

Project:

Reduce, Reuse, Recycle to Protect the Marine Environment and Coral Reefs (3RproMar)



BASELINE REPORT

A study on solid waste management system at the municipality level in Tran De Town, Tran De district, Soc Trang province.

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LIST OF ABBREVIATIONS

AMS	:	ASEAN Member States
ASEAN	:	Association of South East Asian Nations
AWGCME	:	ASEAN Working Group on Coastal and Marine Environment
AWGCW	:	ASEAN Working Group on Chemicals and Waste
AWGESC	:	ASEAN Working Group on Environmentally Sustainable Cities
BMZ	:	German Federal Ministry for Economic Cooperation and Development
CCI	:	Clean Coast Index
DONRE	:	Department of Natural Resources and Environment
EPR	:	Extended Producer Responsibility
GIZ	:	Deutsche Gesellschaft für Internationale Zusammenarbeit
HHs	:	Households
IWC	:	Informal Waste Collectors
KAPs	:	Knowledge, attitudes practices
KIIs	:	Key Informant Interviews
MSW	:	Municipal Solid Waste
PPC	:	Provincial People's Committee
Qs	:	Questionnaire Surveys
TCVN	:	Vietnam Standards
SPWC	:	Soc Trang Public Works Company
VASI	:	Vietnam Agency of Seas and Islands
WABA	:	Waste Assessment and Brand Audit
WFD	:	Waste Flow Diagram

EXECUTIVE SUMMARY

Plastic waste pollution is a serious and growing problem in Vietnam's sea and rivers. According to the Vietnam Agency of Seas and Islands (VASI), Vietnam is one of the countries with the largest amount of plastic waste in the world and ranked fourth out of the top 20 countries with about 0.3-0.8 million tons/year¹.

Within this context, the project "Reduce, Reuse, Recycle to Protect the Marine Environment and Coral Reefs" (3RproMar) (2020-2025) is being implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) in cooperation with the ASEAN Secretariat. The project aims to improve the implementation capacities of ASEAN Member States (AMS) for reducing land-based waste leakage to protect the marine environment in four focal countries (Vietnam, Cambodia, Philippines and Indonesia) with one geographical focus covering the Mekong River system. As part of the project activities in Vietnam, a pilot project demonstrating the reduction of plastic waste leakage to the environment through improvements in waste collection and management, as well as an increase in the recycling rate will be implemented. Tran De Town, located in Tran De District, Soc Trang Province in the Mekong Delta of Vietnam was chosen as pilot location. The ultimate objective is to achieve a 20% reduction of plastic waste leakage to the marine environment during the project implementation period.

To assess the current status quo of waste management and plastic waste leakage at the pilot site, a baseline study using the GIZ-Waste Flow Diagram (WFD) tool was conducted. The tool makes use of a rapid assessment methodology to map the flows of macro waste in a municipal solid waste management system at the municipality level of Tran De Town, including the quantification of the amount of plastic leakage, its sources, and the fate of leaked plastic wastes in the local area.

With a population of over 13,639 people in 2021 (Tran De District Statistical Office, 2022), Tran De Town is a dynamic coastal area, which is central to many socio-economic activities of Tran De District (Soc Trang Province) and constitutes one of key aquaculture areas of the Mekong Delta. The town is well-known with key main sectors: fishing, agriculture, and forestry production, commercial fisheries and services and cottage industry.

Along with economic growth, this study found out that the amount of municipal solid waste generated is constantly increasing. On average, the Town generates about 5.217 tons per day, of which plastic waste accounts for a large proportion (20.19%) and is predicted to increase in coming years due to the development of Tran De Industrial zone and deepwater port.

Soc Trang Public Works Company (SPWC) collects 72.5% (3.78 tons/day) of waste from Tran De District and Town, followed by informal sector actors (waste pickers and informal collectors) (15.3%), and other social unions (1.28%). That leaves about 10.9% of total waste

¹ Applying remote sensing photos to monitor plastic waste leakage into ocean by Ministry of Natural Resources and Environment (link: [Bồ Tài nguyên và Môi trường - Bản tin \(monre.gov.vn\)](https://monre.gov.vn))

generated as uncollected waste which is either discharged into canals and rivers, buried or burned.

The survey results show that the total plastic waste volume generated in Tran De Town is 1.05 tons/day (equivalent to 385 tons/year). The sources of waste are quite diverse, including households (60.94%), the fishing port (13.41%), markets (12.45%), institutions (5.18%), accommodation, as well as commercial and service establishments (8.02%). The solid waste auditing looked at the composition of the municipal solid waste (MSW): organic waste (61.63%), plastic waste (20.19%), metal (7.11%), paper (5.87%), and the remaining wastes (4.96%). Notably, the share of low value plastic waste in Tran De is relatively high, including plastic bags (71.18%), and single-use items (i.e. styrofoam, food or beverage containers, straws) (18.98%). Higher value plastic items (i.e. PP, HDPE) account for 9.84%.

The collection rate in Tran De is 89.1% of which 73.8% is covered by SPWC and 15.3% by the informal collectors. This leaves the uncollected rate at 10.9%. Based on the findings of this study, **40 tons of plastic waste annually** leaks into the environment in Tran De Town, accounting for 10.4% of the total amount of plastic waste generated. The leakage can be attributed to (i) limited collection service in some small alleys and scattered areas, (ii) households dumping garbage improperly, (iii) fishing vessels discarding of waste directly into the sea, and (iv) waste leakage at landfills.

Based on the survey results, several recommendations are proposed, of which some are presented below:

- SPWC Soc Trang needs to increase the collection rate to at least 76%, and especially connect areas currently not covered by the existing collection system.
- Local government should: (i) prohibit households from open burning and burying plastic waste, (ii) prevent people from littering and stop plastic hotspots, and (iii) issue the solid waste segregation plan which encourages onsite solutions to treat solid waste (e.g. composting, food waste collection).
- Awareness raising is prerequisite to improve the solid waste management system at offices, schools, enterprises, households, etc. to foster behavioral changes.
- Community-based solid waste management should be considered as a low-cost and sustainable approach in Tran De.

This report presents key results from the baseline survey of municipal solid waste (MSW) management system in Tran De Town, under the GIZ-3RproMar project, conducted in January/February 2023. The main contents of this study include:

- i. Overview of 3RproMar project and introduction of baseline survey
- ii. Methodology of the baseline survey
- iii. Result of the baseline survey (including analysis on MSW generation and plastic waste leakage)
- iv. Stakeholder mapping
- v. Recommendations to improve MSW management in Tran De Town

1. INTRODUCTION

1.1. Project background

The ASEAN-German project “Reduce, Reuse and Recycle to Protect the Marine Environment and Coral Reefs” (3RproMar) (2020-2025) is being implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) in cooperation with the ASEAN Secretariat to support AMS, in particular Vietnam, Cambodia, Indonesia and the Philippines. The project’s objective is the improvement of implementation capacities for reducing land-based waste leakage to protect the marine environment.

In Vietnam, the project interventions include four areas of activities, namely (a) promoting regional cooperation and knowledge management among Vietnamese National Focal Points of the ASEAN working groups dealing with marine litter and plastic pollution, i.e., the ASEAN Working Group on Coastal and Marine Environment (AWGCME), the ASEAN Working Group on Chemicals and Waste (AWGCW), and the ASEAN Working Group on Environmentally Sustainable Cities (AWGESC); (b) supporting the development of national measures for waste leakage reduction as well as their translation into local strategies; (c) identifying barriers to 3R approaches in the private sector; and (d) implementing pilot projects in the Mekong Delta to improve waste collection and increase recycling rates.

The project includes four output areas:

- Output 1: Enhancement of regional cooperation and knowledge management among the ASEAN Working Groups based on the ‘ASEAN Framework of Action on Marine Debris’.
- Output 2: Development of national measures for waste leakage reduction within the focal AMS, as well as their transmission to strategies on the local level.
- Output 3: Identification of barriers for the private sector to develop approaches for waste leakage and plastic waste reduction along the value chain through the application of 3R.
- Output 4: Implementation of two pilot projects to reduce the leakage of plastic waste leakage by 20% through improve municipal waste management, and improved collection and recycling along a plastic value chain including the informal sector.

1.2. Objectives and scope of the baseline study

During the survey period from 12-22 February 2023, data was collected for the baseline study capturing and analyzing the current status of solid waste management in general, and plastic waste in particular, in Tran De Town, Tran De District, Soc Trang Province. The result of the baseline study is firstly used to design and adjust project strategies ensuring the implementation of evidence-based interventions, and secondly, to generate a baseline reference measuring the pilot project’s impact with regards to the reduction of plastic waste leakage over the course of time. Lastly, baseline results will enable learning and sharing of community practices on using innovative tools and resources to help mitigate plastic waste pollution.

- **Objectives:**
 - i. To provide a rapid assessment of Tran De Town's municipal solid waste management system and visualize the flows of waste.
 - ii. To use observation-based assessments quantifying the sources of plastic leakage into the environment from the municipal solid waste management system and determining the fate of this uncontrolled waste.
 - iii. To identify the high-priority sources of plastic pollution to allow informed interventions.
 - iv. To allow for benchmarking and comparison between cities (optional).
 - v. To propose interventions that will improve the solid waste management system and decrease plastic leakage.
 - vi. To understand the actors' landscape, their roles and responsibilities with regards to waste management, and the challenges they are facing.
 - vii. To identify hotspots of plastic waste pollution/plastic leakage and propose recommendations to monitor and improve the problem.

- **Main audiences:**
 - Project partners, including central to local government, the private sector, and in general everyone interested in plastic waste management and reduction in Tran De Town.
 - The ASEAN Secretariat.
 - The Federal Ministry for Economic Cooperation and Development (BMZ).
 - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).
- **Geographic scope of the study:** The geographic scope of the baseline study is limited to Tran De Town, which is located in the centre of Tran De District, Soc Trang Province in the Mekong River Delta region of Vietnam.

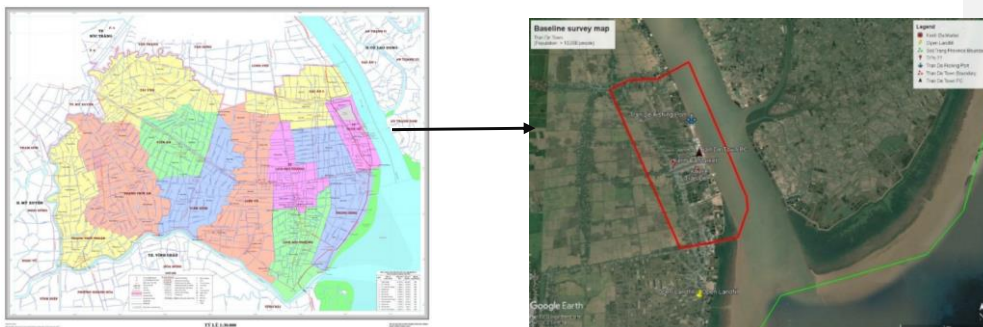


Figure 1. Maps of Soc Trang province (left) and Tran De Town (right)²

² Electronic Information Publication of Tran De district, "Administrative map of Tran De district" (<https://trande.soctrang.gov.vn/Default.aspx?sname=htrande&sid=1283&pageid=30648&catid=53994&id=265723&catname=Ban-do-dia-gioi-hanh-chinh&title=BAN-DO-HANH-CHINH-HUYEN-TRAN-DE>)

1.3. Overview of Tran De Town

1.3.1 Geographical conditions

The town of Tran De occupies an area of 18.69km², lying in Tran De district, located in the southeast of Soc Trang province and downstream of Hau River, which is one of main branches of the Mekong Delta. The town borders Cu Lao Dung district across Hau River in the east, Trung Binh and Dai An communes in the west, Trung Binh commune in the south and Dai An 2 commune in the north.

Tran De Town is divided into four hamlets: (1) Cang Hamlet, (2) Dau Giong Hamlet, (3) Giong Chua Hamlet and (4) Ngan Ro 1 Hamlet. Its topography is quite flat, being located in the low-lying area of the Hau River with the main slope from the northwest to the southeast.

Tran De has a tropical monsoon climate with two distinct dry and rainy seasons per year. The rainy season usually lasts for five months (from the end of May to the end of November) with an average rainfall of 1,977mm/year (accounting for 90% of total annual rainfall). The dry season usually lasts from December to April with little rainfall. The average temperature in the town is around 26.8°C with relatively high humidity of around 83-86%.

With its main river and thick network of canals, Tran De Town is influenced by the hydrological regime of Hau River and the tidal regime of the Bien Dong Sea³, with the following characteristics:

- Hau River: The flood season lasts from June to November, and due to the topographical characteristics of the Lower Mekong Delta Region, the flooding peak can last for many days. The maximum flow velocity in the flood season is 1.3m/s.
- Tides: The tidal cycles have two daily high and low tides. The average water level fluctuates between 0.4m to 1m. The average volume flow rate is 7,000-8,000m³/s in the rainy season, decreasing to 2,000 - 3,000m³/s in the dry season⁴.

³ The Bien Dong Sea is also known as South China Sea

⁴ The public portal of Tran De district, "Natural conditions of Tran De town"



Figure 2. Location of Tran De Town (consultation team, 2023)

1.3.2. Socio-economic characteristics

a. Demographics

According to Tran De District Statistical Office (2022), Tran De Town has a population of 13,639 as of 2021, of which the female population counts for 6,666 persons (48.9%), and the male population for 6,972 (51.1%). The average population density is 719.7 people/km², with the Kinh population predominating at about 81.2% (11,066 people), the Khmer accounting for 17.8%, and the ethnic Chinese accounting for 1% (145 people). The total number of households is 3,348, of which there are 36 poor households and 159 near-poor households⁵.

b. Economy

Tran De Town is home to many socio-economic facilities of Tran De district, especially Tran De port⁵. The economic structure of the town consists of three (03) main sectors:

- *Fishing, agriculture and forestry production*: Three main sub-sectors include fishing, aquaculture and agriculture. Tran De Town is one of the key aquaculture areas of the Mekong Delta.
- *Industry*: According to the Statistics Office, the town has 952 production and business establishments, (in which there are: 52 industrial establishments; 16 construction establishments; 358 wholesale establishments; 373 service establishments; 153 transport establishments). Among these, there are 02 companies and 25 large enterprises operating within Tran De Fishing Port. The town has obtained planning approval and is building Tran De Industrial Park in Ngan Ro I Hamlet, located next to Hau River and South Song Hau Street with an area of 160 hectares, which is planned to be put into operation in 2023.
- *Commerce – Services*: Services are mainly related to fisheries, including occupations such as trading and transporting aquatic products, consumer goods services, and transporting tourists to Con Dao island.

According to Tran De Town's economic development directions, it will focus on restructuring the economic sectors, increasing the proportions of industry, services, fisheries, and reducing the proportions of other agricultural sectors.

⁵ Tran De District Statistical Office (2022), "Report on the socio-economic situations of Tran De district in 2021", The Statistics Publisher.

2. METHODOLOGY

2.1. Waste flow diagram

The Waste-Flow-Diagram (WFD) tool estimates the amount of solid waste leaking into nature and the ocean, also identifying sources of waste leakage. Through a scenario function, it simulates how improved waste management could reduce environmental pollution and avoid marine litter. On behalf of the German Federal Ministry of Economic Cooperation and Development, the tool was developed in cooperation by GIZ, the University of Leeds, Eawag-Sandec and Wasteaware. It is based on a preliminary method as applied in two case studies as part of the report "Marine Litter Prevention"⁶.

The WFD is an excel-based tool that maps municipal waste flows using Sankey diagrams. It quantifies the sources as well as fates of plastic waste entering the environment. The toolkit is specifically designed to integrate with SDG 11.6.1 by informing on the sub-indicators and can be operated either as a baseline assessment or used for scenario forecasting (Figure 3).

Waste Flow Diagram Assessment Tool - Baseline Data Entry

Key

Input cell
Error cell
Check cell
ⓘ = hover for more info.
Hyperlink

NOTE: All percentage units are in terms of weight %

1. Waste generation information		Baseline			
No.	Item	Description	Unit	Value	Information ⓘ
1	Population ⓘ	How many people live in the area (city, urban district, region) you want to model?	Persons		Please use an estimate based on the last census or other official data.
2	Municipal solid waste generation per capita ⓘ	How much municipal solid waste per person is produced per day?	Kg/capita/day		This value should be measured at source using waste characterisation exercises as explained in the user manual. As a last resort, please use values from comparable areas or the default values below: High Income: 1.58 kg/capita/day Upper Middle Income: 0.83 kg/capita/day Lower Middle Income: 0.63 kg/capita/day Low Income: 0.43 kg/capita/day

Baseline data entry | Scenario data entry | Flow diagrams | Results summary | Quick Reference Guide | Calculation...

Figure 3. The WFD Tool

2.2. Data collection methods

To collect adequate data for the WFD, the baseline study utilizes a combination of quantitative and qualitative methods, including desk study, Questionnaire Surveys (Qs), Key Informant Interviews (KIIs), and observation (with images/videos captured as evidence). It is noteworthy that non-indicator information will also be collected using the same methods to describe the prevailing conditions and other important information (if any) of the targeted population that can be used to improve the design of activities before implementation begins. Each of the data collecting methods will be described and justified in the following parts.

The primary data for WFD was collected at Tran De Town during 10 working days from 12th to 22nd February 2023.

⁶ <https://www.giz.de/expertise/html/62153.html>

2.2.1. Desktop study

The desktop study aims to provide appropriate information for reasonable and reliable data sampling, tool adjustment, and needed supplement information to define the level of available data and indicators for WFD, baseline value, and issues related to solid waste management in Soc Trang province, Tran De District and Tran De Town. The desktop study focuses on existing studies of the surveyed area, including relevant online information, documents, local reports, master plans, and statistical data.

2.2.2. Questionnaire surveys (QSSs)

In this study, sampling strategy and calculation will follow the statistical guidelines⁷. Population based sampling will be applied as follows:

$$n = \frac{(S)}{1 + \frac{(S-1)}{N}}$$

$$\text{of which } S = Z^2 * P * \frac{(1-P)}{M^2}$$

Where:

S = sample size for infinite population

Z = Z score measures how many standard deviations a data point is from the mean in a distribution (e.g., for a confidence level of 95%, α is 0.05, and the critical value is 1.96)

P = population proportion (Assumed as 50% or 0.5)

M = Margin of error (The acceptable margin of error usually falls between 4% and 8% at the 95% confidence level)

The QSSs carried out used structured questionnaires developed based on the objectives of the baseline study. The household questionnaire (Annex 1) is designed to collect data on the solid waste generation and the local residents' knowledge, attitudes and practices (KAPs) towards solid waste and plastic waste reduction (e.g. 3R). The questionnaires were then translated into Vietnamese, and the consultation team collaborated with local authorities in Tran De to conduct face-to-face interviews. A purposive sampling strategy was used to select the households participating in the interviews. The selection ensures the diversity in terms of geographical locations, households' incomes (according to GIZ waste flow diagram manual⁸) and households' members (one-person or couple households, households made up of a couple and children, and multigenerational households) (Table 1). It should be noted that the percentages of different income groups were defined according to the ratio of households' incomes, reported in the socio-economic report of Tran De District (2022).

⁷ https://study.sagepub.com/sites/default/files/sampling-essentials_1.pdf

⁸ <https://www.giz.de/expertise/downloads/giz-waste-flow-diagram-user-manual.pdf>

Table 1. Household samplings for questionnaire surveys

Group (Under Tran De Town)	Low income (14%)	Lower middle income (44%)	Upper middle income (29%)	High income (13%)
Group 1 (Giong Chua Hamlet)	4	12	17	4
Group 2 (Dau Giong Hamlet)	1	19	16	9
Group 3 (Cang Hamlet)	5	19	4	4
Group 4 (Ngan Ro 1 Hamlet)	11	16	6	2
Total (n = 149)	21	66	43	19

Note: Defining household sampling is also referred to the guideline of SDG indicator 11.6.1- Waste Wise Cities Tool (UN-Habitat, 2021, p.33).

Testing and adjustment of household questionnaires of at least three samples of each sampled population was carried out in advance of the actual data collection to fix potential errors, and to familiarize the survey team with the survey.

2.2.3. Investigation and solid waste auditing

The solid waste auditing was carried out using the GIZ (WFD) manual⁹ as a major reference. The study also applied another reference, namely “Waste wise cities tool” (UN-Habitat)¹⁰ which is linked with WFD for assessing a city’s municipal solid waste management performance.

In addition, to further investigate solid waste compositions, two main audit methods were used for the baseline study, which are widely adopted in Vietnam, including:

(1) Standard TCVN 9461:2012 on “Solid waste - Method to determine the composition of untreated municipal solid waste” for larger solid waste generators (above 300kg/day);

(2) The guideline “Waste assessment and brand audit, volume 1: domestic solid waste” developed by the Green Development Assistance Center (GreenHub), Vietnam Zero Waste Alliance and Pacific Environment (PE) (known as WABA Audit tool¹¹).

The selected methods exercised for each object is presented in Table 2 as follows:

Table 2. Solid waste audit

Targeted groups	Solid waste audit methods
Landfills/dump sites	Standard TCVN 9461:2012
Garbage trucks	Standard TCVN 9461:2012

⁹ [giz-waste-flow-diagram-user-manual.pdf](#)

¹⁰ [Waste wise cities tool - EN 13.pdf \(unhabitat.org\)](#)

¹¹ Green Development Assistance Center (Greenhub), “Waste assessment and Brand audit. Practice guide. Vol 1: For Household” (https://greenhub.org.vn/wp-content/uploads/2020/07/WABA-Vietnamese-Translation_2020Apr29-copy.pdf)

Enterprises (hotels/restaurants)¹² (n=7)	WABA Audit tool
Households (n=99)	WABA Audit tool
Institutions (schools and Tran De People Committee Office)	WABA Audit tool
Tran De market	WABA Audit tool
Tran De and Mo O fishing ports	WABA Audit tool

While guidelines of SDG indicator 11.6.1 - Waste Wise Cities Tool suggest a sample size of 90 households for medium-sized urban areas, the consultant team planned to acquire 100 samples (25 households at each hamlet) in order to avoid any possible problems arising from implementation. However, as one selected household at Cang hamlet went for a vacation after two auditing days, the team decided to remove this household from the audit, leaving a total sampling of 99.

Table 3. Household sampling for solid waste auditing

Group (Under Tran De Town)	Low income (10%)	Lower middle income (45%)	Upper middle income (35%)	High income (10%)
Group 1 (Giong Chua Hamlet)	2	12	8	3
Group 2 (Dau Giong Hamlet)	1	9	12	3
Group 3 (Cang Hamlet)	2	12	8	2
Group 4 (Ngan Ro Hamlet)	5	11	7	2
Total (n = 99)	10	44	35	10

2.2.4. Key Informant Interviews

Key informant interviews were conducted with representatives of key solid waste stakeholder organizations as shown in Table 4.

Table 4. List of interviewees

No.	Organization	Interviewed themes	No of interviewees
1	Department of Sea and Island (under Soc Trang DONRE)	<ul style="list-style-type: none"> - Existing management of marine plastic (implementation of the province marine plastic prevention plan and the challenges) - Main issues of marine plastic waste in Soc Trang Province and Tran De District/ Town - Initiatives solving the existing challenges and future vision - Implementing the National Action Plan on reducing marine plastic wastes 	2
2	Department of Environmental Protection	<ul style="list-style-type: none"> - Existing management of solid waste in Soc Trang and Tran De - Challenges/gaps/difficulties emerged and solutions 	3

¹² Based on the pre-survey investigation, estimation of solid waste generation from hotels and restaurants in Tran De town are less than 300kg/day

No.	Organization	Interviewed themes	No of interviewees
	(under Soc Trang DONRE)	- The plan and vision to 2025 according to the new Environmental Protection Law (in solid waste management)	
3	Soc Trang Public Works Company (SPWC)	- Existing process of solid waste collection and treatment in Soc Trang and Tran De (collection route, time, amount of MSW, disposal facilities, etc.) - Challenges and solutions in solid waste management - Future investment (if any) and vision to 2025 according to the new Environmental Protection Law	3
4	Division of Natural Resource and Environmental Protection (under Tran De District People's Committee)	- Existing management of solid waste in Tran De District and Town (collecting available solid waste statistics, reports) - Challenges/gaps/difficulties emerged and solutions - The plan and vision to 2025 according to the new Environmental Protection Law (in solid waste management) - Backlog problems in garbage collection in residential areas (if any)	2
5	Cadastral and Environmental Officer of the town (under Tran De District People's Committee)	- Existing management of solid waste in Tran De Town (collecting available solid waste statistics, reports) - Challenges/gaps/difficulties emerged and solutions in solid waste management - The plan and vision to 2025 according to the new Environmental Protection Law (in solid waste management) - Backlog problems in garbage collection in residential areas (if any)	1
6	Civil Society Organizations (Women Union and Youth Union)	- Solid waste related activities (campaign, communication, awareness raising, etc.) (their roles in mitigating solid waste pollution) - Challenges/gaps/difficulties emerged (if any) (e.g. lack of stable fund, human resources, ideas for communication) - Future expectation and potential contribution to the project	2
7	Local SPWC workers (in Tran De)	- Existing collection and treatment of solid waste in Soc Trang and Tran De (collection route, time, amount of MSW, etc.) - Challenges and solutions in solid waste management - Sorting waste during collection for recycling	4
8	Informal waste collectors in Tran De Town and in dumpsites	- Daily activities (description) - Estimation of recyclable wastes collected (weekly/monthly) and income generated - Challenges/gaps/difficulties emerged (if any) (e.g. recyclable waste prices, social conflicts, accidents)	7 (2 waste pickers, 2 waste pickers at the Trung Binh dumpsite and 3 scrap buyers)
9	Junk shops (both registered and informal)	- Daily activities (description) - Estimation of purchase of recyclable waste (daily/weekly/monthly) and income generated - Challenges/gaps/difficulties emerged (if any) (e.g. recyclable waste prices, social conflicts, accidents)	6

No.	Organization	Interviewed themes	No of interviewees
		<i>(Observation will be needed to clarify the information obtained from the interviews)</i>	
10	Tran De, Mo O Port Management Board and Kenh Ba Market	<ul style="list-style-type: none"> - Current status of solid waste management at the two ports and market (sources of generation, waste collection...) - Initiatives/activities related to solid waste or the environment - Challenges/gaps/difficulties in management work - Future expectations and potential contribution to the project 	3
11	Schools	<ul style="list-style-type: none"> - Current status of solid waste management at the schools (sources of generation, waste collection...) - Initiatives/activities related to solid waste, or the environment have been implemented at the schools - Challenges/gaps/difficulties in management work - Future expectation and potential contribution to the project 	3
12	Fishermen (onshore and offshore)	<ul style="list-style-type: none"> - Fishing activities - Solid waste disposal (compositions, amount, etc.) - Feasibility to reduce solid waste 	6
13	Farmers at shrimp farm	<ul style="list-style-type: none"> - Farming activities - Solid waste disposal (composition, amount, recycle) - Feasibility to reduce solid waste 	8

2.2.5. Stakeholder analysis

The stakeholder mapping was organized based on the Source-to-Sea (S2S) framework for marine litter prevention including primary stakeholders, targeted stakeholders, enabling stakeholders, supporting stakeholders, and external stakeholders¹². Identification of stakeholders and their roles according to the S2S framework was accomplished through in-depth interviews and analysis of relevant studies.

2.2.6. Transect walk and observation (leakage assessment – WFD)

During the field trip, on-site visits to all areas of Tran De Town were carried out. This strategy helped the survey team to familiarize with local practices of solid waste-related activities (from disposal, collection to treatment) and, at the same time, support data validation. The observation method was used in parallel with other data collecting methods to investigate adequate visible and invisible information (i.e. attitudes, photos, videos) as requested by some WFD indicators.

As required by the WFD tool, an observation checklist of “Plastic leakage potential levels per leakage influencer” and “Plastic pollution level per fate” was undertaken prior to conducting the field trip to provide observation guides and ensure collecting adequate evidence (refer to the User Manual of Waste Flow Diagram, p77-79).

2.2.7. Training enumerators

During the survey period, the consultation team collaborated with Tran De Women Union to select the informal waste collectors who are familiar with solid waste and enthusiastic to

support and participate in waste auditing activities at households. Before the solid waste auditing, local enumerators were employed and trained on waste auditing methods. There were 21 participants in the training workshop, including two Women Union members, the vice-chairman of Tran De Town, one staff of the Office of Natural Resources and Environment of Tran De District, 12 informal waste collectors (IWC), and 05 households. Of the IWC, two enumerators were recruited for waste auditing at Trung Binh dumpsite, and four informal waste pickers voluntarily participated in solid waste auditing at households.

The workshop allowed the consultation team to introduce the project's potential activities including: (i) women's initiatives in solid waste reduction; (ii) feasibility to promote recycling activities in Tran De Town; and (iii) the roles of IWC in plastic pollution reduction and waste auditing methods at households.



Figure 4. The solid waste audit training for Woman Union in Tran De Town on 15 Feb 2023.

2.3. Data processing and analysis

Data entry and processing plan

The consultation members used Google Docs Survey form for data entry before importing the data into Excel and NVivo in line with guidance and software functions to limit the errors of validation. All data sets were kept under accessible files with raw data and explanation for modification, log files, and codebook (if any).

Data analysis

SPSS (quantitative) and NVivo (qualitative) were used as the main tools for analysis. The analysis was conducted for each community and disaggregated by gender (wherever possible). The qualitative results from the interviews were recorded, transcribed, strategical keyword translated, and analyzed as data sources using NVivo with codes mainly taken from the research methodological framework and evaluation indicators of WFD (Annex 2).

During the implementation of the project, the consultant team identified a number of possible errors and proposed solutions to manage and mitigate these risks as follows: (1) increasing the sampling sizes about 10% as suggested in the sampling methods and consulting with local partners to ensure the diversity and representative, (2) taking additional backup samples to replace erroneous samples during the survey, (3) preparation of checklists,

including checking recording data and taking notes during research implementation, and (4) the encryption and careful copying of collected information to the cloud platform.

Data points

a. Household MSW generation and composition

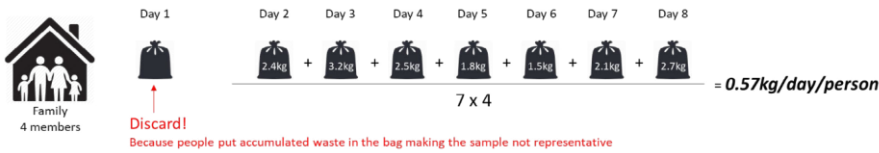
As mentioned in Section 2.2, the household sampling size is 99 households, which is divided into four hamlets (Giong Chua, Ngan Ro 1, Dau Giong and Cang Hamlet).

- Calculating average per capita household waste generation rate

Following the instructions of the Waste Wise cities tool, the sample of Day 1 was discarded, as people tend to put waste in the bag which has been accumulating at their home, making the sample not representative. The results of the remaining 7 days were added, and subsequently divided by the number of days and the number of people residing in the household to attain the average per capita MSW generation.



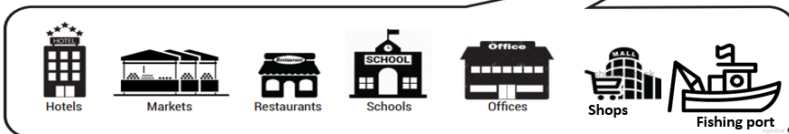
For example:



(Source: UN-Habitat, Waste Wise cities tool, 2021, p.41)

b. Non-household MSW generation

Besides calculating the household waste generation, also non-household waste generation was taken into account, i.e. total MSW generated in Tran De Town. In the survey area, non-household MSW sources included hotels, markets, restaurants, schools, offices, shops, and Tran De fishing port. The total amount of municipal solid waste was calculated as follows:



(Source: UN-Habitat, Waste Wise cities tool, 2021, p.41)

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Please have an explanation for all the abbreviations as Remarks under all the graphs

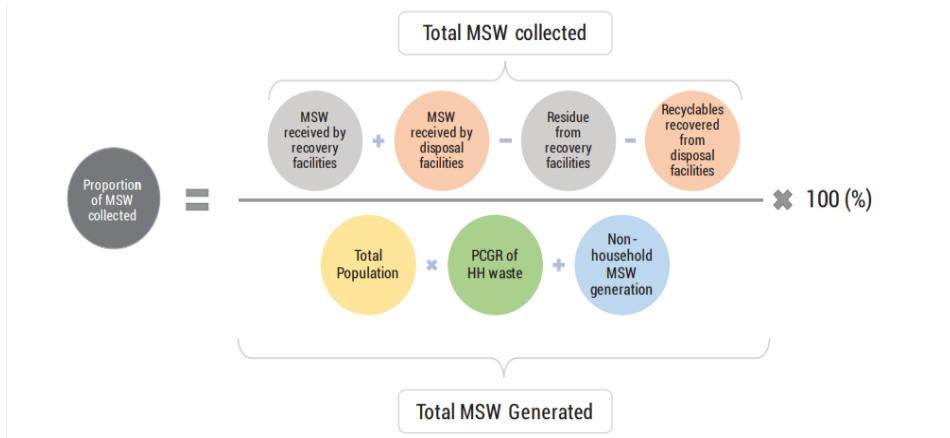
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c. Total MSW collection

Total MSW collected is defined as the amount of MSW generated that is moved from the point of generation, such as specific addresses or designated collection points, to facilities where the waste is recovered or disposed.



(Source: UN-Habitat, Waste Wise cities tool, 2021, p.21)

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d. Total MSW managed in controlled facilities

MSW managed in controlled facilities refers to MSW collected and transported to recovery and disposal facilities with basic, improved, or full control according to the ladder of waste management facilities' control level.

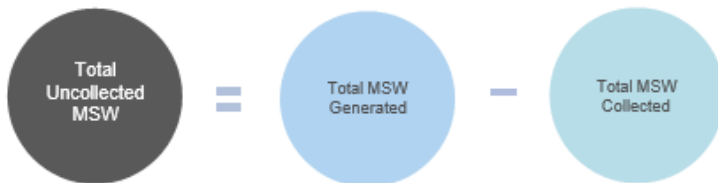


(Source: UN-Habitat, Waste Wise cities tool, 2021, p.24)

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e. Total uncollected waste

Total uncollected MSW is total MSW generated minus the total MSW regularly collected.



(Source: UN-Habitat, Waste Wise cities tool, 2021, p.24)

3. MAIN FINDINGS

3.1. Municipal solid waste management in Soc Trang province

3.1.1. Administrative management system

In general, the solid waste management system of Soc Trang Province includes: Provincial People's Committee (PPC); Department of Natural Resources and Environment (DONRE) and relevant Departments/Boards; Environmental Protection Branch; People's Committees of cities/districts and communes/towns/wards; Department of Natural Resources and Environment of the city/district.

To implement the policies and laws on municipal solid waste management, Soc Trang PPC has assigned DONRE as responsible for monitoring and supervising the operation of waste collection units. Roles of key departments are described as follows:

- PPC: enacts specific regulations on solid waste and plastic waste management to adapt the socio-economic development conditions of the province.
- DONRE: advises the Provincial People's Committee on the implementation of the solid waste treatment plan; the conducting of annual plans for MSW collection, transportation, and treatment, as well as planning appropriate financial budget for MSW management and waste collection units at the locality.
- The Department of Construction advises the PPC on the planning and defining of locations for waste gathering points, waste transferring stations, and solid waste treatment areas; construction management; setting up and managing the cost and price of solid waste treatment services.
- The People's Committees of cities and districts are responsible for environmental issues respective localities, urging and directing the implementation of regulations and programs in the decentralized management of MSW and natural waste.
- The People's Committee of the wards/communes/towns: Cadastral – Construction - Urban and Environment Department is a focal point to coordinate, organize and implement assigned tasks of environmental protection and sanitation in the locality and fulfils the requests from the higher levels (People's Committee cities/districts) on the management of solid waste and plastic waste in the responsible areas.
- The Cadastral - Construction - Urban and environment office of town is a specialized division at the grassroots level under the People's Committees of wards/communes/towns that is responsible for formulating annual plans and organizing the implementation of monitoring and supervision of the current status of solid waste in the area. Simultaneously, they also report on the current status and advise the People's Committee to implement guiding and inspection documents on solid waste management.

3.1.2. Legislations on solid waste management

Soc Trang PPC has developed and issued several policy documents to strengthen the implementation of solid waste management in general, and of plastic waste in particular, in the province. Solid waste-related regulations and plans of Soc Trang province are as summarized follows:

- Plan No. 124/KH-UBND dated December 19, 2018, of the People's Committee of Soc Trang province on the implementation of "Anti Plastic Waste Movement" in the province;¹³

- Directive No. 14/CT-UBND dated August 30, 2019, of the People's Committee of Soc Trang province on strengthening the implementation of measures to reduce plastic waste in the province¹⁴;

- Official dispatch No. 852/UBND-KT dated May 28, 2020 of the People's Committee of Soc Trang province on the approval of the implementation of the task "Development of a scheme to implement the model of classification and treatment of waste at source";

- Decision No. 2419/QD/UBND dated September 3, 2020 of the People's Committee of Soc Trang province on promulgating the implementation plan of the National Action Plan on ocean plastic waste management to 2030 in the province¹⁵;

- Plan No. 41/KH-UBND dated March 15, 2021, of the People's Committee of Soc Trang province on strengthening management, reuse, recycling, treatment, and reduction of plastic waste in the province ¹⁰.

- Plan No. 66/KH-UBND dated May 7, 2021, of the People's Committee of Soc Trang province to implement the Project "Promoting propaganda on plastic waste prevention and control in Soc Trang province (2021 -2025)"¹⁶.

Remarkably, the Soc Trang PPC directed the development and issued Decision No. 2419/QD-UBND on the approval of the Action Plan for Management of Marine Plastic Litter by 2030 according to the Decision 1746 issued by the Prime Minister in 2019¹⁷ in Soc Trang province with the goals and implementation plans presented in detail in the table:

Table 5. Summary of goals, plans and implementation results Decision No. 2419/QD-UBND on National Action Plan on ocean plastic waste management to 2030 in the provinc

No.	Objectives	Plan	Status of implementation
1	50% of fishing gear lost or discarded is collected	1. Propagating, raising awareness, changing behaviors and dealing with plastic products and ocean plastic waste through communication, training and encouraging programs to	Evaluation results up to now, have not achieved the set target, due to: - The promulgated policies are overlapping; notably, there are no specific
2	80% of coastal tourist accommodation business establishments do not use single-use plastic products		

¹³ Chau Thanh rural district: deploying the reduction and prevention of plastic waste (soctrang.gov.vn)

¹⁴ Soc Trang: Issuing a Directive on strengthening the implementation of measures to reduce plastic waste in the province (soctrang.gov.vn)

¹⁵ 2419_QD_039_2020.pdf (soctrang.gov.vn)

¹⁶ The Soc Trang provincial tourism industry has actively promoted reducing plastic waste in tourism activities. (soctrang.gov.vn)

¹⁷ Decision 1746/QD-TTq 2019 introducing national action plan for management of marine plastic litter in Vietnam (thuvienphapluat.vn)

	and non-degradable plastic bags	increase recycling and reuse of plastic waste.	guidelines for the implementation plan or mechanisms for supervising and evaluating the implementation.
3	Organize a campaign to collect and clean the coast at least twice a year	2. Collect, classify, store, transport and treat waste and plastic waste in coastal areas and at sea through organizing movements and campaigns to collect and clean the beach at least twice a year.	- The rate of domestic waste collection in rural areas remains low.
4	Reduce 50% of the habit of using single-use plastic products and non-biodegradable plastic bags in coastal districts, towns	3. Controlling plastic waste from the source through the investigation, statistics, classification and assessment of plastic waste generated. Preventing and minimizing the disposal and loss of fishing gears with strict implementation of sanctions and tools to penalize violations.	- At the time of the baseline survey (Feb 2023), waste segregation at source had not yet been issued into a specific document regulation. Instead, the practice is only integrated into the goal in the provincial plastic waste management plan.
5	The percentage of households implementing waste separation at source reaches to 30% of total households in coastal districts and towns, districts with island communes	4. International cooperation, scientific research, application, development and technology transfer on ocean plastic waste treatment.	

3.2. Municipal solid waste management in Tran De District

3.2.1. MSW generation, collection, and treatment system

a. MSW generation: According to the report of the Division of Natural Resources and Environment of Tran De District, the average amount of solid waste generated in the whole district is 30 - 32.5 tons/day¹⁸. Main sources of solid waste generation in the town: (1) directly arising from daily activities (households, commercial services, offices, schools, markets, fishing ports, etc.), and (2) waste from upstream Hau River and ocean, washed ashore in the Tran De fishing port and the town's mangrove protection forest.

Other waste sources are:

- *Medical solid waste*: Currently, there is a Medical Centre in Tran De district and a town health station. Medical solid waste generated in the town is collected, classified, and treated separately. At the medical stations, medical waste incinerators have been installed to treat the medical solid waste generated. Particularly, the district health centre has an incinerator with 02 primary and secondary combustion chambers with a burning capacity of 20-28 kg of waste/hour. In addition, the collection and treatment of

¹⁸ The People's Committee of Tran De district (2022), "Report on environmental protection in 2022 in Tran De district".

hazardous medical solid waste generated from the health care centre is contracted to Vinh Chau town's health centre in accordance with the regulation of cluster model in Plan No. 42/QD- People's Committee dated April 10, 2017 of the People's Committee of Soc Trang province on collection, transportation, and treatment of hazardous medical solid waste in Soc Trang province in the period 2016-2020.

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- *Solid waste from farming activities*: Agricultural farming activities generally generate pesticides packaging bottles and containers. Due to the lack of waste collection points, most waste is dumped directly into canals, ponds, or lakes.

- *Solid waste from aquaculture activities*: Recyclable materials from aquaculture are actively collected by shrimp farmers, then classified into categories, such as food packaging, medicine bottles, tarpaulins, propellers, etc. to sell to scrap collectors/houses. Meanwhile, domestic waste generated from the operation of shrimp farm is buried or burned at farms.

b. MSW collection and treatment: In Tran De district, SPWC is contracted by Tran De District People's Committee to collect, transport, and treat waste in 10 of a total of 11 communes and towns in the district (excepting Thanh Thoi Thuan commune which can not be accessed by the garbage collection truck as the road in the communal area is too narrow)¹⁹. After the waste is collected, it is transported to three (03) dumpsites which are located in Lich Hoi Thuong town, Tai Van commune and Trung Binh commune. According to the Report on environmental protection in Tran De District (2022), the amount of collected municipal waste currently exceeds the loading capacity of these dumpsites²⁰ (refer Table 6).

Table 6. Landfills in Tran De District

Landfill location	Area (m2)	Designed capacity (ton/day)	Actual capacity (ton/day)	Waste treatment methods	Waste collection areas
Trung Binh commune	10,000 m ²	6	10 - 12	- Dumpsite - Waste water treated by biological ponds	Tran De Town & Trung Binh Commune
Lich Hoi Thuong Town	16,818 m ²	10 - 12	14 - 16	- Dumpsite - Waste water treated by biological ponds	Lich Hoi Thuong Town, Lieu Tu commune and Dai An 2 commune.

¹⁹ In Tran De District, there are 10 communes accessing to waste collection services: Trung Binh commune; Dai An 2 commune; Tran De town; Lich Hoi Thuong town; Lich Hoi Thuong commune; Vien Binh commune; Vien An commune; Tai Van commune; Lieu Tu commune and Thanh Thoi An commune.

²⁰ The term "dumpsite" in this report refers to open landfills with leachate treatment system. MSW, however, is not buried.

Tai Van commune	7,219 m ²	3	3 - 4	- Dumpsite - Waste water treated by biological ponds	Vien An commune, Tai Van commune and Thanh Thoi An Commune
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(Source: The People's Committee of Tran De district (2022), "Report on environmental protection in Tran De District in 2022")

According to the report of the district Division of Natural Resources and Environment, the rate of collection and treatment of domestic solid waste reaches 92.5% in urban areas. For rural areas, the rate of solid waste collection and treatment in rural residential areas is 55% which meets the waste collection rate standard of rural areas²¹.

Recyclable waste is separated by households and sold to scrap collectors who use three-wheeler motorbikes to transport and sell the waste to local scrap houses.

c. Human resources: In total, there are 6 government staff directly in charge of MSW management including 3 staff of DONRE province, 2 staff of Division of Waste Management Tran De district and 1 staff of Tran De Town. SPWC has 6 staff in charge of MSW in Tran De including 1 manager, 2 drivers, and 4 waste workers.

d. Financial mechanism: Based on the allocated environmental budget from the Soc Trang PPC, the Tran De District People's Committee directs the Division of Natural Resources and Environment to develop a plan to use the budget for the MSW management, collection, transportation, and treatment in the district to ensure compliance with relevant regulations.

e. Toll fee collection: At present, toll fees are collected in accordance with the Decision No. 3534/QD-UBND, dated October 18, 2019, issued by Tran District People's Committee on regulating the price of domestic waste collection and transportation services funded by the State budget in Tran De district. Even though the waste collection fee is only 15,000 VND-19,000 VND/ household/month, toll fee collection is facing difficulties as some households refuse to pay the fee. Payment rate is only about 33%.

Some households located in backstreets, alleys, and narrow alleys can further not be serviced by the waste collection since vehicles cannot access these locations due to bad traffic infrastructure. Some households take their waste to public trash bins; as SPWC does not directly collect from their houses, they assume that no payment is required. Many households collect and treat their waste by themselves through digging holes for burial, burning or disposing indiscriminately into lakes, rivers or canals. Lack of monitoring and fining are further reasons for the low rate of payment.

3.2.2. Intervention activities to reduce plastic pollution in Tran De District

The following activities to reduce plastic waste were carried out in Tran De District and town in 2022:

²¹ The People's Committee of Tran De district (2022), "Report on environmental protection in Tran De district in 2022".

- Tran De District PPC directed DONRE to coordinate with the District Women's Union to organize 02 training courses about the anti-plastic waste model for members of the Women's Union at all levels, attended by 100 participants.

- A training / sharing section on implementing the model of collection, classification, and treatment of waste at source for local people was implemented.

- Contests, festivals, movements, thematic activities on prevention, control and reduction of plastic waste such as: "The youth with the environment", "Green Sunday", "Let's clean-up the ocean", etc. have been organized.

- "Against plastic waste" communication activities were integrated into the program of the rally to respond to the campaign of "Action month for the environment" and the World Environment Day.

- Storage tanks for used chemical bottles and plant protection drugs were built to propagate and raise people's awareness on environmental protection during agricultural production processes.

- Implementation of the campaign "Clean up the environment" to collect and treat waste along Kenh Ba and Bai Gia culverts once a month with the participation of Youth Union, Women's Union, Farmers' Union, and other unions. As result, the estimated volume of waste is two tons of domestic waste/time. This activity is organized with the purpose of raising people's awareness about environmental protection and responding to the "Anti Plastic Waste" movement for the surrounding community.

- The Women's Union of Trung Binh Commune is organizing a program, called "Turning trash into cash" where members collect recyclable waste from their households to sell it to scrap buyers on every 15th of the month. The money collected is kept as loan capital (3 million VND/per month). Every month, the Union provides loans for women who are dealing with difficulties in life. The person who received a loan pays back in the following month. If the amount of scrap sold does not reach 3 million VND, the women in the Union will continue contributing till the target of 3 million VND is reached.



Figure 5. "Turning trash into cash" activity is implemented by the Women Union of Trung Binh Commune

3.3. Municipal solid waste management in Tran De Town

3.3.1. Generation and composition of MSW

During the survey period (Feb 2023), the volume of municipal waste generated in Tran De Town was found to be **5.217 tons/day** (equivalent to 1,904 tons/year). The sources of waste are quite diverse, including households, markets, institutions (schools and governmental offices), industrial production, business, commercial and service establishments, as well as aquaculture and agricultural activities. Recyclable waste arising from the latter is usually collected by scrap collection facilities, while the remaining waste is burned or buried.

All waste sources and the respective amount of waste generation are presented in Table 7.

Table 7. Waste sources and estimated waste generation in Tran De Town²²

Waste sources	Average weight (ton/day)	Note
Households (HHs)	2.692	Total of 3348 HHs generating 0.8kg/day per household (3348 * 0.8 kg/day)
Small businesses	0.099	Total of 165 units (grocery store, dry goods stores, motorbike repair shops, etc.) generating 0,6kg/day per small business (165 * 0.6kg/day)
Tran De port	0.593	Tracking handbook
Super Dong cruise port	0.085	Tracking handbook
Administrative agencies	0.023	Total of 9 administrative offices (including: district and town level) generating 2.5kg/day per small business (9*2.5kg/day)
Schools	0.022	There are 3 schools in the town (01 kindergarten, 2 primary schools and 1 middle and high school) that collect waste. The resulting volume is determined by weighing the volume of waste generated at the town. School (Tran De A primary is self-treated by open - burning activity)
Kenh Ba market	0.55	The resulting volume is determined by weighing the volume of waste generated at the market
Accommodations/ Hotels - commercial - services	0.354	- Number of accommodations: 10 units, the rate of waste generated per accommodations: 2.4kg/day - Food service (diners, side walk pubs) 53 units, the rate of waste generated: 4.4kg/day - Beverage service (Trung Nguyen coffee): 01 units, the rate of waste generated: 16kg/day - Mini supermarket: 2, total waste generated: 81 kg/day
Aquacultural activities	0	Waste generated from aquaculture is collected and recycled and daily/domestic waste of farmers is self-treated by open-burning.
Farming households	0	Self-treatment (recycling, burning and burying)
Breeding households	0	Self-treatment (recycling, burning and burying)

²² Because statistical data is collected via a field survey of SPWC's collection process (an audit and measurement of the waste volume), the collected waste is not included the recycled waste that is segregated at source and provided to IWC. (Analyzed diagram in Figure 13)

Fishermen (nearshore fishing and offshore fishing)	0	Broken fishing gear and plastic bags (used to preserve fish) are collected and purchased by scrap shops. The remaining waste is treated in two ways, including (i) dumping a large volume of waste directly into the sea and (ii) others being stored in trash cans on board, then it is dumped in trash containers in Tran De Port
Urban sanitation	0	None of the urban sanitation
Medical Waste	0	Medical waste is separately segregated, collected and treated in Tran De Town
Total amount of MSW generation from all sources above (i)	4.417	Does not include the amount of recyclable waste collected from Informal Waste Collectors (IWC)
Total amount of recyclable waste collected by IWC (ii)	0.8	
Total MSW generation (i) + (ii)	5.217	Includes amount of recyclable waste collected from IWC

Source: [The result of baseline survey](#), 2023)

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Based on the statistics of waste generation at source, Figure 8 shows that the main waste sources of Tran De Town are households (60.94%), followed by Tran De port activities (13.41%) and markets (12.45%). The proportions of waste generation are shown in Figure 8 below:

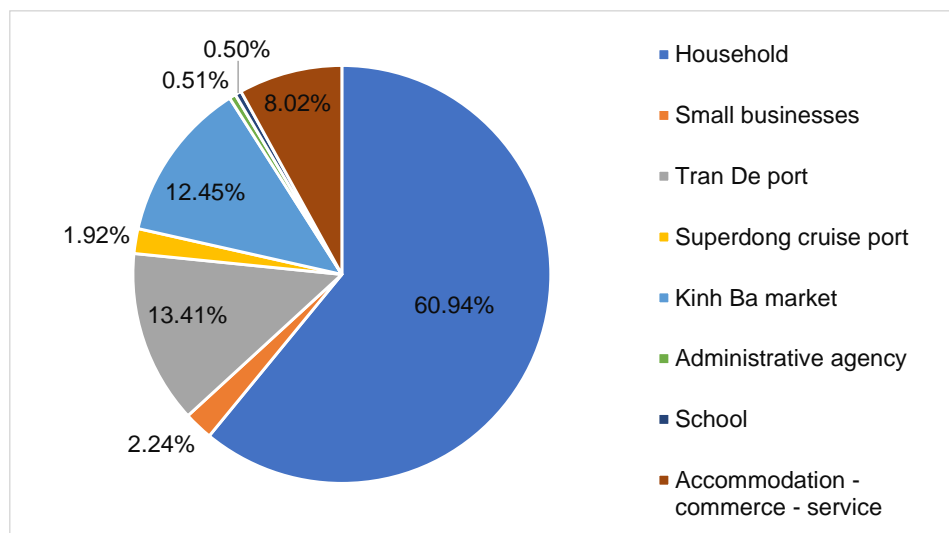


Figure 6. The proportions of municipal waste generation sources in Tran De Town

The waste auditing at these waste generation sources shows that organic waste (61.65%) makes up the biggest share of the municipal waste composition of Tran De Town, followed by plastic (20.19%, equivalent to 1.05 ton/day) and metal (7.11%), as shown in Figure 9.

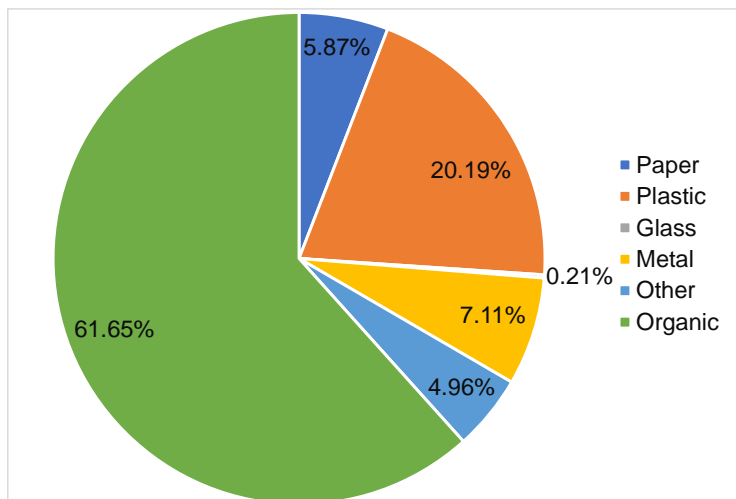


Figure 7. Composition of municipal waste in Tran De Town

3.3.2. MSW collection system

Waste collection in Tran De Town is contracted to the formally registered SPWC - Tran De branch. The informal sector (including waste pickers and informal collectors) also contribute to waste collection. In addition, waste discharged into the canals and rivers is cleaned up on a monthly basis by the People's Committee of Tran De Town (particularly, society organizations and associations). The rates and volumes of collection are shown in Table 8 below.

Table 8. Calculation of the rate and volume of solid waste collection in Tran De Town

MSW collection unit	Weight (tons/day)	Waste collection rate (% of total MSW generation at 5.217 tons/day)	Method of collecting data
a. Formal waste collection: SPWC (Tran De Branch)	3.78	72.5%	Observation waste transportation routes and the numbers of waste trucks arrived at Trung Binh dumpsite during 7 days of survey. Conduction of weighing method to determine the total volume of waste collection.
b. Informal waste collection	0.8	15.3%	Interviews with scrap collectors
c. Social unions (from cleaning activities in community)	0.067	1.28%	Interviews with associations
Total	4.647	89.08%	

a. Formal waste collection system

Currently, MSW generated in Tran De Town is managed through a contract between Tran De district's Division of Natural Resources and Environment and SPWC. The SPWC is responsible for collecting and transporting waste to the open landfill at Trung Binh commune. The formal collection utilizes two waste trucks with a volume of 7m³ and 4m³ respectively to collect waste regularly in the Town.

Up to now, 835 households²³, 230 production and business households, 50 companies, 04 schools, 01 market, and all local administrative agencies have registered to formal waste collection, as reported by SPWC during the survey period²⁴.

The frequency of waste collection is once every two days. According to local authorities in Tran De District and SPWC, the waste trucks and waste collection equipment used cannot access some households located in scattered and remote areas. As a result, these

²³ Tran De Town (2022), "Report on socio-economic development in 2022 and directions for tasks in 2023".

²⁴ SPWC (SPWC), "List of paying for waste in Tran De town"

households dispose their waste on empty land, bury, burn, or discharge it directly into rivers and canals.

The MSW waste collection service in Tran De Town covers two main areas:

- (i) Areas/alleys wider than 3m: waste is collected by a 4m³ compactor truck, and
- (ii) Households along the main roads, offices, the port, markets, and schools (except for Tran De A Primary School²⁵): waste is collected by a 7m³ compactor truck.

As the waste compactor trucks do not have an automatic mechanism to lift the waste bins, workers must use human strength to lift them into the truck which creates a risk of waste leakage into the environment during this process. Recyclable waste (metal, paper, plastic (PET, PP, HDPE...)) is usually segregated by households, and collected by scrap collectors who will come to these households to collect and resell in the area.

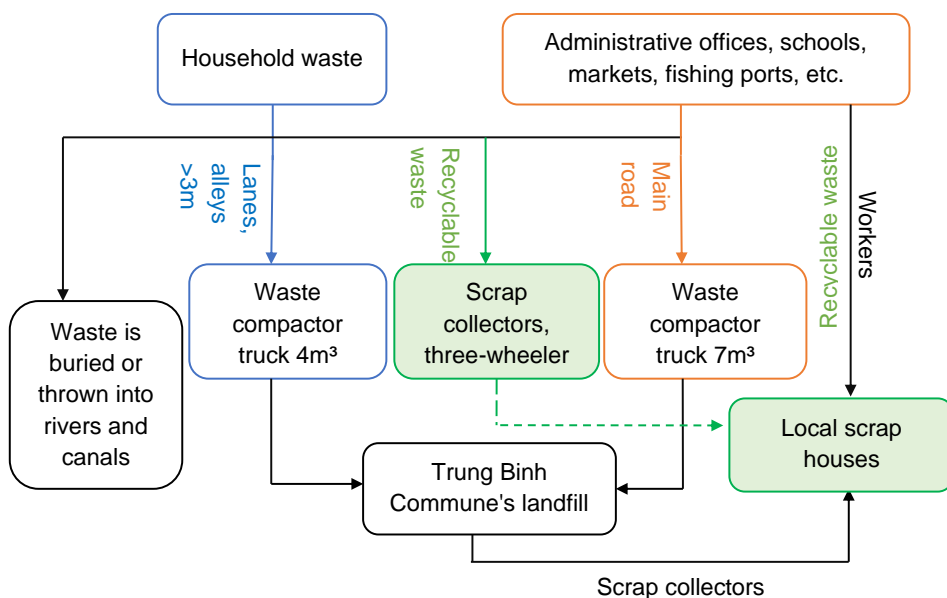


Figure 8. Waste collection process in Tran De Town

²⁵ The Tran De A Primary School treats domestic waste by burning method, so they do not use waste collection service.



Figure 9. Waste collection routes (blue lines) where SPWC’s waste trucks working in Tran De Town.

The status of waste treatment in Tran De Town: Waste generated from households, markets, administrative offices and ports is collected and transported to a dumpsite with an area of 10,000 m², called Trung Binh dumpsite²⁶ for treatment. The dumpsite is responsible for waste treatment in Tran De Town and Trung Binh commune, and is designed for a capacity of 6 tons/day. Currently, however, about 10-12 tons reach the dumpsite daily, exceeding its designed capacity. As there is no weighbridge at the entrance of the dumpsite, it is impossible to track the collected waste. Treatment of MSW at the dumpsite usually consists of periodically spraying microorganisms and biological products onto the waste which is supposed to speed up its decomposition. Ground cleaning is carried out periodically to reduce the generation of odor pollution and bacteria, as well as to enhance the decomposition process of organic waste into humus to reduce the volume of the waste.

b. Informal waste collection

The informal sector collects **0.8 tons/day** (15.3% of total urban waste generation), therewith playing an important role in waste collection and recycling in Tran De Town. The waste composition and volumes collected by the informal sector are presented in Table 9.

²⁶ The term “dumpsite” is used for Trung Binh dumpsite in this report means the open landfill with leachate treatment system but MSW is not buried

Table 9. Composition and volume of waste collected by informal groups.

Categories of scrap waste		Total amount of waste collection (tons/day)
Paper		0.12
Metal		0.345
	PET, HDPE, PP....	0.12
Plastic	Plastic bags	0.11
	Broken fishing gear (fishing nets, buoys, etc.)	0.105
TOTAL		0.8

According to the diagram of the informal collection system, there are a total of 12 waste pickers (women) who directly collect recyclables from the bins, while small-scale purchasing at hamlets and some urban areas is done by buyers on tricycles who come directly to houses and establishments. There are 9 tricycles (usually male) that are used to collect recyclable waste in Tran De Town, including 3 tricycles that belong to scrap points and 6 tricycles that belong to 6 scrap shops (diversity recyclable components are purchased by 4 scrap shops, and plastic bags are purchased by 2 scrap shops) (Figure 12). Scrap shops usually operate on a household scale including 1 male and 1 female. The volume of collected recyclables is provided to large-scale scrap yards in Soc Trang or Can Tho city.

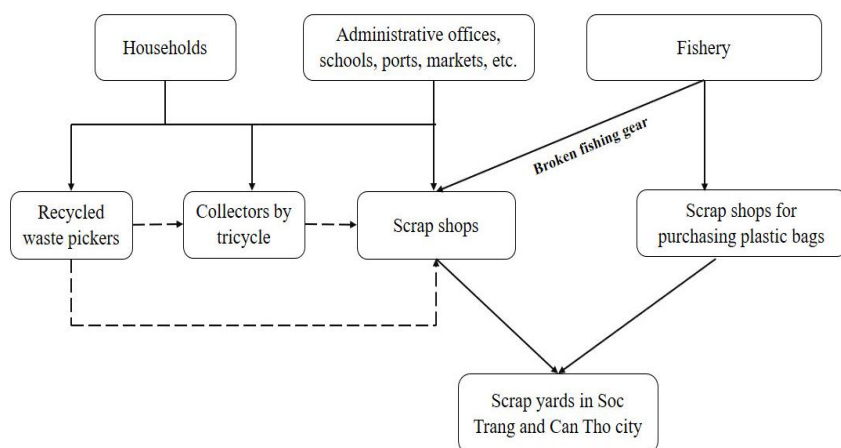


Figure 10. Informal waste collection process in Tran De Town

3.3.3. MSW flow analysis in Tran De Town (Baseline results)

The baseline survey found that the formal waste collection system collects **3.85 tons** of waste per day²⁷ (accounting for **73.8%** of the total municipal waste generated), whilst the informal sector collects 0.8 tons/day (15.3% of total municipal waste generation) making the latter an important actor group in waste collection and recycling in Tran De Town. The remaining 10.9% of waste (0.56 tons/day) is not collected, and mainly originates from areas lacking formal waste collection services leading to waste being discharged into the environment, being burnt or buried (Table 8, Figure 13 and 14).

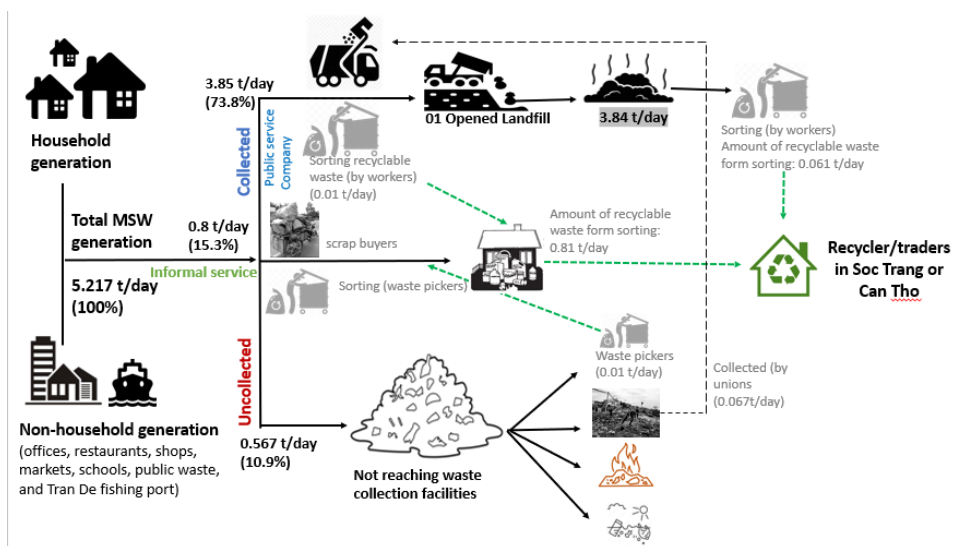


Figure 11. Analysis of MSW flows in Tran De Town (tons/day)

²⁷ The formal waste collection amount (3.85 tons/day) is calculated by the total amount of waste collected by SPWC company (3.78 tons/day) and social unions (0.067 tons/day).

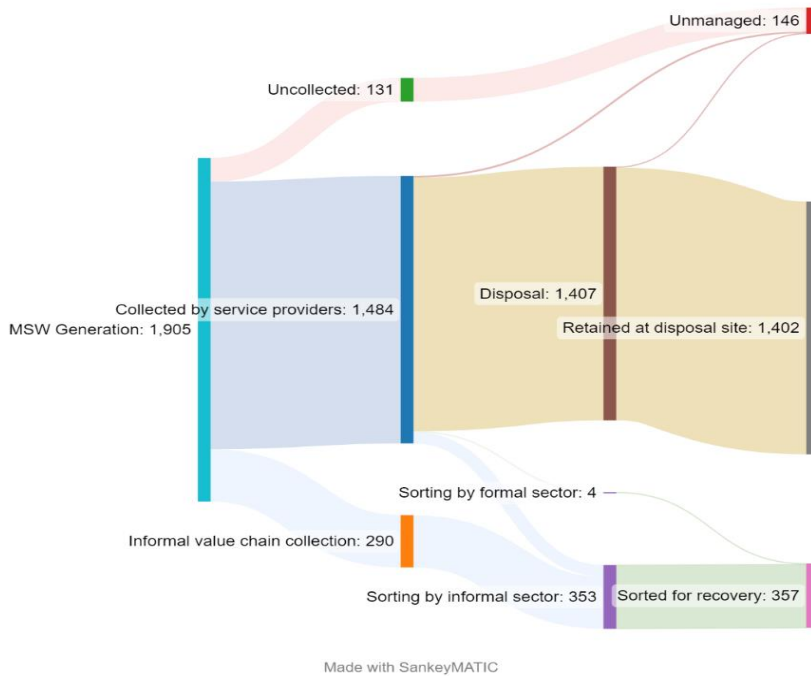


Figure 12. Flow chart of MSW generation in Tran De Town (tons/year)

WFD Assessment: The study shows a difference between the primary data collected on the amount of MSW generated in Tran De Town and the records of the local service agency. According to the report of SPWC, the average amount of MSW emitted in the whole Tran De Town is 8-9 tons/day, whilst the baseline study calculated the volume of urban waste generation to be 5.217 tons/day. This could lead to the conclusion that the actual waste collection rate by SPWC is about **73.8%** (excluding the amount of recyclable waste collected by informal groups) instead of **92.5%**²⁸ as reported by SPWC to the Division of Natural Resources and Environment. Notably, it is expected that in late 2023, Tran De Industrial Park will open which results in the MSW increase from both factories and immigrated workers. Thus, SPWC needs to reorganize the collection route and provide more workers in accordance with equipment and vehicles.

3.4. Plastic waste in Tran De Town

3.4.1. Plastic waste generation and its composition

Plastic generation accounts for 20.19% of total municipal solid waste generation in Tran De Town (5.217 tons/day). Therefore, the total plastic waste volume generated in Tran De Town

²⁸ The People's Committee of Tran De district (2022), "Report on environmental protection in 2022 in Tran De district".

is calculated to be **1.05 tons/day** (equivalent to **384 tons/year**). The main sources of plastic waste generation in Tran De Town are households accounting for 51.99% of total plastic emissions, as well as fishing and seafood processing services at Tran De port reaching to 25.97% (Figure 15). All specific waste sources and generated volumes are presented in Table 10.

Table 10. Plastic waste sources and generated volumes in Tran De Town²⁹

Waste sources	Average weight (tons/day)	Note (MSW waste source x proportion of plastic waste components)
Households (HHs)	0.372	Waste audit, HHs plastic waste rate is 13.82% (0.2692*13.82%)
Small businesses	0.021	Waste audit, small businesses plastic waste rate is 21% (0.099*21%)
Tran De port	0.186	Waste audit, Tran De port plastic waste rate is 31.36% (0.592*31.36%)
Super Dong cruise port	0.025	Waste audit, Super Dong cruise port plastic waste rate is 28.9% (0.085*28.9%)
Administrative agencies	0.005	Waste audit, administrative agencies plastic waste rate is 21.58% (0.022*21.58%)
Schools	0.008	Waste audit, schools' plastic waste rate is 34% (0.022*34%)
Kenh Ba market	0.058	Waste audit and weighing method, market plastic waste rate is 10.58% (0.55*10.58%)
Accommodations/ Hotels - commercial - services	0.042	- Waste audit, accommodations/hotels plastic waste rate is 44.46% (0.024*44.46%) - Waste audit, food and beverage, plastic waste rate is 34% (0.233*10.99%) - Waste audit, coffee shop plastic waste rate is 5.16% (16*5,16%) - Waste audit, mini supermarket plastic waste rate is 5.83% (81*5.83%)
Aquacultural activities	0	Waste generated from aquaculture is collected and recycled. Regarding domestic waste, it is self-treated by open-burning activity.
Farming households	0	Self-treatment (recycling, burning and burring)
Breeding households	0	Self-treatment (recycling, burning and burring)
Fishermen (nearshore fishing and offshore fishing)	0 ³⁰	Broken fishing gear and plastic bags (used to preserve fish) are collected and purchased by scrap shops.

²⁹ Because statistical data is collected via a field survey of SPWC's collection process (an audit and measurement of the waste volume), the collected waste is not included the recycled waste that is segregated at source and provided to IWC. (Analyzed diagram in Figure 18)

³⁰ Waste is thrown directly into the ocean, therefor fishermen do not come back with waste.

		The remaining waste is treated in two ways, including (i) dumping a large volume of waste directly into the sea and (ii) others being stored in trash cans on board, then it is dumped in trash containers in Tran De Port
Urban sanitation	0	None of the urban sanitation
Medical Waste	0	Medical waste is separately segregated, collected and treated in Tran De Town
Total amount of MSW generation from all these sources above (i)	0.717	Excluding recyclable waste collected by IWC
Total amount of recyclable waste collected by IWC (ii)	0.33	
Total plastic waste generation (i) + (ii)	1.05	Including recyclable waste collected by IWC

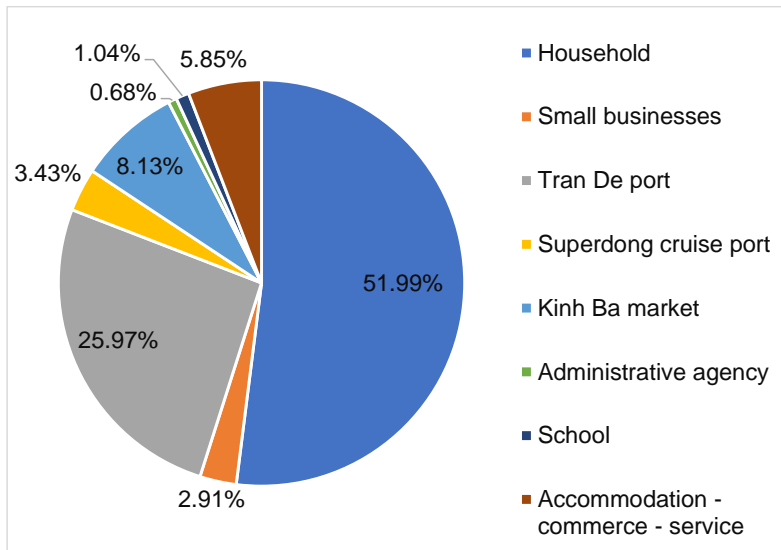


Figure 13. The proportions of plastic waste

The plastic waste audit shows that the majority of plastic waste consists of plastic bags, food packaging, single-layer packaging, other types of plastics (plastic sacks, polybags, plastic crates, etc.). Notably, plastic bags account for the highest percentage of all plastic waste generation (37.48%), owing to their low cost and convenience (Figure 16). Observations showed that high-value plastic waste (PET, HDPE, etc.) is actively being classified by the waste source owners and resold to scrap collectors (0.12 tons/day).

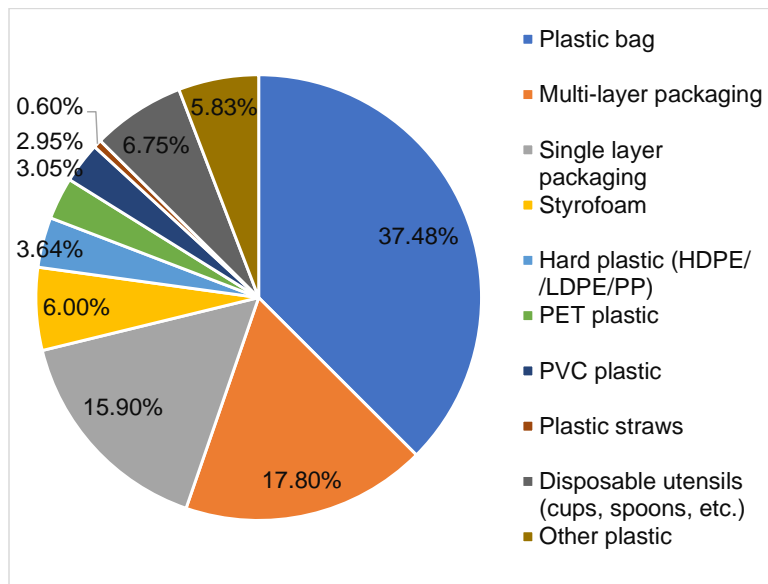


Figure 14. Composition of plastic waste generated in Tran De Town

3.4.2. Plastic waste flow analysis

Currently, the formal collection system collects **0.56 tons/day** of generated plastic waste (accounting for 53.3% of the total generated plastic waste). The informal group contributes significantly by collecting about 0.33 tons/day (accounting for 31.4%). The actual survey results show that plastic waste collected by the informal sector is mainly of high value such as PET bottles, HDPE, broken fishing gears (used to repair other fishing gear), etc. Some plastic bags (especially white nylon bags) coming from fishing activities are collected by this group because of their value and the convenience of being collected by boat owners. In addition, low-value plastic waste (plastic bags, food packaging, single-use plastics, etc.) from other sources are rarely purchased by this group for several reasons, such as: (1) low value and (2) large volume, difficult to transport (Figure 17).

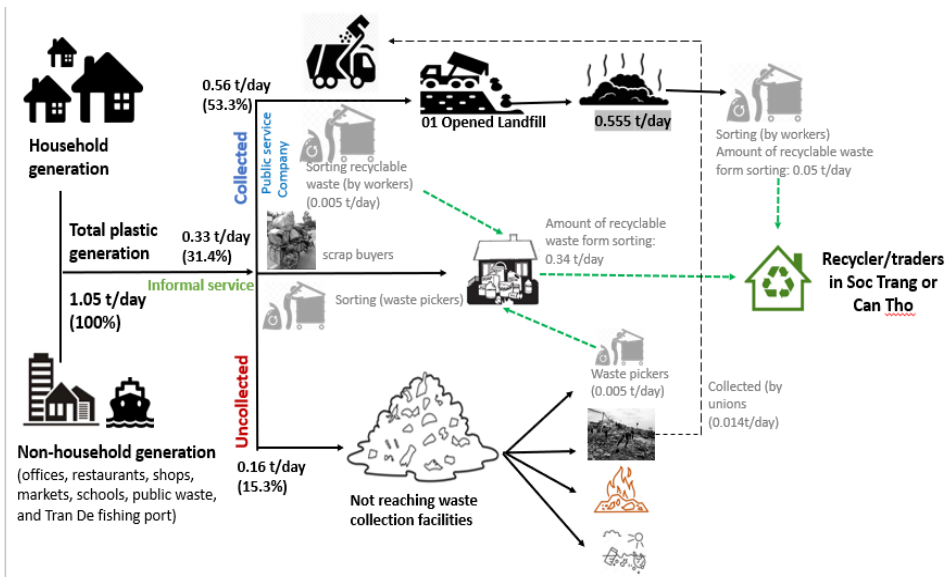


Figure 15. Analysis of plastic waste flow (tons/day)

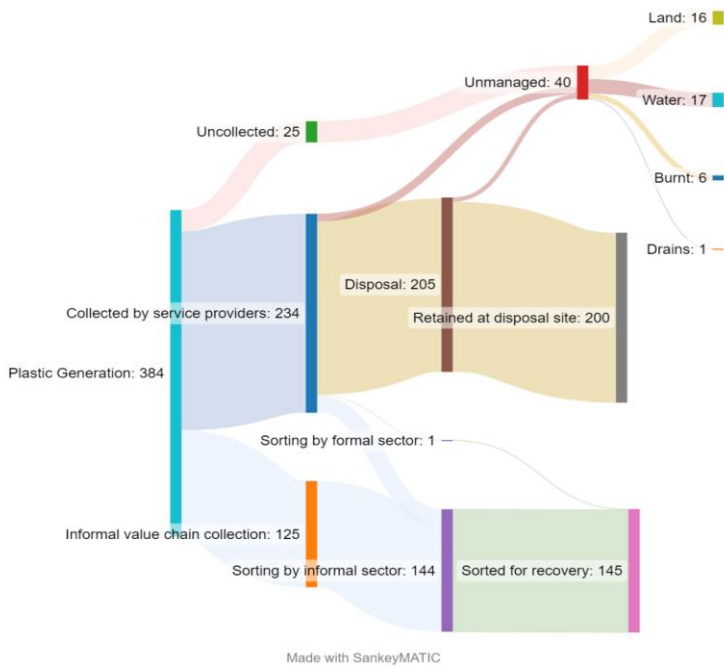


Figure 16. Plastic waste flow chart for Tran De Town (tons/ year)

The WFD tool shows (Figure 18) that the amount of plastic waste leakage (unmanaged plastic waste generation) into the environment in Tran De Town amounts to **40 tons/year**, accounting for 10.4% of the total amount of plastic waste generated. Some of the causes of leakage are: (i) limited collection service in some remote and scattered areas, (ii) households dumping garbage improperly or discarding themselves, (iii) plastic waste released from fishing vessels, and (iv) plastic leaking at landfills. Specifically, waste leakage due to absence of collection service accounts for the highest percentage, at 6.7% (equivalent to 6 tons/year) (Figure 18). The amount of plastic waste released into the environment is mainly trapped in rivers, canals and on land.

3.4.3. Plastic hotspot mapping

Transect walks allowed to identify 15 plastic hotspots in Tran De Town of which Kenh Ba and Hau River mangrove forest resulted to be the most polluted ones. The 15 plastic hotspots were examined by: (i) large amount and area, (ii) complaint of the local residents and, (iii) impact on residential communities and urban landscape (see annex 3). The plastic pollution at most of the hotspots is due to littering mainly into canals, rivers, and bare land areas only about 1m-5m away from rivers or canals. These hotspots arise mainly from people's activities (daily activities, fishing...) and the addition of plastic waste from upstream and storm tides bringing plastic waste from other areas.

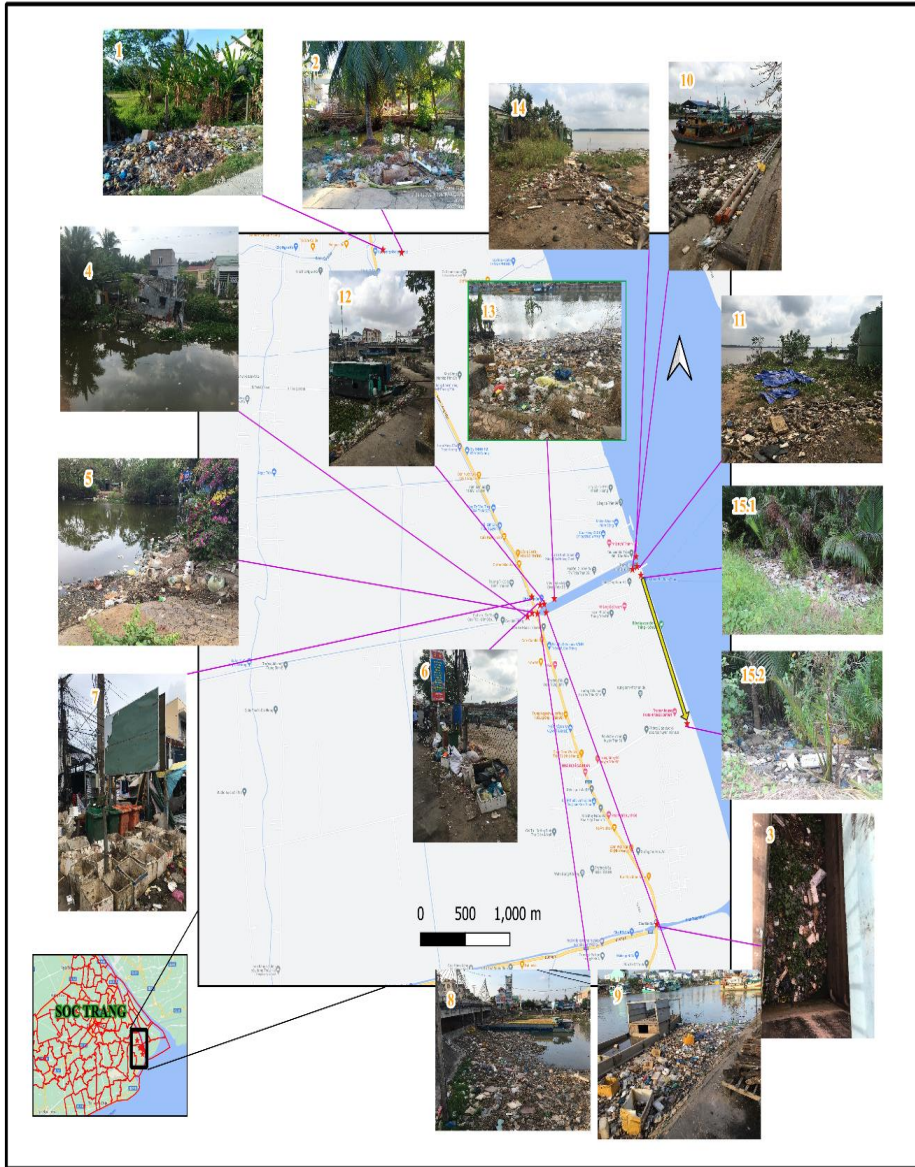


Figure 17. Mapping plastic hotspots in Tran De Town

3.6. Awareness and practices on household solid waste management

3.6.1. Awareness on solid waste segregation

The questionnaire survey (2023) results indicate that 88% of respondents are aware of sorting waste at source but the waste segregation practices are not consistent across Tran De Town (Figure 20). According to the 2020 Environmental Protection Law, solid waste is segregated into three main categories: recyclable waste, food waste and other waste. Yet, in Soc Trang in general, and in Tran De in particular, there is a lack of regulation on this segregation. As stated by the survey data, 52% of respondents suggest that waste segregation is an easy task to implement, and 33% of respondents said that this is their daily activity.

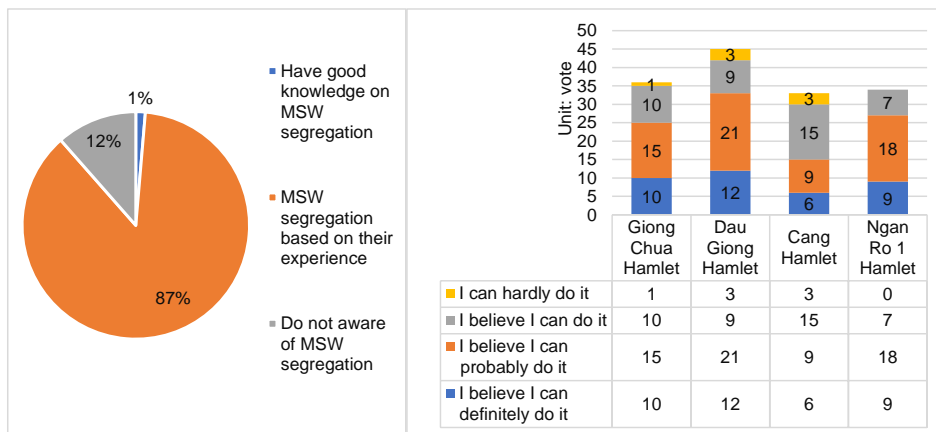


Figure 18. Evaluation of residents' awareness on waste segregation at the source

Despite the launch of the New Environmental Protection Law (2020), some residents, particularly in Cang Group disagree with the mandatory regulation on waste segregation. The reasons for this disagreement are: (i) wasting their time (35%) since there is a lack of separate collection system; (ii) a lack of space to store segregated waste (32%); and (iii) a lack of regular practices of waste segregation and self-treatment at source (33%).

3.6.2. Practice on solid waste segregation

The survey results imply that most residents segregate waste based on their experiences³¹ (87%), whilst 12% declared not to be aware of MSW segregation. All interviewed households separate recyclable waste for sale, and organic waste used to feed livestock (Figure 21). Notably, some households not located in the waste collection area of Tran De SPWC separate organic waste to use it as compost. The remaining waste is collected and transported by Tran De SPWC or self-treated.

³¹ Residents segregate waste based on their experiences: most popular is recyclable waste and other waste, but there are some households also separate organic/food waste for feeding livestock or for composting

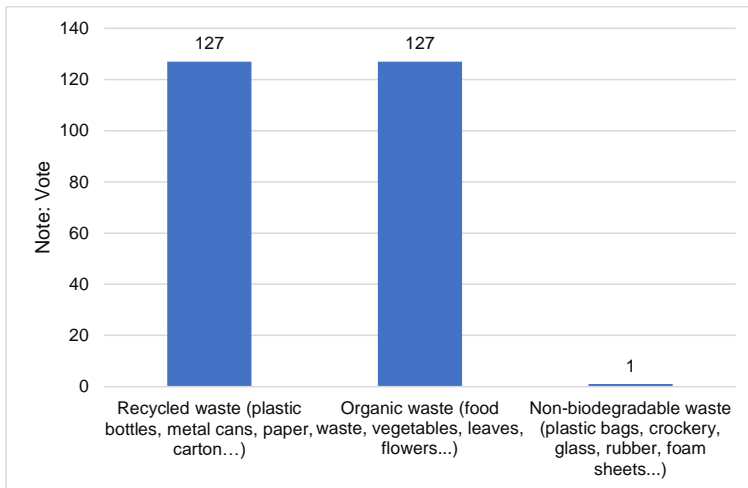


Figure 19. Segregated waste categories at source

Burying (dumping) and open burning are mainly applied in areas without access to waste collection services (e.g. Ngan Ro and Giong Chua Group). Notably, in Cang Group, the waste is thrown directly into the Kenh Ba Canal by the local residents (Figure 22). The interview results indicate that some people consider littering waste into the water bodies as “normal treatment”.

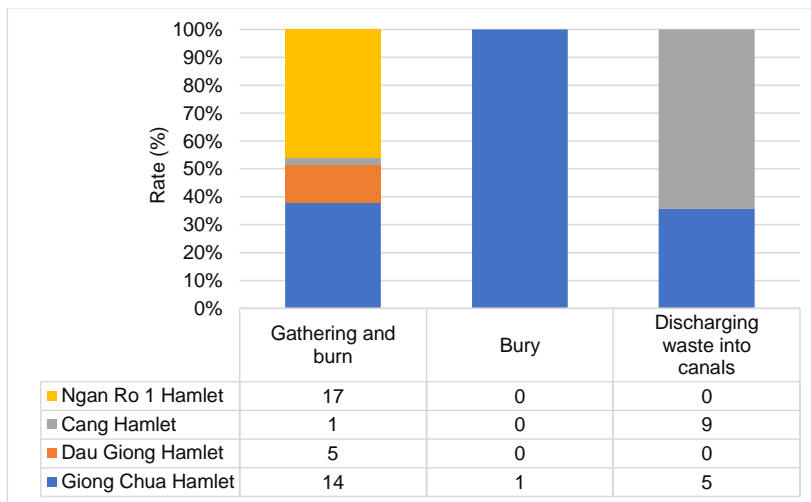


Figure 20. The bar chart illustrates the households' solution of waste self – treatment

The survey results show that local residents have not yet been introduced to the regulations concerning waste segregation at source. Currently, only the heads of civil society organizations (such as the Women's Union, the Farmer Association, etc.) have been trained on this matter. Therefore, in order to promote the public's participation in segregating at

source, some suggestions from households are as follows: (1) organize a training of trainers (local people, businesses, schools, etc.) on knowledge of segregating at source; (2) provide equipment and facilities for segregating at source (120L or 240L trash bin with different colours to enhance segregation); and (3) promulgate policies to support and encourage people to segregate waste at source (Figure 23).

Regarding the evaluation of the current waste collection system in Tran De Town, 73% of respondents suggest that the waste collection system basically meets the town's needs. There are three issues, however, that make the local residents unsatisfied with the existing waste collection systems, namely the lack of trash bins and trash bins without lids along the streets, the improper actions of formal waste workers (e.g. throwing the trash bins) and low collection frequency. To improve the quality of the waste collection service, residents propose the following priority solutions: (i) equip more trash bins with different colors in public places; (ii) promulgate regulations on waste group segregation (three main categories: organic waste, recyclable waste and others); and (iii) improve the waste collection process in accordance with regulations of waste segregation at source.

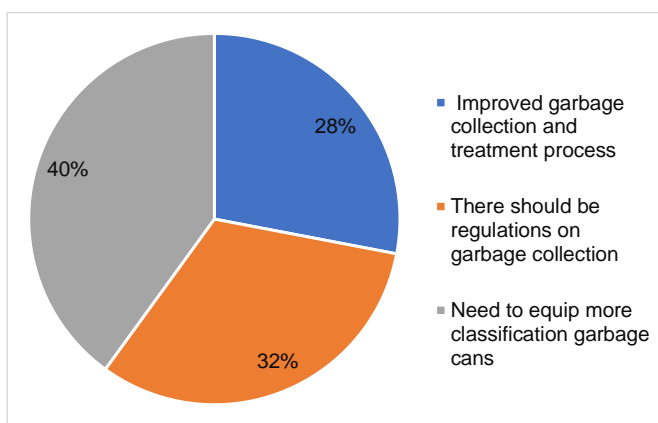


Figure 21. Proposed solution to promote the quality of waste collection service

4. STAKEHOLDER ANALYSIS

The stakeholder mapping is organized based on the Source-to-Sea framework for Marine Litter Prevention³², including primary stakeholders, targeted stakeholders, enabling stakeholders, supporting stakeholders, and external stakeholders. The approach provides an overview of the waste flow diagram and MSW management system in the study area (from town, Soc Trang province, and inter-province). Likewise, the framework contributes to identifying roles and gaps in the collaboration activities of stakeholders in local solid waste

³² Source: SIWI (2019). *Source-to-sea framework for marine litter prevention: Preventing plastic leakage from river basins* (p.19)

and plastic waste management. The identification of the stakeholders was done through interviews conducted during the field work (qualitative primary data) and review of relevant studies and reports (both qualitative and quantitative secondary data) provided by local authorities (Soc Trang province, Tran De District and Tran De Town) and related stakeholders (SPWC – Tran De Branch, Women Union, Youth Union, informal waste collectors and local communities) (Figure 24).

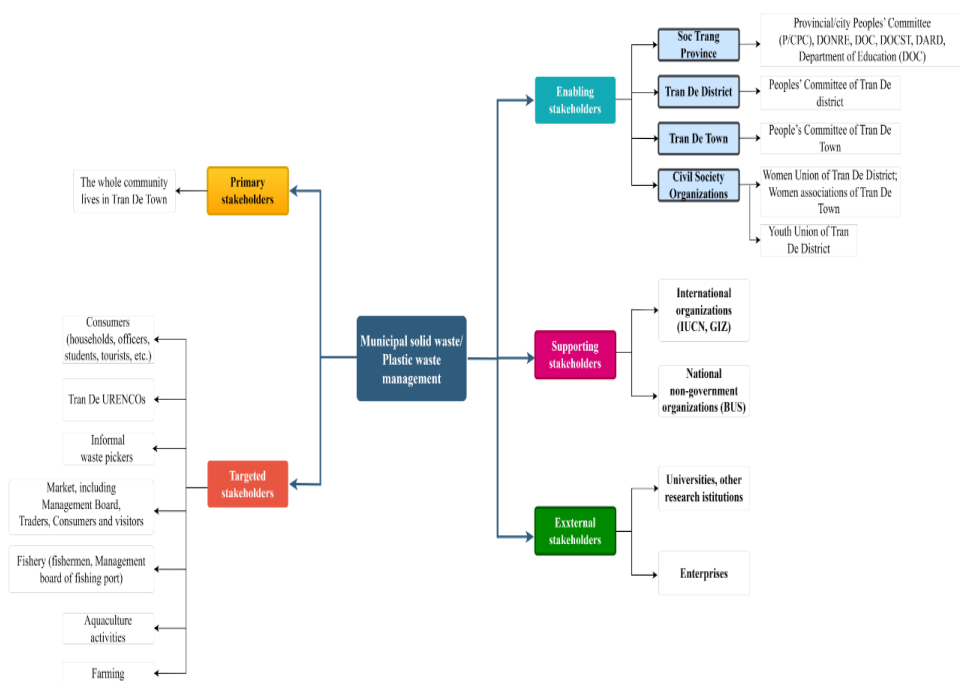


Figure 22. Stakeholder mapping

The roles and engagement of the existing stakeholders in Tran De Town are presented in Table 11.

Table 11. Stakeholder mapping for MSW management in Tran De Town

Stakeholders	Functions/Responsibilities	Study's results
#1. Primary stakeholders are affected by the solid waste/plastic waste pollution, and they gain benefits from the positive interventions		
Community of Tran De Town (e.g. residents, the People's Committee, fishing port, fishermen, etc..)	<ul style="list-style-type: none"> ▪ They are main influencers who generate solid waste and, in turn, are also affected by MSW ▪ They are key actors contributing needed to improve the MSW management 	<ul style="list-style-type: none"> ▪ Lack of awareness, lack of adequate waste storage and collection mechanism, habit of littering, etc. lead to domestic waste leaking into drains, canals, and the environment in general ▪ Local hotspots are established in storm drains, canals, mangroves, and markets ▪ The hotspots are not yet treated, leading to local pollution and a decrease in public health
#2. Targeted stakeholders are actors or sectors whose practices are contributing to plastic pollution and whose behaviour interventions are aimed at changing awareness and attitudes toward reducing and preventing plastic pollution		
Consumers (households, officers, students, visitors, etc.)	<ul style="list-style-type: none"> ▪ Consume (single use) plastic products, such as packaging, plastic bags, bottles, etc. on a daily basis ▪ Possess levers to positively impact creation of waste and its adequate disposal 	<ul style="list-style-type: none"> ▪ Locals and visitors are consumers of single-use plastic products, such as bags/packages due to their convenience, durability, and low cost ▪ Households and small shop owners often use single-use plastic bags/packages. After using, many single-use plastic products are not recovered. Instead, they are collected and disposed at a dump site with other types of wastes ▪ Waste littering is common in Tran De. Waste is leaked into storm drains, roads, fields, etc. Reasons for the leakage are, amongst other factors: (i) the wind; (ii) the quality of trash bins is not qualified for litter (uncovered by lids, broken trash bins, etc.); (iii) waste leakage during segregation, collection and transport of recyclable waste by informal collectors and domestic waste by formal collectors

<p>Waste Service Providers, i.e. Tran De SPWC's with their employees</p> <p>(waste collection workers, drivers, and manager)</p>	<ul style="list-style-type: none"> ▪ Responsible for collection, transportation of waste to the open dump site (Trung Binh) 	<ul style="list-style-type: none"> ▪ During waste collection and transportation, waste transfer points (where waste collection carts gather) are not well managed, and are therefore prone to (plastic) waste leakage ▪ There is no truck-mounted lifting mechanism provided for loading containers, such as waste bins. Thus, the workers must do this task, leading to potential risks to labour health and leakage of waste into the environment ▪ Lack of adequate waste treatment and recycling facilities ▪ Waste transported to landfill is mixed. Waste treatment at landfill is limited to spraying with bio-products to reduce odor pollution ▪ There are no workers at the dump site (only two IWCs). Poor management of dumping sites results in a high risk of plastic waste being leaked into the surrounding environment and then into water bodies ▪ Lack of weighbridge at the landfill, potentially causing inaccurate statistics of waste collection and waste management ▪ Waste collectors are not officially long-term employed; no social insurance is provided to them ▪ Workers are not fully equipped EHS equipment (i.e., no EHS training, no protective gear)
<p>Informal waste pickers (along streets and at landfills)</p>	<ul style="list-style-type: none"> ▪ Collect/recover recyclable materials along streets and at dump site 	<ul style="list-style-type: none"> ▪ Risk of leakage of low value plastic waste to surroundings (storm drains, lands, canals, etc.) is high when looking for recyclable materials, especially along streets ▪ At the dump site, informal workers are looking for recyclables, which increases the risk of leakage of low value plastic waste around areas due to wind
<p>Market, including management board, traders, consumers and visitors</p>	<ul style="list-style-type: none"> ▪ Management board: Responsible for management of solid waste generated at markets ▪ Traders: selling food/goods in the market using lots of single use plastic ▪ Consumer: buying foods, stuffs, etc using lots of single use plastic 	<ul style="list-style-type: none"> ▪ Poor management of solid waste at Kenh Ba markets ▪ Waste containers are open to the environment (no cover), leading to an increased risk of plastic waste leakage ▪ The number of trash containers does not meet the waste generation's needs, allowing waste to easily escape ▪ Extensive use of single-use plastic bags and styrofoam, especially for storing fish and other goods ▪ Garbage collected at the market is stored in large, uncovered bins that are always full. As a result, this area generates odors and insects (such as flies, cockroaches, mice) and affects urban aesthetics as well as business activities

Fishery	<ul style="list-style-type: none"> Fishermen: use plastic bags for personal belongings and particularly for storing seafood (e.i. fish, squid) Enterprises of fisheries commerce and services: use plastic bags for logistic services 	<ul style="list-style-type: none"> Plastic bags commonly littered directly into the ocean after usage Plastic bags used to store seafood are collected and recycled by informal collector groups that do not have registered business license Myriad of plastic bags are used for shipping services to transport seafoods and aquaculture products to customers
	<ul style="list-style-type: none"> Management board of fishing port is responsible for sanitation and waste management at the fishing port 	<ul style="list-style-type: none"> The waste bins do not meet the quality and quantity requirements, resulting in waste leakage into the water bodies Tides in October bringing plastic waste from the ocean to the fishing port, Hau River and mainland
Aquaculture activities	<ul style="list-style-type: none"> Animal feed packaging and styrofoam boxes generate large quantities of plastic waste that is often mismanaged 	<ul style="list-style-type: none"> Waste packaging is recovered and recycled by informal collector groups Daily-life solid waste is gathered and burned open-air, so it causes environmental pollution
Farming activities	<ul style="list-style-type: none"> Agricultural cultivation areas generate bottles and packages of pesticides 	<ul style="list-style-type: none"> Agricultural cultivation areas often generate many bottles and packages of pesticides
#3. Enabling stakeholders: provide the enabling conditions for behavioral changes to occur and benefits to be sustained over time		
Provincial/city Peoples' Committee (P/CPC), DONRE, DOC, DOCST, DARD, Department of Education (DOC)	<ul style="list-style-type: none"> Responsible for planning (long term plan/strategy for SWM, landfills/ dump sites, treatment facilities, etc.) and overseeing solid waste management in the province/ town 	<ul style="list-style-type: none"> Main sources of solid waste generation are: (1) directly arising from diverse activities in Tran De Town (including households, commercial services, offices, schools, markets, fishing ports, etc.); and (2) the amount of waste from upstream the Hau River and ocean, washed ashore in the Tran De fishing port and the town's mangrove protection forest. There is an open dumpsite with an area of 10,000 m² which is responsible for waste treatment in Tran De Town and Trung Binh commune. This dumpsite has a capacity of 6 tons per day, but currently 10-12 tons per day are offloaded there. Moreover, there is no waste treatment at the dumpsite, which increases the risk of local pollution of land, groundwater, and the atmosphere (fire incident at the dumpsite occurred before) and has potential risks to public health in the surrounding areas

Peoples' Committee of Tran De district	<ul style="list-style-type: none"> ▪ Responsible for land-use planning, infrastructure projects and solid waste management at the district level ▪ Reporting to Soc Trang province- DONRE for activities of solid waste management 	<ul style="list-style-type: none"> ▪ Lack of human and financial resources for solid waste management ▪ Poor infrastructure of solid waste collection, transportation, and disposal
People's Committee of Tran De Town	<ul style="list-style-type: none"> ▪ Responsible for solid waste management at town level ▪ Reporting to People's Committee of Tran De District (Division of Natural Resource and Environmental) for implementing environmental protection activities at the locality 	<ul style="list-style-type: none"> ▪ Low collection rate in alleyways ▪ No collection plan/ waste collection service in remote areas ▪ Lack of budget for waste collection ▪ Poor waste collection service provision ▪ Lack of infrastructure for solid waste collection (waste bins, small trucks, etc.) ▪ Limited resources and capacity for solid waste management
Women Union of Tran De District; Women Union of Tran De Town	<ul style="list-style-type: none"> ▪ Responsible for promoting and encouraging the public's responsibility in protecting the environment 	<ul style="list-style-type: none"> ▪ Lack of a roadmap or yearly plan in the women waste-related activities. Waste segregation at source and "Say No To plastic waste" campaign, for instance, merely focus on awareness enhancement. ▪ Lack of human resources to conduct waste-related activities regularly
Youth Union of Tran De District	<ul style="list-style-type: none"> ▪ Develop and deploy initiatives to promote the public's awareness and responsibility ▪ Responsible for promoting and encouraging the public's responsibility in protecting the environment 	<ul style="list-style-type: none"> ▪ Youth Union organizes monthly clean-up activity which collects a considerable amount of solid waste leakage into environment (particularly along Kenh Ba area and Hau River)
<p>#4. Supporting stakeholders: include development partners or financiers whose interventions are aligned with and can support the 3RproMar objectives in term of improving waste management and reducing marine plastic waste.</p>		

International organizations) (e.g. IUCN, GIZ, etc.)	<ul style="list-style-type: none"> ▪ Share technical advice ▪ Build capacity and skills ▪ Create awareness on environmental protection, plastic pollution and sustainable waste management 	<ul style="list-style-type: none"> ▪ GIZ has established a long-term partnership with Soc Trang Province and with the 3RProMar project, GIZ is expected to support Tran De Town to improve the existing solid waste management and to reduce plastic waste leakage to the environment (at least 20%)
Domestic/local non-government organizations (e.g. Greenhub, BUS, etc.)		<ul style="list-style-type: none"> ▪ Greenhub conducted plastic waste monitoring in Cu Lao Dung. Its expertise in plastic waste reduction can technically support the local authority in this matter ▪ BUS can help to share showcases in Central Vietnam in plastic waste management for the local authority
#5. External stakeholders are individuals or groups outside of the system boundary who share an interest in the solid waste management in Tran De		
Universities and other institutions	<ul style="list-style-type: none"> ▪ Contribute scientific data and research about MSW management to local actors 	<ul style="list-style-type: none"> ▪ Research results and publications can be a good resource for reference in solid waste management in Tran De ▪ On the contrary, Tran De can be a good case study for researchers
Private sectors (retail units, plastic production company, recycled sectors, etc.)	<ul style="list-style-type: none"> ▪ Private sectors that work closely with plastic waste reduction or may contribute to plastic pollution in Tran De 	<ul style="list-style-type: none"> ▪ Under extended producer responsibility platform, some potential enterprises may be interested in collecting plastic waste in Tran De (or Soc Trang) for recycling

5. BENCHMARKING IN MSW GENERATION AND COMPOSITION

Several study areas with similar characteristics to Tran De Town in terms of natural and economic conditions were selected to compare the MSW generation and composition. The results in Table 12 show that the waste collection rate in Tran De Town is relatively low as compared to other areas, except of Tuy Hoa City (Phu Yen Province). According to the MSW auditing results, the proportion of plastic waste generated in Tran De Town (20%) is higher than in other areas. Notably, the rate of plastic waste recycled in Tran De Town is relatively high, only lower than Dong Hoi City (Quang Binh Province).

In general, compared with other research areas, the rate of plastic leakage into the environment in Tran De Town is high (10.4%), only lower than in Tuy Hoa City and Rach Gia City (Kien Giang Province). The plastic waste leaking into the canals/ditches and river by the influence of tides has caused stagnation of waste in the canals/ditches, leading to local waste pollution, the town landscape, and the health risks to local residents.

Table 12. Comparison between MSW in Tran De and other areas

No.	Area	Natural and economic conditions	Population	MSW (ton/day)	Collection rate	Plastic waste				
						Plastic waste generation (tons/day)	Generation rate (%)	Recycle rate (%)	Leakage amount (ton/day)	Leakage rate
1	Thanh Khe District, Da Nang City ³³	Coastal region, trade and service	205,341	190	98%	24.25	13%	3.46%	0.38	1.57%
2	Hoi An City, Quang Nam Province ³⁴	Coastal region, tourism	98,599	97	95%	14.78	15%	4.24%		
3	Dong Hoi City, Quang Binh Province ³⁵	Coastal region, industry handicraft, trade - service	125,660	100	95.50%	11.72	12%	36.26%	0.653	5.60%
4	Con Dao Island District, Ba Ria Vung Tau Province ³⁶	Island, fishery and tourism	10,760	11.5	92%	1.74	15%	25.07%	4.39	16%

³³ WWF-Việt Nam (2020), "Baseline study on the current status of plastic waste in Thanh Khe District, Da Nang City".

³⁴ IUCN (2020), "Report on the results of the municipal solid waste audit in Hoi An City".

³⁵ WWF-Việt Nam (2020), "Baseline study on the current status of plastic waste in Dong Hoi City, Quang Binh Province".

³⁶ WWF-Việt Nam (2020), "Baseline study on the current status of plastic waste in Con Dao Island District, Ba Ria Vung Tau Province".

5	Tuy Hoa City, Phu Yen Province ³⁷	Coastal region, industry, trade and service	155,921	150	76%	27.44	18%	18.42%	0.088	5.10%
6	Rach Gia City, Kien Giang Province ⁵	Coastal region, fishery, trade and service	403,120	250	98%	35.7	19%	24.4%	0.45	12.60%
7	Tran De Town, Soc Trang Province	Coastal region, fishery, trade and service	13,639	5.12	86%	1.005	20%	33.83%	0.11	10.40%

³⁷ WWF-Việt Nam (2020), "Report on assessment of plastic waste collection technologies in rivers and their applicability in Vietnam".

The waste audit results of some other studies (Table 13) show that Tran De Town presents the lowest rate of domestic waste generation per capita with only 0.21kg/person/day. Particularly, the rate was twice as low as in Con Dao District and Thanh Khe District with waste generation of 0.42 kg/per/day and 0.397 kg/per/day respectively. Regarding the sources of waste generation from households, the rate of plastic waste generated in Tran De Town is not much different to Thanh Khe District and Dong Hoi City. The rate of organic waste generated in Tran De Town is 76.88% which is higher than in other areas.

The composition of collected waste of Tran De Town that needs to be treated at the landfill is different from that of other study areas (Table 13). The organic waste that needs to be treated at Tran De had the highest percentage (74.66%) while in Thanh Khe District 60%, Hoi An City is 51% and Con Dao is 46.62%. In addition, the rate of plastic waste that needs to be treated is low with 14.41%. This points to the fact that the informal group plays an important role in the collection of solid waste in the town, thereby reducing the pressure required for disposal at the landfill. However, a large amount of organic waste generated has not been sorted, composted or used to feed livestock.

Table 13. Summary of solid waste audit results in some areas

No.	Area	Waste generation per capita	Household waste					MSW					
			Plastic	Metal	Paper	Organic waste	Remaining waste	Plastic	Metal	Paper	Organic waste	Glass	Remaining waste
1	Thanh Khe District, Da Nang City ³⁸	0.397	12%	0.94%	5%	65%	17.06%	16.70%	0.35%	3.50%	60.03%	0.97%	18.45%
2	Hoi An City, Quang Nam Province ³⁹	0.315	16%	2.50%	2%	71%	8.5%	25%	1%	5.87%	51%	1.19%	15.94%
3	Dong Hoi City, Quang Binh Province ⁴⁰	0.32	14%	1%	11%	70.50%	3.50%						
4	Con Dao Island District, Ba Ria Vung Tau Province ⁴¹	0.42	18%	0.50%	7.70%	58.30%	15.90%	29%	1%	4%	46.62%	2%	18%
5	Tran De Town, Soc Trang Province	0.21	13.39%	0.26%	3.01%	76.88%	6.12%	14.41%	0.17%	3.91%	74.66%	0.25%	6.59%

³⁸ WWF- Vietnam (2020), "Baseline study on the current status of plastic waste in Thanh Khe District, Da Nang City".

³⁹ IUCN (2020), "Report on the results of the municipal solid waste audit in Hoi An City".

⁴⁰ WWF- Vietnam (2020), "Baseline study on the current status of plastic waste in Dong Hoi City, Quang Binh Province".

⁴¹ WWF-Vietnam (2020), "Baseline study on the current status of plastic waste in Con Dao Island District, Ba Ria Vung Tau Province".

6. RECOMMENDATIONS

According to the baseline survey results, there are two main categories of recommendations in this section, including recommendation for solid waste generators, and recommendations for solid waste management actors. Such recommendations are aligned with the targeted outcome of the 3RproMar project, reduction of 20% plastic waste leak into environment.

6.1. Recommendations for solid waste generators

6.1.1. Households

Contributing 60.94% of total waste generation, households should be a prioritized target group to reduce waste in Tran De Town. The four intervention categories recommended for households as follows:

- a. Increase household collection rate: currently unserved households that mainly located in small alleys and remote areas are requested to bring their household solid waste to public trash bins. The SPWC and local authority can cooperate with the civil society organizations (CSOs) (e.g. Women Union) to propagate and mobilize people to pay waste collection fees (the current payment rate is low, about 33%)
- b. Stop littering, open burning and burying plastic waste: the local authority should propagate and mobilize people to stop littering, open burning and burying plastic waste through awareness raising activities and should install signs to prohibit dumping in existing spontaneous dumpsite areas.
- c. Reduce the consumption of single-use plastic products: the local authority should cooperate with CSOs to propagate and mobilize people to reduce single-use plastic products (plastic bags, plastic cups...) through regular communication, and campaigns (e.g. clean-up, Say No To Plastic).
- d. Conduct solid waste segregation: the local authority should organize training of trainer (TOT) on waste segregation for officials of CSOs and community leaders first. Then, those trainers will engage such residents in the implementation of the waste segregation through hands-on communication and guidelines for onsite treatment (e.g. composting, recycling). The local government should use various communication channels (e.g. CSOs, social media) to communicate frequently and encourage community-based/household initiatives in solid waste treatment. The local authority should also reward individuals/groups that participate actively in solid waste management to maintain their engagement

6.1.2. Fishing port and fishermen

Contributing 29% of plastic waste generation, fishery activities ought to be considered as a significant group in plastic waste reduction in Tran De. Based on the baseline findings, the consultation team proposes three recommendations as follows:

- a. Reduce the rate of damage and lost fishing gear: under the 3RproMar project, GIZ may cooperate with local government and consultation firm (if required) to develop a fishing map which indicate water prone to fishing gear, unsafe when catching, and incorporate such fishing map to fishermen's GPS. Subsequently, Tran De fishermen will be invited to participate in training on how to use the map.

- b. Promote the “bringing garbage to shore”: The pilot model has been implemented in some places in Vietnam (such as Phu Quoc and Da Nang⁴²). This model trains fishermen on the harmful effects of plastic waste and encourages them to commit to not littering or reducing plastic wastes and damaged fishing gear into the ocean (e.g. by joining the “bringing garbage to shore” model, signing a commitment MoU). Each vessel is equipped with a net-bag or devices for storing garbage on board (behind the vessel). The Fishing Port Management Board supervises, records data and motivates fishermen to participate in this model.
- c. Conduct waste segregation: Local government should organize training for the fishing port managers and fishermen on waste separation, and mobilize fishermen to practice waste segregation at the port. The SPWC should provide more trash bins for waste segregation at the port.

6.1.3. Market

Kenh Ba market contributes 8.1% of plastic waste generation however, this number does not account for the plastic bags handed over to customers to transport their purchases. Thus, some recommendations are proposed to advance solid waste collection and reduction in the market as follows:

- a. Improve the garbage storage area: The Market Management Board should build a hygienic garbage storage house and the SPWC should provide more trash bins to keep hygiene at the garbage collection point.
- b. Conduct waste segregation: Local authorities should cooperate with the Market Management Board to organize a training for small businesses on the implementation of waste separation, mobilize them to carry out waste segregation, and provide more trash bins with different colors for segregation.
- c. Reduce the use of single-use plastic: Local authorities should cooperate with the Market Management Board to propagate and mobilize customers and small businesses to participate in the model “Green market” (e.g. Reduce/replace plastic bags) and to increase solid waste segregation rate through issuing regulations on solid waste practice.

6.1.4. Schools

Schools play key roles in education and awareness raising. Yet the solid waste management performance in most of schools in Tran De remains limited. There are two recommendations for schools to improve such performance as follows:

- a. Conduct waste segregation: GIZ may partner with expertise organizations to organize hands-on training for teachers (TOT) and students on the implementation of waste separation (e.g. flash cards) and onsite waste treatment (e.g. composting). The schools also need more trash bins with different colors for segregation
- b. Reduce the use of single-use plastic: Plastic waste issues should be included in the formal and non-formal education curricula (e.g. campaigns engaging local community with school activities such as trash exchange at school). The school leaders should

⁴² <https://en.vietnamplus.vn/antiplastic-waste-fishing-fleets-launched-to-fight-white-pollution/239415.vnp>

build pilot models of "free plastic school", "green school garden" (recycling collection to raise funds) and promulgate regulations to reduce plastic in schools. Establishment of an environmental club at each school can ensure the regular and sustainable plastic reduction activities

6.1.5. Business establishments

Business establishments of Tran De include hotels, supermarkets, convenient stores, restaurants and coffee shops. Such private sectors can participate in solid waste reduction by following activities:

- a. Conduct waste segregation: Local authorities should organize trainings on the implementation of waste separation and onsite treatment (e.g. composting, organic enzymes, recycling for livestock feeding) at hotels/stores/restaurants. The business owners should construct the guidelines for transforming the existing operation towards sustainability.
- b. Reduce the use of single-use plastic products: Local authorities should propagate and mobilize business owners to change habits of hotel/stores/shops staff and customers to reduce single-use plastic products (e.g. plastic bags, plastic cups...) through green models. The green enterprises should be awarded and be facilitated good conditions to do their business by the local government.

6.2. Solid waste management actors

6.2.1. Local authorities

It is required to have a roadmap for solid/plastic waste management from province to district and town level. Thus, DONRE Soc Trang needs to issue the solid waste segregation action plan, monitor and evaluate the implementation such action plan and improve/adjust (if required). The environmental staff in Tran De Town need to formulate and promulgate regulations banning littering, open burning and burying plastic waste in accordance with building a sanctioning mechanism.

GIZ may consider cooperating with local government to launch capacity building program for solid/plastic waste management, including (i) increase the frequency of sewer drain dredging, especially before the rainy season; (ii) strengthen management, supervision and ensure that no hot spots arise in the town; (iii) organize a study tour to learn and exchange on successful management practices. Moreover, the local authority should establish a working group (from provincial to town level) including different stakeholders (CSOs, URENCO, governmental officials) as a regular exchange mechanism to share information, directions, etc.

Despite the launch of Decision No. 2419/QD-UBND on the approval of the Action Plan for Management of Marine Plastic Litter by 2030, the use of single-use plastic remain popular even in governmental offices in Tran De. Thus, local authorities should propagate and mobilize local agencies and management units not using plastic water bottles and straws, minimize the use of banners and backdrops in meetings, conferences, seminars and events.

6.2.2. The Soc Trang Public Works Company

The SPWC is among the key actors in solid waste management. The SPWC should increase collection rate to at least 76% to ensure the reduction of at least 20% plastic waste leaked into environment. Based on the above-mentioned analysis, the SPWC should:

- a. Improve waste collection services: Provide more trash bins for waste collection, and extend to collection services to small alleys and currently unserved areas. Ensure the collection frequency and optimize of the collection route and time in coordination with stakeholders.
- b. Support waste segregation at source: Waste segregation at source is the foundation of sustainable waste management, reduced landfilling and increased recycling rates. Ensure separate collection and transportation of different waste types. Train staff accordingly.
- c. Limit waste leakage: Install mechanism to stop waste leakage during collection and transportation of MSW, as well as leakage from the dumpsite.
- d. Monitoring and reporting: Install of a weighing station at the Trung Binh landfill to supervise the volume of collected and treated waste. Report to local authorities on a regular basis.
- e. Capacity building and training: Conduct capacity building for waste workers (may include informal waste collectors) in Health – Safety – Environment (HSE), and equip them according to HSE standards.

6.2.3. Civil society organizations

CSOs play crucial roles in public awareness raising and in engaging people in campaigns and programs. According to the baseline survey, some recommendations are proposed for the CSOs in Tran De Town as follows:

- a. Remove waste hot spots: The Youth Union should cooperate with other CSOs and the SPWC to organize clean-up campaigns, to remove spontaneous garbage collection points and transform such points into "green" gathering points, and launch the movement "Green Saturday/Sunday" to clean up garbage.
- b. Conduct waste segregation and stop littering, open burning and burying plastic waste: GIZ and local authorities should organize capacity building trainings for CSOs' members on solid waste treatment and management, and on communication skills. CSOs ought to integrate solid waste into periodic activities and engage their members at local communities in solid waste management.
- c. Recycle waste collection: The Women Union in Tran De should consider to reduplicate the model "Turning trash into cash" learned from Trung Binh commune.

6.2.4. Informal waste collectors

Informal waste collectors significantly contribute to the recycling rate of plastic waste in Tran De. It is estimated that if the rate of recycling waste collection was increased by at least 1%, approximately 1.25 tons of plastic waste would be prevented from leakage into environment. Yet, the working environment of informal waste collectors remains limited, including mental and physical aspects. Thus, GIZ should cooperate with Tran De government to conduct capacity building via trainings on HSE, supporting to connect recycling businesses/scrap collectors to increase the selling price of low-value plastics. The food waste collectors should

also be supported (e.g. means of transportation, containers) to improve the efficiency of collection.

Annex 1. The household questionnaire

SURVEY QUESTIONNAIRE

On KAPs of MSW segregation at source

This questionnaire was deployed within the framework of the 3RproMar project to reduce plastic pollution in Tran De. The survey aims to assess the awareness, attitude, and behavior of people in Tran De Town about solid waste practices (knowledge – attitude – practices).

General information

- 1. Full name:
- 2. Age: Sex (Male/Female)
- 3. Academic level:
- 4. Number of people in your household:
- 5. Mobile phone number:
- 6. Career:
- 7. Income:

MSW segregation at source

I. Belief/knowledge

1.1. The level of importance on MSW segregation at source activity?

- Very important
- Important
- Trivial
- Others.....

1.2. Which of the following statements describes your opinion about the Waste segregation at source?

- I believe I can definitely do it
- I believe I can probably do it
- I believe I can do it
- I can hardly do it
- I cannot do it

1.3. Why do you think you can segregate waste at source?

- A simple activity is easy to practice
- I do activities daily
- I want to protect the environment
- Be a good example for family and community
- Others.....

1.4. Do you believe that local people in your residential area and the whole city can separate waste at source successfully?

- Certainly
- Probably
- Likely
- Never (**go to 1.6.**)
- Others.....

1.5. Why do you think Tran De Town can deploy MSW segregation at source successfully?

- Local people are more interested in health care
- High intellectual level of the people
- Media development
- Government's concern
- Others.....

1.6. Why do you think Tran De Town cannot deploy MSW segregation at source successfully?

- Low intellectual level of the people
- Lack of the awareness of MSW at source
- The garage collection system is not synchronized
- Others.....

II. Attitude

2.1. What is your opinion that people must segregate MSW at source before dumping the trash?

- Agree - Have to regulations on MSW segregation
- Disagree - Depend on public awareness
- Others.....

2.2. Why do you agree with the regulation on MSW segregation at source?

- Protect public health
- Protect environment
- Create job opportunities at local level
- Raise the public awareness
- Cut down on animal feed costs.
- Others.....

III. Social viewpoints

3.1. How do you assess the behavior of MSW segregation at source?

- Inevitable trend
- Lack of the concentration to activity
- Implement ineffectively
- Lack of the knowledge on MSW segregation at source
- The garage collection system is not synchronized
- Others.....

3.2. Do your neighborhoods do the MSW segregation at source? What are their viewpoints on this activity?

- They do this activity and propagate people to do it
- They do this activity and propagate the relatives to do it
- They do this activity and do not propagate the relatives to do it
- They do not this activity
- Others.....

IV. Intention

4.1. Do you have intent to segregate waste at source according to regulations?

- Yes
- No

4.2. Why do you have the intention?

- Follow on the regulation
- The agreement between local community and government
- Protect the urban landscape
- If others can do it, I can do it
- I disagree with it because the implementation depends on public awareness
- Others.....

V. Capacity

5.1 Do you aware of MSW segregation at source?

- Have good knowledge on MSW segregation
- Have knowledge of MSW segregation but no adequacy
- MSW segregation based on their experience
- Do not aware of MSW segregation
- Others.....

5.2. How do you segregate waste at source?

- Recycled waste (plastic bottles, metal cans, paper, carton...)
- Organic waste (food waste, vegetables, leaves, flowers...)
- Non-biodegradable waste (plastic bags, crockery, glass, rubber, foam sheets...)
- Others.....

5.3. What information source do you have access to?

- Media (TV, newspaper, radio, etc.)
- Social networks (facebook, zalo, Instagram...)
- In the meetings of the residential groups
- Banners, posters, flyers...
- Outdoor programs.
- Intimate conversations
- Others.....

5.4. Do you know MONRE and Tran De Town’s regulations on MSW segregation at source?

- Yes
- No
- Others.....

5.5. How long does it take to create a habit of MSW segregation at source?

- 1 week
- 1 month
- 3 months
- 6 months
- Others.....

5.6. What do you do with garbage before dumping the trash can??

- I often segregate waste
- I sometimes segregate waste
- I do not segregate waste
- Others.....

VI. Opportunity

6.1. Why do you segregate waste at source?

- Help the formal collectors
- Buy for the informal collectors and earn money
- Reuse
- Provide to the informal collectors
- Protect environment
- Others.....

6.2 Why do you not segregate waste at source?

- Waste your time
- Lack of the space to deploy
- Form the habit of no segregating at source
- The collection system is not synchronized
- Others.....

6.3. Does the current garbage collection system meet your needs?

- Yes
- No
- Others.....
.....

6.4. What do you think the improvement need to be deployed to have the quality advancement of garbage collection system?

- Improved garbage collection and treatment process
- There should be regulations on garbage collection
- Need to equip more classification garbage cans
- Others.....

6.5. How do you assess the current policy on support MSW segregation at source?

- Good
- Not good
- I do not get access to policies on MSW segregation at source
- Others.....

6.6. What things do you need to improve?

- There should be training programs on raising knowledge of MSW segregation at source
- There are policies to encourage people to implement MSW segregation at source
- Support equipment on MSW segregation at source
- Build segregated waste collection facilities
- Others.....

Annex 2. Evaluation indicators of WFD

10. PLASTIC WASTE LEAKAGE FROM COLLECTION SERVICES

10.1. Collection containers



Images of "collection containers" in sidewalk area, market

Table 1: Leakage potential levels for influencer "collection containers"

Leakage potential	Description	Leakage factor
Very high	Most of the waste is openly stored outside without any dedicated container (e.g. temporary disposal sites). Frequency of collection is very low compared to what is required. Service is very often delayed beyond the minimum frequency. Most waste is disposed of loose.	5
High (selected)	Containers are available in most but not all districts but they are open to the environment (no lids / gaps in side), shows high levels of damage, and/or are readily accessible by animals. The capacity of the bins may be insufficient for the quantity of waste or difficult to access therefore dumping waste around the collection container is typical. Frequency of collection is low	2.5

	compared to what is required. Service is often delayed beyond the minimum frequency. Small amounts of waste are disposed of in bags.	
Medium	Containers are available in most but not all districts. The storage containers are open to the environment (no lids / gaps in side), show low levels of damage, and are not easily accessible by animals. The capacity of the bins is generally sufficient for the quantity of waste but some dumping of waste around the collection container may occur. Frequency of collection is slightly below what is required. Service is occasionally delayed beyond the minimum frequency. Waste is occasionally disposed of in bags.	1
Low	Containers are available in all districts but are typically open to the environment (no lids / gaps in side), show low levels of damage, and are not easily accessible by animals. The capacity of the bins is generally sufficient for the quantity of waste but some dumping of waste around the collection container may occur in small quantities. Frequency of collection is adequate for what is required. Service is very occasionally delayed beyond the minimum frequency. Waste is commonly disposed of in bags.	0.6
Very low	Containers are available in all districts with them closed to the environment (lids and fully enclosed sides), show low levels of damage, and are not easily accessible by animals. The capacity of the bins is sufficient for the quantity of waste with little to no waste dumped around the collection container. Alternatively, waste is kept indoors prior to formal collection. Frequency of collection is adequate what is required. Service is rarely beyond the minimum frequency. Waste is predominately disposed of in bags.	0.1

10.2. Loading method



Images of garbage collection vehicles

Table 2: leakage potential levels for influencer "loading method"

Leakage potential	Description	Leakage factor
High	Most of the waste must be manually loaded to vehicles with shovels / wheelbarrows / heavy machinery. Waste is transferred to the collection vehicle from a fixed collection container / location.	1
Medium (selected)	Most of the waste must be manually loaded to vehicles however the storage containers are generally portable and are transported to the waste collection vehicle with the waste still inside.	0.5
Low	Most of the waste is loaded using automatic systems. The storage containers are portable and are transported to the waste collection vehicle with waste still inside.	0

10.3. Primary transportation



Images of "multiple handling" of waste collectors

Table 3: leakage potential levels for influencer “primary transportation”

Leakage potential	Description	Leakage factor
High	The majority of primary transportation vehicles have a small capacity (<5m ³) and typically run over capacity. The vehicles container is open to the environment (no cover / gaps in side) allowing waste to easily escape. The vehicle is powered by low-tech options such as human / animal power, or small engines (i.e. motorbikes). Sorting may occur within the transportation vehicle.	0.8
Medium	The majority of primary transportation vehicle have a mid to large capacity (>5m ³) but may occasionally run over capacity. The vehicles container is typically open to the environment (no cover / gaps in side) allowing waste to easily escape. Sorting may occur within the transportation vehicle.	0.5
Low (selected)	All primary transportation vehicles are closed to the environment (i.e. covered), stays within its capacity limit and may contain advanced features such as compaction mechanisms.	0
N/A*	There is no distinction between primary and secondary collection (i.e. collected waste is immediately transferred to disposal)	0

10.4. Multiple handling



Images of recyclables extraction method

Table 4: leakage potential levels for influencer “multiple handling”

Leakage potential	Description	Leakage factor
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High	Collected waste is transferred between multiple vehicles / people with low frequency between transfers (i.e. long wait times). There is no dedicated facility for the transfer of waste with this generally occurring on the side of streets. Waste containment during transfer is poor, typically being loaded onto the ground prior to loading the secondary transportation vehicle. Poor / non-existent site management.	4
Medium (selected)	Collected waste is transferred between multiple vehicles / people with a typically short frequency between transfers. There are dedicated facilities for the transfer of waste although waste containment during transfer is poor, typically being loaded onto the ground prior to loading the secondary transportation vehicle. Site management is generally adequate.	1
Low	Collected waste is adequately transferred between multiple vehicles / people. There are dedicated facilities for the transfer of waste with high levels of waste containment. Waste is transferred either directly into secondary transportation vehicles, or stored in designated compartments. Site management is good.	0
N/A*	There is no distinction between primary and secondary collection (i.e. collected waste is immediately transferred to disposal)	0

11. PLASTIC LEAKAGE FROM INFORMAL VALUE-CHAIN COLLECTION

11.1. Recyclables extraction method



Images of recyclables extraction method

Table 5: leakage potential levels for influencer “extraction method of recyclables”

Leakage potential	Description	Leakage factor
High	The informal sector is seen to cause significant release of waste into the environment during collection in most of the city. Practices such as overturning bins to get access to valuable material and discarding unwanted items during the collection (bottle tops, labels etc.) is common.	2

Medium	The informal sector is seen to cause moderate release of waste into the environment during collection. Practises such as overturning bins to get access to valuable material and discarding unwanted items during the collection (bottle tops, labels etc.) occurs occasionally.	0.8
Low (selected)	Most of the plastic materials are separately collected from the source. The informal sector is seen to cause little to no release of waste into the environment during collection. Practises such as overturning bins to get access to valuable material and discarding unwanted items during the collection (bottle tops, labels etc.) are rare.	0.1

11.2. Transportation method



Images of transportation method from informal waste collection

Table 6: leakage potential levels for influencer “transportation method”

Leakage potential	Description	Leakage factor
High	The plastic waste transported is predominantly poorly contained (not in bags). Most vehicles run over capacity	0.5
Medium	The plastic waste transported is occasionally poorly contained. Over capacity of vehicles leading to leakages during transportation is intermittent.	0.1
Low (selected)	Most vehicles used to transport plastic waste are closed to the environment (i.e. cover). Most vehicles stay within their capacity limit	0

14. PLASTIC WASTE LEAKAGE DURING TRANSPORTATION TO DISPOSAL

14.1. Capacity vs load



Images of garbage collection vehicle capacity during transportation to disposal

Table 13: leakage potential levels for influencer “Capacity vs load”

Leakage Potential	Description	Leakage Factor
High	The load in most of the collection vehicles exceeds the capacity.	0.5
Medium	Around half of the trucks’ load exceeds the capacity.	0.3
Low (selected)	The load in most of the collection vehicles does not exceed the capacity.	0.1

14.2. Waste containment



Images of waste containment

Table 14: leakage potential levels for influencer "Waste containment"

Leakage Potential	Description	Leakage Factor
High	Most of the generators in the city do not dispose of their waste contained in bags. Loaders practice cherry picking during transport for which they open most of the bags.	1
Medium (selected)	Around half of the generators in the city dispose of their waste contained in bags and the other half uncontained. Loaders practice some cherry picking during transport for which they open some of the bags.	0.5
Low	Most of the generators in the city dispose of their waste contained in bags and these are not opened during transport.	0.1

14.3. Vehicle cover



Images of the coverage of the collection vehicle

Table 15: leakage potential levels for influencer “Coverage of collection vehicle”

Leakage Potential	Description	Leakage Factor
Very high	Most of the collection vehicles in the city are uncovered vehicles	1
High	The number of collection vehicles are fairly split between uncovered and fully enclosed.	0.5
Medium	Most of the collection vehicles in the city are fully enclosed.	0.1
Low (selected)	All of the collection vehicles in the city are fully enclosed (e.g. compactor trucks)	0

15. PLASTIC WASTE LEAKAGE FROM DISPOSAL FACILITIES

15.1. Environmental hazards

Table 16: leakage potential levels for influencer “environmental hazards”

Leakage Potential	Description	Leakage Factor
Very High	Site is located in an area prone to regular flooding or landslides affecting the majority of the site.	80
High	Site is located in an area prone to occasional flooding or landslides affecting large parts of the site.	40
Medium	Site is located in an area where regular flooding or landslides affect small parts of the site.	10
Low (selected)	Site is located in an area where regular flooding or landslides affect very few parts of the site.	2
None	Site is located in an area which does not regularly have environmental hazards such as flooding or landslides	0

15.2. Exposure to weather



Image of plastic waste leak from “exposure to weather” at Trung Binh dumpsite

Table 17: leakage potential levels for influencer “exposure to weather”

Leakage Potential	Description	Leakage Factor
High	Site is regularly exposed to heavy and persistent winds or surface runoff.	1
Medium (selected)	Site is sometimes exposed to heavy and persistent winds or surface runoff.	0.5
Low	Site is rarely exposed to heavy and persistent winds or surface runoff.	0.1

15.3. Waste handling



Images of plastic waste leak from “waste handling” at Trung Binh dumpsite

Table 18: leakage potential levels for influencer “waste handling”

Leakage Potential	Description	Leakage Factor
Very High	No designated discharge zones. Waste pickers active on all the site. No compaction or management of waste. Waste is piled above ground with full exposure to wind, rain and surface runoff.	1
High (selected)	Waste is generally discharged in designated zones. Waste pickers active on most of the site. Compaction or management of waste typically does not occur. Waste is piled above ground with full exposure to wind, rain and surface runoff.	0.95
Medium	Waste is generally discharged in designated zones. Waste pickers active around discharge zone of the site. Compaction or management of waste is intermittent. Waste is piled above ground with full exposure to wind, rain and surface runoff.	0.75

Low	Waste is discharged in designated zones. Waste pickers are not allowed on site. Compaction or management of waste occurs. Waste is in pits below ground level with minimal exposure to wind, rain and surface runoff.	0.5
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15.4. Coverage



Image of coverage at the Trung Binh dumpsite

Table 19: leakage potential levels for influencer “coverage”

Leakage Potential	Description	Leakage Factor
Very High (selected)	No coverage or covered less than once per month	1
High	Waste is covered typically once per month	0.8
Medium	Waste is covered typically once per week	0.4
Low	Waste is covered typically daily	0.1

15.5. Burning



Image of burning waste at Trung Binh dumpsite

Table 20: leakage potential levels for influencer “Burning”

Leakage Potential	Description	Leakage Factor
Very High	Burning of waste does not occur	1
High (selected)	Burning of waste is rare	0.9
Medium	Burning of waste is occasional	0.7
Low	Burning of waste is widespread and prevalent	0.5

15.6. Fencing



Images of Fencing at the Trung Binh dumpsite

Table 21: leakage potential levels for influencer “Fencing”

Leakage Potential	Description	Leakage Factor
Very High	No fencing	1
High	Fence surrounds less than half of the perimeter or big sections of the fence are broken	0.8
Medium (selected)	Fence surrounds most of the perimeter but is broken in several sections	0.5
Low	Fence surrounds the entire perimeter and is maintained	0.3

16. PLASTIC WASTE IN STORM DRAINS ENTERING WATERWAYS

16.2. Drain clean-up



Image of drain clean-up

Table 23: Leakage potential levels for influencer “drain cleaning”

Leakage Potential	Description	Leakage Factor
Very High	Storm drains do not have any solid waste cleaning activities. Litter traps are not used.	0
High (selected)	A small amount of drains are cleaned once per year. Litter traps are not used.	0.1
Medium	A small amount of drains are cleaned once to twice a year, with this planned to occur before periods of heavy rain (i.e. wet season if applicable). Litter traps are used on a handful of drain outlets and are well maintained.	0.3
Low	A large amount of drains are cleaned once to twice a year, with this planned to occur before periods of heavy rain (i.e. wet season if applicable). Litter traps are used on around half of the drain outlets and are well maintained.	0.5
Very low	The majority of storm drains are cleaned regularly (several times a year). Litter traps are used on the majority of drain outlets and are well maintained.	0.8

17. FATE OF UNCOLLECTED PLASTIC WASTE

17.1. Level of plastic openly burnt



Images of solid waste open burning

Table 24: Level of diffuse open burning

Fate Potential	Description	Fate Factor
Very High (selected)	In areas without waste collection services, there is evidence that residents routinely burn their waste, with it believed to be the primary means of disposal.	0.6
High	In areas without waste collection services, there is evidence that residents routinely burn their waste, with it believed to be a major but not primary means of disposal.	0.4
Medium	In areas without waste collection services, there is evidence that residents may regularly burn their waste, but this is not believed to be the primary means of disposal.	0.25

Low	In areas without waste collection services, there is sporadic evidence that a minority of the residents may regularly burn waste, but this is not believed to be the primary means of disposal for the majority of residents.	0.1
Very low	In areas without waste collection services, there is sporadic evidence that a minority residents may have occasionally burnt waste, but this is believed to be a rare occurrence.	0.05
None	In areas without waste collection services, there is no evidence of open burning occurring.	0

17.2. Level of direct dumping on land



Images of garbage exposed on the mainland

Table 25: Level of diffuse dumping to land

Fate Potential	Description	Fate Factor
Very High (selected)	In areas without waste collection services, there is evidence that residents dump the vast majority of their waste to land, with it believed to be the primary means of disposal. OR In areas without waste collection services, there is evidence that residents routinely dump their waste to land AND regular street sweeping occurs in the areas without waste collection.	0.9
High	In areas without waste collection services, there is evidence that residents routinely dump their waste to land, with it believed to be an important means of disposal. OR In areas without waste collection services, there is evidence that residents may regularly dump their waste to land AND regular street sweeping occurs in the areas without waste collection.	0.65
Medium	In areas without waste collection services, there is evidence that residents may regularly dump their waste to land, but this is not believed to be the primary means of disposal. OR In areas without waste collection services, there is sporadic evidence that a minority of residents may regularly dump their	0.4

	waste to land AND occasional street sweeping occurs in the areas without waste collection.	
Low	In areas without waste collection services, there is sporadic evidence that a minority of residents may regularly dump their waste to land, but this is not believed to be the primary means of disposal for the majority of residents. AND There is no active street sweeping within the areas without waste collection that may be collecting any waste dumped to land.	0.2
Very low	In areas without waste collection services, there is sporadic evidence that a minority of residents may occasionally dump their waste to land, but this is believed to be a rare occurrence. AND There is no active street sweeping within the areas without waste collection that may be collecting any waste dumped to land.	0.1
None	In areas without waste collection services, there is no evidence of waste being dumped to land. AND There is no active street sweeping within the areas without waste collection that may be collecting any waste dumped to land.	0

17.3. Level of direct dumping in drains



Image of the residents routinely dump their waste to drains

Table 26: Level of diffuse dumping in drains

Fate Potential	Description	Fate Factor
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Commented [NTMNGV9]: why there is picture here without caption ?

Very High (selected)	<p>In areas without waste collection services, there is evidence that the majority of the residents routinely dump their waste to drains, with it believed to be the primary means of disposal for many residents.</p> <p>OR</p> <p>In areas without waste collection services, there is evidence that many of the residents routinely dump their waste to drains, with it believed to be the primary means of disposal for a minority of residents AND regular cleaning of the drains occurs throughout the entire area.</p>	0.6
High	<p>In areas without waste collection services, there is evidence that many of the residents routinely dump their waste to drains, with it believed to be the primary means of disposal for a minority of residents.</p> <p>OR</p> <p>In areas without waste collection services, there is evidence that many residents may regularly dump their waste to drains, but this is not believed to be the primary means of disposal for any residents AND regular cleaning of the drains occurs in the area.</p>	0.4
Medium	<p>In areas without waste collection services, there is evidence that many residents may regularly dump their waste to drains, but this is not believed to be the primary means of disposal for any residents.</p> <p>OR</p> <p>In areas without waste collection services, there is sporadic evidence that a minority of residents may regularly dump their waste to drains AND occasional cleaning of the drains occurs in area.</p>	0.2
Low	<p>In areas without waste collection services, there is sporadic evidence that a minority of residents may regularly dump their waste to drains.</p> <p>AND</p> <p>There is no active cleaning of the drains within the vicinity that may be collecting any waste dumped to drains.</p>	0.1
Very low	<p>In areas without waste collection services, there is sporadic evidence that a minority of residents may occasionally dump their waste to drains, but this is believed to be infrequent.</p> <p>AND</p> <p>There is no active cleaning of the drains within the vicinity that may be collecting any waste dumped to drains.</p>	0.05
None	<p>In areas without waste collection services, there is no evidence of residents dumping waste to drains.</p> <p>AND</p> <p>There is no active cleaning of the drains within the vicinity that may be collecting any waste dumped to drains.</p>	0

17.4. Level of direct dumping in water systems



Images of garbage dumped directly into the water system

Table 27: Level of diffuse dumping in water systems

Fate Potential	Description	Fate Factor
Very High (selected)	In areas without waste collection services, almost all of the residents are in close proximity (<500 m) to water systems of which they have access.	0.5
High	In areas without waste collection services, the majority of residents are in close proximity (<500 m) to water systems of which they have access.	0.3
Medium	In areas without waste collection services, around half of residents are in close proximity (<500 m) to water systems of which they have access.	0.2
Low	In areas without waste collection services, a minority of residents are in close proximity (<500 m) to water systems of which they have access.	0.1
Very low	In areas without waste collection services, very few residents are in close proximity (<500 m) to water systems of which they have access.	0.05
None	In areas without waste collection services, there is no presence of waterbodies or access to such water systems is not possible.	0

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18. FATE OF PLASTIC WASTE LEAKED DURING COLLECTION AND TRANSPORTATION

18.1. Level of plastic to land



Images of plastic remaining on land during collection

Table 28: Level of diffuse leakage to land

Fate Potential	Description	Fate Factor
Very High	Throughout all the study area, there is evidence of large quantities of plastic remaining on land (including that caught in vegetation). OR In the majority of the study area, there is evidence of large quantities of plastic remaining on land (including that caught in vegetation) AND regular street sweeping occurs in the majority areas.	1
High (selected)	In the majority of the study area, there is evidence of large quantities of plastic remaining on land (including that caught in vegetation). OR In the majority of the study area, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) AND regular street sweeping occurs in a minority of areas.	0.8
Medium	In the majority of the study area, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) although a minority of areas show evidence of large quantities. OR Throughout all the study area, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) AND infrequent street sweeping occurs in the majority of areas.	0.6
Low	Throughout all the study area, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation). OR In a minority of the study area, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) but the majority of areas show little to no evidence AND infrequent street sweeping occurs in a minority of areas.	0.4
Very low	In a minority of the study area, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) but the majority of areas show little to no evidence. AND There is no active street sweeping that may be collecting any waste leaked to land.	0.2
None	Throughout all the study area, there is no evidence of plastic remaining on land (including that caught in vegetation) AND there is no active street sweeping that may be collecting any waste leaked to land.	0

18.2. Level of plastic to drains



Image of plastic remaining in drains
Table 29: Level of diffuse leakage to drains

Fate Potential	Description	Fate Factor
Very High	Throughout all the study area, there is evidence of large quantities of plastic entering storm drains. OR In the majority of the study area, there is evidence of large quantities of plastic entering storm drains AND the majority of storm drains are cleaned regularly (several times a year).	0.6
High (selected)	In the majority of the study area, there is evidence of large quantities of plastic entering storm drains. OR In the majority of the study area, there is evidence of small quantities of plastic entering storm drains although a minority of areas show evidence of large quantities AND a large amount of drains are cleaned once to twice a year	0.4

Medium	In the majority of the study area, there is evidence of small quantities of plastic entering storm drains although a minority of areas show evidence of large quantities. OR Throughout all the study area, there is evidence of small quantities of plastic entering storm drains AND a small amount of drains are cleaned once to twice a year.	0.3
Low	Throughout all the study area, there is evidence of small quantities of plastic entering storm drains. OR In a minority of the study area, there is evidence of small quantities of plastic entering storm drains but the majority of areas show little to no evidence AND a small amount of drains are cleaned once per year.	0.2
Very low	In a minority of the study area, there is evidence of small quantities of plastic entering storm drains but the majority of areas show little to no evidence AND there is no active street sweeping that may be collecting any waste leaked to land.	0.1
None	Throughout all the study area, there is no evidence of plastic entering storm drains AND there is no active street sweeping that may be collecting any waste leaked to land.	0

18.3. Level of plastic to water systems



Image of plastic diffuse leakage to water

Table 30: Level of diffuse leakage to water

Fate Potential	Description	Fate Factor
Very High (selected)	Almost all of the study area is in close proximity (<1 km) to water systems. Vegetation on the banks of the water systems is very sparse throughout the majority of the study area.	0.25
High	The majority of the study area is in close proximity (<1 km) to water systems. Vegetation on the banks of the water systems is sparse throughout large parts of the study area.	0.2

Medium	The majority of the study area is in close proximity (<1 km) to water systems. Vegetation on the banks of the water systems is dense throughout large parts of the study area.	0.15
Low	The majority of the study area is not in close proximity (>1 km) to water systems. Vegetation on the banks of the water systems is sparse throughout large parts of the study area.	0.1
Very low	The majority of the study area is not in close proximity (>1 km) to water systems. Vegetation on the banks of the water systems is dense throughout large parts of the study area.	0.05
None	All of the study area is not in close proximity (>1 km) to water systems. Vegetation on the banks of the water systems is very dense throughout the majority of the study area.	0

20. FATE OF PLASTIC WASTE LEAKED FROM INFORMAL SORTING

20.1. Level of plastic openly burnt



Image of solid waste open burning by informal collection

Table 31: Level of point source open burning

Fate Potential	Description	Fate Factor
Very High	There is evidence that the majority of sorting facilities routinely burn their sorting rejects, with it believed to be the primary means of disposal.	0.6
High	There is evidence that the majority of sorting facilities routinely burn their sorting rejects, with it believed to be a major but not primary means of disposal.	0.4

Medium	There is evidence that a majority of sorting facilities may occasionally burn their sorting rejects, but this is not believed to be the primary means of disposal.	0.25
Low (selected)	There is sporadic evidence that a minority of sorting facilities may regularly burn their sorting rejects, but this is not believed to be the primary means of disposal for the majority.	0.1
Very low	There is sporadic evidence that a minority of sorting facilities may occasionally burn their sorting rejects, but this is believed to be a rare occurrence.	0.05
None	There is no evidence of sorting facilities openly burning their sorting rejects.	0

20.2. Level of direct dumping on land



Images of plastic point source dumping to land from informal waste collection

Table 32: Level of point source dumping to land

Fate Potential	Description	Fate Factor
Very High	There is evidence that sorting facilities dump the vast majority of their sorting rejects to land, with it believed to be the primary means of disposal. OR There is evidence that sorting facilities routinely dump their sorting rejects to land AND regular street sweeping occurs in the vicinity of the sorting facilities.	0.9
High	There is evidence that sorting facilities routinely dump their sorting rejects to land, with it believed to be an important means of disposal. OR There is evidence that sorting facilities may regularly dump their sorting rejects to land AND regular street sweeping occurs in the vicinity of the sorting facilities.	0.65

Medium	<p>There is evidence that sorting facilities may regularly dump their sorting rejects to land, but this is not believed to be the primary means of disposal.</p> <p>OR</p> <p>There is sporadic evidence that a minority of sorting facilities may regularly dump their waste to land AND occasional street sweeping occurs in the vicinity of the sorting facilities.</p>	0.4
Low	<p>There is sporadic evidence that a minority of sorting facilities may regularly dump their sorting rejects to land, but this is not believed to be the primary means of disposal for the majority.</p> <p>AND</p> <p>There is no active street sweeping within the vicinity of the sorting facilities that may be collecting any waste dumped to land.</p>	0.2
Very low	<p>There is sporadic evidence that a minority of sorting facilities may occasionally dump their sorting rejects to land, but this is believed to be a rare occurrence.</p> <p>AND</p> <p>There is no active street sweeping within the vicinity of the sorting facilities that may be collecting any waste dumped to land.</p>	0.1
None (selected)	<p>There is no evidence of sorting facilities dumping their sorting rejects to land.</p> <p>AND</p> <p>There is no active street sweeping within the vicinity of the sorting facilities that may be collecting any waste dumped to land.</p>	0

20.3. Level of direct dumping in drains



Images of plastic direct dumping in drains from informal waste collection

Table 33: Level of point source dumping in drains

Fate Potential	Description	Fate Factor
Very High	<p>There is evidence that the majority of the sorting facilities routinely dump their sorting rejects to drains, with it believed to be the primary means of disposal for many.</p> <p>OR</p> <p>There is evidence that many of the sorting facilities routinely dump their sorting rejects to drains, with it believed to be the primary means of disposal for a minority of sorting facilities AND regular cleaning of the drains occurs in the vicinity of the sorting facilities.</p>	0.6
High	<p>There is evidence that many of the sorting facilities routinely dump their sorting rejects to drains, with it believed to be the primary means of disposal for a minority of sorting facilities.</p> <p>OR</p> <p>There is evidence that many sorting facilities may regularly dump their sorting rejects to drains, but this is not believed to be the primary means of disposal AND regular cleaning of the drains occurs in the vicinity of the sorting facilities.</p>	0.4
Medium	<p>There is evidence that many of the sorting facilities may regularly dump their sorting rejects to drains, but this is not believed to be the primary means of disposal for any sorting facilities.</p> <p>OR</p> <p>There is sporadic evidence that a minority of sorting facilities may regularly dump their sorting rejects to drains AND occasional cleaning of the drains occurs in vicinity of the sorting facilities.</p>	0.2
Low	<p>There is sporadic evidence that a minority of sorting facilities may regularly dump their sorting rejects to drains AND there is no active cleaning of the drains within the vicinity of the sorting facilities that may be collecting any waste dumped to drains.</p>	0.1
Very low	<p>There is sporadic evidence that a minority of sorting facilities may occasionally dump their sorting rejects to drains, but this is believed to be infrequent AND there is no active cleaning of the drains within the vicinity of the sorting facilities that may be collecting any waste dumped to drains.</p>	0.05
None (selected)	<p>There is no evidence of sorting facilities dumping sorting rejects to drains AND there is no active cleaning of the drains within the vicinity that may be collecting any waste dumped to drains.</p>	0

20.4. Level of direct dumping to water systems



Images of plastic direct dumping to water systems from informal waste collection

Table 34: Level of diffuse dumping in water systems

Fate Potential	Description	Fate Factor
Very High	Almost all of the sorting facilities are in close proximity (<500 m) to water systems of which they have access.	0.6
High	The majority of sorting facilities are in close proximity (<500 m) to water systems of which they have access.	0.4
Medium (selected)	Around half of sorting facilities are in close proximity (<500 m) to water systems of which they have access.	0.2
Low	A minority of sorting facilities are in close proximity (<500 m) to water systems of which they have access.	0.1
Very low	Very few sorting facilities are in close proximity (<500 m) to water systems of which they have access.	0.05
None	There are no sorting facilities in close proximity (<500 m) to water systems or access to such water systems is not possible.	0

21. FATE OF PLASTIC WASTE LEAKED FROM DISPOSAL FACILITIES

21.1. Level of plastic to land



Image of plastic leaked to land from disposal facilities

Table 35: Level of point source leakage to land

Fate Potential	Description	Fate Factor
Very High (selected)	In the vicinity of the point sources, there is evidence of large quantities of plastic remaining on land (including that caught in vegetation).	1
	OR In the vicinity of the point sources, there is evidence of large quantities of plastic remaining on land (including that caught in vegetation) AND regular street sweeping occurs.	
High	In the vicinity of the point sources, there is evidence of large quantities of plastic remaining on land (including that caught in vegetation).	0.8
	OR In the vicinity of the point sources, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) AND occasional street sweeping occurs.	
Medium	In the vicinity of the point sources, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) although some areas show evidence of large quantities.	0.6
	OR In the vicinity of the point sources, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) AND infrequent street sweeping occurs.	
Low	In the vicinity of the point sources, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation).	0.4

	OR In the vicinity of the point sources, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) but the majority of area show little to no evidence AND very infrequent street sweeping occurs.	
Very low	In the vicinity of the point sources, there is evidence of small quantities of plastic remaining on land (including that caught in vegetation) but the majority of areas show little to no evidence AND there is no active street sweeping that may be collecting any waste leaked to land.	0.2
None	In the vicinity of the point sources, there is no evidence of plastic remaining on land (including that caught in vegetation) AND there is no active street sweeping that may be collecting any waste leaked to land.	0

21.2. Level of plastic to drains



Image of plastic leaked to drains from disposal facilities

Table 36: Level of diffuse leakage to drains

Fate Potential	Description	Fate Factor
Very High (selected)	In the vicinity of the point sources, there is evidence of large quantities of plastic entering storm drains.	0.6

	<p>OR</p> <p>In the vicinity of the point sources, there is evidence of large quantities of plastic entering storm drains AND the majority of storm drains are cleaned regularly (several times a year).</p>	
High	<p>In the vicinity of the point sources, there is evidence of large quantities of plastic entering storm drains.</p> <p>OR</p> <p>In the vicinity of the point sources, there is evidence of small quantities of plastic entering storm drains although a minority of areas show evidence of large quantities AND a large amount of drains are cleaned once to twice a year</p>	0.4
Medium	<p>In the vicinity of the point sources, there is evidence of small quantities of plastic entering storm drains although a minority of areas show evidence of large quantities.</p> <p>OR</p> <p>In the vicinity of the point sources, there is evidence of small quantities of plastic entering storm drains AND a small amount of drains are cleaned once to twice a year.</p>	0.3
Low	<p>In the vicinity of the point sources, there is evidence of small quantities of plastic entering storm drains.</p> <p>OR</p> <p>In the vicinity of the point sources, there is evidence of small quantities of plastic entering storm drains but the majority of areas show little to no evidence AND a small amount of drains are cleaned once per year.</p>	0.2
Very low	<p>In the vicinity of the point sources, there is evidence of small quantities of plastic entering storm drains but the majority of areas show little to no evidence AND there is no active street sweeping that may be collecting any waste leaked to land.</p>	0.1
None	<p>In the vicinity of the point sources, there is no evidence of plastic entering storm drains AND there is no active street sweeping that may be collecting any waste leaked to land.</p>	0

21.3. Level of plastic to water systems



Image of plastic leaked to water systems from disposal facilities

Table 37: Level of diffuse leakage to water

Fate Potential	Description	Fate Factor
Very High (selected)	Almost all of the point sources are in close proximity (<1 km) to water systems. Vegetation on the banks of the water systems is very sparse.	0.8
High	The majority of the point sources are in close proximity (<1 km) to water systems. Vegetation on the banks of the water systems is sparse.	0.5
Medium	The majority of the point sources are in close proximity (<1 km) to water systems. Vegetation on the banks of the water systems is dense.	0.3
Low	The majority of the point sources are not in close proximity (>1 km) to water systems. Vegetation on the banks of the water systems is sparse.	0.1
Very low	The majority of the point sources are not in close proximity (>1 km) to water systems. Vegetation on the banks of the water systems is dense.	0.05
None	All of the point sources are not in close proximity (>1 km) to water systems. Vegetation on the banks of the water systems is very dense.	0

Annex 3. The plastic hotspots in Tran De Town

Name of site	No.	Location		Estimation of area			Characteristic	
		Longitude	Latitude	Length (m)	Width (m)	Total area m ²	Waste composition characteristics and generation sources	Management unit
Ngan Ro Hamlet	1	106°10'33,39"	9°32'55,998"	20	3	60	Household waste	Spontaneous dumpsite and treatment by open incineration
	2	106°10'40,248"	9°32'52,302"	15	2	30	Household waste	Spontaneous dumpsite and treatment by open incineration
Dau Giong Hamlet	3	106.203836	9.499077	7	2	14	Water hyacinth, plastic bags, Styrofoam... arise mainly from fishing activities, coming from upstream	Spontaneous dumpsite, stay on the canal
Cang Hamlet	4	106.190692	9.521462	8	2.5	20	Water hyacinth, plastic bags, Styrofoam... arise mainly from fishing activities, coming from upstream	Spontaneous dumpsite, stay on the canal
	5	106.191153	9.521724	10	3	30	Household and local market waste	SPWC (SPWC)
	6	106.191974	9.522314	8	1.5	12	Household local market waste	SPWC
	7	106.191125	9.522884	5	4	20	Household local market waste	SPWC
	8	106.191706	9.52168	75	20	1500	Plastic bags, Styrofoam... arise mainly from fishing activities, upstream flooding and high tides	Spontaneous dumpsite, stay on the canal
	9	106.192576	9.521752	15	3	45	Plastic bags, Styrofoam... arise mainly from fishing activities, upstream flooding and high tides	Spontaneous dumpsite, stay on the canal

10	106.201376	9.524902	15	2.5	37.5	Plastic bags, Styrofoam... arise mainly from fishing activities, upstream flooding and high tides	Spontaneous dumpsite, stay on the canal
11	106.201849	9.525093	20	2	40	Plastic bags, Styrofoam... arise mainly from fishing activities, upstream flooding and high tides	Spontaneous dumpsite, stay on the canal
12	106.192379	9.522378	30	3	90	Water hyacinth, plastic bags, Styrofoam... arise mainly from fishing activities, coming from upstream	Spontaneous dumpsite, stay on the canal
13	106.193420	9.52277	30	3	90	Plastic bags, Styrofoam... arise mainly from fishing activities, upstream flooding and high tides	Spontaneous dumpsite, stay on the canal
14	106.201727	9.525816	15	4	60	Trees, plastic bags, Styrofoam... arise mainly from fishing activities, upstream flooding and high tides	Spontaneous dumpsite, stay on the canal
15	106.20224	9.524479	1200	3	3300	Water hyacinth, plastic bags, Styrofoam... arise mainly from fishing activities, coming from upstream	Spontaneous dumpsite, stay on the mangrove forest
	106.206869	9.513697					

Annex 4. Summary table of survey data results

Table 1. Summary table of municipal solid waste generation and management

Municipal Solid Waste		
	Baseline	Unit
Municipal solid waste generation	1,904	Tonnes/year
Municipal solid waste generation	5	Tonnes/day
Collected waste	1,773	Tonnes/year
Collected waste	93%	% of waste generation
Uncollected waste	131	Tonnes/year
Uncollected waste	7%	% of waste generation
Waste sorted for recovery <i>(excludes energy from waste)</i>	357	Tonnes/year
Waste sorted for recovery <i>(excludes energy from waste)</i>	19%	% of waste generation
Waste sorted for recovery by formal sector <i>(excludes energy from waste)</i>	0%	% of waste generation
Waste sorted for recovery by informal sector <i>(excludes energy from waste)</i>	19%	% of waste generation
Energy from waste	0	Tonnes/year
Energy from waste	0%	% of waste generation
Disposal in disposal facilities	1,406	Tonnes/year
Disposal in disposal facilities	74%	% of waste generation
Managed in controlled facilities	1,044	Tonnes/year
Managed in controlled facilities	55%	% of waste generation

Table 2. Summary table of municipal plastic waste generation and management

Plastic waste		
	Baseline	Unit
Municipal solid waste generation	384	Tonnes/year
Municipal solid waste generation	1,05	Tonnes/day
Collected waste	359	Tonnes/year
Collected waste	93%	% of waste generation
Uncollected waste	25	Tonnes/year
Uncollected waste	7%	% of waste generation
Waste sorted for recovery <i>(excludes energy from waste)</i>	146	Tonnes/year
Waste sorted for recovery <i>(excludes energy from waste)</i>	38%	% of waste generation
Waste sorted for recovery by formal sector <i>(excludes energy from waste)</i>	0%	% of waste generation
Waste sorted for recovery by informal sector <i>(excludes energy from waste)</i>	38%	% of waste generation
Energy from waste	0	Tonnes/year
Energy from waste	0%	% of waste generation
Disposal in disposal facilities	204	Tonnes/year
Disposal in disposal facilities	53%	% of waste generation
Managed in controlled facilities	153	Tonnes/year
Managed in controlled facilities	40%	% of waste generation

Table 3. The proportion of waste components at the generation sources in Tran De Town (Feb 2023)

No.	Items	Compositions	Household (%)	Non-household (%)						
				Small businesses	Tran De Port	Superdong cruise port	Kenh Ba Market	School	Administrative agency	Accommodation - commerce - service
1	Organic waste (for composting)	Putrescible waste	26.7	23.6	12.8	4.2	64.4	9.9	2.4	20.0
2		Residual organic waste	47.0	30.2	37.5	41.8	19.0	16.0	56.1	61.7
3		Leaves	3.2	0.0	0.4	0.0	0.2	4.7	2.1	0.3
4	Recyclable materials	Hard plastic (HDPE/ /LDPE/PP)	0.4	0.0	1.5	0.6	0.0	1.6	3.0	0.5
5		PET bottles	0.2	0.5	1.8	3.2	0.0	2.2	3.8	0.5
6		PVC	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0
7		Metal	0.3	1.6	0.6	1.6	0.0	0.1	1.1	1.7
8		Paper	3.0	4.9	11.0	19.6	0.9	21.8	12.1	1.9
9	Mix Waste (for disposal)	Nylon, packaging, plastic cups...	12.7	20.3	24.6	25.2	10.6	30.2	14.8	11.4
10		Wood	0.1	2.5	0.0	0.0	4.1	0.0	3.1	0.0
11		Textile/shoes	0.6	8.9	0.8	0.0	0.4	0.7	0.0	0.5
12		Glass, ceramics	1.1	0.0	1.4	0.2	0.0	0.0	0.0	0.0
13		Rubber	0.1	2.7	1.4	0.0	0.0	0.0	0.0	0.0
14		Other (Diapers, milk bottle, hazardous, medical waste)	4.6	4.7	3.0	3.7	0.5	12.9	1.5	1.5
Total			100	100	100	100	100	100	100	100

Annex 5. Images of survey and waste audit

1. Images of waste audit at the dumpsite



2. Images of waste audit at the port





3. Images of waste audit at the school



4. Images of waste audit at the household





5. Images of meeting with local authorities



A meeting with Soc Trang DONRE
(Department of Seas & Island)



A meeting with Soc Trang DONRE
(Environmental protection agency)



A meeting with Tran De District People's
Committee (Department of Natural Resource &
Environment)



A meeting with Soc Trang Urban Public Work JSC
Company (Waste contractor)

Annex 6. Waste audit

No.	Categories	Weight (kg)
1	Plastic bag	
2	Multi-layer packaging	
3	Single layer packaging	
4	Styrofoam	
5	Hard plastic (HDPE/ /LDPE/PP)	
6	PET plastic	
7	PVC plastic	
8	Plastic straws	
9	Diapers, sanitary napkin	
10	Metal/cans	
11	Glass	
12	Paper / cartons / card	
13	Wood	
14	Putrescible waste	
15	Residual organic waste	
16	Leaves	
17	Garments	
18	Ceramics	
19	Hazardous waste	
20	Medical waste	
21	Footwear	
22	Diapers/Toilet Papers	
23	Rubber	
24	Milk bottle	
25	Other	
26		

Annex 7: Meeting minutes of local stakeholders (authorities)

Date: 13 Feb 2023

1. First meeting: Environmental Protection Department (Soc Trang DONRE): collecting reports of solid waste management and data for WFD.

- They informed that asking local people to separate waste at source is still facing many difficulties. The policy should have regulations on penalties for people to comply with the separation of waste at source, thereby helping to improve recycling efficiency.
- The rate of garbage collection in rural areas is still low (65%), due to the local lack of budgets, equipment and human resources to increase the rate of garbage collected. This will help reduce waste leakage into the environment.
- Urban waste treatment fee that the Soc Trang province has to pay to the urban service company: 359,000 VND/ton of garbage. Currently, the whole province of Soc Trang has 36 open-air landfills, of which there are 3 landfills in Tran De district, and 05 domestic waste incinerators.
- Current waste statistic reports of Soc Trang are mainly based on estimated data by different methods, so the current statistics on the amount of waste generated, the rate of garbage collected are not accurate and the methodologies used is not consistent between local areas in the province. Therefore, the department is looking forward to being shared the survey results by GIZ, and sharing experiences in local solid waste management.
- Recently, Harvest Waste B.V Group (Netherland) worked with the People's Committee of Soc Trang province and surveyed a number of locations to invest in a Waste to Energy plant (capacity 20MW) with the investment of 100 million USD.

2. Second meeting: The Public Service Company

- In Tran De Town, the total number of waste sources is 870 (including households, offices, and business establishments).
- The current fee for garbage collection at households is 15,000-19,000 VND. The collection fee for the production facilities/ factories will be charged depending on the daily waste volume.
- The waste collection fee will be collected by the Public Service Company. However, this amount only meets a small part of local waste treatment costs. Therefore, Soc Trang province has to pay to the rest of waste treatment fee for the public service company through the government budget.
- In fact, the Public Service company has been contracted by the Soc Trang province to assign municipal waste collection and treatment in Tran De District since 2019 (including 2 towns & 7 communes). However, due to limited budget,

the Company was unable to expand the deployment of collection services in the area.

- The company confirmed that they have sufficient human resources to expand the waste collection area in Tran De Town. Due to the limited budget paid for waste collection and treatment services, so this is the main reason why waste collection service in some residential areas has not been fully implemented.

The Public Service company suggested that if GIZ organization can support finance or providing collection equipment (garbage trucks, garbage cans).

3. *Third meeting: Department of Natural Resources and Environment of Tran De district: collecting reports of solid waste management and data for WFD.*

- Waste collection

+ DONRE contracted with SPWC to collect waste for 10/11 communes (except Thanh Thoi Thuan Commune) and transported it for treatment at 03 concentrated landfills (Lich Hoi Thuong Town, Tai Van Commune and Trung Binh Commune) with the volume of 30 - 32.5 tons/day. These are open landfills, self-decomposing. Periodically every 2 weeks, citizens perform mixing and spraying to treat bad odours generated.

+ For Tran De Town, the generated sources are collected periodically every 2 days, especially the market is collected daily. Currently, in Tran De Town, the waste collection rate is 92%, the main roads are collected; small roads, rural people handle themselves.

+ Particularly, medical waste, DONRE is not managed, the hospital itself signs a contract with another unit to collect it separately.

- Garbage Dumps Hotspots

+ In Tran De Town, Kenh Ba canal is considered an unsolved local waste hotspot. Due to the characteristics of tidal influences, waste is carried by the flow and from the upper reaches of the canal. Monthly, DONRE mobilizes the Youth Union and Women's Union to clean and remove waste with a volume of about 2 tons/ batch.

+ The town's drains, at the end of 2021, the Department of Natural Resources and Environment coordinated with the Department of Infrastructure Economics to dredge drains at Kenh Ba market. Annually, The People's Committee of town conducts a survey and proposes the locations of sewers to be dredged, which the DONRE will consider and approve for implementation.

- Activities and projects that have been and are expected to be implemented

+ In 2007, there was a German project to support people to make compost in Long Phu District (old) but it was ineffective because there was no guarantee of compost output.

+ For areas without a collection system, the district shall invest in making garbage burning pits at households.

+ According to the annual plan, the Department has activities related to the sorting of waste, in 2023, the Department has a communication plan to implement the plastic waste classification for 6 communes.

+ In 2021, the department has a policy to transfer the amount of waste generated in the district to the 400-ton incinerator in Soc Trang for treatment. Currently, we still continue to promote and wait for provincial approval.

- Difficulties and challenges

+ The serious problem of the project in Tran De Town is that the plastic bags containing seafood at the port have not been processed. It is proposed that the project side work with the Port Management Board and fishermen to carry out separate collection and treatment.

+ People's awareness is still limited even though in the Department side there have been many communication programs.

- **Propose solutions:** The project supports the implementation of the plastic waste classification plan, focusing on classifying into 2 main types: organic and inorganic. The Department will coordinate with SPWC to participate in the implementation.

4. Fourth meeting: Tran De Urban Environmental Team: collecting reports of solid waste management and data for WFD.

- Waste collection

+ Number of collection trips : Every day 2 trips, the average amount of waste is 7.5-8 tons / day. The total number of households/production establishments registered to waste collection is 870, of which: Production households: 230, Schools: 4, Business agencies: 50, The remaining 586 are households and 1 market.

+ There are currently 2 specialized garbage trucks, of which 1 vehicle 4 m³ (License plate: 83C-072.16), 1 vehicle 7 m³ (License plate: 83C -056.48) are collecting and transporting waste in Tran De Town. Each vehicle has 3 workers including 2 collection workers and 1 driver.

+ Recyclables waste is only 1 very small part of the collection, workers pick it up (only the collection truck with license plate: 072.16 performs)

- Challenges and difficulties of the unit in management

+ People's awareness in environmental protection: A part of people do not have a good sense of joining hands to maintain environmental sanitation, there is still a situation of bringing garbage to neighboring houses to leave there or throw into canals and ditches next to the houses. When bringing garbage to public garbage cans, a part often does not open the lid of the bin, but throws the garbage on the side of the bin, causing the garbage to be scattered.

+ The situation of people not distinguishing between domestic waste and other types of waste makes it difficult to collect and transport, sometimes people trim trees, clean gardens to mix with domestic waste, sometimes including construction waste.

+ Due to local characteristics, there are small roads, sparsely populated routes far from major roads, so the collection is not thorough to 100% of households.

+ Currently, landfills in the area are still small, unable to divide areas to classify garbage. There is no recycling sorting line.

+ Equipment for storing garbage in public places is limited, especially in crowded places, markets ... so sometimes garbage comes out of the containers.

- Propose solutions

+ It is necessary to strengthen propaganda on environmental protection, set up more panels in public places on penalties for leaving garbage in accordance with regulations.

+ Equip additional garbage containers in densely populated places.

+ Expand more landfills to invest in waste classification technology,

+ Propaganda for people to aware of the types of garbage generated in households so that people can distinguish between domestic waste, hazardous waste...

+ Conduct evidence collection to sanction cases of indiscriminate garbage throwing in accordance with regulations to typical..

About the desire for the project

- The project should propose to local authorities to expand the landfills. Introduce domestic and foreign organizations and enterprises capable of investing in building garbage treatment plants, modern technology waste classification lines.

- In order for the project to be successful and exist with time, it is necessary to fully and regularly address the following issues:

+ Funding sources maintained when the project is transferred and continued.

+ When participating in the project, what are the benefits of participating entities (households, businesses...)?

+ When not using plastic items, what substitutes to use substitute and who is the supplier, is the price reduced and more convenient when using plastic?

+ Formulate sanctions to submit and advise competent agencies to promulgate penalties for violations.

+ Coordinate synchronously between the State, enterprises (especially individuals and enterprises with sea-related activities), people to join hands to synchronously implement solutions and sanctions ... to achieve project goals. Create a green environment without plastic waste.

5. Fifth meeting: People's Committee of Tran De Town - Cadaster - Environment: collecting reports of solid waste management and data for WFD.

- The Town People's Committee is responsible for monitoring the situation of garbage collection, garbage pollution, dredging of sewer drains in the area (collection routes, households...) and advise the district for approval with other units to implement.

- For areas where there are no collection vehicles, encourage people to treat themselves at home in the form of landfill.

- Garbage hotspots in the area are concentrated in Kenh Ba drain, pushed by garbage from the sea by wind and high tide, partly from above the source, causing garbage stagnation here.

- Every year, coordinate with the Youth Union of towns, hamlets, border guards and schools to collect garbage at Kenh Ba drain. The frequency is about 3-4 times, the mass is about 1 ton.

- The current difficulty of the town is at Kenh Ba drain when there is no solution to interfere with waste from other sources pouring in. There is no garbage collection unit on the river, depending only on the sanitation of the unions

- Proposal to equip more trash cans along the Kenh Ba canal; research projects with solutions and systems to collect waste in rivers; taxation of plastic bags, plastic production facilities.

6. Sixth meeting: Tran De Port Management Board - Environmental staff: collecting reports of solid waste management and data for WFD.

- Currently, the source of waste generation at Tran De port is mainly from production and business facilities (about 60 establishments) and 4 seafood preliminary processing

companies. In addition, coming from cruise ship activities and activities of fishermen and surrounding households. Broken fishing gears are sold by boats to recycling units.

- According to the results of monitoring in 1 month of 2022, the volume of waste generated is about 500kg / day. SPWC Company will collect every 2 days, the collection rate is about 90-95%, the leaves are not collected, so the port cleaning workers collect and burn.

- Currently, there are 4 workers cleaning and collecting garbage at the port. There are 120 garbage cans of types 60L, 120, 240L supported by the DONRE, but so far many garbage cans have been damaged due to the collection process of SPWC workers. In particular, the management board belongs to the state management agency, so it cannot be purchased by itself, must submit and apply for a grant from the People's Committee of District every year.

- The Management Board also conducts propaganda by loudspeaker system about the environment and waste on environmental event days such as 5/6. Arrange waste classification bins (recycled and others) at the wharf and donate plastic bags for boats to carry waste to the shore. The Management Board also coordinates with the delegation to collect and clean waste at the port periodically every 1 month.

- Some difficulties of the Port Management Board: (1) Fishing vessels do not have areas to store waste, (2) Fishermen's awareness is limited and (3) Trash equipment is much damaged.

- The project proposal can support investment in trash bin equipment, training programs on the plastic waste classification for fishermen, mobilizing people to bring waste to shore.

7. Seventh meeting: Aquaculture farm: collecting reports of solid waste management and data for WFD.

- Waste in shrimp farming activities mainly generated from livestock activities (packaging, plastic bottles ...) and workers' and people's activities (leftovers, plastic bags ...) will be burned because there is no garbage collection unit. The plastics generated from the pond will be used by people, nets will be purchased, plastic bags of shrimp feed will be collected for scrap.

- Some of the waste resold is as follows:

+ The shrimp farming tarpaulin will be changed for 3-4 years, if put into a concrete tank, it will take 5-10 years to change. After that, resell to scrap dealers 10,000-11,000 VND/kg, or use them to spread for earthen ponds.

+ 1 hectare uses 3 bags (50kg) of shrimp feed, potassium permanganate and 1 bottle of chlorine.

+ Oxygen aerators used for 2-3 years are broken and sold for scrap.

8. Eighth meeting: Fisheries: collecting reports of solid waste management and data for WFD.

- The main source of waste is from fishermen's activities, each time they go out to sea, they bring food, instant noodles, water bottles (1.5L), beer, soft drinks, medicines ... Domestic garbage is thrown directly into the sea, not brought back.

- During the exploitation process, nets are often torn or lost in reef areas because there is no locating point for reefs when fishing outside Con Dao. Torn nets can be repaired directly at sea, if severely damaged, they can be thrown directly at sea. In particular, the rake profession has a high rate of nets entering the reefs.

- In the process of exploitation, garbage is mainly detected in shallow waters and under-detected offshore areas. For raking, there is often garbage in the net, but it is thrown into the sea without bringing it back.

- Bringing garbage to shore is difficult for fishermen because there is no space on board, most of which is for fishing gear.

9. Ninth meeting: Agriculture – rice farmers: collecting reports of solid waste management and data for WFD.

- There is no unit to collect waste from agriculture, so most people handle it themselves. Bottles of protective medicines are collected to burn or bottle ticks purchased, sometimes thrown directly in the field. Plastic bags for rice after using, are often burned or used to store garbage and firewood. Fertilizer bags can be used for waste or for others in need.

- There is no place for people to collect agricultural waste, so it is proposed that these waste collection areas should be made.

Annex 8: The list of formal and informal scrap houses in Tran De Town

No.	Name	Position	Phone	Address
1.	Mr. Dang Hoang Thong	Tran De Urban Environmental Team	0854888880	187 Dau Giong Hamlet
2.	Mr. Nguyen Van Cu	Garbage collection team driver	0336464083	
3.	Mr. Trinh Tan Tai	Formal waste workers	0364802347	
4.	Mr. Lâm Hoang Ni	Formal waste workers	0364814991	
5.	Ms. Dang Thi Yen Loan	Scrap shops	0913545540	Ngan Ro Hamlet
6.	Mr. Quach Tuan Quach	Plastic bags scrap shops	0869779891	Cang Hamlet
7.	Mr. Vuong Hong Vui	Scrap shops	0778612558	Cang Hamlet
8.	Ms. Nguyen Thi Thu Huong	Scrap shops	Not use phone	Cang Hamlet
9.	Mr. Nguyen Van Dat	Scrap shops	0907811292	Giong Chua Hamlet
10.	Mr. Phạm Van Nhan	Plastic bags scrap shops	0867917445	Tran De port
11.	Mr. Lam Van Ba	Waste picker in dumpsite	0397168125	Trung Binh dumpsite