Reduce, Reuse, Recycle to Protect the Marine Environment and Coral Reefs

3RproMar – Kratie Pilot

Final Project Report

Submitted by

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Acknowledgement

This project was the result of the hard work and commitment of the 3RproMar team, who played a crucial role in advancing solid waste management (SWM) in Kratie, Cambodia, from 2022 to 2024. Their commitment to improving waste management practices has been instrumental in creating sustainable solutions that benefit the environment and local communities.

This project was implemented by The Asia Foundation (TAF) with support from the German Government and Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ). International waste experts and Cambodian waste and environmental experts from the Environmental Education and Recycling Organization (COMPOSTED), the Cambodian Rural Development Team (CRDT) and TAF formed core team membership.

Acronyms / Abbreviations

Abbreviation	Meaning
3Rs	Reduce, Reuse, Recycle
3RproMar	Reduce, Reuse, Recycle to Protect the Marne Environment and Coral Reefs
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BCC	Behavior Change Communication
CBET	Community-Based Ecotourism
CCEF	Cambodia Circular Economy Forum
COMPOSTED	The Environmental Education and Recycling Organization
CRDT	Cambodian Rural Development Team
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
KHR	Cambodian Riel
M&E	Monitoring and Evaluation
MRF	Material Recovery Facility
NCDD	National Committee for Sub-National Democratic Development
PET	Polyethylene Terephthalate
PPE	Personal Protective Equipment
SDGs	Sustainable Development Goals
SUP	Single-Use plastics
SWM	Solid Waste Management
SWMP	Solid Waste Management Plan
T&M	Time and Motion
TAF	The Asia Foundation
TOR	Terms of Reference
USD	United States Dollar

1. Executive Summary

This final report for the 3RproMar Kratie Pilot provides a comprehensive overview of the initiatives undertaken to reduce marine plastic leakage in Kratie Municipality, Cambodia. Led by TAF, in collaboration with GIZ, the project aimed to improve SWM, enhance plastic recycling, and foster behavioral change among residents. Over its extended two year and nine-month implementation period, the project focused on addressing the municipality's waste management challenges by designing scalable solutions to reduce plastic waste entering the marine environment while building environmental resilience.

Kratie Municipality, situated along the Mekong River, is located 340 kilometers from Phnom Penh. Known for its sandy beaches and as a habitat for the endangered Irrawaddy dolphins the town is home to a population of 32,939. Kratie's economy largely revolves around agriculture, including rice and corn farming, fishing, and rubber and cassava plantations, along with a growing business, tourism, and professional sector. Kratie faced significant waste management challenges prior to the 3RproMar initiative, with just over half of households having waste collection services and much of the waste being disposed of in an unsustainable open dumping site. Inadequate infrastructure, limited budget, and a lack of public awareness about waste segregation led to widespread littering, dumping, and burning, contributing to plastic leakage and other environmental impacts directly affecting the Mekong River. Additionally, informal waste workers played a key role in recycling, but their efforts were unregulated, resulting in inconsistent practices and at times posing health risks.

Baseline Assessment and Project Design

To address Kratie's waste management challenges and the challenges posed by plastic leakage, a baseline assessment was conducted in early 2022. This study evaluated SWM practices, governance, recycling by the informal sector, and public attitudes toward waste and plastic use. Key findings included improvement in waste collection over earlier findings (increased to 64% in 2022), ongoing issues with open burning and illegal dumping, and continued wide-spread utilization of single-use plastics (SUPs) in everyday activities. Residents with waste services generally accepted waste management fees but desired better services and enforcement. These initial findings shaped the 3RproMar project's focus on SWM, recycling, and behavior change, laying the groundwork for the remaining months of activity.

Following a thorough study of baseline findings, activity implementation began following a work package framework covering three primary areas:

Work Package One: Improving Waste Management in Kratie - As work began, Kratie generated 31.9 tons of waste daily, with 77% collected from four of the town's five Sangkats. A fifth Sangkat, the island of Koh Trung, had no waste collection service. The informal sector was estimated to collect 3.67 tons of recyclables daily across Kratie. Work package one focused on addressing Kratie's waste management challenges through planning and improved capacity development, establishing a sustainable path for improved SWM services.

Key activities included:

- Solid Waste Management Plan (SWMP) development: Covering 2023–2030, with phased action plans (short-, medium-, and long-term) to improve waste collection, recycling, and disposal services.
- Support to new landfill operations: A new 27.85-hectare landfill, operational since April 2024, replaced the old dumpsite and integrated a Material Recovery Facility (MRF).
- Service Expansion focus: Efforts undertaken to expand waste collection to underserved areas through studies on efficiency and route planning.
- School-Based Waste Banks: Initiatives launched to raise awareness and establish recycling systems in schools to promote more sustainable waste and recycling practices.

Work Package Two: Enhancing Recycling and Waste Management in Kratie - This work package focused on improving the collection, recovery, and processing of recyclables, particularly plastic waste, through a community approach and collaboration with the informal sector. The work in this package focused on the development of a pilot activity to address the lack of waste services on Koh Trung, a Mekong Island and significant source of plastic leakage.

This pilot sought to create a community-based waste management system for recycling and composting of waste. It conceived of a locally managed system designed to address the waste management needs of its 1,841 residents and 20,000–25,000 tourists annually, through a focus on waste minimization and reducing SUPs. This included:

- Creating an incentive-based profit-sharing recycling system with waste separation at source.
- Introduction of home-composting for organic waste with links to local agriculture production.
- Strong engagement and consultation with local stakeholders to ensure a system design that corresponds to needs and interests.
- Management by Koh Trung's Community-Based Ecotourism (CBET) organization.

A system of Waste Banks was established at schools and other key locations for collection of plastic bottles, aluminum, and paper, with CBET managing the collection and sale of recyclables, generating profits for schools, community projects, and the waste collection crew. Home and community composting systems were introduced to reduce organic waste, integrating local composting into agriculture. A curbside waste collection system was piloted, with fees paid by households, businesses, and schools, and collection skips placed in key locations. While monthly fees were introduced, additional revenue from recyclables supplemented coverage of system costs, a challenge that has yet to be fully addressed.

Work Package Three: Public Perceptions and Behavior Change in Waste Management - focused on understanding public attitudes towards waste management in Kratie and developing a Behavior Change Communication (BCC) strategy. A survey of households and businesses revealed widespread SUP use, improper waste separation, and open burning of plastic. Based on these findings, a BCC campaign, "It Starts with You," was launched, featuring Facebook

posts, billboards, clean-up events, and mobile announcements reaching over 2,000 families. A December 2023 BCC pilot engaged 210 participants and collected 300 kg of plastic waste.

Assessing impact on plastic leakage

In late 2023, a Monitoring and Evaluation (M&E) component was launched to assess 3RproMar's impact on reducing plastic leakage into the Mekong River. By revisiting the findings of the 2022 baseline study, the M&E effort tracked changes in waste management, focusing on waste collection, recycling, and status of plastic hotspots along riverbanks.

Figure 1: 23 dump trucks of plastic leakage avoided per year.

The findings showed that, despite a 0.72-ton daily increase in waste generation between 2022 and 2024, significant improvements were made in waste diversion, with recycling increasing by 2.4 tons per day over 2022 and 0.57 tons of organic waste organic waste diverted everyday away from the landfill.

3RproMar and Kratie Municipality's efforts also reduced plastic leakage overall by 82%, avoiding an estimated 0.34 tons of plastic daily - equivalent to about three bathtubs daily or 124 tons annually, the equivalent of 23 dump trucks - from reaching river waters.

Recommendations for Future Solid Waste Management Improvements in Kratie

To build on Kratie's waste management and sustainability improvements, the following actions are recommended:

- **Strengthen Revenue:** Shift fee collection to municipal authorities, explore fines and event-related fees, and train local officials in fee collection and management.
- **Enhance Waste Collection:** Expand services, standardize bins, rationalize collection routes, implement waste separation, and subsidize low-income households.
- **Promote Recycling and Composting:** Scale up Waste Banks, incentivize metal recovery, and expand composting facilities.
- **Address Waste Hotspots:** Enforce regulations and use mobile apps for reporting illegal dumping.
- **Support Informal Recycling:** Integrate informal workers into the formal system and offer incentives to leverage existing infrastructure and intermediaries.
- **Reduce Plastic Waste:** Target high volume waste generators by proposing reusable alternatives and consider plastic bag bans and other targeted SUP regulations.
- **Focus on Disposal Facilities:** Train landfill operators, optimize the Material Recovery Facility (MRF), and develop a landfill management manual.

The 3RproMar Kratie project has made significant strides in reducing plastic leakage into the Mekong River and improving waste management in Kratie. Through planning, community engagement, and the beginnings of an integration of formal and informal waste systems, the project addressed key waste management challenges. Efforts to promote recycling, composting, and behavior change have laid a foundation and are already serving as a model for other Cambodian municipalities. Moving forward, the focus on enhancing revenue, expanding waste collection services, and strengthening informal recycling will be crucial for ensuring positive long-term environmental impact and resilience.

1. Introduction and Background

This final project closeout report provides an overview of the activities undertaken by the team led by The Asia Foundation (TAF) to address marine plastic leakage in Kratie Municipality, Cambodia. The project aimed to reduce plastic waste entering water bodies, aligning with the broader goals of marine conservation and sustainable waste management. Funded by the German Government with implementation supported by GIZ and TAF, the project was initially conceived and contracted as a two-year five-month activity (January 2022–May 2024), but was extended in early 2024 by an additional four months with additional budget. The final end date of the project was September 30, 2024.

The project was executed by a multidisciplinary team composed of both national and international experts. The team worked closely with local counterparts in Kratie Municipality and in collaboration with GIZ, which provided overall direction and oversight. Key members of the team included TAF environment specialists, supported by senior management within the organization. Leadership was provided by Team Leader Christopher Godlove (international expert) and Deputy Team Leader Rithy Uch (Composted), with additional expert contributions from international waste specialists Steven Long (Laos/New Zealand) and Delgerbayar Badam (Mongolia). Additionally, a team of national experts from Cambodian organizations COMPOSTED and CRDT played a crucial role in ensuring successful local project execution.

This report highlights the efforts, achievements, and challenges encountered over the project's duration, offering insights into the work carried out to mitigate the impact of marine plastic pollution in the region.

Figure 2: List of 3RproMar team members and affiliation.

Prior to the implementation of the 3RproMar Kratie Pilot Activity, the municipality faced significant challenges in SWM. In 2017, waste collection services were limited to only 50% of households across the four urban and peri-urban communes.

The collected waste was transported to an open dumping site, a 30-hectare public land area located 14 kilometers east of the town center. This disposal method was unsustainable from an environmental standpoint and involved only minimal informal sorting of waste by waste pickers. Waste management operations, handled by a private contractor, utilized only two trucks to serve the entire area, with fees ranging from KHR 4,000 to KHR 15,000 per household.

Kratie's waste management challenges have been exacerbated by rapid urbanization, linked to an increase in both population and waste generation. The infrastructure to support adequate waste collection has traditionally been insufficient, leaving public areas strewn with

uncollected trash. Budgetary constraints further limited the municipality's ability to invest in necessary waste management equipment and infrastructure. Additionally, there has been a lack of public awareness regarding proper waste handling, resulting in littering, dumping and burning of waste, and contamination of recyclables. The involvement of informal waste pickers, while playing a key role in the recycling of plastics and metals, remained poorly understood and unregulated, creating inconsistent practices and potential health risks. Environmental concerns were heightened as improper waste disposal contributed to pollution in the Mekong River, affecting both wildlife and local communities, resulting in high levels of plastic leakage. Policy gaps and weak enforcement of existing regulations further underscored the need for comprehensive local waste management strategies.

Through a collaborative approach involving national and international experts, the project aimed to design scalable waste management solutions while reducing plastic leakage that could also be replicated across Southeast Asia. The pilot activity employed a range of strategies, including capacity building, technical support, stakeholder engagement, exchange visits and policy facilitation, to enhance environmental resilience and reduce plastic waste leakage into the marine environment.

2. Project Goals and Objectives

The project aligns with global efforts to achieve Sustainable Development Goals (SDGs) 11, 12, and 14, focusing on creating sustainable cities, reducing waste generation, and conserving marine ecosystems. 3RproMar, comprising a larger umbrella activity focused on reducing plastic leakage across four ASEAN nations, established an initial target reduction objective for municipal activities in Indonesia, Cambodia, Vietnam, and the Philippines at 20%, estimated to amount to 4,800 tons of plastic.

In addition to addressing global targets, the Kratie project was designed to prioritize local waste management concerns by promoting regional exchanges of experiences and information. It also aimed to shift waste management from a linear to a circular waste approach, leveraging the existing role of the informal sector in materials recovery and embracing community engagement through a fostering of awareness and behavior change. Furthermore, the project sought to secure greater private sector support while considering geographic, socio-economic, and cultural contexts.

At the national level, the Cambodian government is engaged in a broader effort to improve waste management, building on foundational legislation, particularly Sub-Decree 113. Issued in 2015, Sub-Decree 113 regulates SWM in urban areas, addressing the collection, transport, storage, and disposal of waste to ensure environmental sustainability and public health. It outlines the roles and responsibilities of local authorities, waste collection companies, and citizens in managing waste properly.

Within this project, there are three primary areas of focus designed to support reduced ocean plastics:

1. Improvement of solid waste and plastics management in Kratie
2. Enhancement of plastic recycling activities, particularly focusing on the informal sector

3. Analysis of current attitudes among Kratie residents toward waste management and creation of strategies to encourage behavioral change.

4. Stakeholders

The project was conceived, and activities launched based upon a partnership established through initial GIZ discussions and integrated within the 3RproMar activities lead by TAF. As a decision-making authority impacting local waste management activities of Kratie municipality and the surrounding province, key Kratie provincial authorities were also consulted and their participation and support solicited over the course of the project.

In addition to these two government partners, steps were taken early on to establish additional stakeholder partnerships as a foundation for project collaboration. To further strengthen these relationships over the life of the project, with the goal of supporting optimal SWM practices and environmental outcomes in Kratie, the team focused on developing a stakeholder engagement approach that reinforced the three primary objectives of the 3RproMar initiative.

The stakeholder organizations involved in this effort included groups with expertise in the following areas:

1. Waste management planning and implementation
2. Informal worker engagement
3. Capacity building and training
4. Behavioral change strategies
5. Plastics recycling and circular economy
6. Materials and value chain optimization

Engagement with these groups was built around the primary objectives of the project and included a mix of public, private, and civil society organizations. A complete list of stakeholders participating in 3RproMar activities is included in the Appendix 8 attached.

5. Project Design and Implementation

The project design process began with initial launch meetings in early 2022, involving both video conferencing and in-person discussions between GIZ, TAF, and Kratie municipal officials. These meetings served to introduce the team, clarify project focus, and define the sequence of activities.

Following these discussions, baseline data collection and research were conducted that included observations related to waste management practices as well as existing knowledge and behavior of the local population with respect to waste management. These baseline inputs helped contribute to the development of an inception report. This report combined with an analysis of the baseline findings focused on plastic leakage and knowledge and behaviors informed the design of a set of activities and initiatives aimed at achieving the project's objectives. These activities were organized into three key work packages:

1. Integrated SWM and plastic waste management
2. Collection and processing of recyclables with informal sector participation
3. Integrated behavior change measures.

Project Scope

Kratie Municipality is a town in Kratie province lying on the banks of the Mekong River in Cambodia. The town is located 340 kilometers from Phnom Penh via National Road Numbers 6 and 7.[1] The town includes an island in the Mekong River with white sandy beaches, providing habitat to the Irrawaddy dolphins (there are between 66 and 86 dolphins left in the upper parts of the Mekong River).[2] The dolphins are a major tourist attraction for Kratie.

The town has a population of 32,939 with a population density of 33 inhabitants per Km².[3,4] Population growth is estimated at 0.97%.[5] The town is divided into five Sangkats (communes). The majority of Kratie's population works in rice farming, fishing, corn farming, growing vegetables and on plantations that produce rubber and cassava. Most people in Kratie are businesses men/women, professional workers (banks, micro-finance, restaurants, hotels, guesthouses, construction supply stores, agriculture supply stores, woodworking), NGOs, and government officials.[6]

No	Sangkats	Villages	Population
1	Koh Trung	Kbal Koh, Chong Koh	1,841
2	Kra Kor	Krakor, Tuol Monorom	4,681
3	Kro Ches	Doun Chroam, Kratié, Phsar Veng, Trapeang Pring, Wat	7,045
4	Oreussey	Kantring, Kapou, Ou Ruessei I, Ou Ruessei II, Srae Sdau	13,282
5	Roka Kandal	Roka Kandal I, Roka Kandal II	6,090
		Total	**32,939**

Table 1: Administrative breakdown and population of Kratie Municipality in 2022.

Baseline Development

To fully understand the waste management challenges in Kratie and to begin to develop a plan to address these challenges the team began by developing a baseline study to understand the status and current practices with respect to waste management and the attitudes of inhabitants with respect to waste management.

The baseline study for the 3RproMar Kratie Pilot was developed by partners CRDT and COMPOSTED, with oversight from the TAF team. COMPOSTED focused on SWM, plastics recycling, and the informal sector, while CRDT assessed public attitudes and the understanding of waste management in Kratie. Two reports were produced in May 2022: (1) 'Baseline Study on SWM and Informal Sector Recycling', and (2) 'Households and Business Survey Report on SWM of Kratie Town.'

[1] Kratie Provincial Council, *3 Years Rolling Investment Program for 2017-2019*.
[2] Wikipedia, "Kratié (Town)." https://en.wikipedia.org/wiki/Kratié_(town)
[3] Kratie City Hall Administration, "Administrative Data of the 5 Sangkats in Kratie City."
[4] Kratie Provincial Council, 3 Years Rolling Investment Program for 2017-2019.
[5] 'Program for 2017-2019 for Kratie Province,' National Committee for Sub-National Democratic Development (NCDD), 2019. http://ncdd.gov.kh/images/NCDD/2017/CDPandCIP/CIP2017-2019/09-KRT_CIP2017.pdf
[6] CRDT 2022: Household baseline study report under 3RProMar

Baseline study and analysis findings

The study led to several important findings that helped to focus and guide efforts over the following phases of activity design and implementation. Some of the key findings include:

Solid Waste Management: Waste collection has improved since last measurements were undertaken and now cover 65% of households, up from 50% in 2017. However, open burning and dumping remained common among households not having access to collection services. The average family generated 2.55kg/day of waste, while food producers, grocery stores, and hotels generated 10-25kg/day. Kratie town generated an estimated 32.32 tons of waste per day, with 24.53 tons/day reaching the landfill. The remaining 4.12 tons/day remained uncollected, either burned or illegally dumped.

Plastics & Recycling: Households disposed of an average of 32 SUP items per day. Kratie's private waste operator does not collect glass or bulk green waste. About 77% of households separate recyclable materials like aluminum and plastic bottles selling them to informal collectors, while some separate food waste for livestock feed. However, 63% still prefer single-use plastic bags for convenience. The informal sector collects 3.67 tons/day of plastics, but plastic still ended up in the Mekong from hotspots like Koh Trung Island and in mainland Kratie, where waste burning was prevalent prior to project interventions.

Regulations & Fees: Residents generally accepted waste collection fees but desired better services and stronger enforcement of waste regulations. Collection fees ranged from KHR 4,000 to KHR 200,000 per month, depending on the size of the household or business.

Perceptions & Awareness: Despite awareness campaigns, most households were unaware of the existence of fines for littering or burning waste. Waste composition includes a mix of plastic, food, glass, garden, and paper, with 68% of respondents saying plastic dominated. 70% recognized the health risks of burning plastic, and 28%

Plastic leakage calculations for this report are based on a methodology adapted to the specific conditions of Koh Trung and other Kratie Sangkats adjacent to the Mekong which were identified as the primary sources of plastic waste from Kratie. This approach considers:

- **Initial Baseline Data:** We utilized local data on waste generation and handling, with a focus on the Sangkats adjacent to the Mekong River. This data includes the number of households not using the formal waste collection service, which is essential to understand the volume of waste unmanaged by a formal system.
- **Waste Treatment Practices:** The predominant methods for handling waste that is not collected include open burning or open dumping, both of which occurred frequently along the riverbanks. These practices contribute significantly to plastic leakage into the river ecosystem, with open dumping identified as a primary pathway for plastic waste entering the water system.
- **Waste Composition Analysis:** Analysis of the waste dumped along the river reveals the specific plastic content of 28%, providing a critical metric for understanding the volume of plastic leakage and the likelihood of this waste entering the marine environment.

The formula applied for calculating plastic leakage is as follows:

Plastic Waste Leakage = (Waste Generation – (Waste Collection + Recycling + other diverted waste flows)) * 28% Plastic

Figure 3: A note on plastic leakage calculations.

acknowledged its harm to biodiversity when it enters water bodies. However, 75% of respondents were unaware of penalties for illegal waste disposal.[7]

Overview of project activities

During the development of the baseline study and analysis of findings and following the team's first in-person visit to Kratie in February 2022, an inception report was developed. This report outlined key project goals, a strategic approach for activity development, and an initial timeline. It also identified local priorities in SWM, plastic recycling, and community behavior change.

Project implementation was guided by this report, which provided an overall framework while allowing flexibility to adapt plans to evolving conditions on the ground and to changes in Kratie's leadership. Budget availability was also a key factor; as the financial picture became clearer, new activities were developed and added to best respond to project objectives.

The final sequence of activities attempted to balance the level of effort and focus on all three work package areas, ensuring comprehensive coverage both geographically and with respect to stakeholder engagement. The timeline and structure of these activities are presented in Figure 4 below.

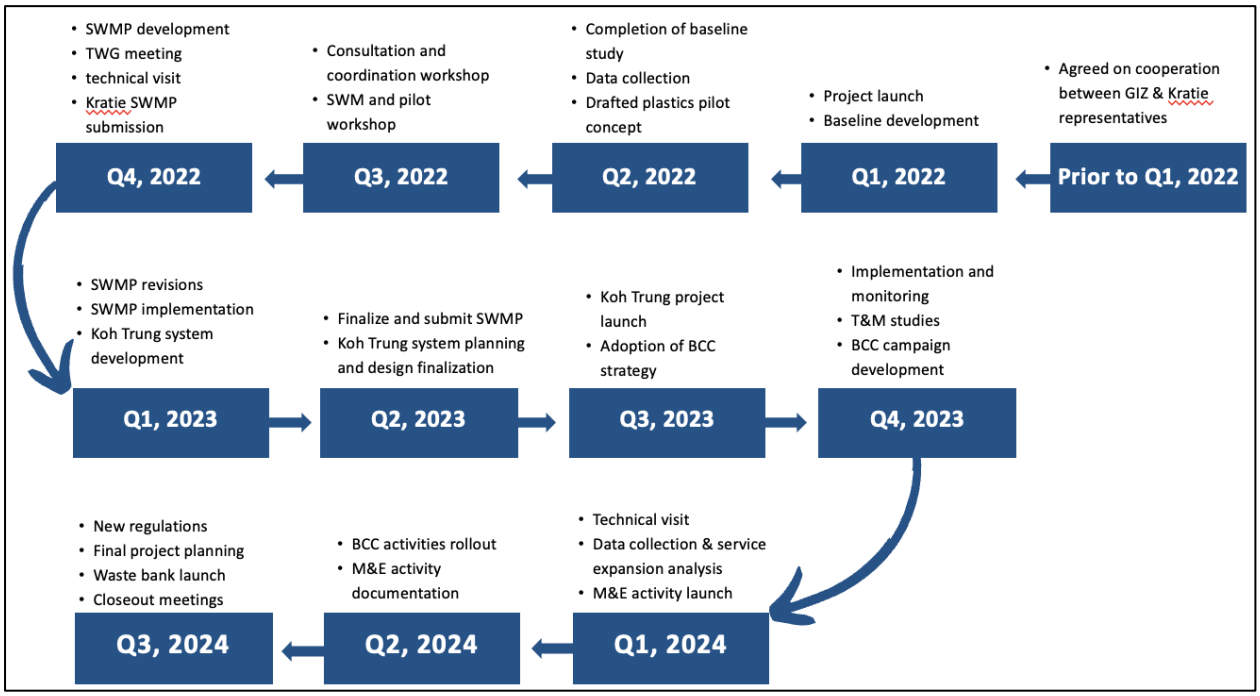


Figure 4: Timeline covering key activities in project implementation.

6. Work Package One: Improving Waste Management in Kratie

Work package one was designed to address Kratie's waste management challenges and to develop a path for improved SWM services. This work package included a focus on

[7] A study designed to assess impacts of project activity focusing on plastic leakage is presented later within this report and includes a comparison of the baseline assessment and post project status.

development of planning instruments designed to lead to improvements of SWM services, increased collection of waste and improved recycling and treatment of recyclables.

Activities developed to address work package one objectives are described in further detail below:

Solid Waste Management Plan

Kratie's SWMP covers the period from 2023 to 2030, with an action plan divided into three phases: short-term (1-2 years), medium-term (3-5 years), and long-term (more than 5 years). The strategy is designed to adapt to the town's evolving needs related to waste management and will be periodically reviewed by Kratie Municipality to reflect any required changes in policy or waste generation patterns.

In 2022, Kratie generated 31.89 tons of waste daily across its five Sangkats, with the composition of waste including 44% organic material (mainly kitchen and garden waste) and 24% plastics. Waste collection services operated daily using two compactor trucks and two motorbike carts, collecting approximately 24.53 tons per day, which accounted for approximately 77% of total waste, primarily from four of the Sangkats. Sangkat Koh Trung was not at this moment included in regular collection services.

Sangkat	Population	Generation Rate (kg/capita/day)	Waste Generation (kg/day)
Koh Trung	1,841	0.63	1,160
Kra Kor	4,681	0.83	3,885
Kro Ches	7,045	1.21	8,489
Oreussey	13,282	0.83	11,024
Roka Kandal	6,090	1.21	7,338
Waste Generation Total			**31,897**

Table 2: Detailed waste generation estimation in Kratie Municipality (2022 Baseline study).

In addition to formal waste collection, the informal sector played an important role by collecting 3.67 tons of recyclable materials daily in 2022. This recyclable waste at the time was composed of 30% paper, 27% plastic, 26% steel, 13% aluminum, and 2% glass. These materials were recovered from various sources, including Kratie's urban center, businesses, and junkshops, as well as 0.42 tons of material per day recovered from the landfill itself.

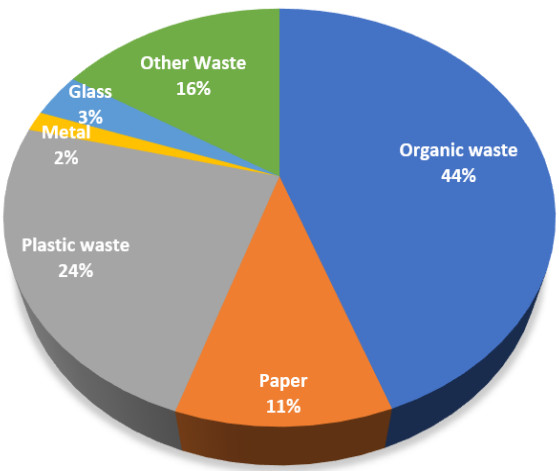


Figure 5: Physical waste composition for domestic waste at source, Kratie 2022.

Previously, waste was disposed of at a dumpsite 14 kilometers from the city, which had been at the time in operation since 2014. However, a new landfill, commissioned in 2023 and put into operation in April of 2024 as part of the Asian Development Bank (ADB)'s 'Second Urban Environmental Management in the Tonle Sap Basin Project (TS-2)', is now

receiving waste from Kratie. This new landfill is located 20 kilometers from the city in Chet Borey District, covers 27.85 hectares, and is expected to significantly improve waste disposal practices in the municipality.

The SWMP for Kratie municipality was developed with a shared vision and six guiding aims designed to achieve a cleaner, healthier environment.

The SWMP vision outlines a future where Kratie is "a clean and beautiful municipality with no waste pollution, creating a healthy place for residents to live and tourists to visit." To reach this goal, the SWMP aims to raise awareness about waste reduction and to promote sustainable collection and recycling practices among residents, businesses, and visitors. It also focuses on strengthening waste collection services to ensure all community members have access to reliable disposal options while preventing harmful disposal methods like burning and uncontrolled dumping.

Key objectives include promoting waste reduction through reuse initiatives, encouraging sustainable material use, and developing systems for recycling and organic waste processing. The SWMP further supports environmentally sustainable landfill management. Covering an eight-year period from 2023 to 2030, the plan is divided into short-, medium-, and long-term phases. It incorporates national and local legislation and outlines governance, financing, and monitoring structures. A set of indicators will track the progress of each of the six aims, ensuring effective management and continuous improvement throughout the implementation period.

The development of the SWMP was a one year-long, iterative process involving frequent formal and informal consultations and exchanges with Kratie counterparts, culminating in an official endorsement of the SWMP in August 2023. While sometimes proving challenging, this continuous collaboration fostered learning and trust, paving the way for a smooth endorsement. The plan now serves as a roadmap for SWM in Kratie from 2023 until 2030.

For complete reports see files: SWMP.final.ENG.pdf and SWMP.final.KH.pdf

Monitoring SWMP implementation

To support the implementation and monitoring of the SWMP, the team developed a monitoring tool to track progress against established timelines and objectives. This tool complements the SWMP by linking main activities and sub-activities, and through the establishment of indicators that measure progress. It also includes a timeline, identifies responsible parties, and outlines next steps.

Additionally, the tool discusses potential risks associated with the implementation of each objective and proposes associated mitigation strategies. Although it was introduced to Kratie municipal counterparts during SWM Technical Working Group meetings, there was not sufficient time to fully support and document its use. However, it is hoped that the tool can serve as a useful guide towards progress in future waste management efforts.

For complete report see file: SWMP.Monitoring.final.pdf

Collection Service Expansion Handbook

A handbook was developed to support the on-going focus on service expansion in currently underserved areas of Kratie. This handbook provides a detailed analysis of current solid waste collection practices in Kratie City, identifies gaps, and offers technical recommendations to transition towards an expanded, sustainable, and cost-effective SWM system.

The handbook includes an evaluation of the existing collection service, technical guidelines for calculating required expansion resources, and suggestions for horizontal measures such as public awareness, capacity building, and training. The goal is to conceptualize an improved SWM system tailored to Kratie's specific needs and conditions. A key challenge identified is the irregularity of public service offerings, including SWM, as the city's infrastructure has not kept pace with its expanding urban areas, resulting in poor service quality and important environmental and health risks.

Expense Category	Cost (Riel)	Cost (USD)
Drivers Salary	4,800,000	1200
Waste Collectors Salary	9,900,000	2475
Fuel	12,000,000	3000
Tax	400,000	100
Electricity	860,000	215
Water	360,000	90
National Social Security Fund	400,000	100
Total	**28,720,000**	**7180**

Table 3: Kratie's estimated yearly costs for waste collection, T&M studies (2023).

As an initial step towards enhancing the efficiency of Kratie's waste collection system, a series of Time and Motion (T&M) studies were conducted to analyze the current waste collection process, focusing on the use of collection trucks, crew behavior, and route planning.

These studies revealed inefficiencies, such as the use of multiple non-standardized waste containers as well as loose waste presented for collection by residents and business, a practice which negatively impacts hygiene and safety.

Figure 6: Timeline overview of collection activities in Kratie from T&M study (2023).

The findings led to several recommendations, including one that focused on the standardization of waste containers, improved safety measures for workers, and better route planning to reduce duplicate trips and minimize fuel use. Additionally, fostering collaboration between service providers and the public is seen as crucial for improving waste management services and addressing ongoing quality of service issues.

Category	Detail
Total Distance Travelled	37.6 km
Distance Travelled While Collecting	9.57 km
Distance Travelled Driving (to Dumpsite)	28.03 km
Total Collection Time	4 hours
Loading Time	3 hours, 24 minutes
Sorting Time During Collection	17 minutes, 32 seconds
Compaction Time	24 minutes, 12 seconds
Packing Recyclables Time	4 minutes, 42 seconds
Total Collection Points	174
Average Distance Between Points	59 meters
Truck Type	Compactor 12m³

Table 4: Overview of data collected as part of T&M study (20cx23).

For complete report see file: ***Service.Expansion.Report.pdf***

Waste banks in mainland schools

A focus on replicating waste bank recycling in schools was launched following the success of the pilot project with this focus on Koh Trung. This initiative was driven by an understanding of the significant impact school-based activities can have, not only in improving waste management within the schools but also in raising awareness among students, teachers, administrators, and indirectly, on students' parents.

Led by CRDT, the activity began with a study of six mainland schools to see how their existing waste management context might be integrated with an adaption of the waste bank concept. Following this initial survey of six schools two were shortlisted and one was finalized for more in-depth focus and partnership. Initially, some hesitancy was encountered from school administrators, but this was overcome following further discussions led by CRDT representatives. Initial visits revealed that schools were not participating in formal waste collection services, while most waste was generated by on-site food vendors serving lunches and snacks to students and staff. In addition, waste was being burned on-site, leading to unhealthy air quality and overall poor environmental conditions. In fact, fires were documented behind each canteen operating at one school - a situation that poses respiratory and other future health risks for those exposed.

A series of interventions were planned to follow the selection of Khav Bun Sun Secondary School on the mainland. This included the development of a set of awareness raising activities directed to students and teachers at Khav Bun Sun. The focus sought to educate students on proper waste management and the need to eliminate open burning by introducing waste recycling systems (Waste Banks) with collection and disposal to landfills. In this school workshops were conducted to teach the basics of waste management, and activities like selecting student ambassadors and hosting upcycling competitions empowering students to take ownership of the process.

The outcome of this initiative included heightened awareness, the establishment of a functional Waste Bank, and a system for recycling dry recyclables. Income from this activity will be used to fund recreational and extracurricular activities. CRDT also supported negotiation of an agreement between the private waste operator and school officials for discounted waste collection services, contingent on the separation of organic and recyclable materials before landfill disposal.

For complete report see file: Mainland.wastebanks.final.pdf

Procurement of equipment on mainland

During the project, most equipment acquisitions focused on supporting the Koh Trung pilot activity. However, some resources were also allocated to waste equipment procurement on the mainland. This included the procurement of 120-liter bins for waste collection in public areas such as the riverfront, markets, and schools, as well as a Waste Bank materials collection point at the Khov Bansun High School.

The launch of mainland bin procurement began in May 2023, following a meeting with His Excellency Hang Chandy, Deputy Provincial Governor, Kratie Province, who formally requested this support. A total of 58 bins were purchased in this first round of mainland procurement. The final batch of 50 bins was acquired in August 2024 and handed over officially to Kratie Municipal authorities during the project's closeout workshop in September 2024. These bins were distributed by Kratie Municipal authorities to schools and Sangkats in October 2024.[8]

The selection of bin colors was guided by technical guidelines on SWM from the Ministry of Environment (2016). Specifically, black bins are designated for waste destined for landfill disposal, green bins for the collection of organic waste, and yellow bins for the collection of PET bottles.

Figure 7: Closeout Kratie workshop, handover of waste collection bins, September 2024.

Policy and regulatory development

As part of the project's objective to improve the policy and regulatory framework governing waste management in Kratie, the team provided targeted assistance in updating, drafting, and implementing local waste management regulations. These efforts were essential in addressing

[8] *A complete listing of equipment procured in support of mainland activity can be found attached in Appendix 4 attached.*

the growing waste management challenges in the region, ensuring sustainable practices, and aligning broader environmental goals.

This section outlines the regulatory framework that guides waste management in Kratie, highlighting key areas where 3RproMar supported critical updates to local regulations. These updates aim to foster more effective waste management systems, with a focus on sustainable practices such as the 3Rs—reduce, reuse, and recycle—to improve both environmental health and community well-being.

National policy, laws and regulation related to waste management

National policies for SWM in Cambodia include the Law on Environmental Protection (1996), Sub-decrees on Environmental Impact Assessment (1999), Water Pollution Control (1999), and Solid Waste Management (1999). The 1999 Solid Waste Sub-decree governs municipal and hazardous waste activities. A more recent Sub-decree on Urban Solid Waste Management (2015) empowered sub-national levels to improve municipal waste management and encourage public participation. Other key regulations include Sub-decree 168 (2017) on plastic bag management, Prakas 195 (2018) on urban solid waste fees, and Inter-Ministerial Prakas 8682 (2019) on waste management penalties.

In 2021, Cambodia adopted an Urban Solid Waste Management Policy (2020-2030) addressing regulatory frameworks, technology for waste reduction, investment opportunities, and public awareness. Sub-decree 189 (2020) established enterprise regulations for managing transfer stations and landfills. Locally, Kratie Municipality enacted Deika Nr 001/21 on urban waste management and Deika Nr 002/21 on waste service fees in 2021, promoting waste separation and proper disposal, supported by enforcement mechanisms through the Working Group on Penalty Implementation (Deika Nr 010/21).

Recently amended and updated local Kratie regulations related to waste management and advanced with the support of 3RproMar include:

- Implementation of cleaning, sorting, packaging, storage and discharge of urban solid waste in Kratie (Approved Instruction No. 001 /May 2024)
- Adjustment and adding transition punishment agents' member Sangkat Koh Trung (Decision No. 20 /May 2024)
- Adjustment of Urban Solid Waste Management Services of Kratie Municipality (Approved Order No. 007 /May 2024)
- Fee revision covering 5 Sangkats (Dissemination of Order No. 007 /June 2024).

Provisions for waste disposal and diversion

Kratie Province's former waste disposal site was located at a 10-hectare dumpsite located 14 kilometers from the urban center in Khsar Village, operating since 2014 and covering 70% of the site. There are plans to remediate this dumpsite in 2025 under the ADB Project. A new landfill, part of the ADB's 'Second Urban Environmental Management in the Tonle Sap Basin Project (TS-2)', spans 27.85 hectares and is located 20 kilometers from the city along National Road No. 7. This new site, previously a dumpsite, faced operational challenges, particularly during the rainy season, but is now constructed and was completed in 2023, becoming operational in April of 2024. The landfill's design prioritizes environmental protection, with

plans for operational trainings and support for long-term operations and management covered by the assessment of tipping fees charged based upon the quantity of waste disposed.

A Material Recovery Facility (MRF) is integrated into the new landfill but remains underutilized due to the lack of waste separation prior to transfer. An additional landfill waste diversion strategy, organic waste treatment via composting, has been introduced on Koh Trung, with tentative composting efforts on the mainland, mainly targeting market waste, though these initiatives are still in early stages.

Work Package One Deliverables Fulfillment

Table 5 below provides an overview of the deliverables produced and the date of their submission in support of efforts falling within Work Package 1.

Work Package 1: Deliverables	Status	Completion Date
Conduct baseline study on Solid Waste Management in Kratie	Complete	May-22
Integrated SWM Plan final draft in English and Khmer	Complete	Dec-22
Procurement specification for solid waste management equipment	Complete	Jun-23
Results of Capacity Development measures documented	Complete	Sep-24
Provide support to the city in developing local regulations	Complete	Sep-24
Provide the training and capacity building for city official and relevant actors in SWM	Complete	Sep-24
Accompany municipal staff in establishing/Improving monitoring of SWM system	Complete	Sep-24

Table 5: Summary of Work Package One Deliverables

7. Work Package Two: Collection and processing of recyclables with informal sector participation

Work Package Two, as outlined in the Terms of Reference (TOR), focused on enhancing the collection, recovery, and processing of recyclables in Kratie, while also including collaboration with the informal sector. The activities in this work package targeted plastic waste and other recyclable materials to improve collection and processing efforts, boost recycling rates, while keeping plastics within the value chain.

Key activities included assessing informal sector waste management practices, developing pilot programs for collection and processing, purchasing equipment with a focus on benefiting women, and supporting the implementation of one pilot activity. The package also emphasized the facilitation of agreements between municipal, community, private, and informal stakeholders to improve their livelihoods and strengthen the recycling process.

Pilot concept development

The baseline study undertaken on Koh Trung identified the island as a significant source of plastic and waste leakage into the Mekong, highlighting the urgent need for waste management

service provision. A conceptual pilot project concept was developed, focused on community-based waste management, recycling, and public awareness, incorporating integrated SWM, waste minimization and zero-waste concepts.

Key aspects of the pilot included:

- Developing an incentive-based recycling system to address the lack of recycling services.
- Engaging Koh Trung's 1,841 residents and 20,000–25,000 annual visitors in waste management initiatives, with a focus on minimizing waste generation and promoting alternatives to SUPs.
- Establishment of a 'Waste Bank' that includes collection bins providing for source separation for recyclables and non-recyclables, and the onward sale of these materials.
- Introducing composting practices, particularly for food and green waste, linked to local agriculture (e.g., pomelo farming).
- Koh Trung Community-Based Ecotourism (CBET) organization leads the management and oversight of system operations and administration, having been designated by Kratie Municipality as the responsible party for these activities.
- Staffing of waste collection operations included a focus on gender balance through the employment of women as part of the waste collection crew operations.
- Strong emphasis on awareness-raising campaigns targeting both national and international tourists, promoting environmental preservation.

The pilot aims to establish long-term sustainability through cost recovery mechanisms and by engaging local households, businesses, and the informal sector.

For complete report see file: Plastic.Pilot.pdf

Consultation, research and system design

Building on the baseline study on waste management conducted in early 2022 an initial pilot concept was developed. Following the development of this concept the team continued to gather information and data related to waste generation, composition and handling on Koh Trung to fully inform the final plan and follow-on implementation of a community-based waste management system. TAF partner Composted, with support from TAF and the international experts, led this effort.

Key findings and proposed strategies included:

- Koh Trung residents, including 406 households (60 of which are small businesses), produce 1.16 tons of waste daily (as of September 2024).
- Focused strategy envisioning minimizing waste sent to the landfill through waste diversion, promoting recycling and keeping organic waste on the island for local composting.

- Tourism is a significant factor, with fluctuating waste volumes throughout the year due to high and low tourist seasons. Peak season is from December to March, and low season from June to September.

Estimated Tourist Waste	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tourist season	Peak	Peak	Peak	Aver.	Aver.	Low	Low	Low	Low	Aver.	Aver.	Peak
Estimated numbers of tourists	5,000	5,000	5,000	1,000	1,000	175	175	175	175	1,000	1,000	5,000
Waste generated (kg)	4,725	4,725	4,725	945	945	165	165	165	165	945	945	4,725

Table 6: Koh Trung estimated waste generation by tourists per month (March 2023).

- Tourist waste, primarily from day visitors on the beach and overnight guests, is estimated to contribute between 0.2 to 4.7 tons of waste per month.

In 2024, the Koh Trung system manages 77% of the generated waste (1.18 t/d), including:

- Daily recycling of 0.45 tons of organic waste through on-island composting;
- Diversion of 0.09 tons of recyclables to the recycling activity;
- Disposal of 0.36 tons of non-recyclable waste, which is collected and transported to the landfill on the mainland;
- While an additional 0.28 t/d of waste remains uncollected, 28% of which is plastic waste, resulting in a rate of plastic leakage of approximately 0.08 tons per day.

This approach integrated community-based waste operations with an emphasis on recycling, composting, and waste minimization. Table 7 provides an overview of waste management following pilot implementation.

RESIDENTIAL WASTE FLOW ESTIMATES	***Day***	***Week***	***Month***	***Year***
	Kg / (Tons)	***Tons***		
Total Waste Generated	***1176 / (1.18)***	***8.2***	***35.3***	***429.3***
Organic waste (52%)	***615 / (0.61)***	***4.3***	***18.5***	***224.5***
Paper (5%)	***61 / (0.06)***	***0.4***	***1.8***	***22.3***
Plastic waste (28%)	***324 / (0.32)***	***2.3***	***9.7***	***118.5***
Metal (0.43%)	***5 / (0.005)***	***0.0***	***0.2***	***1.9***
Glass (2%)	***19 / (0.02)***	***0.1***	***0.6***	***7.2***
Other Waste (13%)	***150 / (0.15)***	***1.1***	***4.5***	***55.0***
Waste Collection	***355 / (0.36)***	***2.5***	***10.7***	***129.8***
Organics to composting by HHs and Community	***290 / (0.29)***	***2.0***	***8.7***	***106.0***
Other organic waste consumption	***156 / (0.16)***	***1.1***	***4.7***	***57.1***
Recyclable waste for recycling	***89 / (0.09)***	***0.6***	***2.7***	***32.5***
Waste collection by OEOO	***10 / (0.01)***	***0.1***	***0.3***	***3.7***
Uncollected waste	***275 / (0.28)***	***1.9***	***8.2***	***100.2***
Plastic Leakage (28% Plastic in 2024)	***76 / (0.08)***	***0.5***	***2.3***	***27.7***

Table 7: Residential waste flow estimates on Koh Trung in 2024.

The guiding principles for the waste management activity on Koh Trung focus on efficient waste separation and sustainable practices:

- Waste must be separated at source into at three streams: organic waste, recyclables, and residual waste.
- Organic waste will be used locally to produce compost.
- Recyclables (plastics, metals, paper) will be collected and transported to the mainland. Initially, glass will be sent for disposal, with hopes for a future sustainable solution.
- Residual waste with no value will be transported to the mainland for disposal in a landfill.

Design options were developed based on observations of waste generation and feedback from residents. The final system design included the following elements:

- Waste Banks for managing recyclables.
- Home composting to divert organic waste from the landfill.
- A locally run collection system for residual waste, funded by fees assessed on households and businesses. This system will manage the collection and transport of waste to the landfill.

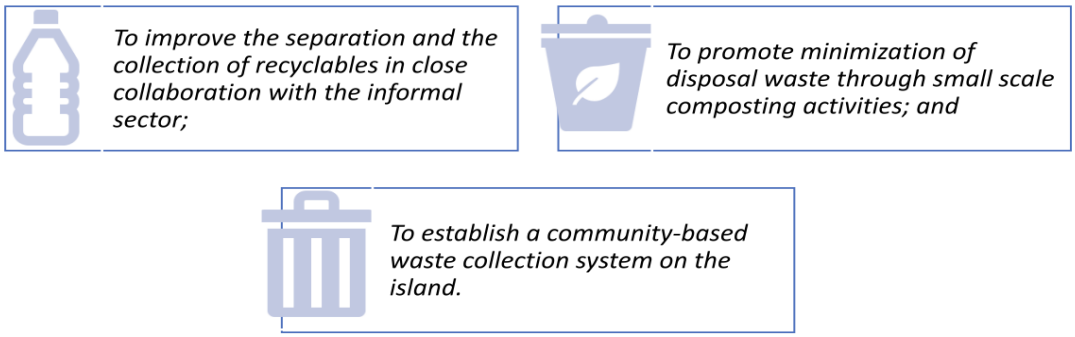


Figure 8: Objectives of the plastics recovery and recycling pilot activity on Koh Trung.

Plastics collection and recycling

Waste Recycling Banks were introduced on Koh Trung as a key element of the recycling and diversion of waste focus. These Waste Banks permitted direct engagement with schools and other community institutions as they served as the base for their operations. This initiative permits households to deposit their collected recyclable materials at the Waste Banks. Material collected (metals, plastics, paper) are then stored and eventually transported on to junk shops that purchase the material providing revenues that are then funneled back into the community. With the proceeds of these sales, community members benefit through the acquisition of study materials for students and environmental improvements for the community at large.

Key aspects of the collection and recycling focus include:

⇒ Focusing on easily identifiable and marketable recyclables such as clear PET, aluminum cans, tin cans, and paper/cardboard.

⇒ Establishing permanent waste banks at four locations: three schools and one community-based site on the island's western side.

⇒ The Koh Trung Community-Based Ecotourism (CBET) group oversees the collection, processing, transport, and sale of recyclables. Three CBET members collect materials weekly, maintaining regular records.

⇒ Proceeds from selling recyclables are used for purchase of study materials, waste collection services, or community development projects to attract tourism. Schools will receive equal shares of the profits, regardless of the volume of recyclables they collect.

⇒ CBET will retain a 10% administration fee from profits, estimated to generate approximately USD80 per month for waste and recycling collections.

Since system startup in 2023 there have been seven batches of recovered recyclable material transported to the mainland and sold to junk shop operators. The total of these sales document the diversion of over 3.5 tons of recyclables from the landfill with a net profit of over USD 600 (KHR 2.5 million) with subsequent profit being shared by beneficiaries as follows: three schools (USD 378), collection crew operators (USD 177), and CBET organization (USD 65).[9]

[9] Conversion of USD based on USD 1 to KHR 4069.

Table 8 below provides additional detail on these sales:

Selling Date	Weight (kg)			Profit (Riel)			Operation cost (Riel)				Total Revenue	Dividends (Riel)		
	PET	Metal	Cardboard	PET	Metal	Cardboard	Ferry	Rent Tuk Tuk	Gasoline	Drinks		3 Schools (60%-75%)	3 Collection Crews (15% - 30%)	CBETs (10%)
21.10.2023	487.5	0	124	487,500	0	18,600	10,000	20,000	0	0	**476,100**	357,000	71,400	47,600
12.12.2023	387.2	46	136.7	387,200	23,000	27,300	10,000	30,000	0	10,000	**387,500**	232,500	116,250	38,750
02.02.2024	479.5	9.29	189	479,500	54,800	37,800	10,000	30,000	22,500	9,000	**500,600**	300,360	150,180	50,060
06.04.24	412.3	0	321.4	412,300	0	64,200	10,000	45,000	22,500	13,000	**386,000**	231,600	96,500	57,900
24.07.2024	381.5	11.40	0	419,600	79,800	0	10,000	30,000	22,500	12,000	**424,900**	255,000	127,500	42,500
14.08.2024	290.5	0	0	324,000	0	0	10,000	30,000	22,500	15,000	**246,500**	147,900	73,950	24,650
27.08.2024	0	0	373	0	0	130,000	10,000	0	0	10,000	**110,000**	16,500	88,000	5,500
Total	**2,439**	**67**	**1,144**	**2,510,100**	**157,600**	**277,900**	**70,000**	**185,000**	**90,000**	**69,000**	**2,531,600**	**1,540,860**	**723,780**	**266,960**

Table 8: Sale and profit from recyclable waste on Koh Trung in first quarter 2024.

Composting and organics management

To reduce the amount of waste collected and transported to the landfill the pilot has been designed to integrate a focus on treatment of organic waste locally on the island, via home composting and community-based processing of organic waste. Organic waste, primarily food and garden waste, makes up around 50% of the total waste generated on Koh Trung. Disposing of organics in landfills produces methane, a potent greenhouse gas, additionally organic waste can contaminate recyclable materials decreasing their resell value. When improperly managed organic waste causes odors and attracts pests, requiring more frequent waste collection, and increasing operational costs. By separating and composting organic waste it is removed from the disposal waste destined for the landfill, thereby reducing waste collection frequency and costs. The plan as originally conceived envisioned the diversion of 80% of all organic waste to composting on the island, with the goal of reaching 100% over time.

This plan was conceived around a focus on home and community-based composting, starting with a household-composting trial. A selected number of households were chosen to participate, with a focus on those willing and knowledgeable about waste separation. These households received home composting units constructed locally from recovered pallets. These households also received basic training and follow-on support from COMPOSTED to ensure composting success. Some of the compost units provided also serve neighboring homes where the rate of generation of organic waste was not so high.

Additionally, in initial plans the organic waste from the market and beach stalls was to be collected and treated on the island and thus prevented from going to disposal in the landfill on the mainland, however in practice this has proven more difficult to implement and has yet to be fully addressed. The head of Community-Based Ecotourism (CBET) and beach stall owners, who are interested in composting, received technical support and equipment in anticipation of a transition to local treatment of organics generated by the stalls. At the same time organic waste composted at CBET headquarters using locally generated organics is being shared back to local end-users, with 30% going back to the community and 70% used for agricultural land.

Collection and disposal

A curb side (door-to-door) waste collection system has been piloted on Koh Trung as favored by local authorities, citizens, and businesses for its convenience, though users are required to pay a fee. Households, schools, and homestays place their waste outside their premises for collection which is collected by the collection crew and tuk-tuk. The waste is then transported to the mainland by ferry to a temporary storage in plastic skips (1,100 liters) located at the wet market near the ferry pier. These skips have polypropylene bulk bag liners to facilitate emptying by the mainland waste collector. The system also serves to collect market waste, improving efficiency by reducing the time required for loading waste into trucks. The mainland's waste collection service picks up the waste for a monthly fee of USD 100.

On Koh Trung, waste collection has been standardized with households required to use official heavy-duty bin bags, which are affordable and easily handled. Waste presented in other containers or bags is not collected, and householders must ensure the bags are secure and safe for collection crews.

Waste skips are placed in key locations, including the main market, Koh Trung market, the beach, and institutions, for secure temporary storage. This collection system has also created employment for islanders, with three full-time positions initially. These roles, which include a driver/supervisor and two collection staff, handle both disposal of waste and recyclables, as well as collecting organic material from the market and beach stalls. The staff works 5 to 5.5 days per week, with the driver earning USD 120 per month and the collection crew USD 100 each.

The project provided staff with training, and ongoing support during the first six months, uniforms, and personal protective equipment (PPE), including gloves, face masks, and steel-toe boots, to ensure a professional and safe service.

Figure 9: Approach to collection of residual waste on Koh Trung.

Financial management and administration

The waste collection system implemented on Koh Trung requires households, businesses, and other service users to pay a monthly fee. These fees have been determined through community consultations, economic assessments, and compliance with local regulations, with the amounts set based on the waste produced and residents' willingness to pay. Key fee details are provided in detail in Table 9 below.

No.	User Type	Monthly Fee ($)	Notes
1	Households	$ 1.25	Standard fee. Subsidies available:
	Poor ID 1	$ 0.25	Very poor households (16 total).
	Poor ID2	$ 1.00	Poor households (118 total) receive a 20% subsidy based on recyclable sales revenue.
2	Small Businesses	$ 3.75	Standard fee.
3	Market Vendors	$ 3.75	Monthly fee when in operation.
4	Beach Stalls	$ 3.75	Pay weekly during operation; no fees collected during the low season when the beach is closed.
5	Homestays	$ 3.75	Fee for homestays with five rooms or less; reduced to standard household fee in low season.
6	Guesthouses	$ 5.00	Arun Mekong Guesthouse, due to larger size.
7	Soriyabori Villas	$ 15.00	Largest waste producer, Receives more frequent waste collection including recyclables.
8	School, Pagoda, Sangkat	$ 5.00	Fee for Government office is 20000 Riel per month

Table 9: Koh Trung system user fees aligned with Deika 002 (2024).

These fees are designed to ensure that waste management on the island remain affordable while promoting responsibility for waste generation.

For complete report see file: SWM.system.design.Koh.Trung.pdf

Equipment procurement, construction and system implementation

After a series of consultations and design revisions, a waste and recyclables collection schedule was developed and approved by community representatives. The island is divided into four collection zones (A, B, C, D), each with a designated Waste Bank. The finalized schedule is outlined in the Table 10.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Morning	Waste Collection (Zone A)	Waste Collection (Zone B)	Waste Collection (Zone C)	Waste Collection (Zone D)	Recyclables Collection & Sorting (Secondary School; Beach; Market)	Recyclables Collection & Sorting (Soriyabori Villas; Beach; Market)
Afternoon	Recyclables Collection & Sorting (Secondary School; West Side; Volleyball Court)	Recyclables Collection & Sorting (Koh Trong Primary School; Market/Beach)	Recyclables Collection & Sorting (Chong Koh Trong Primary School; Secondary School)	Recyclables Collection & Sorting (West Side; Beach; Market)	Recyclables Collection & Sorting (Chong Koh Trong Primary School; Koh Trong Primary School)	

Table 10: Collection schedule by zone and recycling facility location.

In preparation for the Koh Trung pilot, the necessary materials and equipment were procured and delivered to Sangkat Koh Trung between the 1st and 3rd week of August 2023. These items included a trailer-built collection vehicle (tuk-tuk), wheelie bins, waste skips, compost units, organic waste containers, permanent and mobile waste banks, heavy-duty bags, uniforms, a scale, steel toe-capped boots, and other supplies.[10]

Key details included:

- Compost units, consisting of a set of pallets, were delivered on August 1st for residents to use in home composting.
- A tuk-tuk was purchased in Phnom Penh and shipped to Kratie for storage at Kratie Municipality Hall until being transported to Koh Trung.
- Other materials, including bins, skips, and protective gear, arrived on August 4th.
- Customized permanent and mobile waste banks were built by a welder in Kratie and transported to Koh Trung on August 17th.
- A new recycling storage facility (6m x 10m x 3m) was constructed near the volleyball court between August 5th and 18th to support the sorting, processing, and storing of recyclable materials collected from the community and school Waste Banks.

The Koh Trung waste management system was launched on August 24, 2023, alongside a clean-up event to mark the pilot's kick-off. The event had 60 participants, including representatives from Kratie Municipality, the Department of Environment, Department of Tourism, Department of Public Works and Transport, local authorities, Community-Based Tourism, teachers, students, monks, homestay owners, and representatives from the Ministry

[10] *A complete listing of equipment procured in support of the Koh Trung pilot can be found attached in Appendix 3 attached.*

of Environment, GIZ, The Asia Foundation, and COMPOSTED. A total of 43.5 kg of waste was collected during this first clean-up event.

Monitor and adjust operations, provide training and awareness raising

In the third quarter of 2023, a second batch of materials for Koh Trung's SWM system was procured. The quantities of some items were adjusted based on actual needs and budget availability. The materials included 30 sets of pallets and organic waste containers (reduced from 150 due to lower interest), 150 kg of plastic bags (increased due to demand), uniforms, and gloves.

Additionally, door-to-door training sessions were conducted to address waste management misconceptions, targeting households not using the collection service and students and vendors not properly separating waste. The main issue raised by residents was dissatisfaction with the fixed fee system, where everyone pays the same regardless of the waste generated.

COMPOSTED organized a clean-up event on October 26th with 57 participants, collecting 128.45 kg of waste. By the first quarter of 2024, 8,090 kg of waste had been collected and transported to the mainland in 36 ferry trips. A reduction in waste generation, particularly in Zone C, allowed the waste collection crew to save five trips. In February, 677.78 kg of recyclables were sold, generating KHR 500,600, with shares allocated to schools, waste collectors, and CBET.

In May 2024, COMPOSTED distributed 33 additional home compost units, bringing the total to 101 sets. Despite initial challenges, 10% of households fully utilized the compost units, and 5% were producing compost for the second time. COMPOSTED and the Sangkat committee provided guidance to improve composting practices, and additional compost units were made available to citizens upon request. By April, COMPOSTED had procured a total of 150 compost units for the community.

In June 2024, COMPOSTED conducted waste hotspot monitoring across 24 locations on Koh Trung. The results showed that 58.3% of locations (14 sites) were effectively cleaned up, 33.3% (8 sites) still had small amounts of plastic waste, and 8.3% (2 sites) showed no improvement, indicating areas requiring further clean-up efforts.

On August 16, 2024, COMPOSTED recognized local efforts in waste management by awarding certificates to outstanding contributors. Five exemplary home composters, one homestay composter, one school Waste Bank, and Sangkat Koh Trung administration were honored for their contributions. Koh Trung Secondary School and Sangkat Koh Trung also received certificates for leadership in SWM.

Additionally, on August 7, 2024, COMPOSTED provided 300 kg of plastic bags and 17 waste bins to support the waste collection system, with 21 bins installed by August 16 across Chong Koh and Kbal Koh villages. As the project concluded, three large billboards and four signboards were installed along the road on August 30, 2024.

Beach concession considerations

Koh Trung's beach, a major tourist spot, generates significant waste during the dry season. Before the waste collection scheme, vendors either burned or dumped their waste. Now, the collection system includes two skips and a recycling bank, but vendor fees (KHR 15,000 or USD 3.75 monthly) don't cover costs. In February, only USD 2.50 remained after covering transport expenses.

Though vendors produce many recyclables, they sell them directly to waste buyers instead of contributing to the scheme. Waste overflows on weekends, creating odors and unsightly views. Vendors also don't separate organic waste, and loose waste in skips poses safety issues for the collection crew.

The current waste management system will require updates before the upcoming holiday season begins. Short-term changes should aim to improve waste collection efficiency and beach aesthetics, while long-term modifications should redesign the system and adjust tariffs to cover costs and generate additional revenue for the island.

Short-Term Modifications:

- Provide vendors with adequate black bin bags and stress that loose waste will not be collected for safety reasons.
- Issue each vendor a wheelie bin for disposal waste (bagged in black bin bags) and enclosed containers for organic waste, which will be regularly collected and composted.
- Relocate skips to a more discreet area, screened with bamboo.
- Keep the recycling bin visible for tourists and ensure regular cleaning. Add a lined disposal bin with clear signage for tourists.

Vendor Rules:

- Vendors must clear the waste around their stalls.
- Disposal waste must be bagged, stored in wheelie bins, and transferred daily to skips by the vendors.
- Organic waste should be separated, placed in enclosed containers, and transferred to the skip area for collection.

Modifications for the upcoming season includes a proposal including three options for discussion with CBET and the Sangkat. These options should be assessed, and a decision taken prior to the start-up of beach operations in January of 2025 and should be agreed to through discussions between CBET, Sangkat Koh Trung and Kratie Municipality.

The options for consideration are as follows:

- **Option A:** Significant tariff increases to cover costs.
- **Option B:** Moderate tariff increases paired with the sale of recyclables to generate revenue.
- **Option C:** A complete overhaul of the business model for managing the beach area.

These long-term options will help ensure the sustainability of the waste management system and improve conditions in the beach area.

For complete report see file: Proposed.beach.modifications.pdf

Financial sustainability

A standardized waste collection fee system and payment method were agreed upon for Koh Trung. Village chiefs distribute bills to households on the 20th of each month, with payments collected on the same day or at the Sangkat Hall. Poor ID cardholders (households eligible for subsidized service) receive discounts of 25% to 75%, with no collection fee assessed for funerals. The system integrates a transportation cost for waste disposal to the landfill set at USD 20 per week.

For the first seven months, these costs, along with crew allowances and vehicle maintenance, were covered by the project. Afterward, these costs were covered by the fees collected from users with shortfalls covered by the project. However, concerns were raised about users' willingness to pay, and the waste collection crew requested higher allowances, which were partially addressed by offering a 10% bonus from recyclables revenue. Another factor impacting system financial management were the subsidies offered to poor households which were not initially considered when the system was being conceptualized.

In May 2024, 70% of households (261 out of 372) participated in the waste collection service, with 91 households unable to fully pay their fees. The total fee collected from March to May was KHR 5,234,000. In July 2024, a mandated fees increase was implemented raising the household collection fee to KHR 7,000. However, this still fell short of covering costs, as a rate of 95% community participation was needed to break even.

Based on financial analysis at the time it was estimated that reducing the Sangkat fee (currently set at 10%) to 7.5% or 5%, along with increasing business fees to reflect their higher waste generation would put the system on sound financial footing. These proposed adjustments are based upon recognition that the sale of recyclables generated USD 400 less than expected,

Number of households	Month	Households using service	Percentage	Non-participant households	Percentage	Total Fees Collected (Riel)	Sangkat fee (10%) (Riel)	Remaining Operational Budget from Fees (Riel)	System Operational Expenses	Monthly Deficit	Monthly Deficit (USD)
372	23-Sep	255	69%	117	31%	1,312,000	131,200	1,180,800	2,040,000	(859,200)	(211)
	23-Oct	246	66%	126	34%	1,251,500	125,150	1,126,350	2,312,240	(1,185,890)	(291)
	23-Nov	215	58%	157	42%	1,174,000	117,400	1,056,600	2,245,000	(1,188,400)	(292)
	23-Dec	300	81%	72	19%	1,581,500	158,150	1,423,350	2,050,000	(626,650)	(154)
	24-Jan	272	73%	100	27%	1,565,500	156,550	1,408,950	2,165,000	(756,050)	(186)
	24-Feb	267	72%	87	23%	1,675,000	167,500	1,507,500	1,987,500	(480,000)	(118)
	25-Mar	290	78%	29	8%	1,857,500	185,750	1,671,750	1,985,000	(313,250)	(77)
	25-Apr	291	78%	68	18%	1,919,500	191,950	1,727,550	2,182,000	(454,450)	(112)
	25-May	261	70%	91	24%	1,457,000	145,700	1,311,300	2,073,000	(761,700)	(187)
	25-Jun	301	81%	49	13%	1,704,000	170,400	1,533,600	2,040,000	(506,400)	(124)
	25-Jul	276	74%	92	25%	1,518,500	151,850	1,366,650	2,079,500	(712,850)	(175)
	25-Aug	260	70%	83	22%	1,600,000	160,000	1,440,000	2,225,000	(785,000)	(193)
Total	**12**	**270**	**72%**	**89**	**24%**	**18,616,000**	**1,861,600**	**16,754,400**	**25,384,240**	**(8,629,840)**	**(2,121)**

Table 11: System participation, waste fee revenue, operational costs and deficit.

largely because residents continue to sell high-value aluminum cans directly to collectors who visit Koh Trung periodically.

Overall, this implies that more recycling participation from households and businesses is required to more fully enhance financial operations. Additionally, beach vendors, who pay a relatively low fee of KHR 15,000 but generate high waste volumes, were identified as a financial strain on the system, with upwards fee adjustments recommended to their fees to ensure sustainability. A summary of system participation, fee revenues, operational costs and monthly system deficit is provided in Table 11 above.

Future steps

In preparation for a visit by the Cambodian Minister of Environment and the German Ambassador on July 30th 2024, the Sangkat chief and the community made preparations to showcase their efforts. The visit permitted the community to showcase the model that has been developed and successfully implemented over the past year; however, several challenges remain:

- Some households are still not paying the waste collection fee and thus not contributing to sustainable waste management on the island.
- On-going concerns and resistance from citizens to a return to pre-Covid fee assessment levels (KHR 7000).
- Vendors at Chong Koh Market need more guidance regarding proper waste disposal requirements.
- Beach operations during peak tourism season should be addressed before the start of the next session in January 2025.
- Ensuring the future of the waste management system's technical and financial sustainability along with high service quality and achievement of environmental goals.

Proposed solutions include:

- Continuing monitoring and clean-up efforts along riverbanks and roads with the community and waste collection teams.
- Empowering the Transitional Penalty Team to fine for non-payment and non-participation.
- Reducing transportation costs by engaging stakeholders such as ferry owners.
- On-going focus on diversion of organic waste and recyclables via Waste Bank activities and local composting.

Additionally, to ensure continued functioning of the Koh Trung system, municipal and provincial authorities should develop a plan to address the monthly deficit highlighted in Table 11 above. This can perhaps be addressed via budget line items designated for health, sanitation, and environment. Without this support the future viability of the system is called into question.

Work Package Two Deliverables Fulfillment

Table 12 below provides an overview of the deliverables produced and the date of their submission in support of efforts falling within Work Package Two.

Work Package 2: Deliverables	Status	Completion Date
Baseline assessment on informal waste sector in Kratie	Complete	May-22
Concept for activities to support informal sector (according to real needs finding from TAF) (Pilot project concept)	Complete	Jun-22
Purchase of equipment, of which at least parts of it favors women	Complete	Aug-23
Results of Capacity Development measures documented	Complete	Sep-24
Support to the implementation of one pilot (incl. trainings, support to the organization…etc)	Complete	Sep-24
Facilitate agreement between municipal, community, private and formal stakeholders paying special attention to improve livelihoods	Complete	Sep-24

Table 12: Summary of Work Package Two deliverables.

8. Work Package Three: Integrated behavior change measures

The baseline development element of work package three, was designed to gather insights into public perceptions and behaviors around waste management and plastic consumption in Kratie. Surveys were conducted over a week, reaching 120 households and 30 businesses, with the aim of understanding local attitudes and identifying opportunities for behavior change. The surveys explored a variety of topics, from current waste disposal practices to motivations for better waste management.

Figure 10: 3RproMar Kratie pilot logo.

Baseline development

Key findings revealed that street food and drink vendors contribute significantly to plastic waste, as every purchase involves single-use items like plastic cups, straws, and holders, with costs ranging from between KHR 2000 to KHR 8000 per drink. Similarly, businesses selling food products consistently offer plastic bags with every purchase, further driving plastic consumption.

Households tend to separate materials that have resale value, such as recyclables, but do not differentiate between plastic and food waste. This lack of separation leads to improper disposal

of plastic items, which often end up littering public areas. The presence of discarded plastic bags and lunch boxes in public spaces was linked to low awareness about waste management, inadequate public waste bins, and a generally insufficient waste collection system.

Additionally, households that lack access to proper waste collection services often resort to burning their waste in the open, something which - when mixed with plastics - poses environmental and health risks. These findings highlight significant areas where interventions - such as improving waste collection infrastructure, increasing public awareness, and reducing plastic dependency - could make a meaningful impact on waste management practices in the region.

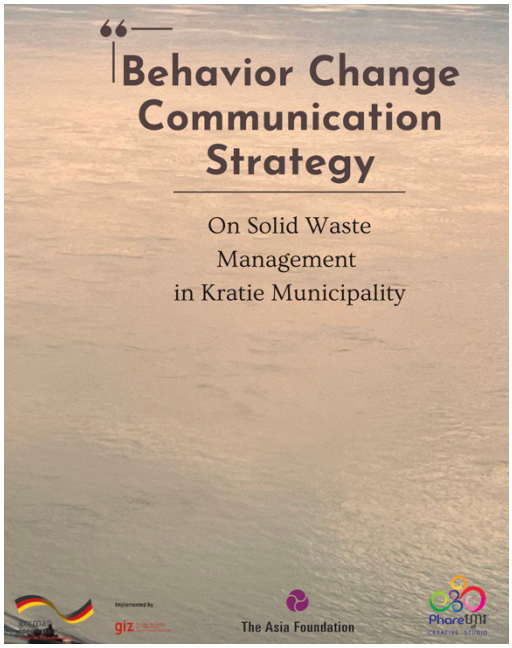


Figure 11: Human-centered campaign design approach selected to maximize impact.

Engagement and consultation process for strategy development

Phare Creative Studio, in collaboration with Kratie Municipality officials and TAF developed a Behavior Change Communication (BCC) campaign to improve plastic waste management in Kratie. The development process involved mapping existing initiatives, holding stakeholder workshops, and conducting concept testing with local communities. Key activities leveraged to create the final strategy included BCC trainings, Kratie's Solid Waste Management (SWM) plan development, a 2022 field survey, and cleanup events organized by 3RproMar and other organizations.

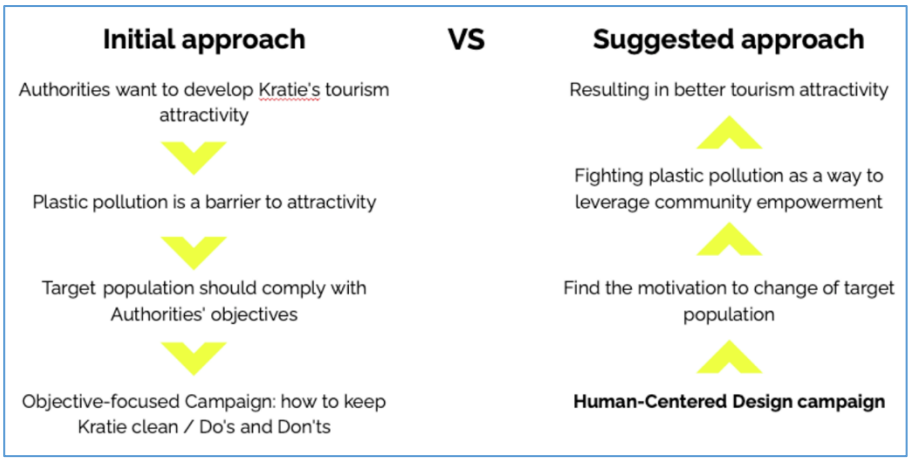


Figure 12: Two approaches considered in the development of Kratie's BCC strategy.

Three BCC concepts were tested with a representative group of students and farmers on May 22, 2023:

1. Be a Plastic Hero: Focused on villagers as the main characters and social media content creators.

2. Beat the Plastic Monster: Highlighted community artistic activities using recycled plastic, including a parade and educational comic book.
3. It Starts with You: A classic approach involving banners, a cleanup event, and direct involvement from local authorities.

The third concept, "It Starts with You," was the favorite, as participants appreciated the involvement of authorities, free event giveaways, and direct engagement with villagers. However, concerns were raised about the effectiveness of banners, and participants stressed the need for more trash bins and waste collection services.

A series of three training workshops were conducted in support of strategy development. These were held in Siem Reap (March 2023), Sihanoukville (April 2023), and Phnom Penh (May 2023) to engage Kratie stakeholders and provide insights into effective waste management practices from other Cambodian municipalities. The workshops aimed to:

- Educate participants on how social behavior change campaigns function and emphasize the need for clear ideas in early stages of development.
- Address stakeholder concerns and review findings from previous research on plastic waste in Kratie.
- Facilitate group discussions to explore local stigmas, motivations, challenges, and baseline knowledge from multiple perspectives.
- Collaboratively brainstorm and select ideas for an upcoming awareness-raising campaign, focusing on concept, narrative, and messaging.

These workshops helped build a foundation for the design and implementation of Kratie's behavior change communication strategy.

Based on this feedback, the final BCC campaign was developed, focusing on activities such as cleanup days and train-the-trainer programs. The campaign also included the development of various communication assets like social media posts, educational materials (comic books, flyers, and games), a logo featuring the Irrawaddy dolphin, billboards, and a series of videos on waste management in Kratie. These assets covered topics such as SUPs, eco-friendly alternatives, waste's environmental impact, and the role of local waste workers.

Conceptual Strategy validation, asset development and pilot implementation

After completing the strategy and incorporating input from the team and stakeholders, the Kratie Municipal Administration officially endorsed the BCC strategy in August 2023. This endorsement followed a comprehensive process of consultation, strategy development, and iterative revisions.

Following the official endorsement, various BCC assets were developed, including videos, Facebook posts, billboards, print materials, and activities like clean-up events and train-the-trainer programs. The pilot phase of the BCC campaign was launched in December 2023 and ran through January 2024. CRDT coordinated the campaign, while different partners and implementers carried out specific activities.

Kratie Municipal Administration led key initiatives such as posting videos and static content on Facebook, coordinating the installation of billboards, and organizing a large clean-up event. Local Sangkat authorities managed audio announcements, and school librarians implemented comic book-related activities in selected schools.

All communications assets developed for the campaign were deployed during this pilot phase. Billboards and comic books were distributed to targeted areas and schools, while the final schedule for Facebook posts and related materials was shared with the Kratie Municipal Administration. Audio recordings and announcements were provided to Sangkat focal points for local dissemination.

Figure 13: BCC visual featuring the selected theme of Kratie's BCC strategy.

Pilot activity development

The BCC pilot campaign on SWM in Kratie, under the 3RproMar initiative, was implemented over a period of two months by the Kratie Municipal Administration, Sangkat authorities, and librarians with support of CRDT. The campaign focused on two Sangkats, Koh Trung and Kro Ches, and used a variety of approaches, including Facebook posts, audio announcements, clean-up campaigns, and educational materials like comic books and billboards.

Key activities of the campaign included:

1. Facebook Awareness Posts: Six posts (3 images, 3 videos) raising awareness on plastic waste issues.
2. Mobile Audio Announcements: 106 hours of audio messages over 25 days reaching 2,018 families.
3. Billboards: Eight billboards were installed in prominent locations across two Sangkats.
4. Clean-Up Campaign: On January 11, 2024, a clean-up event engaged 210 participants, including students, local authorities, and community members, collecting 297 kg of plastic waste.
5. Comic Books: Educational materials were distributed to schools to engage students in waste management practices and behavior change.

Monitoring and evaluation were conducted to assess the pilot campaign's impact, and a reflection workshop was held to review results, challenges, and plans for expanding to additional areas. Despite challenges like inefficient Facebook page management, the campaign increased awareness and inspired actions. Recommendations for improvement included streamlining the FB posting approval process, expanding the comic book initiative, and maintaining collaboration with stakeholders to ensure long-term behavior change.

For complete report see file: BCC Pilot Assessment Report.pdf

Roll-out activity implementation

Following the successful completion of the BCC pilot testing and the assessment from NGO partner, CRDT, it was decided to expand the implementation of the roll-out activities to three additional Sangkats: Sangkat Oreussey, Kro Kor, and Roka Kandal. Targeting five Sangkats in the entire provincial town, the roll-out campaign focused on three key activities: the distribution of comic books to 10 schools, clean-up events organized by Sangkat and Municipal authorities, and Facebook posts managed by Kratie Municipality Administration. The implementation of the three main strategies took place between May and July 2024.

In response to evolving needs and to further improve the campaign's effectiveness, capacity-building training was provided to key implementers, including the authorities from five Sangkats, Facebook administrators, and teachers from the selected schools. This training aimed to enhance their skills and improve the overall effectiveness of activity implementation.

Key achievements from the expanded implementation include:

1. Comic Books: A total of 500 comic books were distributed to 10 schools across five Sangkats.
2. Clean-up Events: A total of 11 clean-up events were organized, involving 1,394 participants, including students, local authorities, and community members. These efforts resulted in the collection of 1,806 kg of waste.
3. Facebook Posts: Kratie Municipality posted 15 pieces of content, consisting of 8 videos and 7 static posts, which reached over 150 thousand individuals.

This strategic expansion ensures that the BCC initiative will continue to build on past success, engaging local communities and stakeholders while strengthening the capacity of key implementers to ensure sustainable and impactful results.

For complete report see file: BCC Rollout Reflection report-final.pdf

Assessment on roll-out implementation

Following the completion of the BCC campaign in Kratie, an assessment was conducted to evaluate its successes, challenges, and opportunities for future initiatives. The campaign had a positive impact on waste management practices. Key findings of the assessment included:

- Increased public understanding of SWM, particularly through Facebook posts showcasing clean-up efforts. However, households were less familiar with the 3R concepts and more familiar with concepts related to general waste management.
- Behavioral shifts were observed among students and households, especially after clean-up events, where students reported reduced practices of burning plastic and increased responsible consumption.
- Comic books were highly effective in educating students mainly leading to an improved understanding of waste sorting.

The assessment suggested several recommendations to increase local inhabitant's engagement:

1. **Expand digital platforms**: While Facebook has been effective, the campaign could broaden its reach by using platforms like Instagram and TikTok, which appeal more to younger generations. Interactive content like short videos or challenges with awards for best SWM practices could amplify engagement.
2. **Enhanced use of comic books**: The comic book's games and educational materials could be extended beyond schools to engage households, where SWM knowledge may be limited. Additionally, introducing online games or mobile apps could make learning about SWM more interactive and fun, particularly for younger audiences.
3. **Sustaining clean-up events**: To extend the impact of clean-up events, the assessment suggests establishing regular clean-up clubs or partnerships with schools and community groups. These events could be smaller, more frequent, and localized (e.g., in schools, villages, or markets) to maintain momentum and gradually instill lasting behavioral changes. Small incentives for participants and consistent monitoring of waste reduction would support long-term progress.

For complete report see file: BCC Rollout Assessment Report.pdf

Household and business trainings

The BCC campaign was supported by two additional elements that supported the overall BCC strategy. These included (1) business workshops and (2) household outreach. These efforts aimed to complement the main campaign by raising awareness and promoting the principles of Reduce, Reuse, Recycle (3R) for sustainable waste management within both local businesses and households.

Business Workshops - Five workshops targeting 50 businesses were conducted, engaging 67 participants from various sectors, such as meat sellers, hotels, and grocery stores. Key findings from post-workshop assessments revealed significant improvements in knowledge about waste management. For instance, awareness of issues like waste burning, burying, and lack of segregation increased by over 30%. Participants also committed to adopting better waste management practices, such as waste separation (82%) and using reusable bottles (62.3%).

Key Goals of the Business Workshops:

1. Educate businesses on waste generation and disposal practices, with a focus on the environmental and health impacts.
2. Raise awareness of legal obligations concerning waste management.
3. Promote practical waste management solutions and foster long-term commitment to the 3R principles.

Household Outreach - The household awareness campaign, conducted by 15 trainers, reached 1,200 households in Kratie, focusing on Sangkat Kra Kor and Sangkat Roka Kandal. Over 70% of the households reported learning proper waste management practices, such as waste separation and storage, and nearly two-thirds began using waste collection services.

The campaign effectively raised awareness about waste dumping (recognized by 55% of households as the top issue), burning, and burying of waste, and significantly improved legal

and health awareness. The initiative also led to behavioral changes, such as increased use of waste collection services and a commitment to reducing plastic use.

Outcomes and Recommendations - Both efforts resulted in increased awareness and engagement in sustainable waste management practices. Future recommendations include more training on waste separation, ongoing community engagement, and further promotion of waste collection services to ensure long-term success.

For complete report see file: Business.trainings.pdf

Waste Profiles: Gender and the Informal Sector

As a final part of the BCC strategy, the development of a set of waste profiles provided insights into how gender and the informal sector are related to Kratie's waste management system. These profiles captured the experiences of individuals working across various roles in the waste sector, from waste collection and recycling intermediaries (junk shops) to management and decision-making positions.

The objective was to create three to five snapshot profiles, highlighting the personal experience of these workers and their contributions to Kratie's waste management system. Baseline observations collected early in the project guided the creation of these profiles. In addition to documenting their roles, the profiles offered additional perspectives on improving waste management and enhancing current practices.

These profiles also served to support a better understanding of the influence that gender and the informal work have upon waste system operations. Table 13 below provides an overview of the individuals profiled and illustrates the diverse roles that both women and men play in Kratie's waste management system, from informal and grassroots collection efforts to positions of leadership in formal waste operations.

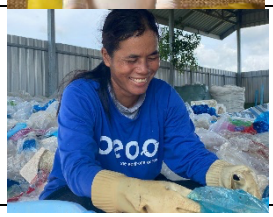
	Name	Gender	Profession	Profile	Photos
1	**Kam Sonoy**	F	Supervisor, Le Tonle Guesthouse	Kam Sonoy leads eco-friendly waste management practices at Le Tonle Guesthouse, advocating for waste segregation and environmental education. Her influence highlights the role women can play in promoting sustainability within the hospitality industry and the broader community.	
2	**Sork Sreymom**	F	Waste Collection Crew, OEOO Team	Sok Pheng's hands-on role in waste collection directly contributes to the cleanliness and appeal of Koh Trung, supporting local tourism. Her work also encourages others in the community to adopt better waste management habits.	
3	**Sok Pheng**	F	Waste Collection Crew, Koh Trung	Sok Pheng lives in Chong Koh Village, Sangkat Koh Trong. She is 43 years old and a member of CBET since 2022. She works at CBET's office taking care of bicycles and at the beach where she looks after the tourist motorcycles. In the evening, she collects waste at the community market on Koh Trung. Since August 2023, CBET's Chief has assigned her to be a waste collection crew on Koh Trung.	
4	**Heng Phirum**	M	Director, Waste Collection Company	Heng Phirum oversees formal waste collection operations, ensuring city cleanliness and efficient waste transport. His leadership extends to public education campaigns, which helps to foster improved waste management practices among residents.	
5	**Lay Kanha**	W	Junkshop Owner	Lay Kanha acts as a key intermediary between informal waste workers and recycling facilities, demonstrating the economic role women play in Kratie's waste management. She not only provides income for waste pickers but also educates them on recyclable materials, improving sorting efficiency and supporting environmental sustainability.	

Table 13: Waste profiles, gender, and informal sector focus.

For complete report see file: Waste.profiles.pdf

Work Package 3 Deliverables Fulfillment

Table 14 below provides an overview of the deliverables produced and the date of their submission in support of efforts falling within Work Package 3.

Work Package 3: Deliverables	Status	Completion Date
Assess the current core behavior and perception patterns related to SWM and plastics consumption	Complete	May-22
integrated behavior change measures	Complete	May-23
3 training or other CD measures implemented	Complete	Aug-23
Implementation results and experiences (PPT)	Complete	Apr-24

Table 14: Summary of Work Package Three Deliverables

9. Plastic leakage and waste management Monitoring and Evaluation (M&E)

A Monitoring and Evaluation (M&E) activity was developed to assess the impact of the 3RproMar efforts on reducing plastic leakage into the Mekong River by comparing waste management practices before and after the project's main phases of implementation. The M&E process revisited the 2022 baseline study on plastic leakage and aimed to ensure alignment with project indicators for waste collection, recycling, and diversion.

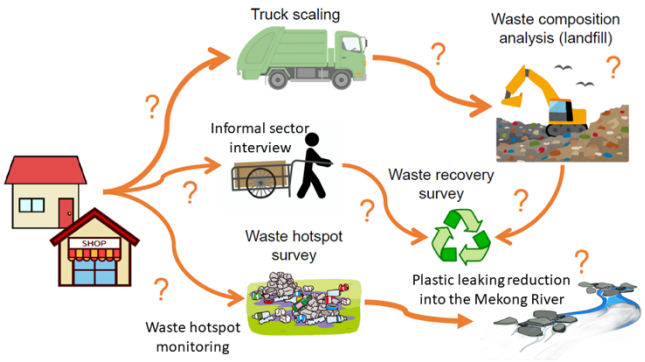


Figure 14: Overview of M&E approach to measuring plastic leakage.

The M&E methodology integrated three main areas of focus:

1. Waste composition analysis and daily waste weighing at landfills.
2. Recyclable waste tracking by both formal and informal workers.
3. Monitoring plastic hotspots along the riverbanks to evaluate reductions in plastic leakage.

Plastic Waste Leakage

= (Waste Generation – (Waste Collection + Recycling + other diverted waste)) * 28% Plastic

Note: Applied only for Koh Trung estimates.

Figure 15: Plastic waste leakage calculation.

The estimation of plastic leakage focused on waste hotspots, which are land-based waste piles formed by illegal dumping from residents who do not use waste collection services. These piles are not regularly cleaned up. Plastic deposited here can wash into the river when water levels rise.

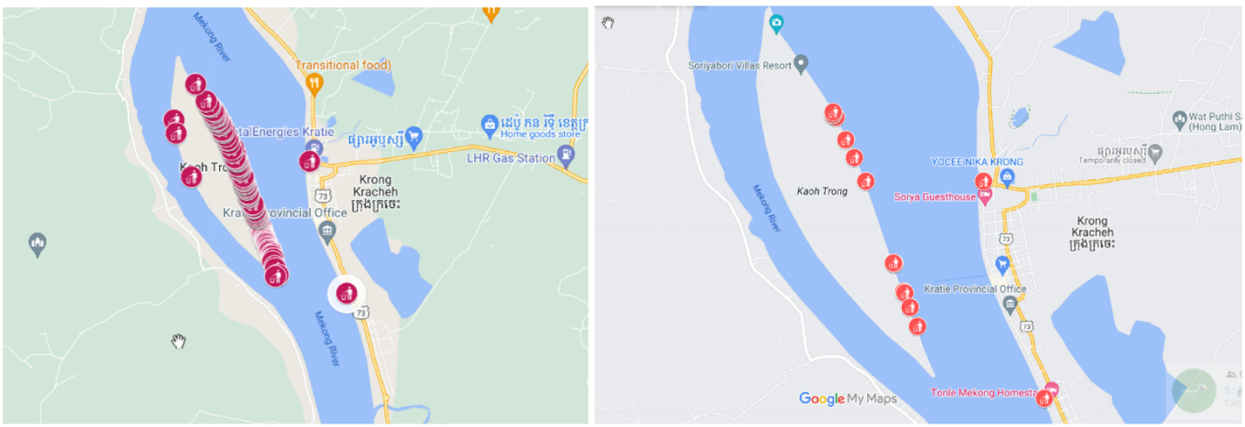


Figure 16: Before and after: Hotspot identification on Koh Trung and mainland Kratie.

To estimate leakage, factors such as the number of households not using waste collection services, the prevalence of open burning or dumping, and the composition of plastic waste are considered. Cleanup efforts by the OEOO Team of COMPOSTED were excluded from the leakage estimates.

Key M&E study findings include:

1. Waste generation increased by 0.72 tons per day between 2022 and 2024, while overall waste collection decreased due to diversion of materials to recycling (increasing by 2.6 tons/day over 2022) while organic waste diversion linked to composting was introduced in 2023 (estimated at 0.57 tons/day).

2. Plastic hotspots, especially on Koh Trung, are associated with 0.08 tons/day of plastic waste, with high potential for leakage into the Mekong River during the rainy season.

	2022		Kratie City 2022	2024		Kratie City 2024
	Koh Trung Island	Mainland		Koh Trung Island	Mainland	
Population	1,841	31,098	**32,939**	1,867	31,957	**33,824**
Waste Generation (T/day)	1.16	30.73	**31.90**	1.18	31.44	**32.62**
Waste Collection (T/day)	0	24.53	**24.53**	0.36	20.49	**20.85**
Organic waste to compost (T/day)	0	0	**0**	0.29	0.12	**0.41**
Other organic waste consumption (T/day)	n.a	n.a	**n.a**	0.16	n.a	**0.16**
Recyclable waste for recycling (T/day)	0	3.76	**3.67**	0.09	5.98	**6.07**
Waste collection by OEOO (T/day)	0	0	**0**	0.01	0.19	**0.20**
Uncollected waste (T/day)	1.16	2.96	**4.12**	0.27	4.65	**4.93**
Plastic Leakage (T/day)	0.31	0.10	**0.41**	0.08	0	**0.08**
Equivalent Plastic Leakage Per Capital in Kratie Municipality Per Year (Kg/capita/year)	**4.51**			**0.82**		
Plastic Leakage Reduction into the Mekong River						**82 % or 0.34T/day**

Table 15: Calculating Kratie's plastic waste leakage into Mekong.

Kratie's efforts to reduce plastic leakage led to a significant **82% reduction in plastic waste leakage** entering the Mekong, **preventing an estimated 0.34 tons of plastic from reaching the marine environment each day, or 124 tons avoided in a year.**

Visualizing Plastic Waste Leakage Reductions

To better understand the impact of this significant daily reduction it is helpful to visualize the volume of 0.34 tons of plastic waste in a relatable object like a bathtub or a dump truck. To do

this we take the average plastic waste density of 450 kg/m³. A calculation tells us that 0.34 tons of plastic waste would occupy approximately 0.76 cubic meters. This volumetric measurement equates to roughly 3 bathtubs, implying the avoidance of 3 bathtubs worth of plastic per day going to the marine environment. Over the course of a year, the amount of plastic would accumulate to 275.8 cubic meters of waste.

This 275.8 cubic meters of waste amount would fill around **1,103 bathtubs,** or roughly **23 dump trucks** in a year of avoided ocean plastics.

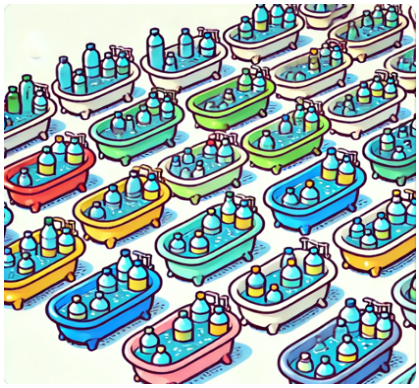


Figure 17: Three bathtubs a day, 1,103 bathtubs per year, diverted from marine environment.

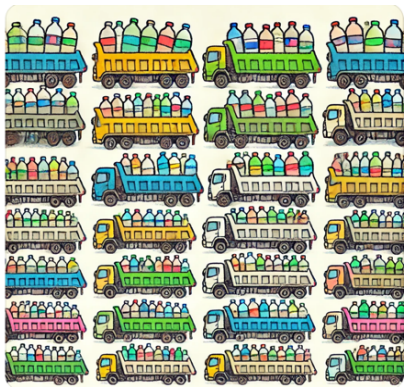


Figure 18: Estimated 23 dump trucks of plastics a year diverted from the marine environment.

For complete report see file: M&E.plastic.leakage.analysis.final.pdf

10. Final close out activities

Several months prior to the planned conclusion of the project set for the end of September 2024, discussions began related to planning for close out activities designed to present an overview of project activities, outcomes and recommendations for future action post-project completion.

In consultation with GIZ a decision was made to coordinate two close-out activities, the first to be held in Phnom Penh as part of the Cambodia Circular Economy Forum 2024 (CCEF) hosted by GIZ and directed towards a mix of Cambodian governmental and national and international waste stakeholder organizations and professionals. The second meeting would be a targeted event to be held in Kratie and designed to engage Kratie partners in a final round of discussions focused on a review of partnership activities and a look to next steps required to ensure sustainability of activities to date.

Closeout Workshop Activity (Cambodia Circular Economy Forum, CCEF 2024)
The project's closeout session, held on September 11, 2024, as part of the Cambodia Circular Economy Forum 2024, aimed to share key accomplishments and lessons learned to inform future projects. A total of 164 participants, including representatives from the Cambodian government, development partners, NGOs, private sector, and local government representatives, attended the event.

The two-hour session included presentations and a panel discussion, focusing on the project's most significant achievements in waste and plastic management and key lessons learned. Facilitators and panelists, including local officials and project leaders, reflected on the project's successes and offered insights for future initiatives. Opening remarks were given by Ms. Meloney Lindberg, Country Representative with TAF, and Mr. Moeurn Sao Kun, Deputy Governor of Kratie Municipality. The event concluded with discussions that emphasized the importance of continued collaboration and applying the lessons from 3RproMar to future waste management efforts.

Closeout Workshop Activity (Kratie Municipality)
On September 13, 2024, 3RproMar held a closing workshop with partners in Kratie to confirm local stakeholders' commitment to waste management goals and to look back at project activities and achievements. The workshop reviewed collection, treatment, and disposal strategies, waste collection service expansion opportunities, and the Koh Trung pilot experience, with discussions on behavior change activities and next steps.

Fifty-seven participants, including representatives from provincial departments, Kratie Municipality, CBET, and the waste collection service provider, attended the workshop. It featured presentations on project achievements and a panel discussion addressing accomplishments, challenges, and future commitments.

During the closing session, Kratie officials reaffirmed their commitment to waste management improvements. Materials, including waste bins and comic books, were handed over to Kratie Municipality. The workshop concluded with expressions of gratitude from the project team for the stakeholders' support.

The workshop secured active engagement from all participants. The knowledge and recommendations shared will guide future SWM improvements in Kratie, ensuring progress and benefits for the community and the environment.

11. Stakeholder consultation and capacity building

The project placed a strong emphasis on aligning activities with the needs of local stakeholders, ensuring that action planning efforts, such as the SWMP, Koh Trung pilot, and BCC activities, were developed with strong local ownership.

Additionally, all consultation and action planning activities were accompanied by a capacity-building component, focusing on ensuring prospects for long-term sustainable waste and materials management in Kratie. A summary of all consultation and capacity-building activities is provided in a table in Appendix 7.

12. Decentralized waste system design guide

A guide that aims to assist local authorities and development agencies in developing decentralized waste collection schemes in Southeast Asia such as the one established on Koh Trung, was developed to support replication of similar activities.

This guide was developed based upon the experiences documented as part of the Koh Trung pilot in Kratie under the 3RproMar Project. It is also important to note that this guide was not an original deliverable under the project, but an additional value-added piece of work.

This guide promotes the concept of decentralized waste collection, a scheme that shifts SWM responsibilities to local entities rather than a central authority. In Southeast Asia, urban areas often receive waste collection services, but semi-urban and rural regions are underserved, leading to dumping and burning. Decentralized schemes address these challenges using local labor, smaller vehicles, and transfer points, while encouraging recycling and organic waste diversion.

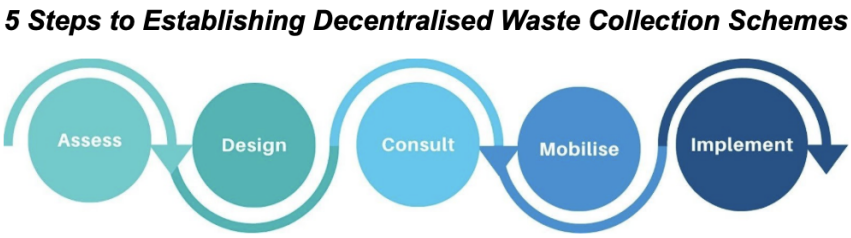


Figure 19: The five steps to establishing decentralized waste collection.

Decentralized waste collection schemes offer numerous benefits, including expanded service coverage, environmental improvements, community empowerment, cost efficiency, job creation, and increased sustainability and revenue.

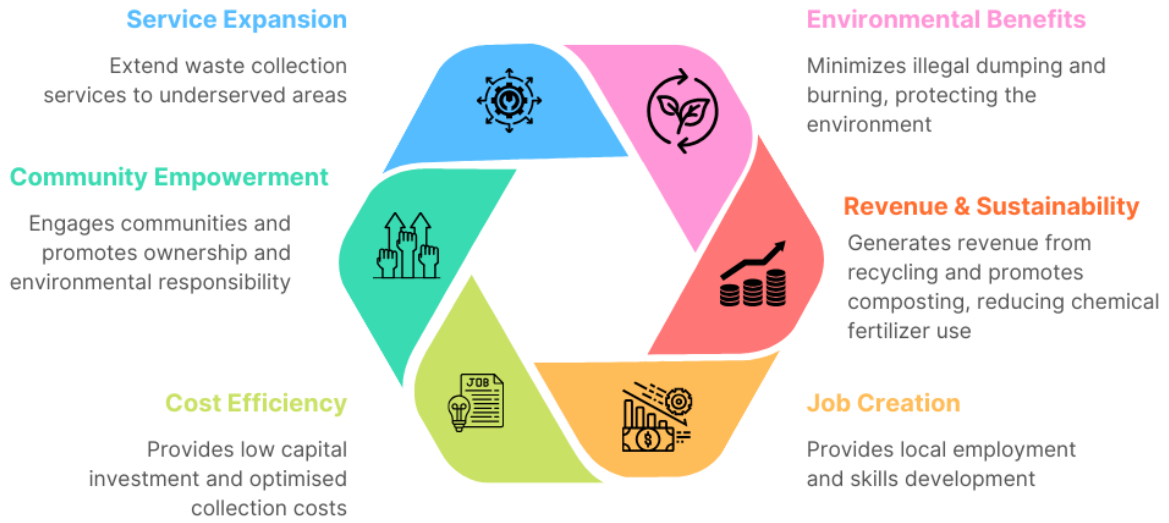


Figure 20: Benefits of decentralized waste collection schemes.

For the complete report see file: [Community.decentralized.system.handbook.pdf]

13. Considerations for the Future

Kratie Municipality has made significant improvements to local waste management during the past two years, yet there is significant scope for it to improve its SWM practices and contribute to a more sustainable and environmentally friendly future.

Some recommendations for needed improvement focus include:

Strengthening Revenue Generation and Budgeting: Strengthening revenue streams from fees as well as the introduction of financial planning will help sustain waste management activities and ensure long-term service delivery and environmental impact.

- Kratie faces fee collection challenges common to Cambodian municipalities, relying on private waste service providers to collect fees from businesses and households. These fees are the primary revenue source for maintaining waste services.
- The private company struggles with fee enforcement due to limited authority and lack of information on household and business occupants, making it difficult to adjust fees appropriately.
- Shifting fee collection responsibilities to the municipal authority would provide better control and facilitate planning related to budgeting and spending for waste management.
- Additional revenue sources, such as fines for improper disposal, fees for bulk waste disposal, and large-scale events, should be explored to support the system further.
- Increased budget resources are needed to ensure full waste collection coverage, enforcement of regulations, and future investment. National and provincial funding options should be considered with this focus in mind.
- Provide training and resources to local authorities and community leaders to enhance their ability to manage and collect waste fees in collaboration with waste service providers.
- Adapt a mobile application or software system for billing and invoicing of the waste fee.

Enhancing Formal Collection: Expanding the service of the formal collection system to reduce uncollected waste and prevent open dumping of waste as lack of reliable collection of waste leads to irregular dumping and burning. Kratie City faces poor SWM services due to inadequate infrastructure, causing environmental and health impacts.

- Standardize waste bins for the safety, hygiene, and occupational health of both users and collectors.
- Optimize waste collection routes to save time and reduce operational errors.
- Strengthen collaboration between the waste collection company and the public to improve services.
- Ensure adequate waste storage at households; avoid heavy containers for temporary storage.
- Implement waste separation to improve recycling rates and reduce waste collection costs.
- Study alternating collection schedules by neighborhood and ‘bring’ systems, where waste is carried by residents to a centralized eco-point to facilitate collection in more rural areas where service is lacking.
- Introduce a separate waste collection system to accommodate wet and dry wastes.
- Offer subsidized waste collection services for low-income households to ensure everyone can afford proper collection services.

Promoting Recycling and Composting: Encourage community participation in recycling and composting initiatives to divert organic waste from landfills and reduce plastic consumption.

- Recycling efforts on Koh Trung have advanced with the introduction of Waste Banks, a community-driven system that shares recycling revenue among key stakeholders (schools, CBET, workers, etc.).
- Challenges remain in integrating material recovery from beach concession operations during the touristic (low water) season, including both dry recyclables and organic waste.
- High-value materials like aluminum and metals are often sold directly by residents to informal collectors. To streamline this process, a system should be developed to provide incentives for the incorporation of metals recovery into Waste Bank models.
- A scaled recycling approach should be developed for the mainland, aligning with larger waste volumes. This could combine Waste Banks in schools with other community hubs (temples, markets, administrative buildings).
- Scale-up home and centralized composting facilities on the mainland, linked to markets, schools, and institutions to manage organic waste from households and large generators, diverting it from landfills.
- Establish recycling centers or facilitate junk shop access where residents can drop off recyclable materials, serving to reduce waste volumes requiring collection and disposal.

Addressing Waste Hotspots: Implement targeted interventions to manage waste in areas prone to dumping and burning.

- With the introduction of waste collection, disposal, and recycling on Koh Trung much of the localized dumping (hotspots) has been reduced or eliminated.
- While some of these areas of dumping are still present it is expected that with ongoing support for waste collection and management on the island these sites will not return.
- Mainland waste collection does not cover all Sangkats now but is being addressed through municipal efforts. Until full-service provision is offered some irregular dumping can be expected and should be addressed through monitoring and enforcement of existing waste regulations.
- Adopt mobile apps that allow residents to report illegal dumping and burning. This can help authorities respond quickly and address issues promptly.

Strengthen Informal Collection and Recycling: Support and regulate informal recycling activities to ensure proper waste handling and prevent environmental harm.

- Until recently, most recycling in Kratie has been handled by informal waste workers who collect materials for resale to intermediaries (junk shops), which are then sold to bulk buyers.
- While this informal workforce plays a crucial role in material recovery, their small scale and limited capacity hinder the potential for expanding recycling efforts.
- Municipal initiatives should focus on better coordination of material recovery, starting with recognizing the value of informal workers and integrating their expertise into a scaled-up system that preserves their livelihoods. This could involve developing a business model that combines both informal and formal systems.
- A new Material Recovery Facility (MRF) exists alongside the newly operational sanitary landfill, but a clear plan for scaling local and provincial recycling efforts is lacking. A

strategy is needed to integrate informal activities with formal processes to divert recyclables from the landfill and promote productive reuse.
- Offer rewards or incentives for informal waste workers or residents who bring recyclable materials to junk shops. Incentives could include mobile phone credit, free Wi-Fi, or complimentary newspapers or books.
- Organize community recycling challenges with prizes for those who recycle the most.
- Partner with local businesses to establish convenient collection points for recyclables.
- Collaborate with schools and community organizations to promote and engage in recycling programs.
- Develop a user-friendly website and maintain active social media profiles to share success stories, recycling market information, prices, and customer testimonials, while encouraging community involvement in recycling efforts.

Implementing Plastic Waste Reduction Measures: Promote policies and programs to reduce plastic consumption and prevent plastic waste from entering waterways.

- BCC messaging in Kratie has emphasized waste reduction, but this focus has not yet been fully implemented in practice.
- Early waste reduction efforts should target activities that generate high volumes of plastic, such as food and beverage outlets (particularly coffee shops and food carts), hotels, conferences, public celebrations, and markets.
- Potential interventions include providing water dispensers in hotels, offering discounts for using refillable cups at coffee shops, efforts to reduce unnecessary packaging, and considering plastic bag bans in local commerce.

Improving Waste Disposal Facilities: Maintain the landfill and waste treatment facilities to minimize environmental impacts.

- Training of operators: Provide training to ensure sound landfill and facility operations, focusing on safe waste handling, leachate control, and the future landfill gas management.
- Optimization of MRF operations: Develop a business model that integrates formal and informal sector approaches to maximize MRF recycling operations and reduce landfill waste.
- Cost recovery through tipping fees: Build on the existing system for collecting tipping fees to provide for maintenance, upgrades, and promote waste reduction.
- Hazardous waste disposal: Expand programs for safe disposal of hazardous materials (cleaners, paints, e-waste), with designated collection points and public education.
- Medical waste management: Strengthen protocols for handling medical waste in healthcare facilities to ensure safe disposal and prevent contamination.
- Other considerations: Explore composting, bulk and green waste disposal, and community education campaigns to reduce waste and encourage proper disposal.
- Develop landfill operational manual covering waste reception, area planning, leachate and gas collection, waste transport and disposal, compaction, impact mitigation (dust, odors,

litter, pests, noise, fires), waste picker management, equipment maintenance, health and safety guidelines, and landfill closure and rehabilitation plans.

14. Appendices

Numbered appendices providing additional detail on project activities are attached below.

1	**3RproMar Reporting Deliverables Summary**
2	**Project Timeline**
3	**Koh Trung Pilot Equipment Procurement Overview**
4	**Mainland Equipment Procurement Overview**
5	**Waste management KPIs**
6	**Reports referenced within final report and developed in support of 3RproMar Activities**
7	**List of Workshops and Trainings**
8	**Key Stakeholder List and Contact Information**

1 - 3RproMar Reporting Deliverables Summary

The following table provides an overview of the reporting deliverables and their date of submission. This includes an inception report, 10 quarterly reports, a draft final report and the present final report.

Reporting Deliverables	Status	Completion Date
Inception Report with operational plan	Complete	Mar-22
Progress report with workplan updates	Complete	Mar-22
Progress report with workplan updates	Complete	Jun-22
Progress report with workplan updates	Complete	Sep-22
Progress report with workplan updates	Complete	Dec-22
Progress report with workplan updates	Complete	Mar-23
Progress report with workplan updates	Complete	Jun-23
Progress report with workplan updates	Complete	Sep-23
Progress report with workplan updates	Complete	Dec-23
Progress report with workplan updates	Complete	Mar-24
Progress report with workplan updates	Complete	Jun-24
Draft final report	Complete	10/4/24
Final report	Complete	10/23/24

2 - Project Timeline

A high-level overview of project activities by quarter follows:

Pre-Launch:

- Prior to Q1 2022: GIZ and Kratie representatives meet to agree on cooperation focus centered on waste improvement and marine plastic leakage reduction.

Q1 2022:

- Project launch and baseline development (waste and behavior focus).

Q2 2022:

- Completion of baseline study, data collection on SWM and recycling.
- Development of plastics pilot concept draft.

Q3 2022:

- 3RproMar consultation and coordination workshop held in Kratie (Aug 16-17).
- SWM Planning and Plastics Pilot Development workshop.

Q4 2022:

- Development of SWMP (Version 1.0).
- Convened Technical Working Group (TWG) meeting (Oct 28).
- Technical visit by SWM expert (Oct 21-25).
- Submission of Kratie SWMP (Version 1.0).

Q1 2023:

- Revisions to SWMP (Version 2.0).
- Analysis of financial viability for waste management system.
- Focus on SWMP implementation, monitoring, and Koh Trung pilot system development.

Q2 2023:

- Finalized SWMP revisions, submitted for endorsement.
- Development of Koh Trung Pilot planning and equipment procurement list.
- Finalization of Koh Trung pilot system design.

Q3 2023:

- Launch of Koh Trung waste and recycling collection (Aug 24).
- Official endorsement of Kratie SWMP.
- Adoption of BCC strategy for Kratie.
- Finalized SWMP published in Khmer and English.
- Procured and launched Koh Trung pilot equipment.

Q4 2023:

- Monitoring of implementation across work packages.
- Conducted time and motion (T&M) studies in peripheral Kratie areas.
- Development of BCC campaign tools and training activities.
- Coordination of Kratie City Governor's visit to Koh Trung.

Q1 2024:

- Conducted technical visits (landfill, market, health clinics) for waste management assessment.
- Ongoing data collection and service expansion analysis.
- Expanded home-composting on Koh Trung.
- Final design and launch of M&E activity for plastic leakage reduction.

Q2 2024:

- Continued monitoring and support for waste management improvements.
- Rollout of BCC activities with local officials.
- Launch of M&E activity for plastic leakage documentation.

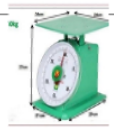
Q3 2024:

- New local waste regulations announced in Kratie.
- Planning of final 3RproMar activity.
- Conducted waste management trainings for mainland businesses.
- Launched mainland waste bank implementation.
- Kratie-wide BCC kick-off meeting and Facebook outreach training.
- Organized clean-up activities and distributed educational materials in schools.
- Visit of Cambodian Minister of Environment and German Ambassador (July 30).
- Final close-out meetings in Phnom Penh (CCEF 2024) and Kratie.
- Final report submission October 2024.

3 - Koh Trung Pilot Equipment Procurement Overview

The following provides detail on equipment procured in support of the waste management and recycling pilot activity on Koh Trung. This list is divided into three different equipment components: 1. disposal and waste collection, 2. materials recovery facility, and 3. composting and other equipment. ***For complete file see: List.equipment.procurement.xlsx***

No.	Facility/Equipment/Materials	Size	Quantity (Units/Pairs/Kg)	Remarks	Photo
I	**Disposal Waste Collection**				
1	Wheelie bins	120L	45	Locations for installations: schools, pagodas/temple, Sankgat hall, CBET, market, beach, and along the roads	
2	Plastic bags	Size 20kg	1250	Distributionc to households who particpate in using the service	
3	Waste collection vehicle	Engine capacity: 260CC Trailer: L: 2.4m W: 1.4m H: 0.5m	1	In blue and for collecting disposal waste	
4	Extra cage forTuk Tuk	L: 2.4m W: 1.4m H: 0.7m	1	Made from steel with blue color	
5	Heavy duty bags with handles	L: 90 cm W: 90 cm H: 90 cm.	30	As inner of waste bank bins and waste skips	
6	Waste skips on both island and mainland	L: 135cm W: 103.5 cm H: 129.5 cm.	5	1 at Koh Trung market 1 at the beach 3 at Phear Leu Market	
7	Uniforms	M & L	3	For waste collectors	
8	Safety materials	Mask:10	10	For waste collectors	
9	Steel toe capped boots		6	For waste collectors	
10	Gloves		24	For waste collectors	
11	Other materials		broom:6 , tongs: 50 & plastic hoe: 6		

II	Materials Recovery Facility				
1	Permanent Waste Banks	L: 285 cm W: 95 cm H: 124 cm (120 cm - slope) Hole - 95cm in height Hole - approximately 15 cm circle	4	installed in schools and the community	
2	Mobile Waste Banks	Topper: H: 1.20m L: 90cm W: 90cm Hole - 100cm high Hole - approximately 15 cm circle	6	Installed at different locations in Koh Trung	
3	Havy duty bags with handles	H: 90 cm L: 90 cm W: 90 cm	50	Inner of waste banks	
4	Heavy duty bags with no handles	H: 1 m L: 1 m W: 1 m	120	Used to pack the collected recyclables	
5	Scale	30kg	1	Used to weight the collected recyclables	
6	Waste storage center	Roof and Concret for waste Storage (Roof : 6,5m X 11m X 1,2m), (Concret: 6m X 10m), and Wire Net (W:5m*L:6m*H:2.6m)	1	Located near the volleyball court Used to store recyclable materials	
7	Basket	H: 54.3cm L: 70.2cm W:67.5cm	280	Provided to citizens who joined the training. Used for storing recyclable materials	

III	**Composting**				
1	Wheelie bins	240L	2	Used at the market and on the beach	
2	20L waste bins	20L	150	Provided to the citizens who participated in home composting	
3	Composting units	(1m* 1.15m)x3 & (1m*0.5m)x1 (1unit=4pallets) (1chambers) Total purchase= 150pcs	150	Location of each home composting on Koh Trung	
4	Community compost plant	6m x 5m	1	Installed at Koh Trung Community-Based Tourism Head's house	
IV	**Other equipment and materials**				
1	Speaker		1	Model: AIWA X300DSP. This speaker is used for broardcasting voice messages to citizens in Koh Trung.	
2	Banner	1m x 2.5m	5	There were 5 banners of waste collection system, waste bank, composting, waste collection service and waste separation.	
3	Blower	Model CGS, 20v DC blower	1	Used to blow tree leaves along the roads	
4	Signboard	70cm x 120cm	8	Awareness raising signboard	
5	Billboard	2m x 3m	3	Waste management system billboard in Koh Trung	

4 - Mainland Equipment Procurement Overview

The following provides detail on the equipment procured in support of waste management and recycling in mainland Kratie. ***For the complete file see:*** ***List.equipment.procurement.xlsx***

Mainland

No.	Facility/Equipment/Materials	Size	Quantity (Units/Pairs/Kg)	Remarks	Photo
I	**Disposal Waste Collection**				
1	Wheelie bins	120L	108: Black: 65 Yellow: 39 Green: 4	Distributed to schools and Sangkats	
2	Waste Banks	L: 270 cm W: 90 cm H: 115 cm (110 cm - slope)	2	Installed at Khov Bunsun Highschool	
3	Wheelie bins	120L	2	Distributed to Khov Bunsun Highschool	

5 - Waste management Key Performance Indicators (KPIs)

The following table provides an overview of KPIs for measuring service quality and coverage and offers an important tool for ensuring and maintaining service quality in the future.

Indicator	**Unit**	**Quantity** (Sep 2024)
Waste generation	T/Day	32.62
Waste Collection	T/Day	20.85
Collection coverage	%	64
Uncollected waste	T/Day	4.93
Plastics recovered (recycling)	T/Day	1.66
Organic waste diverted	T/Day	0.57
Kratie municipality population	Inhabitants	33,824
Waste Fees (normal flat)	USD/Month	1.71
Plastic leakage	T/Day	0.08

6 - Reports referenced within this final report and developed in support of 3RproMar Activities

The following list provides a summary of the reports referenced in the main text of this report. These reports provide additional detail on each of the activities described.

Reports referenced within final report and developed in support of 3RproMar		
#	Title	Filing organization reference
1	SWMP.final.EN.pdf	Work Package 1
2	SWMP.final.KH.pdf	Work Package 1
3	SWMP.Monitoring.final.pdf	Work Package 1
4	Service.Expansion.Report.pdf	Work Package 1
5	Mainland.wastebanks.final.pdf	Work Package 1
6	Plastic.Pilot.pdf	Work Package 2
7	SWM.system.design.Koh.Trung.pdf	Work Package 2
8	Proposed.beach.modifications.pdf	Work Package 2
9	BCC Pilot Assessment Report.pdf	Work Package 3
10	BCC Rollout Reflection report-final.pdf	Work Package 3
11	BCC Rollout Assessment Report.pdf	Work Package 3
12	Business.trainings.pdf	Work Package 3
13	Waste.profiles.pdf	Work Package 3
14	M&E.plastic.leakage.analysis.final.pdf	Baseline+M&E
15	Community.decentralized.system.handbook.pdf	Work Package 2
16	List.equipment.procurement.xlsx	Work Packages 1 & 2

7 - List of Workshops and Trainings

The following is a list of all workshops and trainings conducted in support of the 3RproMar Kratie pilot activity.

#	Workshop dates	Number of Participants trained	Location	Workshop title	Lead Partner
1	26-May-22	38	Kratie	1st workshop: "Consultation workshop on baseline study reports" c	CRDT/TAF
2	17-Aug-22	30	Kratie	2nd workshop: "Consultation workshop on SWM planning and plastic pilot development"	CRDT/TAF
3	24-Nov-22	31	Kratie	3rd workshop: "Consultation workshop on SWM planning and plastic pilot development"	CRDT/TAF
4	21-Feb-23	32	Kratie	4th workshop: "Consultation workshop on SWM planning and plastic pilot development"	CRDT/TAF
5	17-May-23	40	Kratie	5th workshop: "Consultation Workshop and Capacity Building Training"	CRDT/TAF
6	14-Mar-23	25 (7 females)	Siem Reap	Training on Behavior Change Communication (BCC)	TAF
7	25-Apr-23	29 (5 females)	Preah Sihanouk	Communication Strategy Development Workshop/Training	TAF/Phare Creative Studio
8	31-May-23	42 (13 females)	Phnom Penh	Consultation Workshop on Behavior Change Communication Strategy for Kratie	TAF/Phare Creative Studio
9	7-Nov-23	23 (4 famales)	Kratie	Training of Trainers on "Communication Assets for Behavior Change in Waste Management"	TAF/Phare Creative Studio
10	15-Feb-24	44 (12 females)	Kratie	BCC Pilot Reflection Workshop	CRDT/TAF
11	11-Sep-24	164 (59 females)	Phnom Penh	Reduce, Reuse, Recycle to Protect Marine Environment and Coral Reefs Project Conclusion Session	TAF

#	Workshop dates	Number of Participants trained	Location	Workshop title	Lead Partner
12	13-Sep-24	57 (28 females)	Kratie	Reduce, Reuse, Recycle to Protect Marine Environment and Coral Reefs Project Conclusion Workshop - 'Ensuring Sustainability of Kratie's Waste Management Operations'	TAF
13	18-May-23	31 (18 females)	Koh Trung	Training session for citizens	COMPOSTED
14	19-May-23	37 (31 females)	Koh Trung	Training session for citizens	COMPOSTED
15	19-May-23	33 (28 females)	Koh Trung	Training session for citizens	COMPOSTED
16	19-May-23	20 (12 females)	Koh Trung	Training session for citizens	COMPOSTED
17	22-Aug-23	32 (14 females)	Koh Trung	Training session for citizens	COMPOSTED
18	18-Sep-23	23 (10 females)	Koh Trung	Training session for citizens	COMPOSTED
19	19-Sep-23	17 (10 females)	Koh Trung	Training session for citizens	COMPOSTED
20	19-Sep-23	10 (9 females)	Koh Trung	Training session for citizens	COMPOSTED
21	16-Jan-24	15 (8 females)	Koh Trung	Training session for citizens	COMPOSTED
22	17-Jan-24	11 (8 females)	Koh Trung	Training session for citizens	COMPOSTED
23	18-Jan-24	10 (7 females)	Koh Trung	Training session for citizens	COMPOSTED
24	20-May-24	17 (13 females)	Koh Trung	Training session for citizens	COMPOSTED
25	21-Jun-24	20 (14 females)	Koh Trung	Training session for citizens	COMPOSTED
26	28-Jun-24	35 (21 females)	Koh Trung	Training session for citizens	COMPOSTED
27	26-Jul-24	41 (29 females)	Koh Trung	Training session for citizens	COMPOSTED
28	1-Aug-24	84 (59 females)	Koh Trung	Training session for citizens	COMPOSTED
29	16th - 17th Nov2023	10	Kratie	Training session for trainers	CRDT
30	16th Dec 2023	91	Kratie	Training for Business	CRDT
31	15th Feb 2024	44	Kratie	Training for Business	CRDT
32	15th March 2024	16	Kratie	Training for Business	CRDT
33	15th March 2024	3	Kratie	Training for Business	CRDT
34	25th April 2024	21	Kratie	Training for Business	CRDT
35	22nd May 2024	26	Kratie	Training for Business	CRDT
36	12th June 2024	22	Kratie	Training for Business	CRDT
37	21th June 2024	25	Kratie	Training for educators	CRDT
38	28th June 2024	17	Kratie	Training for Municipality	CRDT
39	27th June 2024	12	Kratie	Clean up activity	CRDT

8 - Key Stakeholder List

The following is a list of the key participants in 3RproMar activities, providing both feedback in consultation activities as well as participating in training and capacity building exercises.

Institution or Organization	Type of Organization	Role in Kratie Waste Management
Kratie Municipality Administration	Government	- Oversee SWM system operation in the city - Develop and enforce relevant local regulations in line witht the national policies and programs - Promote awareness and behavior changes
Sangkats	Government	- Enforce relevant local regulations in territories - Promote awareness and behavior changes territories
Provincial Department of Environment	Government	- Enforce relevant local regulations - Implement relevant national policies and programs - Promote awareness and behavior changes
Provincial Department of Tourism	Government	- Enforce relevant local regulations in tourism sector - Implement relevant national policies and programs
Provincial Department of Public Works and Transport	Government	- Operate and manage landfill
Waste Collection Service Provider	Private	Operate and manage waste collection system
Community Based Eco Tourism (CBET)	NGO	Waste and recycling services provider on Koh Trung
Mainland and Koh Trung Schools	Government	Oversight of waste operations in educational institutions and support for waste banks
Businesss and commerce	Private	Took part in SWM trainings
Households	Private	Took part in SWM trainings
Ferry operators	Private	Supported Koh Trung pilot implementation