URBAN
OCEAN

PROJECT STATEMENT

Bangkok

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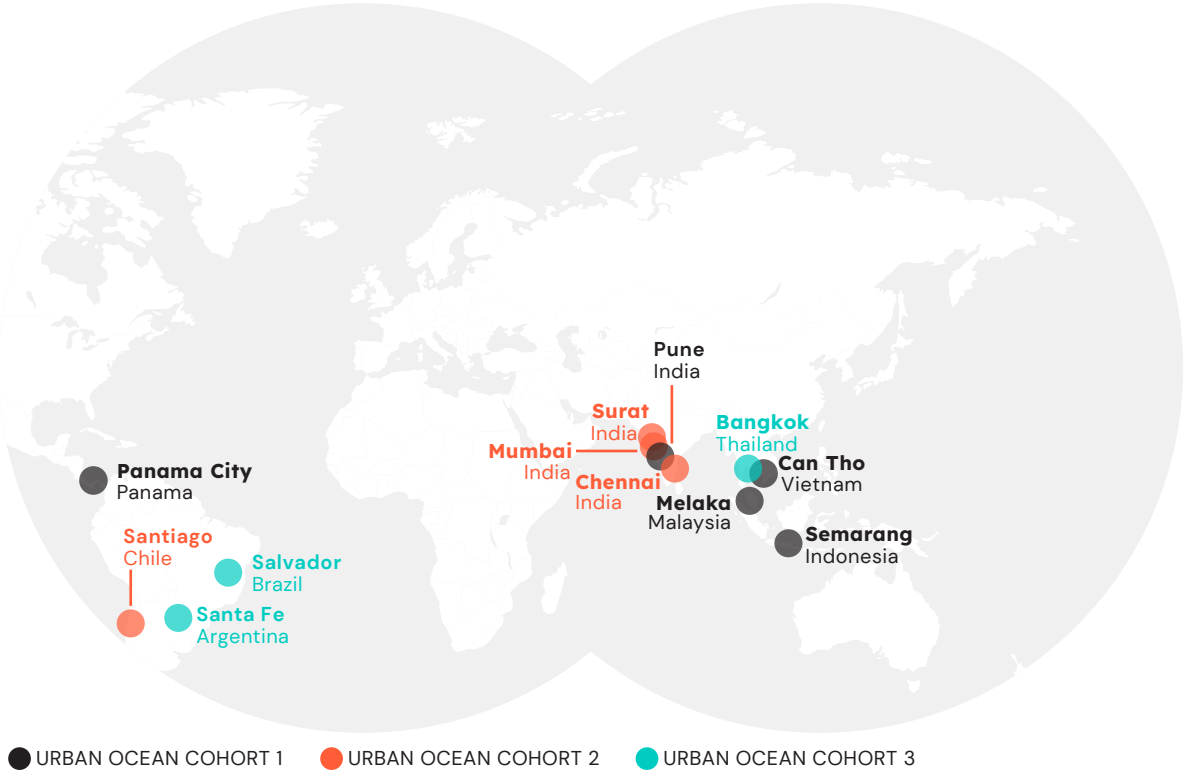
1. Introduction

Urban Ocean is a capacity-building and accelerator program for cities that champions circular economy principles, builds awareness of ocean plastic pollution, and assesses waste management systems. The program works with city leaders to bring new ideas, partners, and resources together to solve interrelated resilience challenges associated with waste management, reduce plastic leakage, and protect the ocean and other water bodies. It demonstrates how actions to improve waste management and recycling can provide resilient and sustainable solutions that reduce ocean plastic pollution while addressing key city priorities such as improving public health, supporting economic development, and reducing greenhouse gas emissions. Furthermore, Urban Ocean provides cities with the opportunity to showcase leadership and share knowledge and experience across the Resilient Cities Network community and beyond.

The program is jointly led by Resilient Cities Network, Ocean Conservancy, and The Circulate Initiative, in partnership with Bangkok Metropolitan Administration (BMA) and King Mongkut's University of Technology Thonburi.

FIGURE 1
Urban Ocean Cities



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 emissions. Neither climate nor social targets will be met without a deep transformation of urban centers

towards a more inclusive, sustainable and, ultimately, resilient path. Approaching urban waste management systems through a resilience lens reveals complex, interrelated ramifications for social, economic, and environmental systems. The International Labor Organization estimates that the waste management sector alone has the potential to create 45 million jobs globally by 2030 while reducing greenhouse gas emissions by 15 to 20 percent. Additionally, within the same time frame, circular economies offer a $4.5 trillion USD economic opportunity by reducing waste, stimulating innovation, and creating employment. Currently, plastic usage continues to grow, remaining a threat to public and environmental health in the ocean and in cities. City governments have a unique opportunity to implement policies and projects that promote a more resilient and circular waste sector in their cities. Now is the time to set out on the path towards a more resilient urban–ocean relationship that highlights the importance of preventing marine plastic debris.

Urban Ocean Cities

Urban Ocean works closely with cities to demonstrate tangible solutions and highlight progress in addressing waste management challenges. The first cohort of Urban Ocean cities, launched in 2020, included Pune (India), Can Tho (Vietnam), Panama City (Panama), Semarang (Indonesia) and Melaka (Malaysia). In 2022, the program expanded to four additional cities in Cohort 2 – Chennai, Surat, and Mumbai (all in India) and Santiago (Chile), and then in 2023 to Cohort 3 – Salvador (Brazil), Bangkok (Thailand), and Santa Fe (Argentina). This expansion aimed to broaden the program's geographic scope, strengthen waste management, circular economy, and resilience ecosystems, increase collaboration with local governments, and establish effective waste-management systems that generate environmental, social and economic co-benefits for cities.

Program Objective

Urban Ocean provides a platform for ocean advocates, city leaders and allies to join forces with other collaborators in developing comprehensive solutions that meet the needs and priorities of cities and their communities, creating meaningful and sustainable impact. The program provides and coordinates baseline assessments to gauge the efficacy, challenges and opportunities of existing waste management systems. Urban Ocean sparks critical conversations that help participating cities identify, develop and implement solutions to improve waste management and reduce plastic pollution through circular and resilient lenses that also promote social inclusion, public health, environmental protection, and reductions in greenhouse gas emissions. Once opportunities are identified, Urban Ocean supports cities to attract support to implement solutions.

Program Approach

Urban Ocean provides support for cities to develop strategies and projects designed to address the interrelated challenges of ocean plastics and community resilience. The program approach in cities is shown in figure 2:

FIGURE 2
Urban Ocean Program Approach

Project Statement

This project statement is the result of two years of work and dedication by the BMA, King Mongkut's University of Technology Thonburi and the Urban Ocean team to develop specific actions that the city hopes will advance solutions to address plastic waste challenges. The project statement is based on the results of a Circularity Assessment Protocol (CAP), a rigorous gap assessment process and several one-on-one interactions and consultation sessions that helped the city pinpoint the best opportunities for impact. It outlines the context and the needs of the city on which the project is built. It provides the city's vision and outlines the desired impact.

The statement presents the specific characteristics and conditions of Bangkok that have a direct impact on the detailed project. For a more detailed overview of the functioning of the waste management system and the local political context, see Bangkok's Waste Management Profile. For a more comprehensive analysis of material flows and opportunities to drive the transition to a more circular economy, see the Circularity Assessment Protocol. Both documents were developed within the Urban Ocean framework.

2. Executive Summary

Bangkok Context

Bangkok, Thailand's capital, serves as the national hub for administration, education, tourism, finance, and development. Originally a small fortress town on the Chao Phraya River, it has evolved into one of Southeast Asia's most prosperous and modern cities. With a population of around 5.4 million residents, Bangkok spans 50 districts and covers an area of 1,568 square kilometers. Rapid growth and industrial prosperity in the city have led to migration from across the country and beyond, causing an increase in the city's population and bringing economic, environmental and social challenges. Bangkok is also vulnerable to climate change impacts, including rising sea levels and flooding.

Bangkok is defined by its extensive network of rivers and canals (khlongs) and its proximity to the ocean. These waterways have driven development in Bangkok through transportation and trade. Bangkok's urban development, along with its expanding population and degree of sprawl, contributes significantly to the increase in waste generation. The city generated over 9000 tons of waste daily in 2024 (The Active, ThaiPBS), with a per capita generation of around 1 kg, exceeding the global average of 0.74 kg (World Bank, 2018). The ongoing surge in economic activities and tourism also intensifies waste production, often outpacing the city's existing waste management infrastructure. Thailand has integrated circular economy principles into its national policies to tackle the growing waste crisis. Bangkok, as the capital city, has been at the forefront of these efforts by transitioning its waste-management system to include more recycling and composting and seeking technologies to create value from its waste. Both national and local waste management strategies over recent years have evolved to include actively engaging with communities in waste management practices for long-term impact.

Project Statement for Bangkok

The project statement focuses on leveraging identified opportunities to enhance systems aimed at preventing waste leakage into Bangkok's environment and waterways. The opportunities identified for Bangkok emerged from a series of consultations with BMA staff and key stakeholders to build local, sustainable and resilient solutions in one neighborhood by activating collaborative and cross-sectoral efforts, rooted in effectuating change on the ground and building momentum to scale to other parts of the city.

VISION

Bangkok aims to implement a comprehensive waste separation and recycling project that encourages environmental stewardship among citizens. The initiative will involve local communities, businesses, and institutions in promoting circular waste management, focusing on recycling and organic waste segregation to reduce landfill waste and prevent plastics from polluting local canals and the ocean

OBJECTIVES

1. Foster positive behavioural changes related to waste separation and recycling through targeted awareness and engagement initiatives.
2. Cultivate a culture of reuse and recycling by promoting sustainable practices and facilitating access to recycling opportunities.
3. Enhance data collection and waste traceability in alignment with the district office's annual key performance indicators (KPIs) ensuring transparency and accountability.
4. Leverage tourism for waste reduction to raise awareness and reduce plastic waste leakage into the environment and local canals, engaging tourists in sustainability efforts.
5. Foster stakeholder collaboration with community members, local businesses and schools for a collective sense of responsibility towards a cleaner environment and improved public health.

Community-Driven Solutions for Waste in Thonburi

THONBURI DISTRICT CONTEXT

The project is proposed for implementation in the Talat Phlu area of Thonburi district, which is one of Bangkok's 50 districts and known for its extensive canals and its role as a key transportation and commerce hub via the river. The district is rich in cultural landmarks, including renowned temples, vibrant markets, local eateries and traditional wooden houses lining the canals. Unlike the bustling core of central Bangkok, Thonburi is known for its relaxed, community-oriented atmosphere. Economically, Thonburi thrives in diverse sectors such as retail, services and traditional crafts, with a strong focus on supporting local businesses.

The Talat Phlu area has been promoted as a community tourism hub through various initiatives, including the Creative District project and Bangkok Design Week. In November 2024, Bangkok Governor Mr. Chadchart Sittipunt visited Talat Phlu to highlight the area's potential for further promotion and revitalization. Additionally, there is strong local interest from communities for waste management and environmental improvements. The Thonburi District Office is actively working on decentralized waste management and data collection efforts to strengthen the district. Thonburi's proximity to the Chao Phraya River, which flows into the Gulf of Thailand, makes its waste-management practices directly relevant to ocean health. The Urban Ocean project further supports this initiative, offering an opportunity to advance solutions that align with the city's policy plan to enhance public participation in waste management across BMA districts.

KEY STAKEHOLDERS FOR IMPLEMENTATION

LEAD AGENCIES

- BMA
- Thonburi District Office
- KMUTT
- YOLO
- JAK Reward Technology

KEY PARTNERS

- Community leaders in Talat Phlu
- Wat Ratchakri school
- Local entrepreneurs in Talat Phlu
- Sun Power Boat
- Talad Phlu Du Dee Group
- Private contractors for waste collection hired by Thonburi district

FIGURE 3

Snapshots of Talat Phlu Area in Thonburi District, Bangkok

Source: KMUTT Project Team, Thonburi District Office

ACTIVITIES FOR IMPLEMENTATION

1 EMPOWER LOCAL COMMUNITIES IN THONBURI DISTRICT FOR WASTE SEPARATION

Appointing local champions and encouraging and enabling community members to participate in this initiative effectively will foster community collaboration to enhance waste separation. Regular workshops with demonstrations will be undertaken with champions, community leaders, residents and the district office to understand core issues and raise awareness of the importance of waste separation, aid in the selection of a location for a waste bank within the community and reduce the amount of waste entering the canals. Additional micro-activities, such as community clean-up days, can be organized based on the specific needs and characteristics of each community.

2 ESTABLISH A COMMUNITY WASTE BANK FOR RECYCLABLES

Establishing a waste bank in the community in collaboration with the district office, local non-governmental organizations (NGOs) and active groups will provide valuable expertise and resources. A site for the waste bank will be designated, and the bank will be equipped with sorting bins and a robust record-keeping system, with clear guidelines for waste deposits to ensure the system runs smoothly. To encourage participation, a rewards system for recyclables will be implemented and regular collection events such as pop-up markets will incentivize community members.

3 HOST POP-UP RECYCLING WASTE MARKETS AT WAT RATCHAKRI SCHOOL

Putting in place a pop-up recycling waste market will provide a physical space for community members to drop off recyclables, participate in educational activities and engage with sustainable waste-management practices. Such markets will be set up bi-monthly at the Wat Ratchakri school to serve as a platform for local business and individuals to display and sell their innovations using recycled products. The market will also host workshops and live demonstrations on topics like waste separation, recycling processes and composting.

4 COLLECT DATA TO IMPROVE THE TRACEABILITY OF RECYCLABLES

To ensure effective waste traceability, an integrated data collection system with a dashboard is being developed by JAK Reward Technology, an organization working closely with Thonburi district and several other communities in Bangkok. This system will be adopted for the selected community to enhance existing data collection efforts concerning recyclables by leveraging the digital platform to streamline the process of capturing and managing waste-related information, in alignment with the district's annual KPIs to be reported to the BMA.

5 IMPROVE ORGANIC-WASTE SEPARATION AND TRACKING

The objective is to encourage households to separate their waste and assess the amount of organic waste being generated by households and establishments in the community by applying the digital system being developed by JAK Reward Technology. Additionally, local shops and restaurants will be encouraged to participate in organic-waste separation, in alignment with the BMA's initiative launched in 2024 to promote separation of food waste in markets. Given that more than half of the waste generated in Bangkok is organic, reducing this volume can significantly alleviate pressure on landfills, minimize greenhouse gas emissions and promote more sustainable waste-management practices. Organic waste separation and quantity of separated organic waste can increase through a multipronged strategy that encourages composting at both the individual and community levels, as well as in businesses and institutions. The city could establish industrial-scale composting facilities to handle organic waste collected from various sources, including households, businesses and markets.

6 INTEGRATE SUSTAINABILITY INTO TOURISM

Sun Power Boat and the Talat Phlu Du Dee Group organize boat and walking tours in the area and are interested in integrating sustainability principles into their tours. By working with private tour operators, the project aims to engage with tourists to cultivate a culture of cleanliness and environmental awareness and to reduce waste dumping in the canals.

7 ENCOURAGE COMMUNITY-DRIVEN SOLUTIONS FOR PLASTIC REMOVAL FROM SUB-CANALS

This activity will assess the extent of plastic pollution in the sub-canals and engage community members to brainstorm effective strategies for clean-ups through a sense of shared responsibility for maintaining a clean environment. Partnering with contractors hired by the district office will ensure efficient collection and disposal of waste captured, creating a seamless process for both the community and local authorities.

IMPLEMENTATION ROADMAP

The project emphasizes local partnerships and leadership to drive sustainable waste management in Talat Phlu that will create impactful, scalable solutions aligned with Bangkok's sustainability goals.

TABLE 1 IMPLEMENTATION ROADMAP

Implementation Timeline	**2 years**
Budget	**8,342,425 Thai Baht** ($241,250 USD)
Scaling and Sustainability Plan	Starting the project in a single neighborhood community will help refine the approach and ensure effectiveness before scaling up and will allow testing of models for waste segregation, collection and recycling. This approach aims to create a model that can be scalable in other communities within the district and eventually to other districts in Bangkok. The project will collaborate with local and international environmental organizations that can provide expertise, resources, and funding. NGOs can help with the educational and engagement components, as well as advocacy and policy. Corporate sponsors can be leveraged in the first year of the project to explore potential funding streams. By demonstrating measurable success in Thonburi, the project will position itself to attract government support, funding and potential grants for expansion into other districts in Bangkok.

3. Bangkok Context

Overview

Bangkok, also known as Krung Thep Mahanakorn in Thai, is in central Thailand and is the country's capital and the national center of administration, education, tourism, finance and development. Rapid growth and industrial prosperity in the city have led to migration from across the country and beyond, causing an increase in the city's population. Historically a small fortress town on the eastern bank of the Chao Phraya River, Bangkok has now turned into one of Southeast Asia's most prosperous and modern cities. Central Thailand is known for its flat and fertile plains which are reliant on natural and artificial waterways. To this day, the river and canals are integral to the city's landscape and economy, with thousands of people using an extensive network of large and small river and canal boats for transport and commercial purposes. In the 20th century, the river and its delta developed quickly to support port facilities, warehouses, shipyards and rice mills. Over the decades and with the influence of globalization, Thailand has grown its export industries beyond agricultural products to include vehicles, electronics, heavy and light machinery, plastics and refined petroleum to become one of the major exporting countries in the region and the 22nd largest exporter in the world (Resilient Cities Network, 2016).

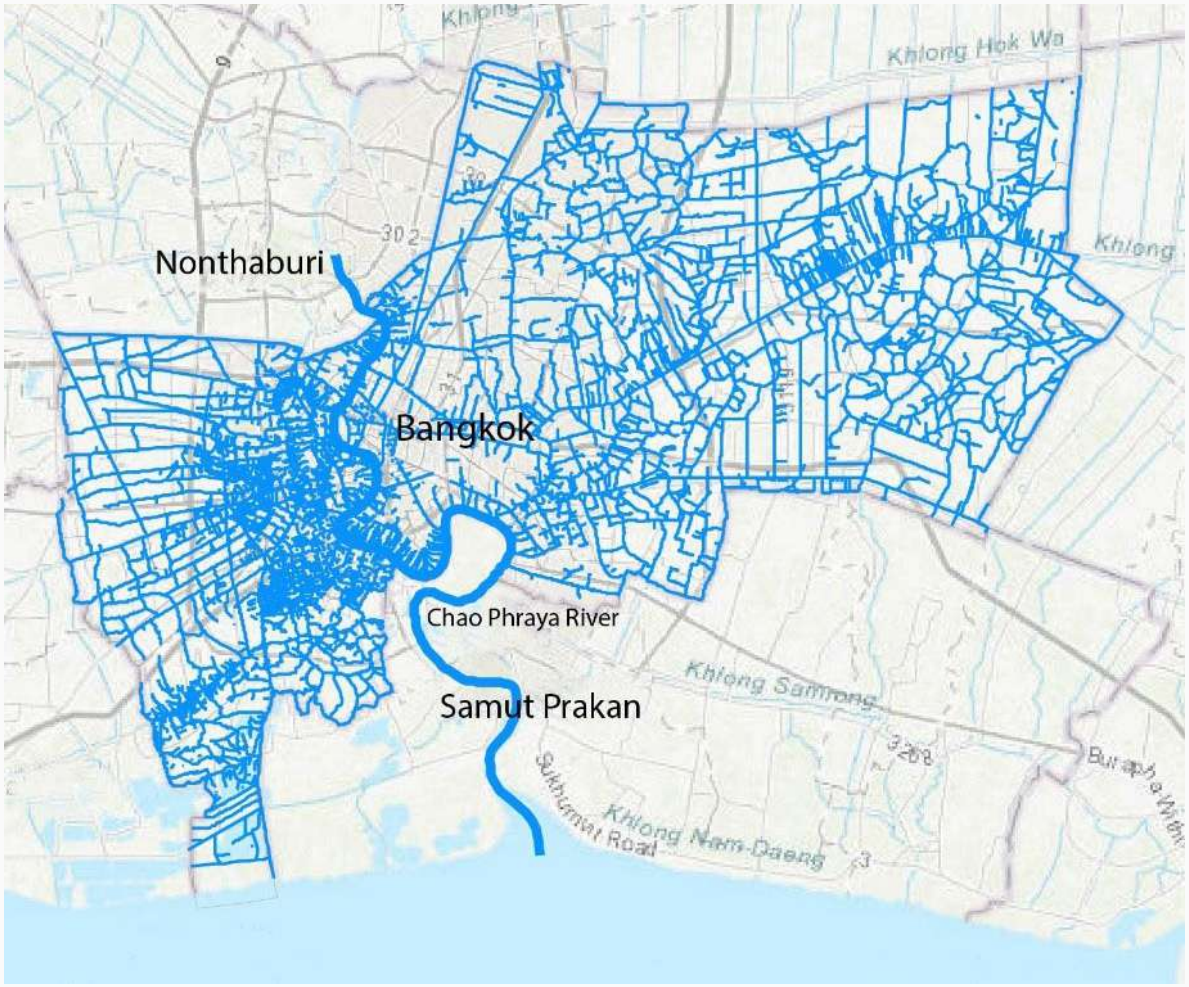
Bangkok has a population of approximately 5.4 million residents across 50 districts, covering an area of 1,568 square kilometers – its population density is about 3,488 people per square kilometer. The city's rapid population growth has increased the built-up area to nearly 16 times its size since 1958, bringing economic, environmental and social challenges. Bangkok is also vulnerable to climate change impacts, including a 1.2-centimeter annual rise in sea levels, compounded by groundwater extraction and construction activities that contribute to land erosion and subsidence (Global Covenant of Mayors for Climate and Energy Southeast Asia, 2023).

Renowned for its lively street scenes, rich cultural heritage and flavorful cuisine, Bangkok attracted an estimated 22.78 million visitors in 2023 (Royal Thai Embassy, Copenhagen, Denmark, 2023). Tourism boosts economic resilience for local communities; however, it also puts pressure on waste-management systems, especially in popular tourist areas. Some 16.8 kilotons of mismanaged plastic waste is estimated in tourist hotspots annually, some of which leaks into the environment from inadequate disposal and waste going uncollected, polluting the city's environment and waterways (World Bank Group, 2022).

Bangkok's urban development, degree of sprawl and increasing population each contribute to rising waste generation. The surge in economic activities and tourism also intensifies waste production, often outpacing the city's existing waste-management infrastructure. In 2024 Bangkok embraced smart city initiatives and innovative infrastructure projects, such as the Ocean Cleanup's efforts to address plastic pollution in the Chao Phraya River. However, environmental concerns with air and water pollution accentuate the need for long-term and sustainable upstream solutions in addition to effective waste collection, disposal and recycling practices. Preparing for long-term solutions will align Bangkok with the United Nations Agenda 2030 Sustainable Development Goals for urban resilience and sustainable growth. The city's efforts to manage waste are essential for maintaining public health and enhancing the overall quality of life, while also adapting to and mitigating the environmental impact of urbanization.

FIGURE 4

Chao Phraya River and the extensive network of canals in the city



Source: Bangkok Office of Urban Planning and Development

Bangkok and its Waterbodies

Bangkok's identity is inextricably linked to its extensive network of rivers, canals (khlongs), and proximity to the Gulf of Thailand. Historically, these waterways served as vital transportation routes and trade arteries, shaping the city's development and cultural heritage. However, this intimate relationship presents significant challenges. The Chao Phraya River, while a lifeblood for transportation and economic activity, is vulnerable to flooding caused by rapid development around the riverbed built on its floodplain, which is further exacerbated by climate change. The khlongs, though charming, suffer from pollution and neglect for reasons such as waste and sewage disposal. Bangkok's coastal location provides access to marine resources but also raises concerns about marine pollution originating from land-based activities. According to the Department of Drainage and Sewerage, the BMA collected close to 400,000 tons of garbage from around 950 canals across the city between 2014 and 2019 (Bangkok Post, 2019).

Even with regular clean-ups and collection efforts by the BMA, waste continues to pollute the water and clogs the drainage system, increasing flooding and impacting water quality and public health. Most stakeholders interviewed during the circularity assessment protocol – a key baseline assessment of plastic waste and circularity within the city conducted as part of the Urban Ocean program – saw plastic pollution as a major problem, especially when it comes

to water pollution. They noted the foul smell and visual pollution of plastic waste in their everyday lives. Several respondents observed problems with plastic waste clogging drainage pipes in marketplaces and walkways and causing flooding. The biggest concern, however, was the impact of plastic pollution on aquatic wildlife and, eventually, human health.

Addressing these challenges requires a holistic approach encompassing practical and evidence-based strategies and policy interventions, improved waste management systems, sustainable community practices and adaptation to the growing dynamic city. Effective flood management is crucial, alongside efforts to reduce contaminants, such as plastic, from entering the waterways. For the city's long-term sustainability and the well-being of its communities and economy, it is vital to protect the biodiversity of the river and canal ecosystems while fostering sustainable economic activities like fishing, trade, floating markets, restaurants and boutique hotels.

Bangkok's Waste Management System

Thailand is among the five countries in the world discarding the most plastic waste pollution into oceans (United Nations Economic and Social Commission for Asia and the Pacific, 2019). Solid-waste management in the country is governed by central policies and implemented by local authorities like the Bangkok Metropolitan Administration. Bangkok's waste-

FIGURE 5
Canals and Waterways in Bangkok

Source: R-Cities

management system is complex and evolving, addressing challenges related to sustainability in a large urban environment. The city generates over 8,500 tons of waste daily (BMA, 2024), with a per capita generation of around 1 kg, exceeding the global average of 0.74 kg (World Bank Group, 2018). Factors such as population growth and economic development contribute to the increasing waste generation. The BMA Environmental Department oversees the city's waste management and collaborates with its 50 district offices. An overview from source to disposal of waste is shown in Figure 5.

Major sources of waste in Bangkok include households, offices, schools and industrial sites. A significant portion of this waste is food waste, accounting for 42-52 percent of the total, while recyclable materials comprise 10-12 percent. With more than 30 percent of recyclables going unprocessed, significant opportunities exist to increase recycling in the city.

FIGURE 6
Waste Management System in Bangkok

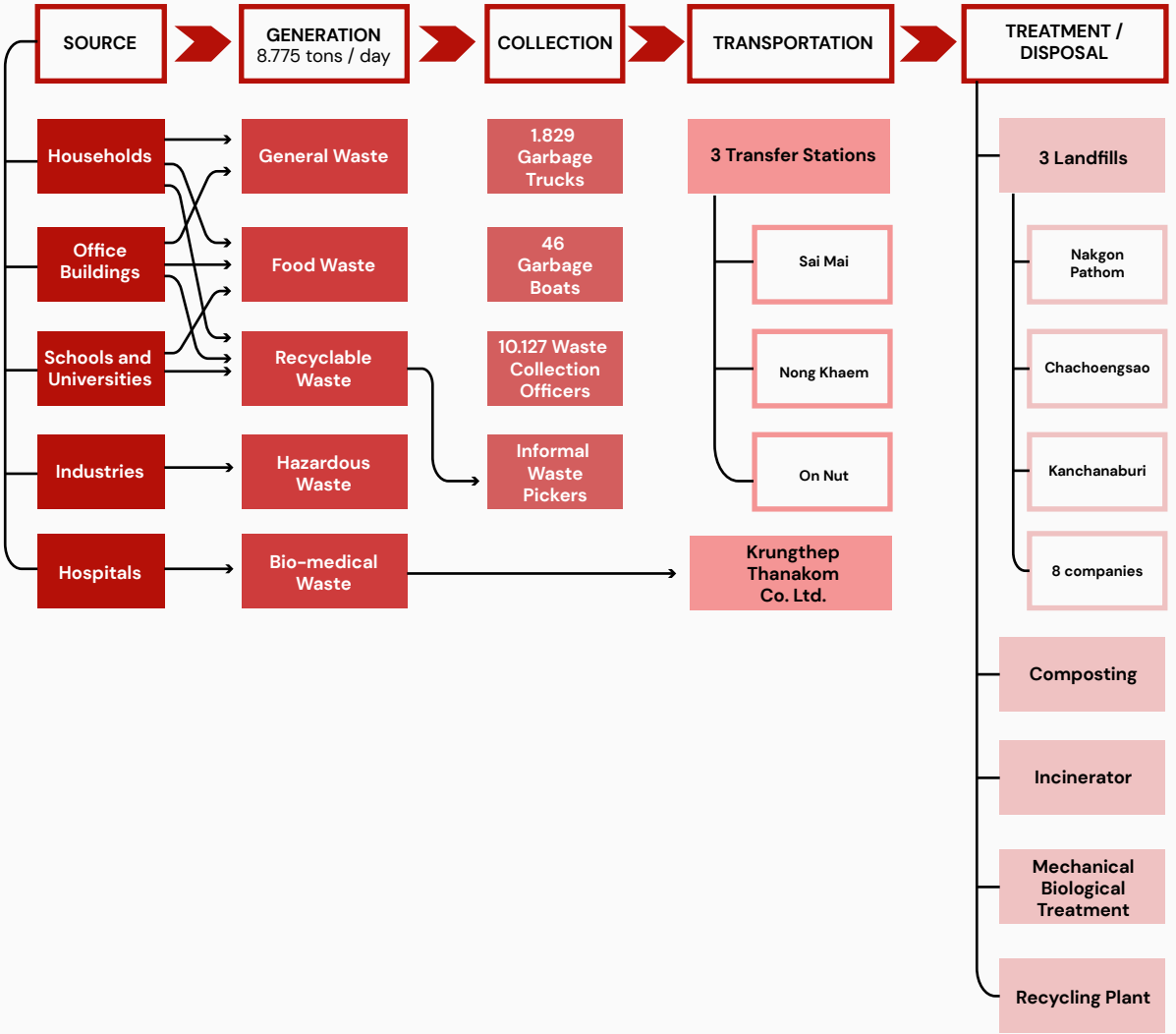
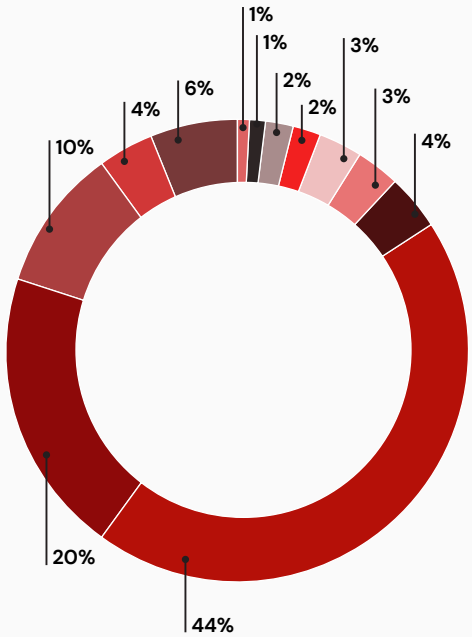


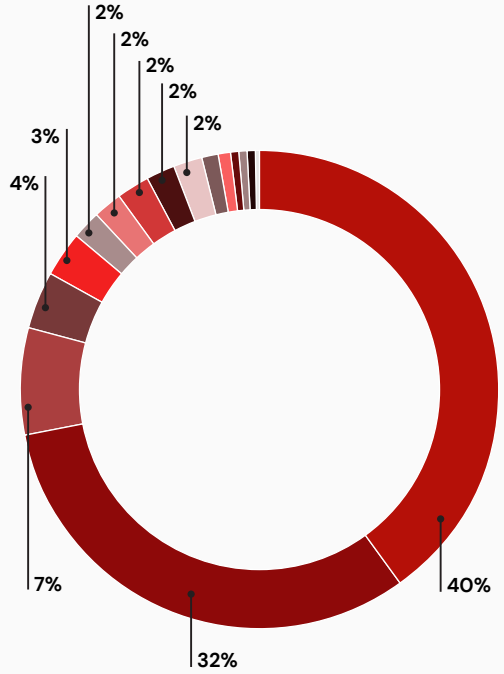
FIGURE 7
Material Breakdown for Litter Items



- Other compositing types
- Stone and ceramics
- Leather and rubber
- Metal
- Bones and shells
- Foam
- Glass
- Recycled paper
- Clothes and fabrics
- Non-recycled paper
- Non-recycled plastic
- Food waste

Source: United Nations Economic and Social Commission for Asia and the Pacific

FIGURE 8
Deonar Dumping Ground



- Food related plastic packaging
- Tobacco products
- Other plastic
- Metal
- Paper
- Cloth
- Plastic fragments
- Glass
- Organics
- Personal protective equipments
- Food-related paper
- Personal care
- Construction and demolition materials
- Electronic waste
- Other
- Fishing gear

Source: CAP Report 2024

The circularity assessment protocol for Bangkok found the most common litter items in the city to be plastic cigar/cigarillo tips, straws and plastic food wrappers, highlighting the challenges in managing single-use, low-value plastic. Stakeholder interviews point to a significant amount of waste such as plastic cups or bags being observed in the canals, polluting the water. This waste is harder to collect and process because of its diverse composition and variable degradation rates due to prolonged exposure to water. Preventing waste from entering canals and waterways is crucial for maintaining ecological balance, safeguarding public health, and reducing clogging and blockages of stormwater systems. City-level data indicate some 20 percent of total waste being non-recycled plastic which then leaks into the environment. Improved at-source segregation and collection, along with more convenient access to recycling bins and a focus on recycling infrastructure, are key to preventing recyclable materials from leaking into the environment. Mainstreaming recycling as part of the solid waste management services provided by the BMA will help Bangkok achieve a cleaner and more sustainable waste management system.

The canals in the city are connected to the Chao Phraya River, which receives an estimated 385,300 kg of plastic debris per year (Oceanic Society, 2023). This floating waste chokes the waterways and the river, severely impacting both the surrounding communities and the river's ecosystem, and it further exacerbates issues of flooding and clogging during heavy rainfall. There are efforts to clean up and recycle collected plastics in Bangkok's waters through groups like the TerraCycle Thai Foundation or the Ocean Cleanup, however community-level efforts are crucial as they are sustainable, localized, upstream solutions to prevent waste from entering the waterways in the first place. Community-level efforts foster a sense of responsibility, collaboration and resilience among residents, helping to protect waterways from pollution.

Waste collection in the city is managed by the BMA through door-to-door services that occur daily or every other day. Bangkok's waste management infrastructure includes more than 1,800 garbage trucks and around 45 garbage boats, along with more than 90,000 waste bins provided to communities, placed in small alleys, schools and government offices, managed by over 10,000 waste collection officers, ensuring effective waste management even in inaccessible areas. In narrow alleys, workers manually transport waste using small handcarts to maintain cleanliness. The BMA has been taking steps to encourage waste separation at the source as part of its larger strategy to improve waste management, reduce waste transported to landfills and increase recycling. Some districts of Bangkok have introduced incentive schemes whereby households and businesses are rewarded for separating their waste properly. For example, people who separate recyclables might receive discounts on waste collection fees or participate in local programs where they can exchange recyclables for small rewards, such as household products or vouchers. The BMA charges a monthly waste collection fee of 20 baht ($0.5 USD) for households, with an increase to 60 baht ($1.75 USD) planned to be implemented in middle of the year 2025 for those who do not separate their waste.

After it is collected, municipal solid waste is transported to three large waste transfer stations in Bangkok. The Nong Khaem Waste Transfer Station relies heavily on waste-to-energy technology to process waste, a practice that, while generating electricity, produces significant greenhouse gas emissions and fails to reclaim plastics for recycling. The Nong Khaem Waste Transfer Station also employs mechanical–biological treatment for a small amount of waste, aimed at material recovery. However, approximately 2,700 tons per day are still disposed of via landfilling, which highlights the urgent need for improved waste segregation at the source to enhance the recovery of recyclable materials and reduce landfill and reliance on waste-to-energy processes. Additionally, waste-to-energy plants have negative consequences because of associated greenhouse gas emissions and because they have no reuse or recovery of plastics for recycling. Urban Ocean partners recognize the need for implementable and circular solutions that hold plastics producers accountable for the full lifecycle of their products, cease the leakage of plastics into the environment and incentivize reuse. Future waste strategies must emphasize alternatives such as increased recycling rates, composting for organic waste, and community-level reuse initiatives to minimize environmental harm.

The On Nut Waste Transfer Station focuses on organic waste management through composting, although better segregation of organics and general waste is necessary for optimal efficiency to reduce contamination, lower operational costs and maximize the quality of compost. Last, the Sai Mai Waste Transfer Station processes around 1,200 tons through a mixed-waste treatment system, while about 1,600 tons are handled via traditional landfill methods. The reliance on landfilling and mixed systems at Sai Mai indicates a pressing need for investments in infrastructure to boost recycling and composting capacities across all stations.

Outside of the BMA's services, actions by residents and NGOs constitute part of the waste-management system. Local communities regularly engage in recycling programs, supported by educational campaigns from NGOs and civic groups that raise awareness about proper waste separation at source. Private recycling companies and informal waste collectors, known as Saleng, play vital roles in this process by collecting recyclables like plastics, paper and metal from households and businesses to sell to recycling facilities. The materials are then taken to recycling centers, where they are sorted, cleaned and processed into raw materials for new products. Additionally, Thailand's first material recovery facility is currently under construction in Bangkok as part of the Smart Recycling Hub project, aiming to recover at least 50,000 tons of plastic waste annually. The informal recycling sector in Bangkok plays a crucial – but often

overlooked – role in the city's waste-recycling system, primarily comprising waste pickers and municipal waste-collection crews. These individuals contribute to recycling by separating recyclables from waste streams at transfer stations and collection points, which enhances overall recycling rates and provides supplemental income. Informal recyclers handle a significant portion of the city's recyclable materials, particularly those that the formal system struggles to efficiently collect or process, such as low-value items or those dispersed across various locations. Operating at a lower cost than formal systems thanks to cheap and readily available manual labour and reduced regulatory overhead, the informal sector reaches areas where formal collection systems may be inadequate or non-existent, broadening the scope of recycling efforts. Furthermore, this sector provides employment for many individuals who are often from low-income backgrounds, making it an essential component of Bangkok's waste management landscape.

Policies and Mandates

The Government of Thailand plays a crucial role in the management of solid waste across the country, particularly in setting policies, providing guidelines and ensuring the implementation of waste management strategies. The Pollution Control Department and the Department of Climate Change and Environment, under the Ministry of Natural Resources and Environment, is responsible for developing national policies and regulations on waste management. These are implemented by local authorities in the country, such as the BMA for the city of Bangkok. Within the BMA, the overall environmental management and improvement in the performance of solid waste management is the responsibility of the Environment Department and the Environment and Sanitation sections within each of the 50 BMA district offices. The national and local policies guiding waste management in Bangkokare summarized as follows.

TABLE 2 NATIONAL LEVEL POLICIES AND REGULATIONS

#	Act, regulation or guidelines	Year	Key Provisions
1	**Waste Management Act**	1992	Establishes responsibilities for waste generation, collection, transportation, treatment and disposal; promotes recycling, and waste reduction.
2	**National Environmental Quality Act (NEQA)**	1992, revised in 2019	Aims to maintain and improve environmental quality, including provisions related to waste management; sets standards for waste treatment and disposal.
3	**Hazardous Substances Act**	1992	Regulates the management of hazardous waste to protect public health and the environment.
4	**National Policy on Solid Waste Management**	2016	Outlines the national strategy for solid-waste management, encouraging public participation and collaboration.
5	**Regulations on Plastic Waste Management**	2019	Aims to reduce plastic waste and promote sustainable alternatives; implements a ban on specific single-use plastics and establishes reduction targets. The Ministry of Natural Resources and Environment's Pollution Control Department and Department of Climate Change and Environment play key roles in policy and enforcement.

TABLE 3 LOCAL LEVEL POLICIES AND REGULATIONS

#	Act, regulation or guidelines	Year	Key Provisions
1	**Waste Management Ordinance**	2000	Establishes the framework for waste management in Bangkok, defining roles and responsibilities.
2	**Bangkok Solid Waste Management Plan**	2021-2025	Outlines strategies and actions for improving solid waste management; focuses on waste reduction, improved segregation and recycling, and enhanced treatment facilities.
3	**Bangkok's Plastic Waste Reduction Strategy**	2020	Aims to reduce plastic waste within the city; encourages businesses to adopt sustainable practices.
4	**Local Environmental Quality Standards**	N/A	Set guidelines for waste management operations and treatment plants.
5	**Community Engagement Guidelines**	N/A	Promote community involvement in waste management. The BMA's Environment Department is primarily responsible for local waste management implementation, working closely with 50 district offices.

Thailand has integrated circular economy principles into its national policies and strategies to tackle the growing waste crisis. Bangkok, as the capital city, has been at the forefront of these efforts, with initiatives focused on improving the city's waste management system to support a more circular approach. Bangkok's waste management system has been transitioning to include more recycling and composting and has been seeking technologies to create value from its waste. National and local waste management strategies over recent years have both evolved, with significant attention being paid to engaging actively with communities in waste management practices for long-term impact.

4. Bridging Challenges and Opportunities

This section documents the waste management challenges prioritized in the city of Bangkok. These challenges were identified by the CAP and the Opportunity Assessment Tool (OAT) under the Urban Ocean program. This process included strategic consultations with stakeholders such as city officials and representatives of NGOs, academia and civil society involved in waste management. The identified challenges, in turn, inform the opportunities and recommendations in this project statement.

Challenges

→ Inadequate Waste Separation at Source

The BMA is actively promoting at-source waste separation through a combination of public awareness campaigns, waste segregation infrastructure, incentives and regulatory measures. However, despite efforts by district offices to promote waste separation at the household level, a lack of participation is witnessed in many communities. In condominiums, apartments or housing-estate settings managed by a legal entity, households are often not given the option to separate their waste, as they have already paid a waste management fee to the management entity. Nonetheless, some residents, particularly housekeepers, manage to segregate certain recyclable materials that are free from food contamination for extra income, thereby contributing to a reduction in the waste being directed to landfills. Bangkok's waste management infrastructure faces challenges in keeping up with the city's rapid population growth and increasing waste volume. Landfill space is increasingly limited, and the current system struggles to efficiently handle all waste types. Additionally, inefficient waste separation at the source significantly hampers the effectiveness of recycling programs. The lack of consistent and widespread at-source separation contributes to large amounts of mixed waste, including recyclable materials, ending up in landfills and leaking in the city's waterways.

→ High Plastics and Food Waste Generation in Commercial Areas and Markets

Food waste consistently accounts for a significant portion (42-52 percent) of overall waste in Bangkok. Much of this food waste is generated in the several food markets that act as tourist hubs throughout the

FIGURE 9
Mixed waste before collection

Source: KMUTT Project Team

city. In addition, the recent surge in online food orders for delivery has contributed to an increase in the amounts of non-recyclable plastic and paper waste. Thee high volume of food and plastic waste places significant pressure on the city's waste-management infrastructure, underscoring the urgent need for enhanced waste-reduction and recycling strategies.

Also, many restaurants still use single-use plastic containers given the convenience factor and low cost, leading to significant amounts of plastic waste that is not recyclable. Food contamination renders single-use plastic containers difficult to clean, and the low market value of this plastic makes recycling economically unfeasible. As a result, the district office is responsible for managing a considerable volume of non-recyclable plastic waste within the city's waste management system.

→ Need for an Improved Recycling Ecosystem

The Ministry of Natural Resources and Environment and local authorities in Bangkok have developed waste management plans that focus on reducing the waste being sent to landfills and on promoting recycling. The BMA is implementing waste segregation programs to encourage households and businesses to separate recyclable from non-recyclable waste, by providing color-coded bins for different types of waste such as plastics, paper and organic waste.

However, the recycling ecosystem in Bangkok is complex, involving various stakeholders, including government authorities, waste management companies, informal waste pickers and local communities. While recycling efforts in the city have made progress in recent years, challenges remain in terms of efficiency, public awareness and infrastructure. Among the more innovative approaches to increase recycling rates, Bangkok has recycling centers where residents can drop off recyclable materials. The recycling centers are often run by the BMA or private waste management companies. However, the availability and accessibility of these centers remain limited in some areas of the city.

Currently, a private company, WasteBuy Delivery, has partnered with the BMA to buy recyclable waste from households, offices and schools. However, WasteBuy Delivery still faces challenges in increasing access to recyclable waste and operating in different neighborhoods. The high operational costs of using vehicles for waste collection restricts service availability, hindering any expansion of recycling collections. Because of the compound challenges in collection and access to materials for buyers, only certain communities can organize and sell recyclable waste, and those who can do so must collect a substantial volume of recyclables to effectively fill their collection containers.

→ Vulnerability to Climate Change Impacts

Bangkok's susceptibility to flooding, intensified by climate change and a shrinking permeable surface area, significantly impacts its waste-management system. Floods carry and accumulate waste, clouding drainage systems and worsening floods. Waste collection is hampered as flooded roads prevent access, leading to waste build up and eventually disease risk.

Additionally, the water bodies, historically used for transportation and waste disposal, are increasingly polluted by improper waste disposal. The interconnectedness of the city's waterways necessitates effective flood management strategies and a comprehensive approach to mitigating the environmental effects of waste. Bangkok is the economic hub of Thailand, and climate change poses significant risks to its infrastructure systems. Disruptions to these systems can have far-reaching economic consequences for the city and country and for the livelihoods of its residents. Addressing climate change vulnerabilities in Bangkok is vital for protecting the city's infrastructure, economy, health and residents.

Opportunities

→ Community-led Initiatives for a Holistic Approach to Waste Management

To address the considerable generation and mixed composition of waste in Bangkok, a multifaceted approach is needed. This involves city-wide as well as community-level campaigns promoting mindful consumption and reusable alternatives, targeted strategies to reduce waste in various sectors through educational programs and incentives, and focused interventions to minimize plastics and packaging waste leaking in the city's environment and waterways and ending up in landfills. Regulations on single-use plastics and incentivizing sustainable packaging could also be explored. A comprehensive food waste management program targeting all sources, from distribution centers to households, and incorporating composting and improved food storage practices,

FIGURE 10
Collection point for recyclable waste set up by WasteBuy Delivery

Source: Thonburi District Office

FIGURE 11
Waste collected from canals after flooding in Bangkok

Source: Nation Thailand

is also vital. Community-led initiatives are key to promoting sustainable practices at the grass-roots level, empowering individuals, creating economic opportunities and building a sense of collective responsibility. By involving everyone in the process, these initiatives foster long-term, sustainable waste management systems that not only reduce waste but also contribute to broader environmental, social and economic goals.

→ Improving Recycling through Waste Separation Programs

To enhance waste management, it is essential to create a standardized waste segregation system across the city, supported by clear labeling and by public education campaigns to ensure consistent sorting of waste. This includes providing readily accessible and appropriately sized bins for different waste streams in residential, commercial and public areas, along with considering incentives for households and businesses that comply with the system. A pilot program should be initiated in selected areas before being rolled out across the city. Additionally, recycling programs should be expanded by increasing the number of drop-off points, optimizing collection routes, and supporting the development of recycling facilities capable of handling various materials to improve efficiency and enhance resource recovery. In alignment with the BMA's vision, such programs will help improve recycling efforts because they streamline the recycling process, reduce contamination, raise awareness and increase public participation. These initiatives support the creation of a circular economy by making valuable materials more available for reuse, reducing landfill waste, and conserving resources. Additionally, they create economic opportunities, contribute to cleaner environments and foster community engagement.

→ Building Resilience to Climate Change through Efficient Waste Management

Bangkok's vulnerability to climate change impacts demands a focus on climate-resilient waste management infrastructure that is capable of withstanding extreme weather events. Strategies are needed to address pollution and flood risks – these involve improvements to drainage systems and canal management and the reduction of waste leakage that blocks these systems. Public awareness campaigns highlighting the impact of climate change on waste management and promoting responsible waste disposal are important for long-term sustainability. These efforts require a collaborative approach involving government agencies, businesses, community groups and the informal sector.

→ Fostering Local Partnerships and Collaborations

Fostering collaboration and building multi-stakeholder partnerships in meaningful ways through the collective effort of various stakeholders – governments, local businesses, non-governmental organizations, citizens and other community-based groups – will help to create more comprehensive and sustainable programs. This will bring together diverse expertise, resources and perspectives that lead to innovative solutions, higher

5. Project Overview

This project statement builds on the opportunities identified above and prioritizes strengthening systems to address the leakage of waste into Bangkok's environment and waterways. The following sections outline a project for the city that has resulted from a series of consultations with BMA staff and other key stakeholders. The primary objective of the project is to build local, sustainable and resilient solutions in one neighborhood by activating collaborative and cross-sectoral efforts, rooted in effectuating change on the ground and building momentum to scale to other parts of the city. The actions identified under the project either build upon existing innovations and systems or have been highlighted as key concerns for which new approaches need to be developed.

Goal

The project seeks to implement a comprehensive at-source waste separation and recycling project in Bangkok through initiatives that will foster a sense of ownership for environmental conservation among citizens. The project will engage representatives of local communities, businesses and institutions to promote responsible waste-management practices, including the segregation of recyclables and organic waste, with the ultimate objective of decreasing the amount of waste being sent to landfill or incineration and preventing waste from entering the local canals. The long-term goals are to improve the water quality in Bangkok's waterways, reduce the annual per capita waste generation rate and grow a circular economy.

Objective

1. **Encourage Behavioural Change:** Foster positive behavioural changes related to waste separation and recycling in a canal community within Thonburi district, Bangkok, through targeted awareness and engagement initiatives.
2. **Cultivate a Culture of Reuse and Recycling:** Establish a waste bank for collecting recyclables and create a pop-up recycling market within the community, promoting sustainable practices and facilitating easy access to recycling opportunities.
3. **Enhance Data Collection and Waste Traceability:** Improve the efficiency of waste-data collection and tracking systems in alignment with the district office's annual key performance indicators for waste management, ensuring transparency and accountability.
4. **Leverage Tourism for Waste Reduction:** Utilize tourism activities such as city walks and boat tours to raise awareness and reduce plastic waste leakage into the environment and local canals, engaging tourists in sustainability efforts.
5. **Foster Stakeholder Collaboration:** Collaborate with a diverse range of stakeholders, including community members, local businesses and school students, to create a collective sense of responsibility for maintaining a cleaner environment and improving public health.

Background

Context of Thonburi District

The proposed site for this project is the Talat Phlu area of Thonburi, one of Bangkok's 50 districts. Situated on the western bank of the Chao Phraya River, Thonburi is known for its extensive canals and its role as a key transportation and commerce hub. The district is rich in cultural landmarks, including renowned temples such as Wat Arun and Wat Prayoon Wongsawat. Thonburi also boasts vibrant markets, local eateries and traditional wooden houses lining the canals. Economically, Thonburi thrives in diverse sectors such as retail, services and traditional crafts, with a strong focus on supporting local businesses.

The Talat Phlu area has been promoted as a community tourism hub through various initiatives, including the Creative District Project and Bangkok Design Week. In November 2024, Bangkok Governor Chadchart Sittipunt visited Talat Phlu, highlighting the area's potential for further promotion and revitalization. Additionally, there is strong local interest from community members for waste management and environmental improvements. Several active community groups, such as Talat Phlu Du Dee (which promotes tourism and community economic development through city walking activities), Sun Power Boat (a sustainable boat tourism operator), Wat Ratchakri School (which advocates for sustainable waste management among students), and Khaya (JAK Reward Technology, a start-up integrating digital technology with waste banks in multiple Bangkok communities), contribute to an enabling environment for collaboration on this project.

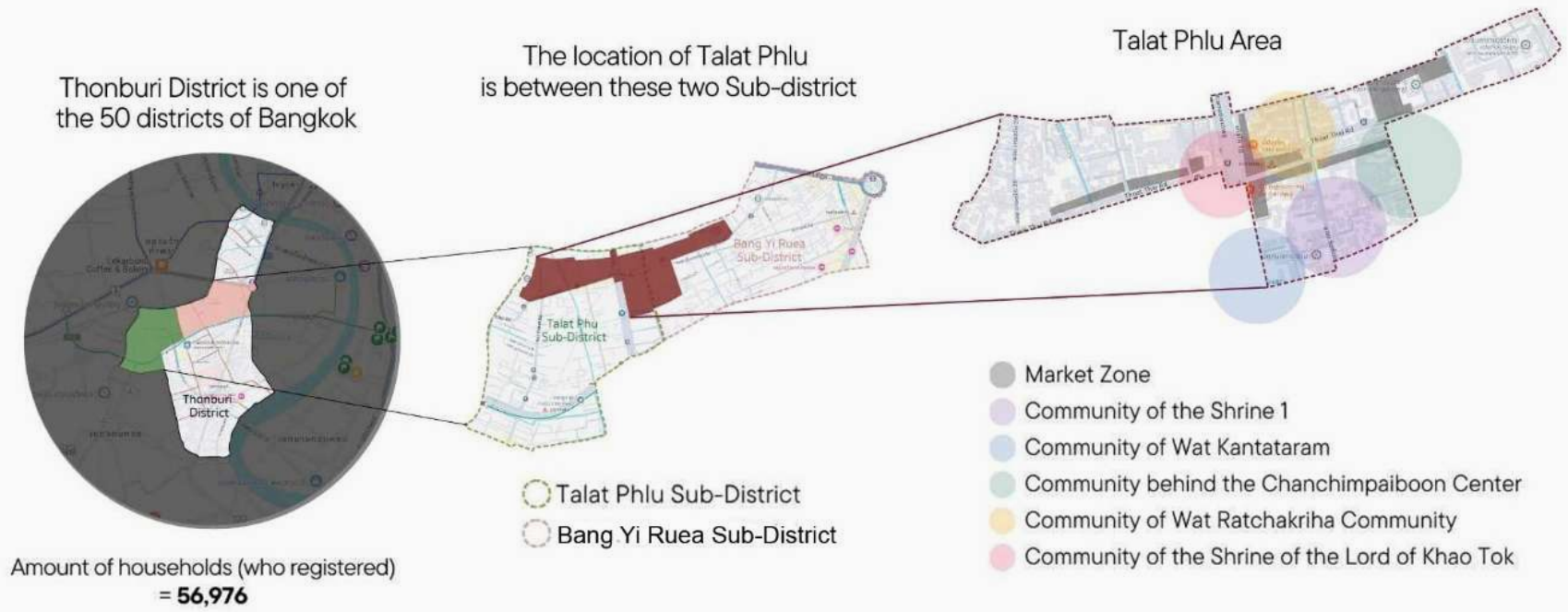
FIGURE 12
Snapshots of Talat Phlu area in Thonburi District

Source: KMUTT Project Team, Thonburi District Office

Moreover, the Thonburi District Office of the Bangkok Metropolitan Administration is actively working on decentralized waste management and data collection efforts to strengthen the district. Thonburi's proximity to the Chao Phraya River, which flows into the Gulf of Thailand, makes its waste management practices directly relevant to ocean health. The Urban Ocean pilot project further supports this initiative, offering an opportunity to advance solutions that align with the city's policy plan to enhance public participation in waste management across BMA districts.

The district is home to 56,976 registered households, with the Bang Yi Ruea and Talat Phlu sub-districts comprising 14,600 households. Together, they generate approximately 32 tons of waste daily, representing 25 percent of the total waste produced in Thonburi district according to Urban Ocean key informant interviews. The district is already engaged in various initiatives aimed at managing waste at the local level.

FIGURE 13
Map of Talat Phlu Area



Source: KMUTT Project Team, Thonburi District Office

Residents are encouraged to separate waste into categories such as general waste, recyclables and organic waste. Thonburi district has implemented several recycling programs to promote the collection of materials like paper, plastic and metal from both residents and businesses. Public education campaigns are conducted to raise awareness about waste reduction, recycling and proper disposal methods.

The Thonburi District Office is very active and has introduced several innovative waste management initiatives, including composting organic waste such as egg shells to produce fertilizer. They have also launched an online system for returning waste to the system through WasteBuy Delivery and Wongpanit Suvarnabhumi. Additionally, recycling programs like Waste to Make Merit are promoted during religious holidays. A reduce–reuse–recycle and secondhand market has been set up in front of the district office, while food waste separation has been introduced, involving 108 shops and restaurants. However, in the Talat Phlu area, only 25 to 30 of these establishments are actively participating. Despite the high volume of waste, typical of urban areas, ongoing efforts are being made to tackle the issue effectively. The proactive involvement in Thonburi make it the ideal district in which to emphasize solutions to collect recyclable materials, foster a culture of environmental stewardship and boost the local circular economy.

FIGURE 14
Waste in Talat Phlu community

Source: Thonburi District Office, Talat Phlu Du Dee Group

FIGURE 15
Waste bags placing on the sidewalk throughout the daythe day

Source: KMUTT Project Team

Moreover, Thonburi benefits from regular waste collection, which facilitates waste segregation at the source. The staff of the Thonburi District Office collects waste in the Talat Phlu area daily from 4 p.m. to midnight. Collection along the main road and in front of shops occurs at 6 p.m., with establishments required to place their waste out at most 30 minutes beforehand to prevent obstruction. However, some individuals disregard this schedule, leaving waste on the sidewalks throughout the day, which disrupts traffic and creates an unsightly urban environment. In response, the Thonburi District Office has introduced additional collection times, operating garbage trucks between 8 a.m. to 4 p.m. and between midnight to 8 a.m. to prevent waste from accumulating on sidewalks.

Finally, Thonburi district has several key elements that are crucial for further enhancing waste separation and collection efforts, notably the active community involvement and leadership. With these strengths, the district holds significant potential for driving a collective shift towards a conducive environment that promotes increased recycling and reduces waste leakage into the environment.

Activities for Implementation

1 EMPOWER LOCAL COMMUNITIES FOR WASTE SEPARATION

The objective of this activity is to foster community collaboration to enhance day-to-day waste separation. This will be done by appointing local champions to advocate for waste separation, recycling and plastic-waste reduction, as well as to encourage and enable community members to participate in the project.

Regular workshops will be organised with local champions, community leaders, residents and the district office to discuss and understand core issues and raise awareness of the importance of waste separation, reduction of waste being dumped in canals and selection of a location for a waste bank within the community. Local champions can also help communities understand how to separate recyclables, compostable waste and non-recyclables through real-time demonstrations. Additional micro-activities, such as community clean-up days, can be organized based on the specific needs and characteristics of each community. It is important to tailor these activities to the local context to ensure they remain relevant and beneficial in the long term. Finally, celebrating milestones and achievements – such as reaching a certain percentage of waste recycled or reduced – can motivate communities to maintain waste separation practices and drive long-term behavioural change.

2 ESTABLISH A COMMUNITY WASTE BANK FOR RECYCLABLES

Setting up a waste bank in the community would require active resident engagement, beginning with informative workshops and the formation of a local committee to oversee the initiative. Collaboration with the district office, local NGOs and active groups can provide valuable expertise and resources, such as donations of dustbins, recyclable waste bags and any other incentives for residents who separate recyclables or practice waste reduction.

A designated site for the waste bank will be established, equipped with clearly labelled sorting bins and a robust record-keeping system. It is crucial to develop clear operational guidelines that outline the procedures for waste deposits to ensure the system runs smoothly. Community members will be incentivized to participate via a rewards system for recyclables and regular collection events such as pop-up markets (see activity 3). Continuous education on waste separation and periodic promotional campaigns will keep the community engaged and informed. Monitoring the waste bank's progress, gathering feedback, and assessing its impact will help refine the process and further strengthen the community's commitment to sustainable waste practices.

3 HOST POP-UP RECYCLING WASTE MARKET AT WAT RATCHAKRI SCHOOL

The objective of a pop-up recycling waste market is to provide a physical space for community members to drop off recyclables, participate in educational activities and engage with sustainable waste management practices. The Wat Ratchakri school was chosen due to its existing interest in innovative waste management solutions, as well as the availability of enough space for a pop-up market. The initial preparation will include logistical arrangements by finalizing volunteers and school staff willing to be involved. It will also include securing a designated space within the school grounds and organizing equipment such as display booths, collection points and workshop spaces. The market will serve as a platform for local businesses and individuals to display and sell their innovations that make use of recycled products. The market will also host workshops and live demonstrations on topics like waste separation, recycling processes, and composting. These activities will educate the community on why these activities are essential for the environment. Conversely, community members can share tips for successful waste separation in small interior spaces or share ideas for how to address common challenges based on their experiences.

Every couple of months, the market will offer direct collection of recyclables from community members and act as a networking space to share ideas, ask questions and collaborate. Quarterly assessments will be conducted to evaluate the market's performance, gathering feedback from participants and stakeholders to identify areas for improvement. Based on these assessments, operational guidelines will be developed to ensure efficient and effective market management. If successful, this pop-up market model could be expanded to other areas, further advancing recycling practices and community engagement in waste management across additional districts.

4 UTILIZE A DATA COLLECTION SYSTEM TO IMPROVE THE TRACEABILITY OF RECYCLABLES

To ensure effective waste traceability, an integrated data collection system with a dashboard is being developed by JAK Reward Technology, an organization working closely with Thonburi district and several communities in Bangkok. This system will enhance existing data collection efforts in selected communities by leveraging a digital platform that streamlines the process of capturing and managing waste-related information. The idea is to collaborate with the district to collect and assess data on recyclables and organic waste, in alignment with the district's annual KPIs to be reported to the BMA. This transition to a digital data collection system not only improves access but also ensures more accurate and timely data capture, which is essential for tracking and achieving waste management goals.

Once the data have been collected, they will be thoroughly analyzed and reported in alignment with established annual KPIs set by the Thonburi District Office. This analysis will provide valuable insights into waste management practices, identifying trends, successes, and areas for improvement. Additionally, the development of a waste-data dashboard will allow for real-time monitoring of waste-management efforts. This dashboard will provide both the Thonburi District Office and the community with accessible, visual representations of data, serving as a vital decision-making tool. It will ensure all stakeholders are informed and enable effective collaboration to optimize waste management strategies throughout the district.

5 IMPROVE ORGANIC WASTE SEPARATION AND TRACKING

Food waste consistently represents a large proportion of total waste in Bangkok. The objective of this activity is to assess the amount of organic waste being generated by households and establishments in the community, providing a regular data of waste patterns that is of interest to the Thonburi district office for their annual KPIs to be reported to the BMA. This will be done through the digital data collection system developed by JAK Reward Technology in Bangkok. Additionally, local shops and restaurants will be encouraged to participate in organic waste separation, in alignment with the BMA's initiative launched in 2024 promoting separation of food waste in markets. The efforts of these establishments can be recognized through small events held during the pop-up recycling markets.

Given that more than half of the total waste generated in Bangkok is organic waste, reducing this volume through composting can significantly alleviate pressure on landfills, minimize methane emissions and promote more sustainable waste-management practices. Organic waste separation and quantity of separated organic waste can be increased through a multipronged strategy that encourages composting at both the individual and community levels, as well as in businesses and institutions. The city could establish large, industrial-scale composting facilities that handle organic waste collected from various sources, including households, businesses and markets. These facilities can turn large quantities of organic waste into compost on a larger scale. Further, Bangkok's bustling markets produce significant volumes of food waste. Setting up dedicated composting facilities at these markets could help reduce their environmental impact.

6 INTEGRATE SUSTAINABILITY INTO TOURISM

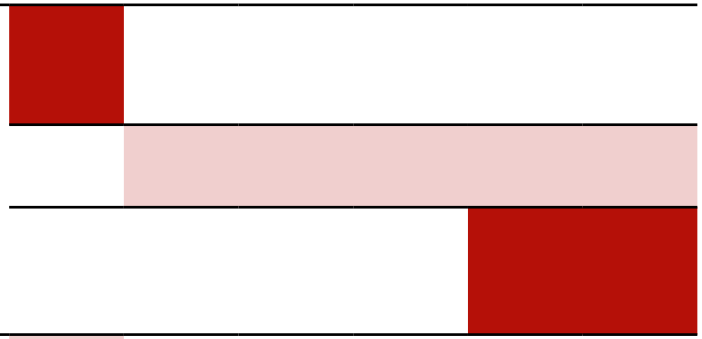
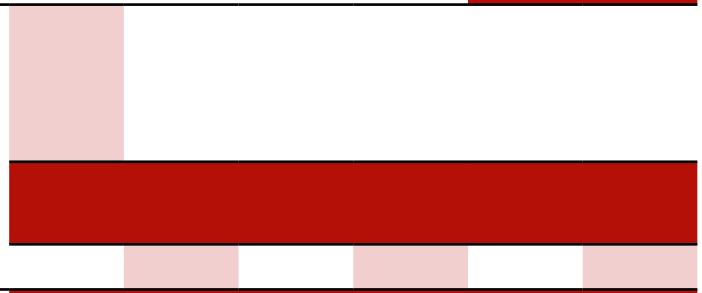
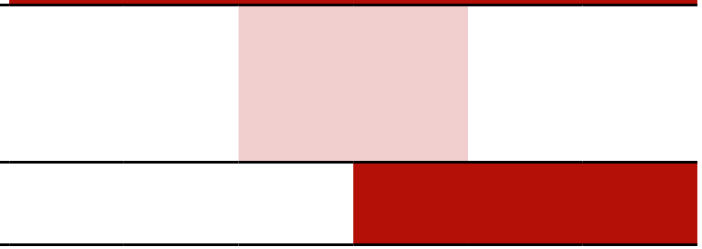
Sun Power Boat and the Talat Phlu Du Dee Group, which organize boat and walking tours in the area, are interested in integrating sustainability principles into their tours. The goal of these organizations is to reflect local culture, preserve environmental cleanliness and reduce waste dumping in the canals. The walking and boat tour routes will be adapted, incorporating narratives on litter reduction and sustainable practices. These tours will engage participants by educating them about local waste issues and offering practical steps to minimize waste during their visit. That said, this initiative will cultivate a culture of cleanliness and environmental awareness of tourists coming to Thonburi District to avoid waste dumping into canals. These groups will also promote their activities through social media, partnerships with local businesses and tourist information centers to attract more participants.

7 ENCOURAGE COMMUNITY-DRIVEN SOLUTIONS FOR PLASTIC REMOVAL FROM SUB-CANALS

The objective of this activity is to assess the extent of plastic pollution in the sub-canals within the selected area and engage with the communities to brainstorm effective strategies for clean-ups. Since waste in canals is a visual nuisance, this activity will encourage participation and create a sense of shared responsibility among community members for maintaining the cleanliness of their environment. Local and effective solutions, such as bamboo traps, can be implemented in collaboration with the district office collection contractors. These bamboo traps can be strategically placed in sub-canals to capture floating plastic waste, providing a sustainable and low-cost method for waste removal. Partnering with district office contractors ensures efficient collection and disposal of the captured waste, creating a seamless process for both the community and local authorities.

Implementation matrix

Activities	Sub-activities	Potential partners	Year 1				Year2	
			Q1	Q2	Q3	Q4	Q1	Q2
Empowerment of local communities for waste separation	Appoint local champions within the community and train them for engagement activities with the community	Thonburi District Office Community Leaders and local champions Local entrepreneurs/groups, e.g. YOLO						
	Design and regularly conduct workshops and engagement activities in collaboration with local working partners							
Community waste bank for recyclables	Establish a local committee/volunteer that can be responsible for the waste bank	Thonburi District Office Community Leaders and local champions Local Entrepreneurs/ Groups: YOLO, JAK Reward Technology						
	Select a suitable space and set up the waste bank within the community							
	Conduct workshops and engagement activities and work with communities to use the waste bank to collect recyclables							
	Evaluate the operations for improvement and gather feedback from residents							
	Develop operation guidelines for the waste bank that can be helpful for scaling into other communities							

Pop-up recycling waste market at Wat Ratchakri School	Engage the school for logistical arrangements and to secure a space within the school	Thonburi District Office Community Leaders and local champions Wat Ratchakri School Local Entrepreneurs/ Groups: YOLO, Jak Reward Technology	
	Plan and implement the market in the school (bi-monthly)		
	Create a manual for the set-up of pop-up markets that can be used in other communities		
Data collection system to improve traceability of waste	Adapt the digital platform by JAK Reward Technology for recyclables and organic waste data collection in Thonburi community	Thonburi District Office Jak Reward Technology	
	Regularly collect data within the community		
	Analyze data and create reports		
Organic waste separation and tracking	Engage with local shops and restaurants for separating organic waste		
	Regularly collect data within the community		
Integration of sustainability into tourism	Engage with local tour operators interested in integrating awareness activities within their tours to reduce waste litter in and around communities and canals	Talat Phlu Du Dee Group Sun Power Boat	
Community-driven solutions for plastic removal from sub-canals	Engage with communities to assess reasons for waste in canals and potential solutions that can be adopted for reduction of canal waste		
	Install solutions that can trap waste that can be regularly collected		

6. Expected Resilience Impacts

Social Impacts

Improved Public Health and Well-Being

By diverting organic waste from landfills, communities reduce the risk of pollution and contamination – this reduction can lead to healthier living conditions. This is especially important for reducing the carbon footprint of landfills as well as the harmful emissions they produce, such as methane. Removing waste from waterways will help improve the quality of water and reduce the risks of water-borne diseases and instances of flooding, which directly impacts the safety and well-being of the community. Cleaner neighborhoods resulting from proper waste separation can improve residents' quality of life, making the community healthier and more aesthetically pleasing.

Social Cohesion

Working together on these initiatives will help build stronger community bonds, as people collaborate toward a common goal of improving their environment. Involving the communities in the decision-making processes and activities will ensure that all voices are heard, particularly those of members of marginalized or under-represented groups. This will foster a sense of equality and inclusivity within the communities. Encouraging local leaders and champions to actively support and participate in the project can inspire more people to get involved, further strengthening the sense of community solidarity. Regularly celebrating milestones and successes achieved through the project via community events, public recognition or media coverage can unite the community by reinforcing the positive impact of collective action. Additionally, recognizing and appreciating both formal and informal recyclers for their vital contributions to the city's waste management will highlight the importance of their work, fostering greater respect for their role in maintaining a cleaner environment.

Environmental Justice and Social Justice

Environmental justice focuses on ensuring that all community members, regardless of their socio-economic status, have equal access to a healthy environment and that the burden of environmental harm (such as pollution or waste) is shared fairly. By providing education and resources to all community members, especially those in under-represented or marginalized neighborhoods, the project will ensure that everyone has access to the knowledge needed to participate in the activities. Furthermore, by promoting waste separation at source, the project will not only reduce environmental impact but also improve the working conditions of both formal and informal recyclers, making their work safer and more efficient. The project has the potential to foster both environmental and social justice by addressing inequalities in access to environmental resources and services, promoting inclusive participation, and ensuring that the benefits of sustainability are equitably shared. By ensuring access to resources and prioritizing community-driven solutions, the project can create more just and equitable communities that can be scaled up in Bangkok.

Environmental Impacts

Biodiversity and Natural Resources

The project activities will help protect local ecosystems, wildlife and natural resources, ensuring that these assets are preserved for future generations. Removing plastic waste from sub-canals reduces the risk of water pollution, helping to restore the natural environment and improve water quality and restoring the aquatic ecosystems which are vital for climate change adaptation. For example, healthy ecosystems can help reduce climate risks, such as by reducing flood risks and providing cleaner water. By preventing

plastic waste from entering larger bodies of water, the project helps protect marine life from the harmful effects of plastic pollution.

Reduced Emissions and Production of Plastics

The increase in recycling will reduce the need for new materials to be extracted and processed, lowering energy consumption and greenhouse gas emissions associated with resource extraction. The recycling waste markets promote the idea of a circular economy, where products and materials are reused, recycled and repurposed, reducing waste generation and extending the lifecycle of materials.

Lower Demand for Landfills and Incineration

Waste separation for both organic waste and recyclables at the source will reduce the volume of waste being sent to landfills and incineration, helping to preserve land and reduce harmful emissions, particularly of methane, a powerful and harmful greenhouse gas.

Economic Impacts

Improvements in Local Economic Activities

As communities engage in waste separation, jobs are created in local waste management, education and community outreach. These roles can be filled by residents, thereby boosting employment and income within the community. The recyclables collected (plastics, metals, paper, etc.) can be sold to recycling centers or manufacturers, providing income for the community or the program itself.

By encouraging recycling and diverting waste from landfills, local governments can save on landfill fees, waste management services, and long-term environmental remediation costs. These savings can be reinvested into other community development projects. Local entrepreneurs and small businesses can also benefit by creating businesses that collect, sort and/or sell recyclable materials, fostering local economic growth. Activities such as pop-up markets can offer a platform for local businesses and microvendors of ecofriendly products to reach a wider audience. This can create opportunities for local entrepreneurship and interest in the recycling sector.

Alternative Material Markets and Circular Economy Opportunities

Empowering communities to separate waste at the source reduces the need for extensive clean-ups and for mass sorting at recycling facilities. This lowers the costs of waste collection, transportation and sorting, resulting in overall savings for municipalities and businesses involved in waste management. When waste is properly separated, more materials can be recycled and reused, contributing to a circular economy. This can create economic opportunities in industries such as recycling, upcycling, and manufacturing of products made from recycled materials. In the long run, availability of micro-level data on waste can increase transparency, ensuring that waste reduction and recycling programs are effectively managed. This can lead to more responsible government spending and potentially unlock funding opportunities from both private and public sectors that are interested in supporting sustainable waste practices.

URBAN OCEAN

Impact on United Nations Agenda 2030 Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are a collection of 17 interlinked global objectives established by the United Nations in 2015 to address social, economic, and environmental challenges. Aiming to eradicate poverty, achieve gender equality, and promote sustainable economic growth, the SDGs provide a comprehensive framework for countries to work towards a more equitable and sustainable future. Each goal includes specific targets and indicators to measure progress, encouraging collaboration among governments, civil society, and the private sector. There are four goals related to the project.

SDG 11 SUSTAINABLE CITIES AND COMMUNITIES

Encouraging local community engagement, waste separation, and cleaner urban environments, helping to build a culture of sustainability and environmental responsibility.

SDG 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

Promoting recycling, reducing waste and fostering sustainable production and consumption, ensuring valuable resources are captured, encouraging the community to adopt circular-economy principles and reduce the demand for virgin materials.

SDG 13: CLIMATE ACTION

Reducing carbon emissions through waste management practices such as organic waste separation and traceability systems, that help mitigate the environmental impact of waste, contributing to efforts to combat climate change.

SDG 14: LIFE BELOW WATER

Protecting aquatic ecosystems by reducing plastic waste in waterways, which ultimately helps prevent plastic from entering oceans and seas.

SDG 17: PARTNERSHIPS FOR THE GOALS

Fostering collaboration and building multi-stakeholder partnerships with local communities, businesses, educational institutions, NGOs and the public sector in a collective effort to address waste management and sustainability issues.

7. Sustainability and Scalability Plan

The project is designed to ensure a sustainable impact within the community by engaging and elevating local stakeholders such as community champions, leaders, the district office, local businesses and schools. Starting the project in a single neighborhood community will help refine the approach and ensure effectiveness before scaling up and allow for testing models for waste segregation, collection and recycling. This approach is aimed at creating a model that can be scalable in other communities within the district and, eventually, to other districts in Bangkok. The data collection and traceability of waste are in alignment with Thonburi district's interest and annual KPIs. By creating a standardized approach, this project can be scaled to empower communities city-wide and ensure that every district has the tools and frameworks necessary to foster a collective impact on Bangkok's waste reduction and environmental goals.

By establishing Thonburi as a model district for community waste management, the project sets a foundation for replicating its success across the city's 49 other districts by leveraging local partnerships, exploring corporate funding opportunities, and counting on the BMA's policy support and annual funding for waste management.

The project partners will collaborate and work with local and international environmental organizations that can provide expertise, resources and funding. NGOs can help with the educational and engagement components, as well as advocacy and policy. Corporate sponsors or corporate social-responsibility programs can be leveraged in the initial years of the project where these align with the BMA's environmental goals to explore potential funding streams. In addition to seeking government grants and corporate sponsorships, the project partners will explore diverse funding avenues such as international environmental funds, international development agencies, crowd-sourced funding, and partnerships with philanthropic foundations focused on environmental sustainability. Organizations such as the German Society for International Cooperation, Unites Nations agencies, the Thai Health Promotion Foundation, and corporations like Unilever have already demonstrated their commitment to supporting waste management projects in Bangkok through funding and partnerships. These organizations present valuable opportunities for exploring additional funding streams. By engaging these agencies and leveraging their existing frameworks for collaboration, the project can access resources to further strengthen and scale its impact. By diversifying funding sources and fostering strong relationships with both public and private stakeholders, the project can ensure long-term financial sustainability and maximize its potential to create city-wide impact.

By demonstrating measurable success in Thonburi, the project will position itself to attract government support and funding for scaling to other districts in Bangkok.

9. Budget

	Item	Cost (Thai baht)	Cost (United States dollars)
1	**Engagement with a canal community in Thonburi district for awareness on waste separation**	**916,370**	**26,500**
1.1	Project staff (500 USD x 18 months)	311,220	9,000
1.2	Workshops (1,500 USD x 10)	518,700	15,000
1.3	Meetings/gatherings with communities (250 USD x 10)	86,450	2,500
2	**Set-up of a waste bank**	**1,123,850**	**32,500**
2.1	Workshops (1,500 USD x 7 nos.)	363,090	10,500
2.2	Set-up of a waste bank within the community and alignment with the BMA's waste collection services	414,960	12,000
2.3	Guidelines	345,800	10,000
3	**Pop-up recycling waste market at Wat Ratchakri school**	**2,204,475**	**63,750**
3.1	Stakeholder consultations/workshops (250 USD x 7)	60,515	1,750
3.2	Project staff (500 USD x 18 months x 3)	933,660	27,000
3.3	Bi-monthly markets (2,000 USD x 8)	553,280	16,000
3.4	Equipment for the market such as booths, display areas, collection bins (lump sum)	345,800	10,000
3.5	Communication and promotion material (banners, posters, promotional items)	138,320	4,000
3.6	Manual	172,900	5,000
4	**Traceability of waste data and data collection**	**864,500**	**25,000**
4.1	Adaptation of a digital platform for recyclable and organic waste (lump sum)	691,600	20,000
4.2	Data analysis reports	172,900	5,000

5	**Organic waste reduction**	**276,640**	**8,000**
5.1	Survey/assessment/stakeholder consultations with local restaurants and shops to separate their organic waste (lump sum)	276,640	8,000
6	**Leveraging of tourism activities to reduce waste**	**414,960**	**12,000**
6.1	Training of tourist operators and inclusion of activities (lump sum)	242,060	7,000
6.2	Promotion of waste-related activities in tours	172,900	5,000
7	**Plastic-waste removal from the sub-canal**	**1,071,980**	**31,000**
7.1	Survey/assessment/stakeholder consultations	172,900	5,000
7.2	Project staff (500 USD x 12 months)	207,480	6,000
7.3	Equipment/infrastructure set-up in the canal	691,600	20,000
Total		**6,872,775**	**198,750**

Note : The conversion rate is $1 USD = 34.58 Thai Baht as of November 18, 2024.

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