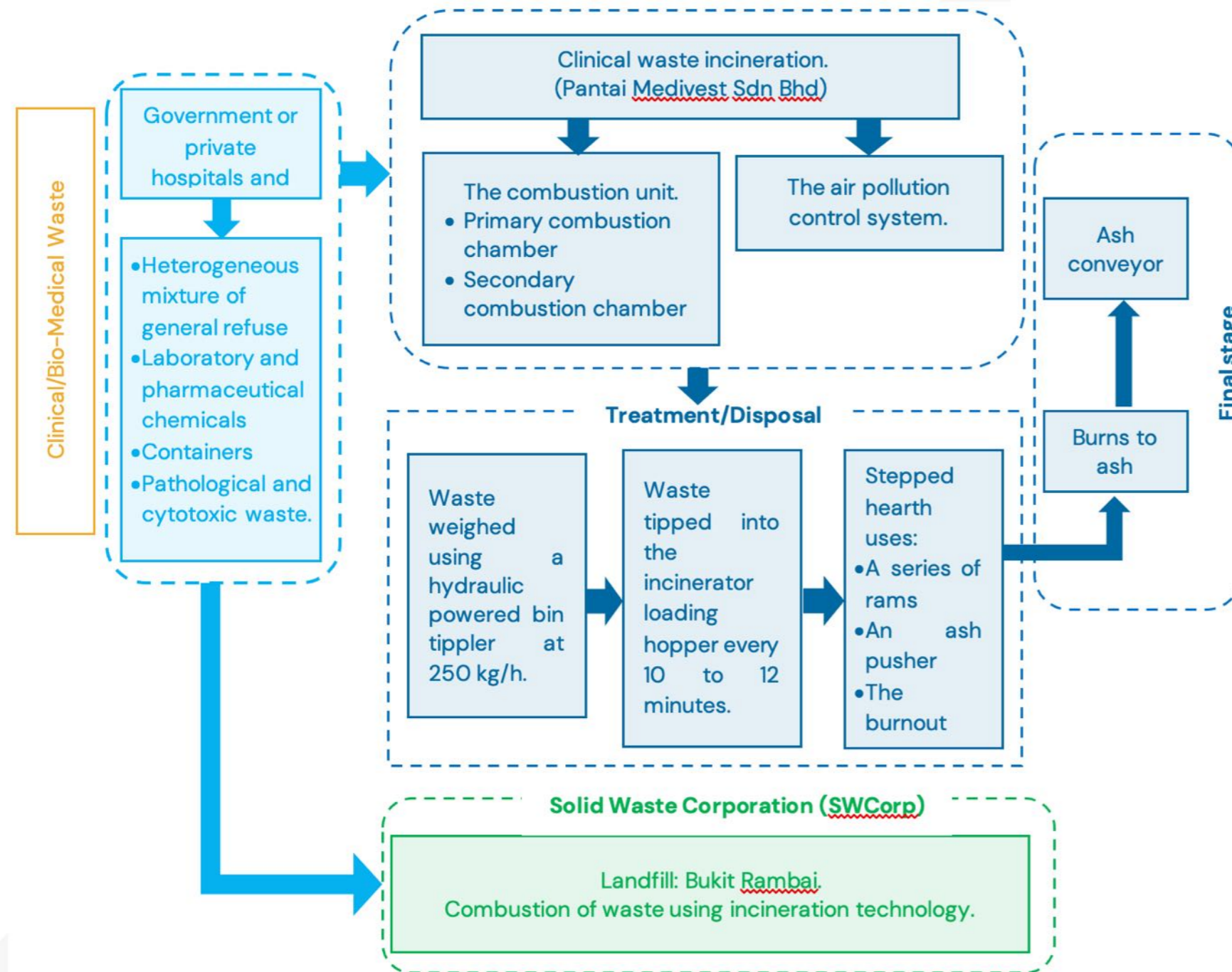
PROJECT ACTIVITY	Year 1				Year 2				Year 3				BUDGET ESTIMATION (USD)
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
1. CLEAN RIVER AND COASTAL AREA													230,000.00
Enhance the grease traps and trash trap		■											
Upgrade and increase the loading capacity of grease traps			■										
Enhance waste management technology and prevent waste from entering water bodies			■	■									
Procure advanced technologies			■	■	■	■							
Collaborate among key stakeholders and establish a core working group					■	■	■	■					
Fund R&D&C, promotion and awareness programmes							■	■	■	■			
Government initiatives							■	■	■	■			
Enhance educational promotion and awareness programmes							■	■	■	■			
2. Review the smoke-free and litter-free policies and enhance waste collection and recycling facilities													100,000.00
Collaborate on policy and infrastructure improvement	■	■	■										
Review and upgrade of Melaka's Smoke-Free Policy and creation of a Litter-Free Policy			■	■	■	■							
Enforce of Melaka's Smoke-Free Policy and Litter-Free Policy							■	■	■	■			
Implement of a centralized recycling bin system								■	■	■			
Review and achieve efficient management of recyclables collection									■	■	■	■	
Engage citizens and community							■	■	■	■	■	■	
3. Establishment of City Taskforce													100,000.00
Establish a community/society-based taskforce and support community on waste management technology approach (the community helps run the system)	■												
Educate the community		■	■	■	■								
Empower public involvement				■	■	■	■	■	■	■	■	■	
Run an awareness campaign					■	■	■	■					
Raise awareness						■	■	■	■	■	■	■	
Monitor community compliance			■	■	■	■	■	■	■	■	■	■	
Monitor behaviour			■	■	■	■	■	■	■	■	■	■	

Annexes

Annex 1: Regulations

OPPORTUNITIES	REGULATION
Clean river and coastal area	<ul style="list-style-type: none"> • Environmental Quality Act 1974 – Act 127 • Environmental Quality (Amendment) Act 2007 – Act A1315 • Environmental Quality (Amendment) Act 2012 – Act A1441 <ul style="list-style-type: none"> ◊ An act relating to the prevention, abatement, control of pollution, and enhancement of the environment, and for purposes connected therewith. • The Melaka Green City Action Plan (2017-2030) <ul style="list-style-type: none"> ◊ The Melaka Green City Action Plan was formed in 2014 as a guideline and strategy for creating a sustainable city.
Review the smoke-free and litter-free policies and enhancing waste collection and recycling facilities	<ul style="list-style-type: none"> • The 11th Malaysia Plan 2016-2020 <ul style="list-style-type: none"> ◊ The 11th Malaysia Plan provides the guiding principles for effective and sustainable waste management. • The Melaka Green City Action Plan (2017-2030)
Establish a city taskforce	<ul style="list-style-type: none"> • Act 672 (Solid Waste and Public Cleansing Management Act 2007) <ul style="list-style-type: none"> ◊ An act to provide for and regulate the management of controlled solid waste and public cleansing to maintain proper sanitation and for matters incidental to it. • The Eleventh Malaysia Plan 2016-2020 • The Melaka Green City Action Plan (2017-2030)

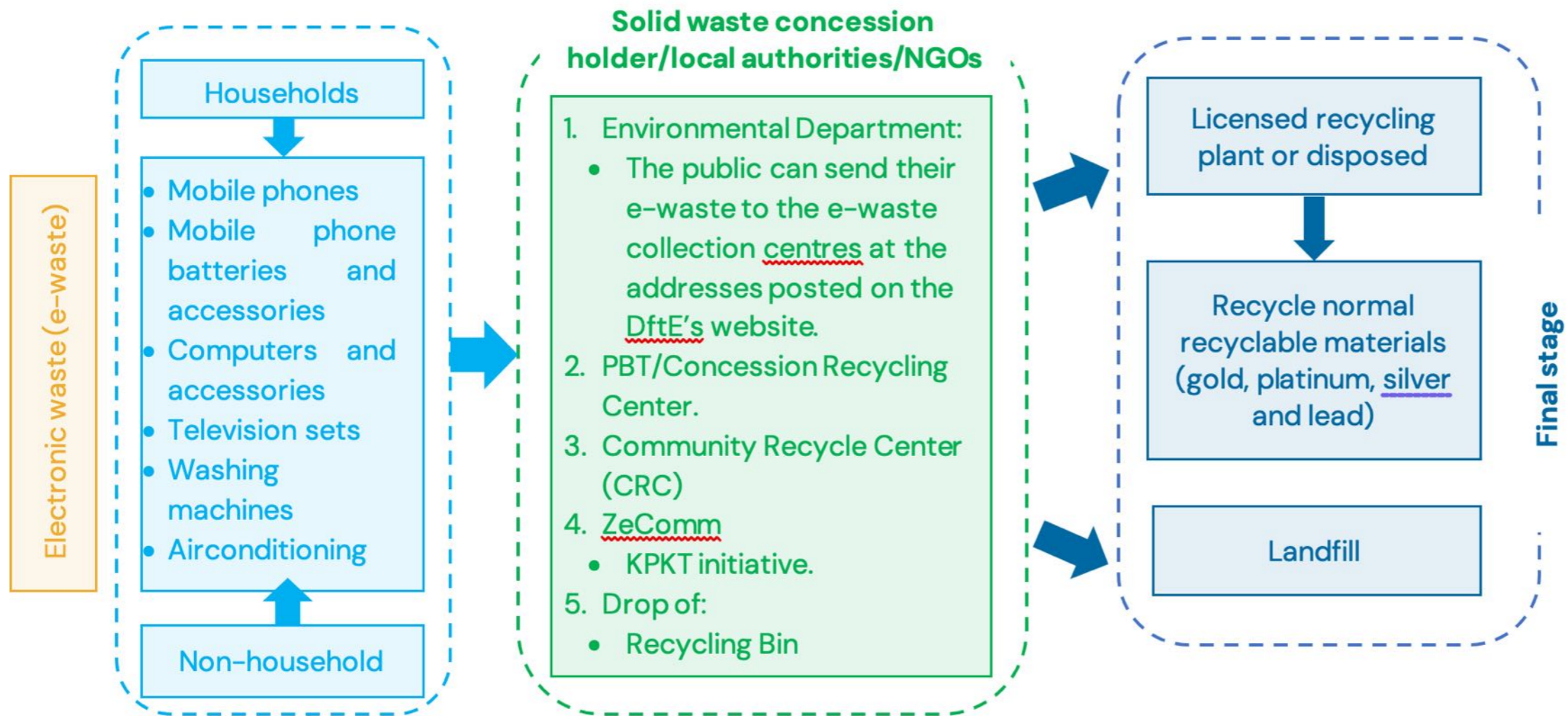
Annex 2: Extra Information about Waste Management in Melaka



- Clinical waste incineration. Waste is collected from various government or private hospitals and clinics throughout the southern region. The clinical waste management in Melaka is managed by the concession companies, which are Pantai Medivest Sdn. Bhd. (PMSB).
- Clinical waste generated at the hospital is collected daily and transported to temporary storage at the hospital. During collection, new bags and containers of clinical waste marked with the international infectious material symbol are used to replace the accumulated ones.
- Incineration is the last step in clinical waste management. All clinical waste collected and transported to the incinerator plant is burned to ash. PMSB sends their clinical waste to their designated area at the incinerator in Bukit Rambai.

References:

- [1] Baharun, S., Adnan, R., Mohamad, I., Arshad, K., Ahmad, T., Rashid, M., & Zamri, I. (2005). Variables affecting the combustion efficiency of a clinical waste incineration process. *Jurnal Teknologi*, 42, 11–24
- [2] Ghasemi, M. K., & Yusuff, R. B. M. (2016). Advantages and disadvantages of healthcare waste treatment and disposal alternatives: Malaysian scenario. *Polish Journal of Environmental Studies*, 25(1), 17–25.
- [3] Fam, S. F., Utami, S., Prastyo, D. D., Maukar, A. L., Khairuddin, M. A. A. M., & Mustaffa, M. H. (2018). Melaka moving forward to incineration technology management to overcome Municipal Solid Waste (MSW) problem. *International Journal of Engineering and Technology (UAE)*, 7(3.14 Special Issue 14), 386–390.
- [4] Dasimah Omara, Siti Nurshahida Nazlib, Subramaniam A/L Karuppanan. (2012). Clinical Waste Management in District Hospitals of Tumpat. *Procedia - Social and Behavioral Sciences* 68 (2012) 134 – 145 Batu Pahat and Taiping



Melaka City Electronic Waste (E-Waste) Management System

References:

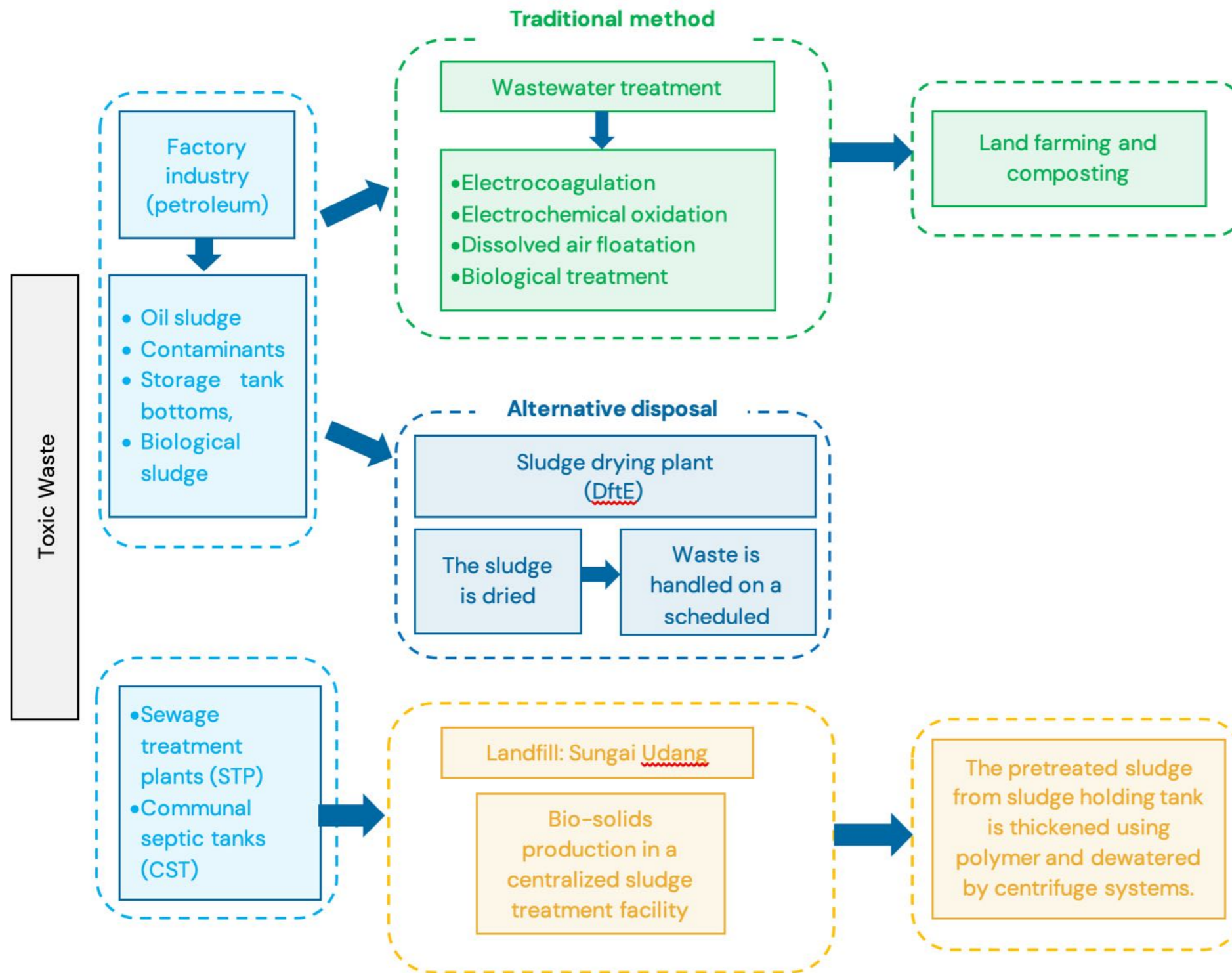
- [1] Tiep, H. S., Kin, T. D. Y., Ahmed, E. M., & Teck, L. C. (2015). E-Waste Management Practices of Households in Melaka. *International Journal of Environmental Science and Development*, 6(11), 811–817. <https://doi.org/10.7763/ijesd.2015.v6.704>
- [2] Report: Melaka full list of information centers and recycling facilities.

a) The public can send their electronic waste (limited to used mobile phones, batteries and accessories, computers, their accessories; and television sets) to the e-waste collection centers at the addresses posted in the DftE's website (www.doe.gov.my) The solid waste concession holders/local authorities are responsible for managing these e-waste collection centers.

b) Their source of e-waste are several intermediaries, collectors, and recycling centers.

c) According to the Malaysian Department for the Environment, all this e-waste is classified as scheduled waste that must be handled by a licensed contractor and transported to a licensed recycling plant or disposed of at a scheduled waste disposal facility.

d) The main activities are to recycle normal recyclable materials such as plastics and metals and to extract valuable metals such as gold, platinum, silver and lead from circuit boards.



Melaka City Toxic Waste Management System

- Toxic waste is generated during petroleum exploration, production, refining and distribution. It is defined as any waste falling within the categories listed in the First Schedule of the Environment Quality (Scheduled Wastes) Regulations 2005.
- Electrocoagulation is an emerging technology that combines the functions and advantages of conventional methods, such as electrochemistry, coagulation, and floatation . It applies the same concept as coagulation, in which the coagulant is generated from its electrode without any need for additional chemical coagulant. Electrocoagulation is based on the principle of electrolysis, using metal electrodes and electric current. Land farming and composting
- Sludge drying plant was built as an alternative disposal method allowed by the Malaysian DftE. Sludge is dried before being sent to Kualiti Alam, a certified scheduled waste handling facility.
- The CSTF is managed and operated by Malacca Indah Water Konsortium (IWK) Sdn. Bhd., Malaysia.

References:

- [1] Mokhtar, N. M., Omar, R., Salleh, M. A. M., Idris, A., Energy, G., & Putra, U. (2011). Characterization Of Sludge from The Wastewater-Treatment Plant Of A Refinery Dielectric Properties Measurements. 8(2), 48–56
- [2] Mahmud, F., Tamrin, K. F., and Sheikh, N. A. (n.d.). A Review of Enhanced Micromixing Techniques in Microfluidics for the Application in Wastewater. Analysis Advances in Waste Processing Technology
- [3] Rahmat, S., Kusina, F.M., & Johari, W.L.W. 2014. Desalination and Water Treatment Performance assessment of centrifuge dewatering unit using multivariate statistical approach: a case study of a centralized sludge treatment facility (CSTF) in Malacca, Malaysia. Desalination and Water Treatment. 37–41.

Endnotes

- ¹ Intergovernmental Panel on Climate Change (2021). Report on Climate Change 2021: the Physical Science Basis. Link: www.ipcc.ch/report/sixth-assessment-report-working-group-i
- ² World Bank (2020). Link: <https://blogs.worldbank.org/developmenttalk/new-poor-are-different-whothey-are-and-why-it-matters>
- ³ International Labour Organization (2018). World Employment Social Outlook; Eunomia (2015). The potential Contribution of Waste Management to a Low Carbon Economy. www.eunomia.co.uk/reports-tools/the-potential-contribution-of-waste-management-to-a-low-carbon-economy
- ⁴ World Resources Institute (2021). 5 Opportunities of a Circular Economy. Link: <https://www.wri.org/insights/5-opportunities-circular-economy>
- ⁵ DOSM (2020).
- ⁶ SWCorp (2017)
- ⁷ Melaka Historic City Council (2020).
- ⁸ More information on these three types of waste is included in the Appendix.
- ⁹ United Nations Framework Convention on Climate Change (2015). Malaysia's update of its first Nationally Determined Contribution. www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Malaysia%20First/Malaysia%20NDC%20Updated%20Submission%20to%20UNFCCC%20July%202021%20final.pdf
- ¹⁰ Kuokkanen et al. (2013).

