Clean Ports, Clean Oceans: Improving Port Waste Management in the Philippines

Solid Waste Management Baseline Study
Port of Batangas

November 2021

Acknowledgement

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This study has been enriched by the great contribution of key stakeholders in the conducted stakeholder interviews and consultations. Their inputs have been taken into account by the authors BUT do not necessarily represent their opinions and positions. We are grateful for their contributions.

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Acronyms

AMH	AMH Philippines, Inc.
AO	Administrative Order
ATI	Asian Terminals, Inc.
BCT	Batangas Container Terminal
CBU	Completely Built Units
CENRO	City Environment and Natural Resources Office
DENR	Department of Environment and Natural Resources
DOST	Department of Science and Technology
DOTC	Department of Transportation and Communication
DOTr	Department of Transportation
DWT	Dead Weight Tonnage
E	East
E-Code	Environment Code of Batangas City
EMB	Environmental Management Bureau
EO	Executive Order
FGD	Focused Group Discussion
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GRaSPS	Green, Resilient and Smart Port Strategy
Grieg	Grieg Star Group AS
ha	Hectares
HDPE	High Density Polyethylene
HME	Harmful to the Marine Environment
IMO	International Maritime Organization
iPrudential	iPrudential Stevedoring and Port Services, Inc.
ITDI	Industrial Technology Development Institute
km	Kilometer
km2	Square Kilometer
LDPE	Low Density Polyethylene
LGU	Local Government Unit
m	Meter
m2	Square Meter
m3	Cubic Meter
MARINA	Maritime Industry Authority
MARPOL	International Convention for the Prevention of Pollution from Ships
MC	Memorandum Circular
MEPC	Marine Environment Protection Committee
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
N	North
NPCC	National Pollution Control Commission
NPOA	National Plan of Action on Marine Litter
NSWMC	National Solid Waste Management Commission
PCG	Philippine Coast Guard
PD	Presidential Decree
PET	Polyethylene Terephthalate
PMO	Port Management Office
PP	Polypropylene
PPA	Philippine Ports Authority
PS	Polystyrene
PSA	Philippine Statistics Authority
PT	Passenger Terminal
PVC	Polyvinyl Chloride
RA	Republic Act
RoRo	Roll-on/Roll-off
SDG	Sustainable Development Goals
SLF	Sanitary Landfill
SRF	Shore Reception Facilities
SWM	Solid Waste Management
SWMP	Solid Waste Management Plans
TEU	Twenty-footer Equivalent Units
UN	United Nations
UNDP	UN Development Programme
UNEP	UN Environment Programme
WACS	Waste Analysis and Characterization Study
WaCT	Waste Wise Cities Tool
WasteCon	WasteCon, Inc.
WOBVIF	Waste On-Board Vessel Information Form

INTRODUCTION

This report presents the results of the conducted baseline study for the Port of Batangas (Figure 1), which includes a waste analysis and characterization study (WACS) and port- and vessel-generated waste flow analysis.

Port-generated wastes pertain to solid waste generated from port facilities and offices operating in the port area. Vessel-generated wastes refer to solid waste generated on board vessels.

In October 2020, the World Wide Fund for Nature Philippines (WWF-Philippines) and the World Wide Fund for Nature Norway (WWF-Norway) started the project “Clean Ports, Clean Oceans: Improving Port Waste Management in the Philippines”, funded by the Grieg Foundation to help address the issue of plastic pollution in Philippine ports. The project is being implemented in partnership with a private sector entity, Grieg Star Group AS (Grieg). WWF-Philippines then contracted AMH Philippines, Inc. (AMH) to conduct baseline studies at select Philippine ports – Manila North Port, Port of Batangas, and Cagayan de Oro Port (Figure 1). AMH is also currently tasked to conduct a national baseline study.

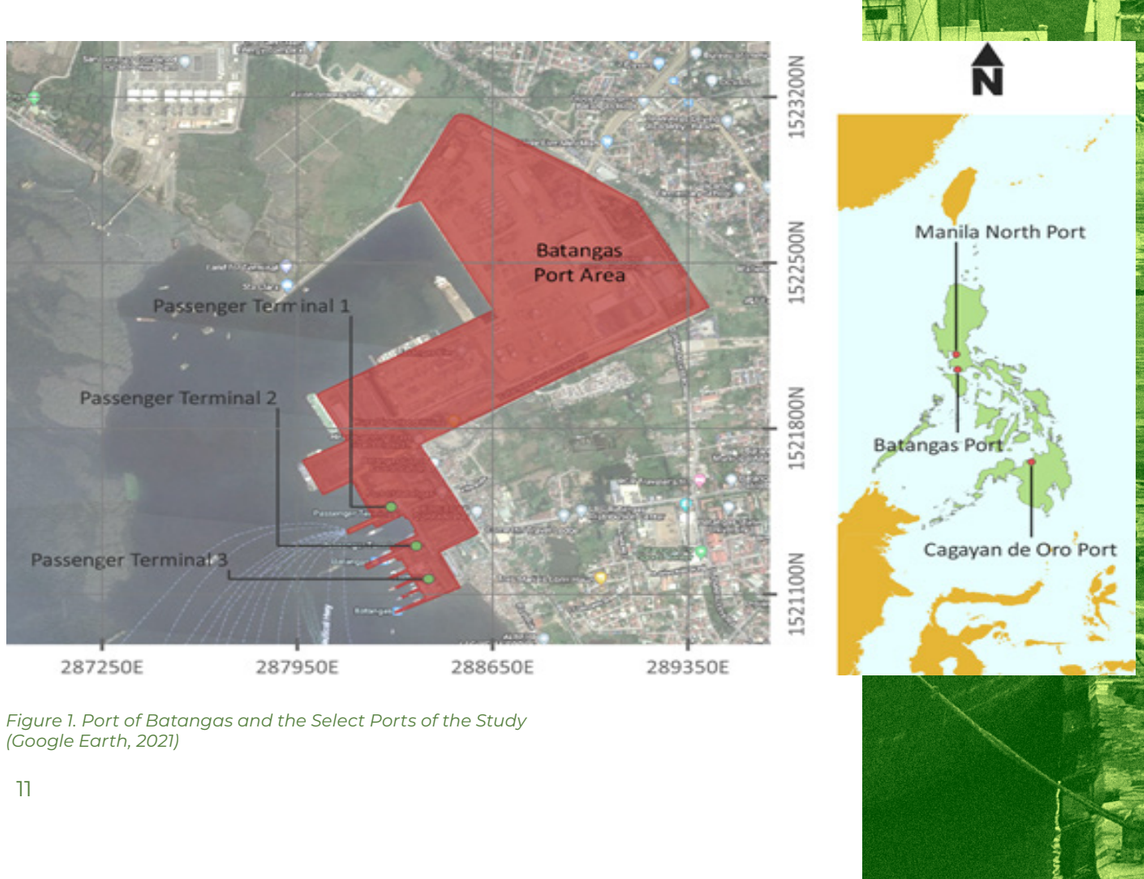


Figure 1. Port of Batangas and the Select Ports of the Study (Google Earth, 2021)

Background of the Study

The Sustainable Development Goals (SDGs) is a campaign of the United Nations (UN) to address the challenges the humanity is currently facing on a global scale. Many SDGs directly relate to waste management and sustainable development such as SDGs 11, 12, 14 and 17.

SDG 11 – **Sustainable Cities and Communities** seeks to make cities inclusive, safe, resilient, and sustainable. One of its global targets is that by 2030, the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management, has reduced (United Nations, 2021).

SDG 12 – Responsible Consumption and Production has a goal to ensure sustainable consumption and production patterns. This also aims that by 2030, waste generation are substantially reduced through prevention, reduction, recycling, and reuse (United Nations, 2021).

SDG 14 – Life Below Water aims to conserve and sustainably use the world's ocean, seas, and marine resources. One of its targets is to prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution. An estimate of 5 to 12 million metric tons of plastic enters the ocean every year, which costs roughly US$ 13 billion per year for clean-up costs and financial losses in fisheries and other industries. About 89% of plastic litter found on the ocean floor are single-use items like plastic bags (United Nations, 2021).

SDG 17 – Partnership for the Goals strives to strengthen the means of implementation and revitalize the global partnership for sustainable development. One of its specific targets is to promote the development, transfer, dissemination, and diffusion of environmentally sound technologies to developing countries on favorable terms, including technologies with regards to waste management (United Nations, 2021).

Plastic pollution is the most widespread problem affecting the marine environment. It threatens ocean health, food safety, human health, and tourism.

The geographical distribution of marine plastic debris is strongly influenced by the entry points and the different transport pathways, which are in turn determined by the density of plastic debris coupled with prevailing currents, wind, and waves (Rech, et al., 2014). Wastes coming from ports, vessels and the communities near the coast have

a greater chance of polluting the marine environment than other waste sources.

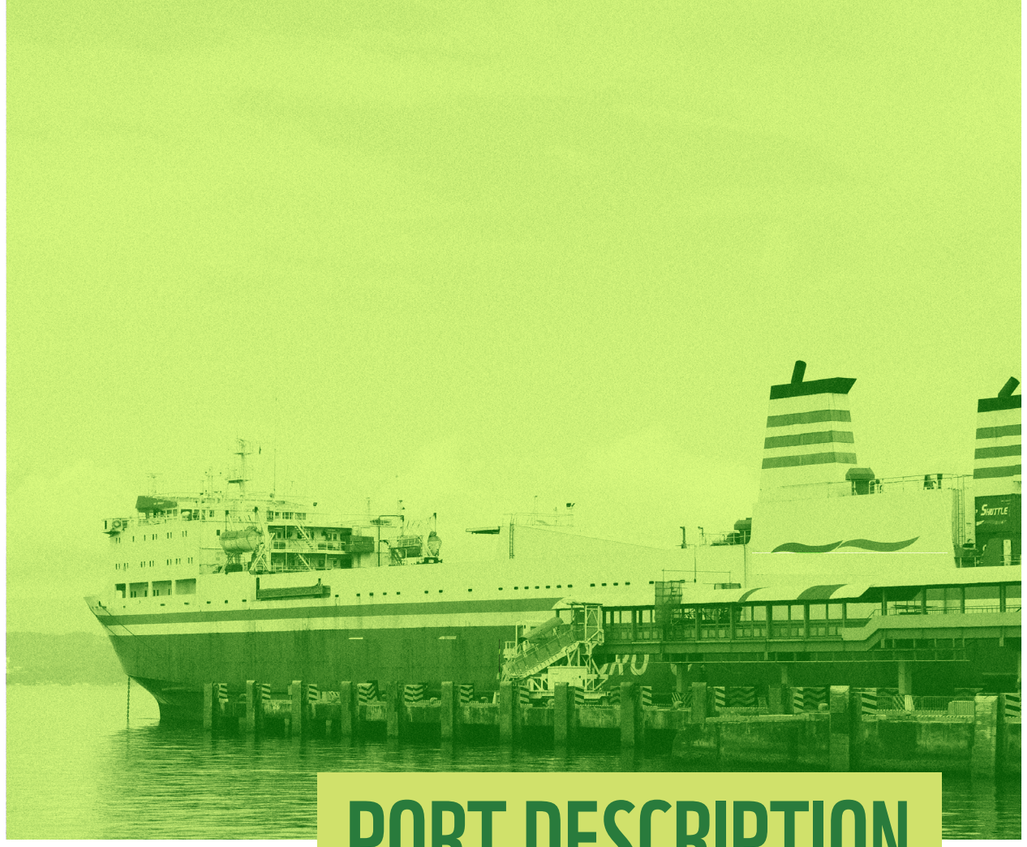
Despite the provisions of the MARPOL and the Republic Act (RA) 9003: The Ecological Solid Waste Management Act of 2000, there are still large amounts of solid wastes present within the Philippine marine water bodies. Around 2.7 million tons of plastic waste are generated in the country each year with about 20 percent of it ending up in the ocean (McKinsey & Company, 2015) making Philippines the third largest contributor of plastic wastes into oceans (Jambeck, et al., 2015).

Objectives of the Study

The main objectives of this selected ports' study are to determine proper and scientifically based recommendations to achieve the 50% target reduction of plastic waste leakage and to provide baseline data against which to monitor progress towards the reduction of plastic waste leakage.

The project specifically aims to provide the waste generated per passenger, per collection point, per vessel and per deadweight tonnage[1] (DWT) or gross tonnage[2] (GT) data; to develop the waste flow diagrams for port/vessel-generated wastes; to provide the data on volume of wastes coming from ports, vessels, and on the recovered and disposed volumes at end points and possible leakage points; and to document the current management of waste, especially plastic waste, in ports in the Philippines.

1 Deadweight is the unit of measure of how much weight a ship can carry (Philippine Ports Authority, 2021)
2 Gross tonnage is the volume of all enclosed spaces of a ship (Philippine Ports Authority, 2021)



PORT DESCRIPTION

The Port of Batangas is accessible through the Bauan-Batangas Provincial Road from the end of the South Tagalog Arterial Road Tollway which is connected to the South Luzon Expressway. The wide road access enables goods to be conveniently transported from the port to the rest of South Luzon (Asian Terminals Inc.). It is located in the Batangas Bay.

Batangas Bay is a semi-closed body of water bordered by the mainland Municipalities of Bauan, San Pascual and Mabini. It also includes Verde Island in Batangas City and the Municipality of Tingloy. Its surface area is estimated to be at 220 km2 and total coastline stretches to 92 km. It accommodates a variety of uses for industries such as fisheries, recreation, and shipping (Batangas LGU, 2017). Batangas Bay is currently classified as Class SC marine water (Environmental Management Bureau, 2021). This class can be used for the propagation and growth of fish and other aquatic resources, commercial and sustenance fishing; for boating, fishing, or similar activities; and, for fish and wildlife sanctuaries as marshy or mangrove areas (Environmental Management Bureau, 2021). It is, therefore, critical to study the handling of plastic wastes within the port and its surrounding community to monitor and reduce the levels of plastic pollution around Batangas Bay. Some of the drainage lines of Batangas City drain to the canal parallel to the Batangas Port Access Road at the southwest portion of the port.

History

The Port of Batangas is the second largest international seaport in the Philippines, next to the Port of Manila.

The Port of Batangas was declared a national port in 1953. In 1990, Executive Order No. 431 declared the expansion and delineation of the Port of Batangas Zone and placed it under the management of the PPA. It was also declared to be the International Port of Batangas (WOWBatangas.com, 2009).

It has also been an integral part in the development and growth of the economy in CALABARZON Region making it a subject of investments with its growing list of customers including the Batangas Container Terminal (BCT) and Passenger Terminals (PT).

The port mainly serves container-carrying vessels, bulk cargoes, and passenger vessels. Handling of international general cargoes – such as high-density rocks, steel, lumber, completely built units (CBUs) and other bagged and project cargoes – is facilitated using two foreign multipurpose berths (Asian Terminals Inc.).

The Port of Batangas was conferred by the Asia-Pacific Economic Cooperation (APEC) Port Services Network last 2017 with the Green Port Award System (GPAS) (Lu, 2019). This program is a green evaluation system for ports in the APEC region, intended to improve environmental awareness and increase the understanding of green port development strategy. The port is recognized with the award for its initiatives for environmental protection and conservation.

Physical Description and Facilities

The Port of Batangas, which is operated by the Asian Terminals, Inc. (ATI), covers 150 ha. Within its area are the BCT, three passenger terminals, and administrative buildings. Phase 1 and Phase 2 (Figure 8) of the port area are being managed by ATI-Batangas and is also called the "Baseport" of Batangas Port. Baseports are under the jurisdiction of the Philippine Ports Authority Port Management Office (PMO). The BCT, which covers 15 ha and has a port capacity of more than 300,000 twenty-footer equivalent units (TEUs), serves the different major industries found in South Luzon (Asian Terminals Inc.).

There are three passenger terminals in Batangas Port (Figure 1). Passenger Terminal 1 has an estimated area of 2,500 m2 (Asian Terminals Inc.) and is located nearest to the administration buildings in Phase 1 of the ATI Traffic Management Area with coordinates 1,521,473 N, 288,298 E. Passenger Terminal 2 has an estimated area of 1,250 m2 and is located at 1,521,298 N, 288,375 E. Passenger Terminal 3 has an estimated area of 2,500 m2 located at 1,521,165 N, 288,417 E (Figure 1). Currently, only Passenger Terminal 2 accepts passengers while Passenger Terminal 1 and 3 are closed due to the pandemic which limited the transport of people (Figure 2).

Figure 2. Passenger Terminal 3 last September 26, 2021

Food stalls, offices, waiting areas, comfort rooms and other facilities can be found inside the passenger terminals.

The passenger terminals provide transport to several islands of Luzon and Visayas. Destinations include Puerto Galera, Sibuyan Island, Calapan, Abra de Ilog, Roxas City, Masbate City and Caticlan (Maritime Industry Authority, 2017). Passenger vessels that dock at the passenger terminals include Roll-on/Roll-off[4] (RoRo) ferries and high-speed inter-island ferries[5].

Administrative buildings within the port include the office buildings of ATI-Batangas, Orient Freight, Inc., Provincial – PPA Livelihood Center, and the Bureau of Customs. It also includes the Stella Maris Drop-In Center, an automotive logistics facility, the port police station, parking buildings, and a jeepney terminal.

PPA implemented Memorandum Circular (MC) No. 32-1999 on July 13, 1999 to ensure maritime safety, enhance smooth flow of vessel traffic, and maintain safe anchorage operations at the Baseport of Batangas – amending MC No. 11-1996, which specified the anchorage grounds at the baseport.

There are four anchorage grounds located offshore of the Baseport of Batangas: Area-A, Area-B, Area-C, and Area-D. They are placed linearly along the offshore area bounded by the line connecting the coordinates: 1,521,126 N, 287,733 E and 1,520,719 N, 287,928 E and by the line connecting 1,520,582 N, 286,683 E and 1,520,174 N, 286,896 E. Area-D is at the north-westernmost part and Area-A at the south-easternmost location. Area-B, which is located nearest to the baseport, is divided into anchorage area and a fairway for fast crafts and RoRo vessels calling at the Baseport of Batangas due to the provision of MC No. 32-1999.

3 TEU is the unit of measurement equivalent to a container's length of 20 ft. It is often used to express the capacity of container ships or container terminals (Philippine Ports Authority, 2021)
4 RoRo are specially designed vessels for carrying trailers, cars and other rolling equipment which is discharged through the bow or stern ramps or both (Philippine Ports Authority, 2021).
5 High-speed inter-island ferries are type of high-speed craft (HSC) or high-speed water vessels for civilian use. It is also called a fastcraft or fast ferry (Philippine Ports Authority, 2021)

Waste Value Chain in the Port of Batangas

Figure 3. Waste Management System and the Involved Stakeholders

The whole system of plastic waste management in the Port of Batangas is governed by laws, policies, regulations, and ordinances implemented by various institutions (Section III) including those set by the International Maritime Organization (IMO) and by the local government unit (LGU) where the port is located. IMO is a specialized agency of the United Nations that is to impose measures to improve the safety and security of international shipping and to prevent pollution from ships (International Maritime Organization, 2019). For the case of the Port of Batangas, it is under the jurisdiction of the LGU of Batangas City.

In the Philippines, the administration, financing, operations, and maintenance of the ports is handled by the Philippine Ports Authority (PPA) as mandated by the Presidential Decree No. 505 and Executive Order No. 159 (Philippine Ports Authority, 2021); while, the management of wastes in Philippine ports such that port-related and vessel-related activities do not heavily impact the surrounding marine ecosystem is being handled by the Department of Environment and Natural Resources (DENR). The Maritime Industry Authority (MARINA) also assists the national government in terms of the plastic waste management system at the Port of Batangas and other Philippine ports by enforcing compliance of the ports with safety standard and other regulations – including the policies in handling vessel-generated wastes; while, the Philippine Coast Guard (PCG) ensures marine environmental protection. The National Pollution Control Commission (NPCC), which is now part of the Environmental Management Bureau (EMB), is also responsible for managing marine pollution (Presidential Decree No. 979, 1974).

Offices, business containers, and passenger terminals within the port area, and vessel operators and shipping lines of vessels docking at the port are the main sources of plastic wastes at the Port of Batangas. 2GO Travel, Oceanjet Ferry, Montenegro Lines Shipping, Sikat Ferry Bus, Starlite Ferries, Island Water Ferry, and FastCat Ferry are among the vessel operators and cargo handlers in the Port of Batangas (PHBus Travel Philippines).

WasteCon, Inc. (WasteCon) and iPrudential Stevedoring and Port Services, Inc. (iPrudential) are the two service providers that collect the wastes from the port. WasteCon, which is contracted by ATI, collects all wastes from the port facilities including Business Container Terminal (BCT), Passenger Terminal and Old Administration Building. iPrudential, which is the accredited PPA port service provider for the vessels departing and arriving at the Port of Batangas, collects the wastes from the vessels.

Prior to the pandemic, the janitorial services personnel of ATI Batangas were allowed to sell the recyclables to junkshops, diverting the plastic and non-plastic recyclable wastes from the waste collection to disposal waste stream. With the current situation, however, the janitorial services personnel are prohibited to sort the wastes before bringing it to the collection points for their safety. All the waste collected from the ports and vessels in the current situation are, therefore, directly disposed to the sanitary landfill.

The landfill operator ensures that the port and vessel-generated wastes from the Port of Batangas and other sources are being dumped on the designated active cell in the landfill. They also ensure the maintenance of the landfill to avoid leakage of wastes to the surrounding environment.

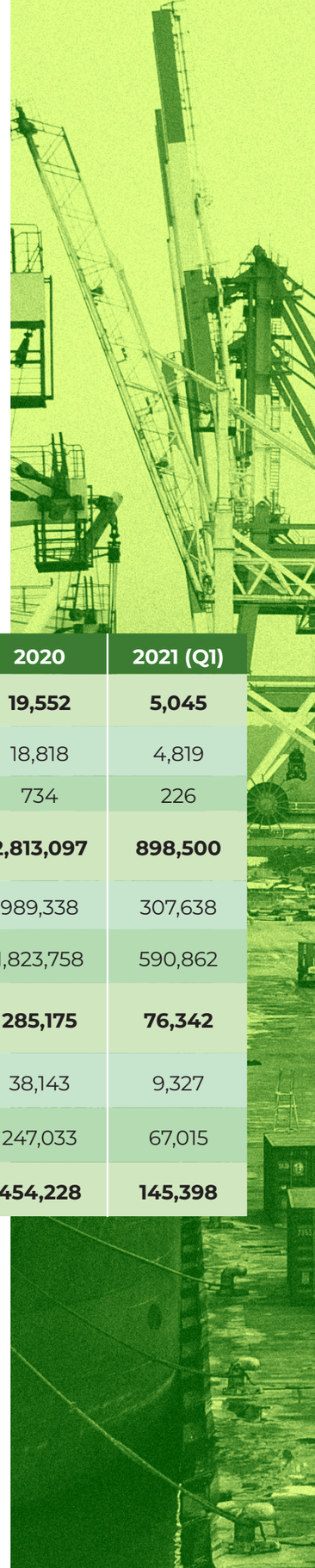
Cargo Tonnage

The Port of Batangas receives more than 35,000 ship calls[6] (Table 1) with majority of the vessels coming from various ports across the country and only more than 700 shipping calls from foreign vessels (Philippine Ports Authority, 2021).

It also handles more than 2.6 million metric tons of cargo throughput[7] and 300,000 TEUs of container traffic. The RoRo traffic has increased from 681,513 vehicles to 740,745 vehicles between 2018 and 2019. All these numbers have then decreased in 2020 due to the stricter travel restrictions imposed across the country brought about by the COVID-19 pandemic (Table 1).

Table 1. Port of Batangas Statistics (Philippine Ports Authority, 2021)

Type of Vessel	2018	2019	2020	2021 (Q1)
Shipping Calls	**35,364**	**35,079**	**19,552**	**5,045**
Domestic	34,668	34,294	18,818	4,819
Foreign	696	785	734	226
Cargo Throughput (MT)	**2,623,143**	**2,813,542**	**2,813,097**	**898,500**
Domestic	971,256	933,830	989,338	307,638
Foreign	1,651,888	1,879,713	1,823,758	590,862
Container Traffic (TEU)	**297,970**	**356,095**	**285,175**	**76,342**
Domestic	49,360	44,306	38,143	9,327
Foreign	248,611	311,789	247,033	67,015
RoRo Traffic	**681,513**	**740,745**	**454,228**	**145,398**



6 Ship calls refer to the number of vessels which call or arrive at a particular port at any given time (Philippine Ports Authority, 2021).
7 Cargo throughput is the total volume of cargo discharged and loaded at the port (Philippine Ports Authority, 2021)

Passenger Traffic

The Port of Batangas received an annual passenger traffic of more than 6.5 million passengers between 2018 and 2019 (Philippine Ports Authority, 2021). This, however, has declined to around 2 million passengers in 2020 due to the travel restrictions that have been imposed across the country because of COVID-19 (Table 2).

Table 2. Passenger Traffic of the Port of Batangas from 2018 to First Quarter of 2021 (Philippine Ports Authority, 2021)

Passenger	2018	2019	2020	2021 (Q1)
Disembarked	3,673,437	3,890,497	1,076,882	190,767
Embarked	2,966,540	3,411,750	995,166	208,192
Cruise Ships	0	0	0	0
Total	**6,639,977**	**7,302,247**	**2,072,048**	**398,959**

PORT OF BATANGAS SOLID WASTE MANAGEMENT

International Policies and Laws

The International Convention for the Prevention of Pollution from Ships (MARPOL) and the London Convention and Protocol are among the legal efforts done internationally to address marine pollution.

MARPOL aims to prevent pollution from ships caused by operational or accidental causes and was adopted by the International Maritime Authority in 1973. Annexes I to V of MARPOL 73/78 was ratified in the Philippines in 2001; while, the Instruments of Accession of the MARPOL Annex VI has been deposited to the International Maritime Organization (IMO) Secretary General on April 24, 2018 (Maritime Industry Authority, 2020). Amendments to the MARPOL were made through the Marine Environment Protection Committee (MEPC) with the latest amendment finalized in March 2020.

MARPOL Annex V, entitled "Regulations on Prevention of Pollution by Garbage from Ships," completely bans the disposal of all forms of plastic into the sea (International Maritime Organization, 1988). Wastes discharged are also to be recorded following a set of categories (Table 3).

Table 3. Garbage Categories Recorded in Ships (Marine Environment Protection Committee, 2016)

Assigned Letter	Waste Category
A	**Plastics**
B	Food Waste
C	Domestic Waste
D	Cooking Oil
E	Incinerator Ashes
F	Operational Waste
G	Animal Carcasses
H	Fishing Gear
I	E-waste
J	Cargo Residues (Non-HME)
K	Cargo Residues (HME)

Plastics including synthetic ropes, fishing nets, and plastic bags, are prohibited to be disposed outside and inside special areas[8] applied to all vessels including fixed or floating platforms[9] and associated vessels based on MARPOL 73/78 Annex V.

The Garbage Record Book, according to Annex V of MARPOL (Annex A), should be utilized to record the date, time, position of the ship, description of the wastes, and the estimated amount incinerated or discharged. The data should be kept for up to two years after the date of the last entry. The annex also states that only those cargo residues that cannot be recovered using commonly available methods for unloading could be considered for discharge. Cargo residue that contains substances that are harmful to the marine environment[10] (HME) must be taken to port reception facilities.

8 Special areas under Annex V are the Mediterranean, Baltic, Black, Red, and North Seas areas and the Gulfs area (Maritime Industry Authority, 2020).
9 Fixed or floating platforms and associated vessels includes all fixed or floating platforms engaged in exploration, exploitation or associated offshore processing of seabed mineral resources, and all ships within 500m of such platforms (United States Coast Guard, 2014).
10 Harmful to Marine Environment (HME) is a designation for cargo residues containing hazardous chemicals, restricting release and discharge of these residues to the sea (Marine Environment Protection Committee, 2016).

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, known as the "London Convention and Protocol," regulates what materials can be dumped at sea and what materials are not permitted.

Persistent plastics and other persistent synthetic materials are among the materials prohibited from being dumped into the sea as stated in Annex I of the London Convention and Protocol (Table 4).

Table 4. Kinds of Waste Prohibited from being Dumped into Sea (London Convention and Protocol, 1972)

Annex I of the London Convention and Protocol
Organohalogen compounds
Mercury and Mercury Compounds
Cadmium and Cadmium Compounds
Persistent Plastics and Other Persistent Synthetic Materials
Crude Oil and accompanying wastes
Radioactive Wastes or Other Radioactive Matter (Unless Contains Exempt Levels of Radioactivity as Defined by the International Atomic Energy Agency)
Materials Produced for Biological and Chemical Warfare
Substances that make Edible Marine Organisms Unpalatable, or Endanger Human Health or that of Domestic Animals
Industrial Waste

A wide range of land-based and sea-based activities is recognized by the IMO Action Plan to Address Marine Plastic Litter from Ships as the main entry modes of plastics to the marine environment; and, this was adopted by the MEPC in 2018. The plan highlights the negative effects of large plastic items, small plastic particles, and microplastics on biodiversity, marine life, and human health impacting fishing, shipping, and tourism. This plan then aims to build on the policies that have been established by MARPOL and the London Convention and Protocol with the agreed actions that affect ships and fishing vessels to be completed by 2025 (International Maritime Organization, 2018).

The Coordinating Body on the Seas of East Asia (COBSEA) Regional Action Plan on Marine Litter (RAP MALI) was originally adopted at the 19th Intergovernmental Meeting of COBSEA in Cambodia in 2008. It focuses on enabling the participating countries[11] to deliver the targets of SDG-14 and to prevent and significantly reduce all kinds of marine pollution particularly from land-based activities including marine debris and nutrient pollution. The plan specifically aims to prevent and reduce marine litter, foster sustainable consumption and production considering a whole lifecycle approach, remove existing marine litter through environmentally acceptable methods, improve monitoring and assessment of marine litter, enhance collaboration and awareness on the impacts of marine litter, and support existing efforts at the national level in coordination with regional and international cooperation (COBSEA, 2019). RAP MALI includes four critical actions: prevent and reduce marine litter from land-based sources, prevent and reduce marine litter from sea-based sources, monitor and assess marine litter, and support the implementation of COBSEA RAP MALI (Annex B).

The ASEAN Regional Action Plan for Combatting Marine Debris in the ASEAN Member States (ASEAN Regional Action Plan) was developed to provide a bold set of actions to tackle the plastic waste littering and marine debris issues in the ASEAN and aims to make the vision of a more sustainable approach to plastics a reality (ASEAN, 2021). It has four components namely policy support and planning, research innovation and capacity building, awareness, education and outreach, and private sector engagement. It also includes an implementation plan for the effective implementation of the regional action plan.

[11] The East Asian countries participating in the action plan are Cambodia, Indonesia, Malaysia, the People's Republic of China, the Philippines, the Republic of Korea, Singapore, Thailand, and Vietnam (COBSEA, 2008).

Local

There are certain national, local, and port waste management policies, protocols, and laws the Port of Batangas should abide with.

Philippine Plans, Programs, Protocols, and Policies

For land-based sources of solid waste, RA 9003: Ecological Solid Waste Management Act of 2000 is the national law governing the implementation of a systematic, comprehensive, and ecological solid waste management plan down to the barangay level (Republic Act No. 9003, 2001) with the National Solid Waste Management Commission (NSWMC) as the government entity in-charge of properly implementing the rules and regulations (IRR) of the act. RA 9003 implements solid waste management from the national level to the local barangay level by outlining the responsibility at each level[12]. At the provincial level, municipal SWM plans are reviewed with coordination between LGUs encouraged where possible. At the city/municipal levels, a municipal solid waste management (SWM) plan must be prepared, implemented, and monitored. At the local level, barangays are required to handle waste collection, to establish materials recovery facilities (MRFs), and to conduct educational campaigns and seminars (WWF Philippines, 2020). The currently being formulated Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP) being led by the National Economic Development Authority (NEDA) and the currently being processed House Bill (HB) No. 6279: Extended Producers Responsibility for Plastic Waste Act introduced by Representative Rufus B. Rodriguez are expected to augment the provisions of RA 9003 through sustainable consumption and production (SCP) and recycling and waste and chemicals management (Department of Environment and Natural Resources, 2021) and through addressing the collection of plastic wastes (Extended Producers Responsibility for Plastic Wastes Act, 2020), respectively.

For sea-based sources of solid waste, policy support is provided by Presidential Decree (PD) No. 979: Maritime Pollution Decree of 1976. PD No. 979 is a national policy to prevent and control the pollution of the seas that considers waste dumping and waste discharging into the marine environment unlawful. The National Pollution Control Commission (NPCC) – now the Environmental Management Bureau (EMB) – was empowered by this decree, along with the Philippine Coast Guard (PCG) to promulgate national rules and policies governing marine pollution.

For the management of all designated protected areas (PAs), RA 11038: Expanded National Integrated Protected Areas System Act of 2018 provides for the maintenance of essential ecological processes and life support systems and maintenance of their natural conditions to the greater extent possible. It prohibits the dumping of any waste products and leaving refuse or debris in ground or in bodies of water and provides for deputation of support for enforcement and inclusion of waste, sewerage, and septage management in PA management plans (Department of Environment and Natural Resources, 2021).

[12] Levels include solid waste management boards at both the provincial and city/municipal levels, and barangay officials (Republic Act No. 9003, 2001).

EO 533, Series of 2006: Integrated Coastal Management (ICM) Policy adapts user-fee schemes for waste management and inter-LGU cooperation as it promotes integrated waste management along with basin-wide management approaches, environmental protection measures at ports, and involvement of the private sector in ICM. EO 57, Series of 2011: National Coast Watch System established the coordination between agencies for maritime concerns and the National Coast Watch Council (NCWC) for the provision of strategies and policy directions to be carried out by the National Coast Watch Center (Department of Environment and Natural Resources, 2021).

The NSWMC Resolution No. 1441, Series of 2021: Resolution Adopting the National Plan of Action for the Prevention, Reduction, and Management of Marine Litter (NPOA-ML) resolved the issuance of appropriate documents for the implementation and dissemination of the resolution on May 12, 2021. NPOA-ML has six strategies under its programmatic cluster of actions and four strategies under its enabling/cross-cutting cluster of actions (Table 5).

Table 5. NPOA on Marine Litter Activities Related to Port and Vessel Waste (DENR, 2019)

Strategy	Details
Programmatic Cluster of Actions	
Strategy 1	Establish science- and evidence-based baseline information on marine litter
Strategy 2	Mainstream circular economy (CE) and sustainable consumption and production (SCP) initiatives
Strategy 3	Enhance recovery and recycling coverage and markets
Strategy 4	Prevent leakage from collected or disposed waste
Strategy 5	Reduce maritime sources of marine litter
Strategy 6	Manage litter that is already existing in the riverine and marine environments
Enabling/Cross-Cutting Cluster of Actions	
Strategy 7	Enhance policy support and enforcement for marine litter prevention and management
Strategy 8	Develop and implement strategic and targeted social marketing and communications campaigns using various media
Strategy 9	Enable sufficient and cost-effective financing and other institutional resource requirements for the implementation of the NPOA-ML
Strategy 10	Strengthen local government unit (LGU) capacities and local level implementation of NPOA-ML

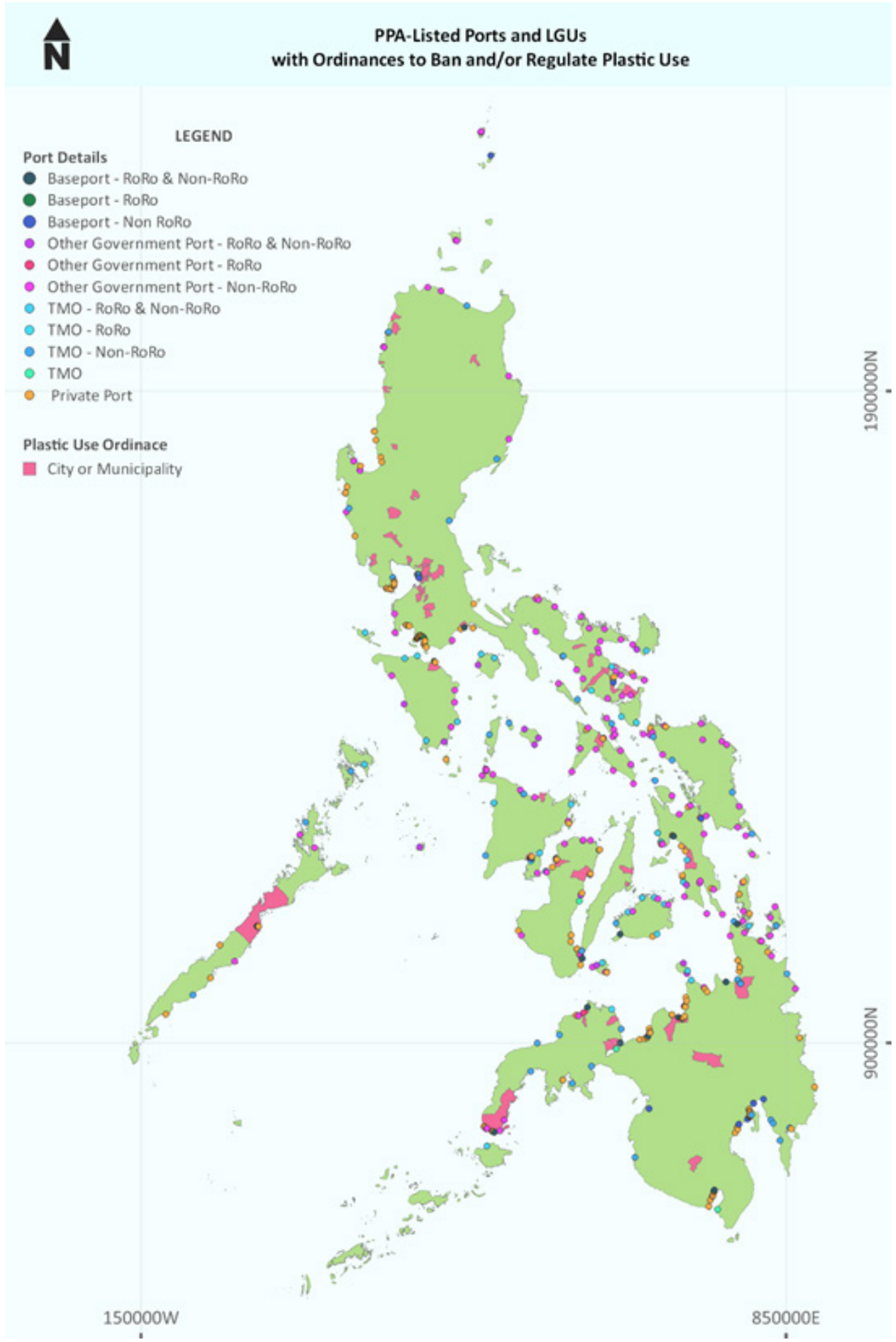


Figure 4.PPA-listed Ports and the Cities and Municipalities with Plastic Bans and/or Regulations on Plastic Use (The Nerve, 2019; NAMRIA, 2020)

The NSWMC Resolution No. 1363: Resolution Directing the Department of Environment and Natural Resources (DENR) to Prepare and Implement the Banning of the Use of Unnecessary Single-Use Plastics by National Government Agencies (NGAs), Local Government Units (LGUs) Offices and Other Government Controlled Offices is a state policy on the adaptation of a systematic, comprehensive, and ecological solid waste management system which shall set the guidelines and targets for solid waste avoidance and volume reduction. Plastic cups of thickness lower than 0.2 mm, plastic drinking straws, plastic coffee stirrers, plastic spoons, plastic forks, plastic knives, plastic labo, and thin-filmed sando bags are considered unnecessary single-use plastics (SUPs) under this resolution. As of 2019, there are 59 cities and municipalities, including Batangas City, with ordinances on bans and/or regulations on plastic use (Figure 4).

These national plans, programs, protocols, and/or policies are then supplemented by memoranda and orders from PPA and PCG.

PPA Memoranda and Orders

The PPA has around 10 memoranda and/or orders pertaining to solid waste management.

PPA Memorandum Circular (MC) No. 07-1995: Anti-Pollution Measures with the Port Zone aims to ensure clean, safe, and environmentally friendly port, to ensure effective enforcement of relevant regulations against pollution in the port, to extend all possible assistance to the Philippine Coast Guard (PCG) for the effective enforcement of PCG and PPA issuances against pollution in ports and harbors, and to undertake measures in ports designed to control pollution and promote protection of the port and environment. It has guidelines related to the IMO Regulations against the discharge of wastes and under pollutants, particularly MARPOL 73/78 and to the following PCG Anti-Pollution Regulations.

- PCG MC No. 01-91: Prevention, Containment, Abatement and Control of Maine Pollution
- PCG MC No. 02-91: Dumping and Discharges of Wastes and Other Harmful Matter at Sea

PPA Administrative Order (AO) No. 16-1995: Rules and Regulations on the Prevention/Control of Oil, Garbage, and Sewage Waste through the Use of Reception Facilities/Collection of Vessels Refuse applies to all foreign and domestic vessels calling at any government or private port within the jurisdiction of PPA. This AO aims to keep harbor clean and prevent/minimize the pollution of marine life through proper disposal of vessel waste and to implement the provisions of MARPOL 73/78. It also includes guidelines on the mandatory disposal of waste at reception facilities and monitoring and inspection of certificates including the International Garbage Pollution Prevention Certificate (IGPPC).

PPA MC No. 29-2004: Guidelines to Implement the Solid Waste Management System in the PPA and Directing its Strict Monitoring and Compliance aims to maintain an environment-friendly and healthy working atmosphere in all areas within PPA jurisdiction, to instill environmental consciousness in the PPA, particularly through the proper solid waste management in all ports, to utilize environmentally sound methods and maximize the utilization of valuable resources and encourage resources conservation and recovery, to encourage all levels of PPA to contribute to national efforts on conservation and environmental protection through education, information dissemination and implementation of a workable waste management system, to ensure the proper segregation, collection, transport, storage, and disposal of solid waste, to reduce by 10% the volume of solid waste generated in all the PPA Responsibility Centers, to minimize operating costs by about 5% annually from the present level through conservation and austerity measures, to attain for PPA officials and employees, in particular, and for the port community, in general, a cleaner and healthier environment, and to encourage greater private sector participation in solid waste management. It includes the classification of solid wastes: biodegradables, non-biodegradables, bulky wastes, and hazardous wastes, a 3-Step Solid Waste Management: sorting at source, packaging of wastes, and 3Rs – reduce, reuse, and recycle, the sanitary requirements for the segregation and storage of refuse/solid wastes, a matrix for solid waste management in PPA (Table 6), and reporting – semestral – and monitoring provisions.

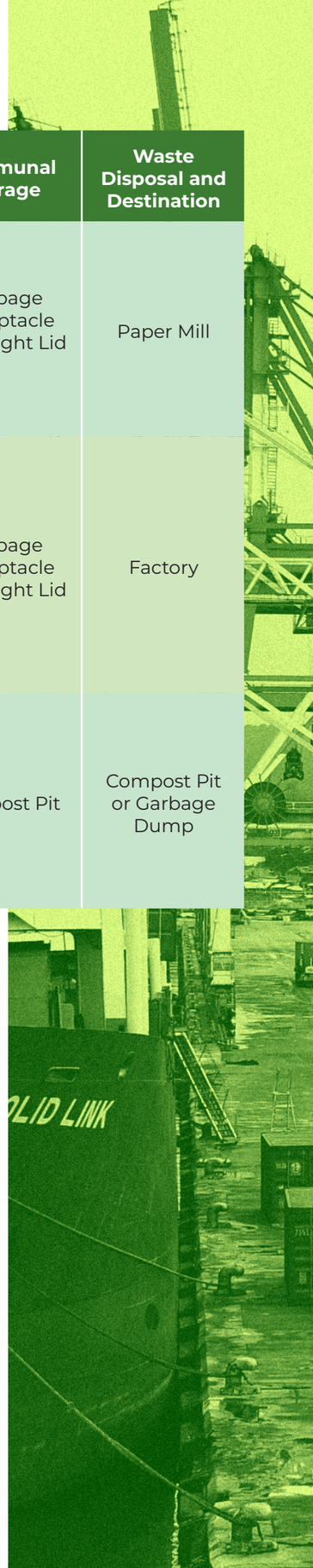
PPA MC No. 16-2005: Strict Implementation of PPA Administrative Order No. 02-2003 Entitled "Implementing Guidelines on MARPOL 73/78 Requirements for Shore Reception Facilities (SRF)" is in response to Civil Case No. 1851-99, an anti-sea pollution complaint against PPA and other co-defendant government agencies and to ensure full compliance to PPA AO. No. 02-2003. Under PPA AO No. 02-2003, Waste on Board Vessel Information Form (WOBVIF) should be accomplished and submitted by the shipping agent/line/company when applying for berth and that sanctions for vessels that fail to dispose of the garbage into the reception facility, to discharge the oily waste or noxious liquid substance into the reception facility after PCG's verification, and to pay the required fees be applied.

Table 6. Solid Waste Management Matrix Under PPA MC No. 29-2004 (Philippine Ports Authority, 2004)

Waste Generation	Waste Discharge and Storage	Primary Collection	Communal Storage	Waste Disposal and Destination
Paper *all kinds of office paper, computer paper, newspaper, carton, corrugate or packing boxes*	Carton Boxes placed in each office	At Source: PPA official/ employee For Storage: Utility Worker	Garbage Receptacle with Tight Lid	Paper Mill
Dry Recyclables *aluminum soft drink cans and tabs, plastic bottle containers, plastic utensils, plastic or glass containers/ bottles*	Blue Covered Bin in each office	At Source: PPA official/ employee For Storage: Utility Worker	Garbage Receptacle with Tight Lid	Factory
Wet Garbage *food scraps*	Red Covered Bin in each office	At Source: PPA official/ employee For Storage: Utility Worker	Compost Pit	Compost Pit or Garbage Dump

PPA MC No. 13-2009: Supplementary Guidelines on Waste Management and other Environment - Friendly Practices in PPA includes the following supplementary guidelines in line with PPA MC No. 29-2004.

- Immediate practice of proper solid waste management, the most basic form of environmental responsibility
- Reduction of solid waste generation by fifty percent (50%) within the next six (6) months thru the full implementation of law on solid waste management
- Reduction by fifty percent (50%) the consumption of fossils fuels within two (2) years from the issuance of RA 774



PPA AO No. 07-2015: Guidelines on the Implementation of PPA Orange Book on Safety, Health, Environmental Management and Handling of Dangerous Goods is for the proper implementation of port safety, health, and environmental management in PPA ports nationwide for the compliance and guidance of all port users/stakeholders. The PPA Manual on Port Safety, Health and Environmental Management (SHEM) or the PPA Orange Book is divided into three parts: Book I – Safety and Health in Ports, Book II – Environmental Management in Ports, and Book III – Transport, Handling and Storage of Dangerous Goods in Ports. Book II includes provisions for collection of vessel wastes and for the installation of MRFs in PPA Head Office, PMOs, TMOs, CHOs/Terminal Operators.

PPA AO No. 08-2018: Interim Guidelines on the Issuance of Permit to Operate (PTO) for "Shore Reception Facilities (SRF)/Waste Disposal Service Provider ensures the continuity of providing SRF/waste disposal service in ports under the jurisdiction of the PPA.

PPA AO 05-2018: The Port Environmental Policy (PEP) complies with the following and aims to define the corporate directions of PPA in support of its policy and strategy on environmental protection and preservation in the pursuit of its mandate, to encourage and provide guidance to and where necessary compliance by port stakeholders in adopting environmental protection and preservation while doing business inside the ports, to provide a framework for the formulation and design of capacity-building courses consistent with environmental protection, preservation and management, and to provide the legal basis and effective enforcement of PPA's programs, projects and activities to implement and sustain the Green, Resilient, and Smart Port Strategy (GRaSPS).

- PD No. 857: Providing for the Reorganization of Port Administration and Operation Functions in the Philippines, Revising Presidential Decree No. 5050 dated July 11, 1974, Creating the Philippine Ports Authority, by Substitution, and for other Purposes
- PD No. 1586: Philippine Environmental Impact Statement System
- RA No. 8749: The Philippine Clean Air Act of 1999
- RA 9275: The Philippine Clean Water Act of 2004
- RA 9003: The Ecological Solid Waste Management Act of 2000
- RA 9279: The Climate Change Act of 2009
- RA 6969: Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal
- United Nations Framework Convention on Climate Change (UNFCCC) Kyoto Protocol on Emission Reduction Targets
- 2015 Paris Agreement in the Evolution of UN Climate Change Regime International Convention for the Prevention of Pollution from Ships (MARPOL)
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
  1996 London Protocol
- International Convention on Oil Pollution Preparedness, Response and Co-operation of 1990
- Protocol on Preparedness, Response, and Co-operation to Pollution Incidents by Hazardous and Noxious Substances of 2000
- International Convention on the Control of Anti-Fouling Systems on Ships of 2001
- International Convention for the Control and Management of Ship's Ballast Water and Sediments of 2004

GRaSPS Framework hard infrastructure includes waste collection facilities such as sewer lines, drainage lines, waste collection/treatment facilities, and material recovery facilities; while, its soft infrastructure includes governance such as port rules and regulations, business processes and contract management that integrates environmental protection and preservation (Philippine Ports Authority, 2018).

PPA MC No. 19-2020: Collection of Ship Generated Wastes from Cruise and Passenger Ships aims to supplement the guidelines of the PPA in the collection and disposal of wastes on board ships during Community Quarantine due to the COVID-19 pandemic and to report status of ships, information, type, and quantity of wastes received by SRF Provider.

PPA MC No. 11-2021: Ban on the Use of Unnecessary Single-Use Plastic Products is based on the NSWMC Resolution No. 1363 and is to be applied to all ports and port facilities under PPA, including all offices and establishments inside the ports. Reports on its implementation are to be submitted 30 days after issuance of the resolution and every month after.

PCG Memoranda

The Philippine Coast Guard implements at least four memoranda in safeguarding the Philippines waters from solid waste.

PCG MC No. 02-2005: Prevention of Pollution by Garbage from Ship specifically mandates Philippine registered vessels and small crafts engaged in either domestic or international trade to abide by the rules in preventing pollution of Philippines waters. It explicitly states that any material made of plastic and any domestic, cargo-associated, maintenance and/or operational waster is considered unlawful to be disposed to any body of water in the Philippines. Vessels are mandated to dispose plastic garbage at respective port reception facilities.

PCG MC No. 01-2006: Rule Prohibiting the Dumping and Discharging of Wastes and Other Harmful Matters mandates the procedures and policies for proper dumping of wastes and other harmful materials into Philippines waters to prevent pollution. It covers offshore plants, ships, and any entity that is a source of marine pollution. The list of materials that is prohibited from being dumped found in Annex I of the memorandum is the same as those listed in the London Convention and Protocol.

PCG MC No. 02-2006: Marine Pollution Inspection/Apprehension Report is to prescribe the policies and procedure implementing the provisions of MARPOL and PCG rules and regulations. Commanders, marine environmental protection command, and coast guard district/station are made in charge of the inspection and apprehension of persons and entities causing marine pollution.

PCG MC No. 07-2014: Prevention of Pollution from Garbage aims to provide rules and regulations to prevent pollution from garbage within the Philippine maritime jurisdiction and to prescribe fines and penalties. Under this memorandum, it is unlawful for any person to dispose into any Philippine waterbody any material made of plastic and any domestic, cargo-associated, maintenance, and/or operational wastes. Any person found violating the policies and requirements of the circular are liable to pay the administrative fine of Php 50,000.00 without prejudice to civil and/or criminal action/s which the PCG may file against the violated whenever warranted.

City Protocols and Ordinances

Batangas City has put up a City Environment and Natural Resources Office (CENRO) in 1998 to address and monitor environmental services and concerns.

In 2010, the Environment Code of Batangas City (E-Code) was passed and enacted in 2010. Its Article X specifically outlines regulations that focus on protecting and conserving the marine and coastal resources through control of marine pollution, abatement of destructive fishing practices and overfishing. It is also stated in this section of the E-Code that the CENRO is responsible for preventing and controlling the pollution of the sea. It is through this section of the article that spilling, leaking, or dumping of oil and gas, ballast water, and other from any marine vessel is prohibited at the municipal level. Part of the E-Code is the establishment of a Solid Waste Management Plan that is to be reviewed every two years.

The current solid waste management plan indicates the creation of a solid waste management system by the offshore industries. Offshore industries may either build their own solid waste disposal facility or contract a private operator or the city to receive their solid waste. The plan also bans the collection of plastic bags and Styrofoam in the regular solid waste collection within the city. This ban covers the jurisdiction of the Local Government Unit, as such the port also has a mandate regarding minimizing plastic bags and avoiding Styrofoam. It also mandates that these banned wastes be cleaned and dried and be given to the respective barangay MRF (City Government of Batangas, 2010).

Waste Management System at the Port of Batangas

Waste generation, segregation, collection, recovery, and disposal efforts are in place at the Port of Batangas.

Waste Generation

Port staff, passengers alighting and arriving in passenger terminals, stalls inside the port, and other waste generating activities contribute to the wastes generated[13] at the Port of Batangas (Table 7).

The Passenger Terminal 2 produced the most amount of waste in the Port of Batangas at the second semester of 2020 at a total generation rate of 1,449 kg in six months. The Baseport Office, on the other hand, had the lowest generation within the same period at only 68.57 kg. The access of people to the facilities have greatly affected the numbers. Passenger Terminal 2 is the only fully operational terminal amid the pandemic while establishments in Passenger Terminal 3 are currently closed.

13 Waste generation refers to the total municipal solid waste (MSW) generated by the population and their economic activities within the defined system boundary (UN Habitat, 2021).

Table 7. Waste Generation from Each Facility for July to December 2020 (Philippine Ports Authority, 2020)

Port Facility	Recyclable Materials (kg)			Non-recyclable Materials (kg)		Total Waste Generated per Facility for 6 Months
	Paper/ Paper Products	Plastic Containers	Other Recyclables	Food Waste	Residual Waste	
Administration Building	69.75	21.25	26.75	126.00	90.50	334.25
Baseport Office	34.18	0.00	0.14	34.25	0.00	68.57
Passenger Terminal 2	663.00	352.00	0.00	126.00	308.00	1449.00
Passenger Terminal 3	154.00	29.00	0.00	8.00	72.00	263.00
Total	**959.65**	**451.71**	**40.47**	**347.36**	**507.93**	**2307.12**

Vessel-generated wastes at the Port of Batangas come from ships docking and embarking on the wharfs or piers of the port. Passengers and ship crews are the main source of vessel wastes with most of the wastes coming from domestic vessels docked at the Baseport (Table 7).

Table 8. Vessel Waste Generation in the Port of Batangas for 2019 (iPrudential, 2019)

Port Area	Domestic		Foreign		Total	
	No. of Vessels Served	Solid Waste (m^3)	No. of Vessels Served	Solid Waste (m^3)	No. of Vessels Served	Solid Waste (m^3)
Baseport	23,513	9,402.77	336.00	700.76	23,850	10,103.54
Private	29.00	165.41	333.00	1,227.63	362.00	1,393.04
Total	**23,519.00**	**9,432.90**	**422.00**	**928.29**	**23,941.00**	**10,361.20**

Waste Segregation

ATI (Section II.C) is implementing a waste segregation[14] scheme on all facilities at the Port of Batangas by providing color-coded collection bins with infographics on samples of wastes that can be thrown to a particular bin (Figure 5). Recylable wastes are disposed of in red trash bins. Non-biodegradable and non-recyclable wastes are to be in the blue waste bins. Biodegradable wastes are to be in green trash bins; while, used personal protective equipments such as face masks, face shield and gloves are to be placed in yellow bins.

14 Waste segregation is separating waste into specific categories, usually biodegradable and non-biodegradable, to utilize waste categories that can still be recycled or used for compost (NSWMC, 2016).

Figure 5. Color-Coded Waste Segregation Bins at the Passenger Terminal 3 last September 24, 2021

Color-coded collection bins, which are also managed by the port operator, are also placed near pier and berthing areas with the same segregation scheme (Figure 6). Infographics, however, are not included.

Figure 6. Waste Segregation Bins near Pier last September 24, 2021

For the vessel wastes, iPrudential (Section II.C) implements their own waste segregation scheme. Shore reception facility[15] (SRF) personnel classify the waste into either hazardous wastes or non-hazardous wastes. Containers of hazardous and non-hazardous wastes are separated and stored with different storage bins which are properly labeled and classified (Table 9).

Table 9. Classification of Vessel Wastes and their Appropriate Containers

Classification	Container
Solid Non-Hazardous Wastes (Mixed/Dry)	Black Polyethylene Bag
Solid Non-Hazardous Wastes (Mixed/Wet)	Black Polyethylene Bag in a Sealed Metal/Plastic Drum
Lead-Acid Batteries/Other Lead Containing Wastes	Sealed Cardboard Box
Busted Fluorescent Lamps/ Other Mercury Containing Wastes	Sealed Cardboard Box
Oily Cloths	Black Polyethylene Bag in a Sealed Metal Drum
Pharmaceutical Drugs	Sealed Cardboard Box
E-Wastes (Wastes Gadgets/Appliances)	Black Polyethylene Bag in a Sealed Cardboard Box
E-Wastes (Cables/Wires)	Sealed Cardboard Box
Sludge/Bilge/Used Oil	Sealed Metal Drums/IBC[16] or Lorry Tanks
Cooking Oil/Paint/Ink/Dyes	Sealed Metal Drums/Container
Paints Cans (Dry)	Polyethylene Bag or Sealed Cardboard Box
Bleaching/Cleaning Solutions	Polyethylene Gallons
Solid Non-Hazardous Wastes with Irregular Shape and Size (Wood Pallets/Scrap Metals)	Tie Using Polyethylene Ropes in an Organized Manner
Other Hazardous Wastes in Metal Compositions	Sealed Drum/Box
Other Hazardous Wastes in Ashes/ Paper Compositions	Polyethylene Bag in a Sealed Cardboard Box

15 Shore Reception Facility (SRF) refers to a physical system ashore or afloat used for receiving discharges of oily wastes, noxious liquid substance, and waste from vessels (Philippine Ports Authority, 2021).
16 Intermediate bulk containers are known as IBC tanks which serve as containers for the mass handling, transport and storage of liquids, semi-solids, or solids (Philippine Ports Authority, 2021).

Waste Collection

Collection[17] of port wastes starts from the collection bins located strategically within the port area. Janitorial services personnel collect the wastes from the bins and carry the wastes to either BCTI, Old Administration Building, and PT collection points. These three collection points for port-generated waste are managed by WasteCon (Figure 8).

Vessels, with the assistance of SRF checkers, bring their non-hazardous waste to one of five green receptacles located near the piers. These five receptacles for vessel-generated waste are managed by iPrudential (Figure 8 and Figure 8). The first receptacle, which is located at the west of Passenger Terminal 1 with coordinates 1,521,475 N, 288,217 E (Figure 8), has no label. The second receptacle, which is located at the front of Passenger Terminal 1 with coordinates 1,521,427 N, 288,249 E (Figure 8), is labelled “non-biodegradable”. The third collection bin, which is located southeast of Passenger Terminal 1 with coordinates 1,521,437 N, 288,352 E, is labelled “biodegradable”. The fourth and fifth collection bins with coordinates 1,521,378 N, 288,381 E and 1,521,266 N, 288,319 E, respectively, both have two compartments – “biodegradable” and “non-biodegradable” (Figure 10). SRF checkers also document the volume of vessel waste disposed using the Waste On-Board Vessel Information Forms (WOBVIFs).

Vessel wastes from anchorage, which is located offshore are transferred from the ships by the shore reception facility personnel to the collection points through motorized boats. Based on the interviews with iPrudential (Annex C), the personnel are trained such that the wastes are safely transferred from the ship to the receptacles without any leakage. Vessel wastes are carried in bags which are enclosed and tightly bound. The collection and transportation of vessel wastes from anchorage areas are usually conducted via PCG and MARINA accredited barges partners (iPrudential Stevedoring and Port Services, Inc., 2021).

17 Collection refers to 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, regardless of collection modality (UN Habitat, 2021).

Figure 7. Disinfection of Collection Bin by Shore Reception Facility Personnel Wearing Proper Protective Equipment last September 27, 2021

The wastes are gathered from each collection point by collection trucks when the receptacles are full with the wastes manually loaded to the dump trucks (Figure 15, Figure 16, and Figure 17). Most of the wastes are stored in black bags. These, however, are all being loaded in the dump trucks without much observation of waste segregation since there is only a single compartment inside the truck. Wastes storage bins, especially those managed by iPrudential, are disinfected before and after collection of wastes as an added preventive measure against the spread of COVID-19 virus.

There are seven designated collection points within the Phase 1 of the ATI Traffic Management Area (Figure 8). Five of the collection points are being managed and used by iPrudential; while, the remaining two are by WasteCon (Figure 8). WasteCon (Section II.C) collects the wastes from the port facilities; while, iPrudential (Section II.C) collects the wastes from the vessels.

Figure 8. Collection Points at the Port of Batangas (WWF Philippines, Inc., 2021)

Figure 9. Vessel Waste Collection Bins at the Port of Batangas last September 26, 2021

Figure 10. Disinfection of Collection Bin after the Transfer of Waste to Dump Truck last September 27, 2021

Wastes from the passenger terminals are gathered at the Passenger Terminal (PT) Collection Point (Figure 8 and Figure 11); while, wastes from Batangas Container Terminal which includes the whole Phase 2 of the ATI Traffic Management Area, are temporarily stored in a roofed facility (Figure 8 and Figure 13) where residual wastes are separately contained from contaminated materials. Waste generated from the Old Administration Building are disposed at a location tagged as a waste disposal bin (Figure 14). No recovery happens during the storage of wastes in these collection points.

All wastes are to be collected by the collection trucks to be disposed to the landfill (Section III.C.5).

Figure 11. Passenger Terminal Collection Point Tagged as a Materials Recovery Facility last September 24, 2021

Figure 12. Passenger Terminal Collection Point Tagged as a Materials Recovery Facility last September 25, 2021

Figure 13. Batangas Container Terminal Roofed Storage Facility last September 24, 2021

Figure 14. Collection Point for Old Administration Building Wastes last September 26, 2021

WasteCon uses its compactor trucks (Figure 16) and dump trucks (Figure 17) when collecting port wastes. There is no segregation during the manual loading of the wastes since compactor trucks tend to mix wastes during compaction and dump trucks only have a singlecompartment. The loading of trucks are also conducted in a quick manner, not minding the mixing of wastes inside the trucks.

Figure 15. Manual Loading of Wastes to Collection Truck at Passenger Terminal last September 25, 2021

Figure 16. Compactor Truck of WasteCon used for Port Waste Collection last September 25, 2021

Figure 17. Dump Truck of WasteCon used for Port Waste Collection last September 26, 2021

Collection of wastes by trucks starts from the PT Collection Point, passes by the Old Administration Building Collection Bin, then – lastly, to the roofed storage in the Batangas Container Terminal.

Tare weights of the trucks are usually taken first at the weigh bridge prior to the collection. The trucks are then re-weighed after collecting the wastes from collection points (Figure 17). After which, the truck will get its permit from the port management to go to the landfill.

Figure 18. Weighing of Collection Truck before Disposal last September 25, 2021

Waste Recovery

There is no observed waste recovery[18] facility within the port. All the port waste generated are disposed to the Sanitary Landfill during the pandemic. Pre-pandemic, however, janitorial service personnel of ATI Batangas were allowed to separate the recyclables from the other wastes before bringing the wastes to the truck collection points. The recyclables they collected were brought to junkshops for extra income. For safety purposes, this practice of recovery of recyclables were prohibited by the port management.

For the vessel-generated wastes, there is also no observed separation of recyclables during the truck collection. All the wastes collected from the receptacles are disposed to the sanitary landfill (SLF).

The facility tagged as a materials recovery facility within the port (Figure 10) is currently being used as a receptacle of wastes and not as a recovery facility where sorting, segregation, and utilization of wastes are being done.

18 Recovery means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfill that function, in the facility or in the wider economy (UN Habitat, 2021).

Waste Disposal

Both the port wastes and vessel wastes are disposed[19] to the landfill after getting the weight of the collection truck on the weigh bridge and obtaining the gate pass from the port management (Figure 18). The landfill is a Category 2[20] sanitary landfill located in Barangay San Jose Sico, Batangas City, Batangas. The wastes at the SLF are covered daily with the site having basic compaction equipment such as bulldozers. The whole sanitary landfill is fenced with access control. It also has a certain level of containment and leachate control. The site is also appropriately staffed and basic environmental health and safety measures are being implemented. There is also no evidence of burning of waste and all slopes are stable and landslides are mitigated.

The waste deliveries are routinely weighed and recorded.

For wastes containing hazardous materials generated from ports such as contaminated oil, they are brought to treatment, storage, and disposal (TSD) facilities. Solid and liquid hazardous vessel wastes are not disposed to sanitary landfills and is treated by DENR accredited treater partner of iPrudential.

19 Disposal defines any operation whose main purpose is not the recovery of materials or energy even if the operation has as a secondary consequence the reclamation of substances or energy (UN Habitat, 2021).
20 Category 2 Sanitary Landfill refers to a disposal facility with net residual waste generated of greater than 15 tons per day but less than or equal to 75 tons per day (DENR, 2006).

Figure 19. Truck Route from the Port of Batangas to Sanitary Landfill (WWF Philippines, Inc., 2021)

METHODOLOGY

The conduct of the baseline study for the Port of Batangas involves four major activities (Figure 20) which are adapted from the ITDI-DOST, UN Habitat, and GIZ, University of Leeds, Eawag-Sandec and Wasteaware methodologies (Table 9).

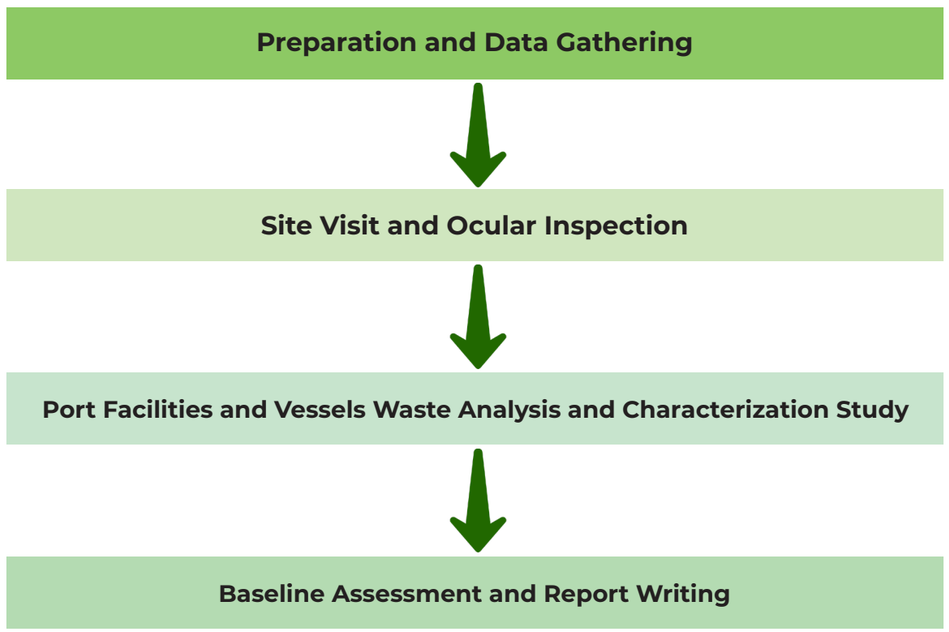


Figure 20. Baseline Study Methodology

Table 10. Waste Guidelines and Tools Adapted

Guidelines and Tool	Developer	Year
Waste Analysis and Characterization Study (WACS)	ITDI-DOST	2021
Waste Wise Cities Tool	UN Habitat	2021
Waste Flow Diagram	GIZ, University of Leeds, Eawag-Sandec and Wasteaware	2020

The field activities conducted at the Port of Batangas from September 13 to October 7, 2021 included courtesy visits, interviews, orientation, observation of waste management systems, and waste analysis and characterization study (WACS) of solid waste generated by port facilities and vessels as well as the solid waste received by the disposal site (Table 10).

Table 11. Schedule of Activities Conducted in the Port of Batangas

Activity	September								October		
	23	24	25	26	27	28	29	30	1	2	3
Travel to Batangas City and Fieldwork Team Meeting											
Tour of the Port of Batangas and Interviews with Stakeholders											
Site Visit at SLF and Interviews with Stakeholders											
Orientation of Sorters in San Jose Sico Cooperative											
WACS Day 1 for Port- and Vessel-Generated Waste											
WACS Day 2 for Port- and Vessel-Generated Waste											
WACS Day 3 for Port- and Vessel-Generated Waste											

Preparation and Data Gathering

Secondary Data Collection and Research

Data needed for the baseline studies were collected from PPA, ATI, WasteCon, and iPrudential.

The general information on the Port of Batangas, the solid waste management plans (SWMP) and solid waste management policies and ordinances of the Batangas City were reviewed for this study (Section II to Section III.B). Available data on waste analysis and characterization study (WACS) were collected.

Pre-COVID-19 port waste generation rates from each collection point were calculated using existing waste collection data collected from the PPA (Philippine Ports Authority, 2021); while, vessel waste generation rates for each type of vessel on a pre-COVID-19 scenario were calculated from vessel traffic data and total solid waste generation in 2019 (Philippine Ports Authority, 2021).

Interview with Relevant Stakeholders

A series of interviews with relevant stakeholders such as representatives from port management, SRF service provider, landfill operator, training institute, shipping association, port facilities, port janitorial service and shipping operators was conducted using phone communication, video conferencing apps, and in person (Annex C).

Site Visit and Ocular Inspection

Recovery and disposal facilities involving the solid waste management system of port and vessel-generated waste were visited. The recovery facilities were identified as “Intermediate Traders[21]”, “Apex traders[22]” and “End of Chain Recyclers and Recoverers[23]”. Using the set of criteria provided by the Waste Wise Cities Tool (WaCT) and waste flow diagram (WFD), the amount of waste received, plastic leakage and level of control of recovery and disposal facilities (Annex D and Annex E) were identified.

Conduct of Waste Analysis and Characterization Study

Wastes from the Port of Batangas – both from the port facilities and the docking vessels – were collected between September 25 to September 27. These were then sorted the day after each collection.

WACS for port and vessel-generated waste was conducted in a tented area at the sanitary landfill from September 26 to 28, 2021, within the official working hours which were from 8:00 AM to 5:00 PM including morning, lunch, and afternoon breaks. Weather conditions for all sampling days were sunny with air temperature ranging from 26^{o}C to 34^{o}C.

Prior to the WACS, an orientation on Materials for WACS (Figure 21) and Solid Waste Categories for WACS (Figure 22) was conducted.

21 Intermediate traders receive materials from both formal and informal recyclable collection systems b(including waste pickers), store and prepare these materials for onward trading to apex traders (UN Habitat, 2021).
22 Apex traders receive materials from intermediate traders or directly from both formal and informal recyclable collection systems (including waste pickers), store and prepare these materials for onward trading to end-of-chain recyclers/recoverers (UN Habitat, 2021).
23 End of chain recycler/recoverer receives materials from apex traders or direct from both formal and informal municipal solid waste collection systems and processes them into materials and products that have value in the economy either through recycling, incineration with energy recovery, or other recovery process (UN Habitat, 2021)

Figure 21. Materials for WACS

Figure 22. Solid Waste Categories Guide for WACS

Port Facilities Sampling

A truck containing the municipal solid waste collected from three collection points within the Port of Batangas were weighed using weigh bridge before and after collection to determine the weights of the wastes to be sampled.
The three collection points involved are BCT (Figure 12), Passenger Terminal (Figure 10), and Old Administration Building (Figure 13). After weighing, wastes were then brought to the landfill for characterization.

It should be noted that although the truck usually used for waste hauling of port-generated waste is a compactor truck but the truck did not compact waste when it was used for sampling for the second day. A dump truck was used for the first and third day of sampling, as the compactor truck was only available during the second day.

Figure 23. Port Waste Collection Truck last September 25, 2021

Vessel Waste Sampling

A truck containing the municipal solid waste collected from vessel waste receptacles within the Port of Batangas was weighed using weigh bridge. Preliminary information on the vessels such as type, gross tonnage, number of passengers, and cargo weight, among others were collected using provided WOBVIFs from iPrudential. Vessel wastes sampled came from vessels that docked the day prior to the sorting day; hence, the dates listed in the following table are one day before the WACS days.

Table 12. Number of Vessels Sampled

Day	RoRo and Passenger	Container	Others (Tank)
September 25, 2021 (Saturday)	31	2	0
September 26, 2021 (Sunday)	46	4	2
September 27, 2021 (Monday)	23	6	0

After weighing, the wastes were then brought to the sorting area for characterization. This process was conducted for three days.

Figure 24. Vessel Waste Collection Truck last September 25, 2021

Figure 25. Vessel Waste Receptacle last September 24, 2021

Pre-weighing, Quartering, Segregation, and Bulk Density Measuring

Around 500 kg were taken from every truck sample, and these were pre-weighed, mixed as thoroughly as possible, and spread out on the flat surface. The sample wastes were divided into four parts using straight lines perpendicular to each other, then a quarter with a weight of around 125 kg will be selected and sorted (Figure 26). The surplus 'three-quarters' were retained for analysis of bulk density. This procedure was done for three port waste samples and three vessel waste samples.

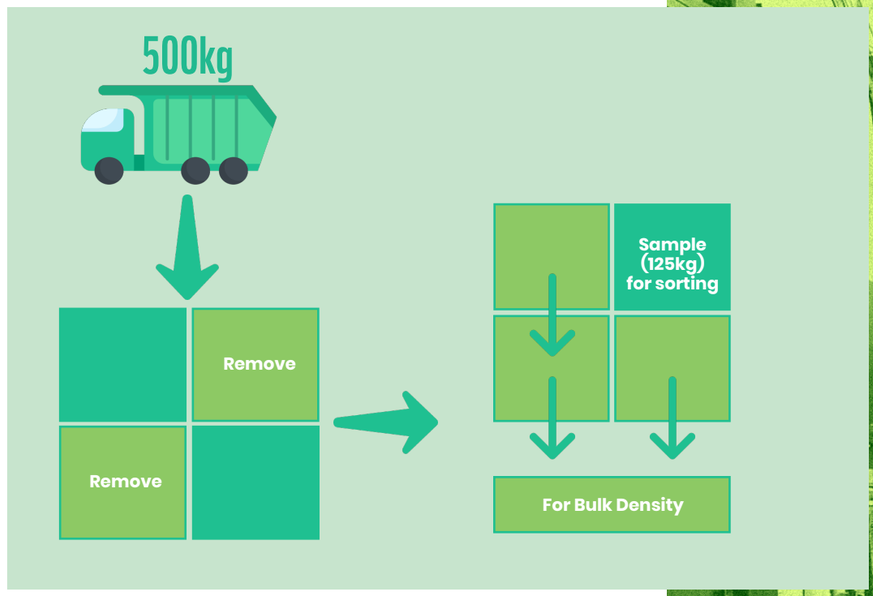


Figure 26. Quartering of Sample Waste

Figure 27. Measurement and Recording of Waste Sample Weight last September 26, 2021

Figure 28. Sorting Area and Quartering of Waste Sample at the Landfill last September 28, 2021

The part taken for segregation was sorted according to specified waste categories (Figure 22). Once sorted, each waste category was weighed and recorded for data processing and analysis.

Figure 29. Sorting of Quartered Waste Sample last September 27, 2021

The other three parts weighing approximately 375 kg were used to measure the bulk density. A container of known volume and weight was filled with the waste up to the brim and weighed. This process was repeated until all the 375 kg of waste were weighed. Bulk density is computed by dividing the weight of the waste by the volume of the container. As this process was repeated multiple times, the average of the all the quotients were taken.

This process was done for three days.

Figure 30. Bulk Density Measurement last September 26, 2021

Waste Flow Analysis

Waste Flow Diagram (WFD) tool was used to measure and visualize how the wastes flow from generation to disposal, depicting the complete picture of the current solid waste management of the Port of Batangas in terms of the quantity and quality of waste as well as the leakage of waste of plastics into the open environment (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2020).

Data obtained from the WACS, interview with the stakeholders and observations during site visit and truck tailgating were incorporated in the diagram. Visual assessment was also conducted to determine the leakage factor at each point of waste management system of the Port of Batangas, specifically, during collection, transportation, and disposal.

Mass flow analysis and data entry software such as STAN and Excel were used to generate the WFD.

WASTE ANALYSIS AND CHARACTERIZATION RESULTS

The port-generated and vessel-generated wastes at the Port of Batangas according to the conducted analyses and characterization were generally composed of 19.72% and 32.98% plastics, respectively.

Port Generated Waste

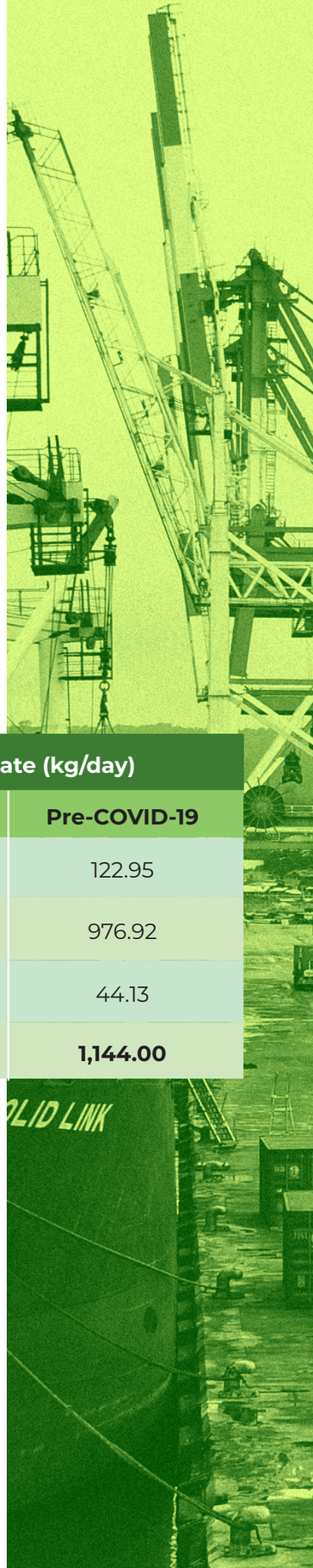
The port-generated wastes were collected at three collection points with one designated for the following areas: passenger terminals, Batangas Container Terminal, and the Old Administration Building. Based on the total amount of daily wastes collected and the bulk waste densities data from the sorting activities, the total waste generation rate for the port facilities was calculated to be at a total of 603.14 kg/day (Table 12).

The current waste generation rate of the port facilities during the pandemic is relatively smaller than the waste generation rate of about 1,144 kg/day on a pre-COVID-19 scenario. Port-generated waste has decreased by 47% during the pandemic. This is likely due to the decrease of passengers and vessels, closure of establishments such as food stalls in passenger terminals, and other activities disrupted by the pandemic.

Table 13. Waste Generation Rate of Port Facilities

Port Facilities Group	Generation Rate (kg/day)	
	COVID-19 (Current)	Pre-COVID-19
Passenger Terminals	64.82	122.95
Batangas Container Terminal	515.05	976.92
Old Administration Building	23.27	44.13
Total	**603.14**	**1,144.00**

Biodegradable wastes was found to be around 51.88% of the total port-generated wastes (Figure 31). Garden wastes make up majority of all biodegradables at 33.32%. Food waste was at 7.15%; while, street sweepings and wet paper were at 5.67% and 4.20%, respectively. Wood and hair were also collected at low quantities.



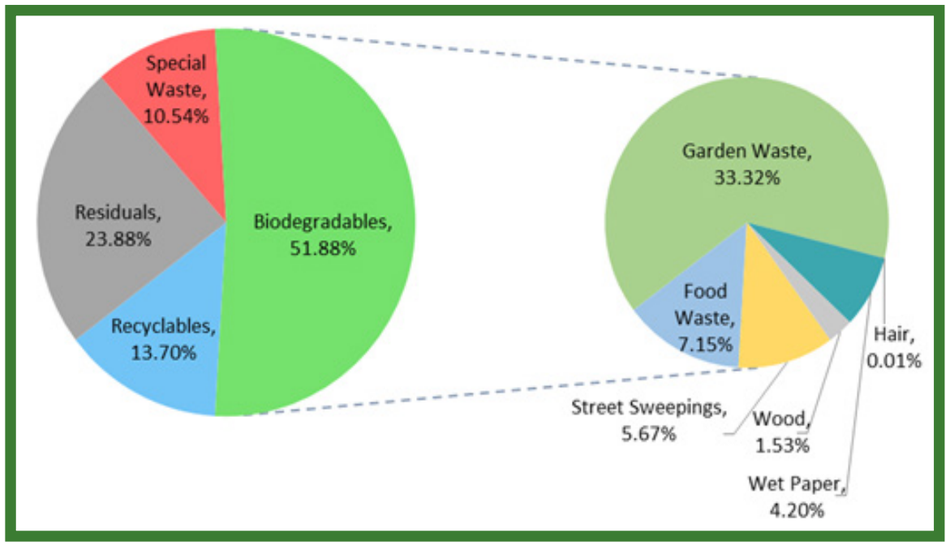


Figure 31. Port-Generated Waste Composition of Biodegradables

Recyclables were found to be at 13.70% of the overall port-generated waste sampled (Figure 32). Plastics were at 6.83%; and, paper were at 5.17%. Plastic and paper comprise majority of the recyclables. Glass was found to be at 1.11%; while, metals at 0.60%.

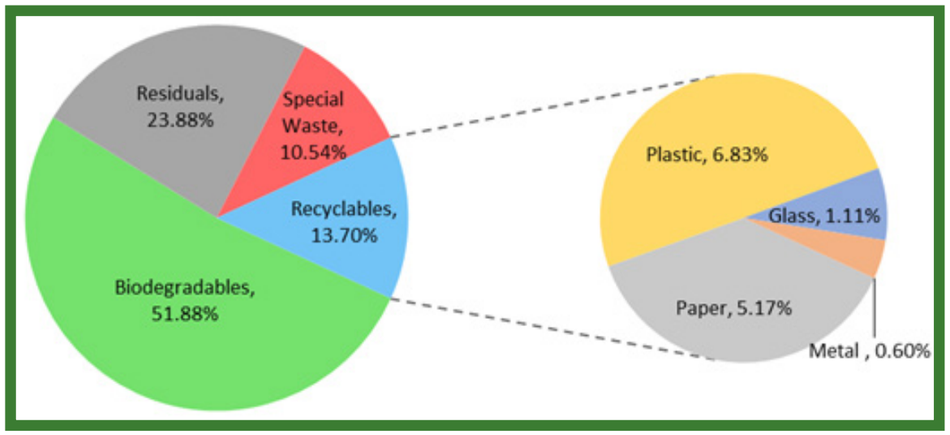


Figure 32. Port-Generated Waste Composition of Recyclables

Residuals comprised 23.88% of total port-generated wastes during sampling (Figure 33). Wastes with potential for recycling[24] were at 9.96% of the entire waste sampled; while, residual wastes for disposal were at 13.91%. The residuals were composed of paper cups at 5.97%, soiled plastics at 4%, and tissue paper at 2.72%. Diapers and napkins were also collected in low quantities.

24 Wastes with potential for recycling are residuals wastes that would normally be considered for disposal in a sanitary landfill due to economic viability but may eventually be recycled if feasible techniques or technologies would be available to an LGU provided these are dry and not contaminated by hazardous or food wastes. Examples of these are sachets, plastic bags, textiles, leather, and rubber (National Solid Waste Management Commission, 2021).

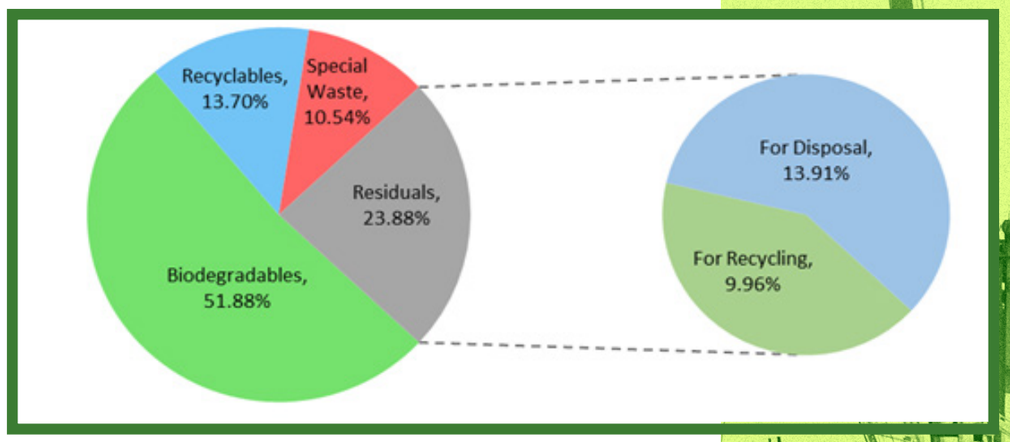


Figure 33. Port-Generated Waste Composition of Residuals

Special wastes comprised about 10% of the total port-generated wastes during sampling (Figure 34). Majority of these wastes were bulky yard waste at 5.27%. Hazardous wastes like busted lights, consumer electronics, paint and other cleaning chemicals were found at 4.29%. Healthcare wastes were found at less than 1% of the entire waste sampled. Majority of these healthcare wastes were face masks. Increase of these wastes is likely due to the ongoing COVID-19 pandemic.

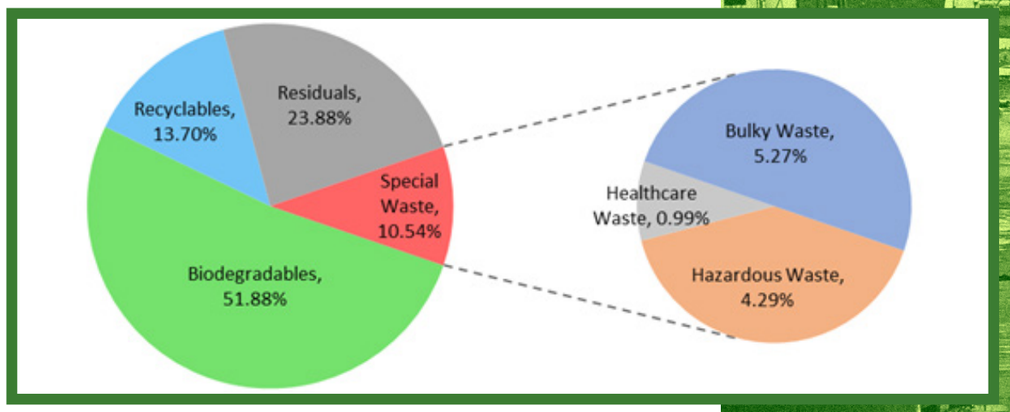


Figure 34. Port-Generated Waste Composition of Special

Of the collected wastes from the port facilities during sampling, 6.85% by total weight accounted for recyclable plastic wastes. Polyethylene terephthalate (PET) and polypropylene (PP) type of plastics had the largest fractions of the recyclable plastic wastes. Polystyrene (PS), polyvinyl chloride (PVC), and high-density polyethylene (HDPE) plastic types were also present in the collected samples (Figure 35).

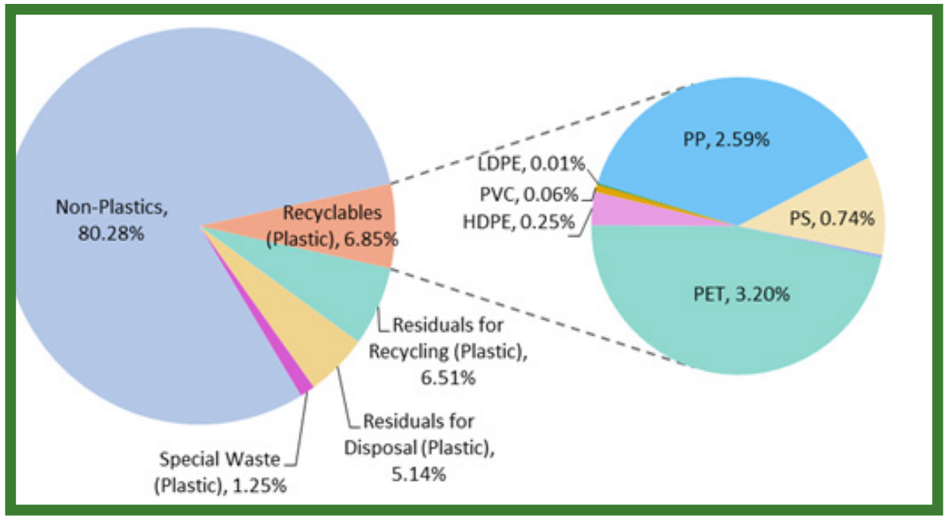


Figure 35. WPort-Generated Recyclable Plastic Wastes

Residual plastic wastes with potential for recycling were observed to be at 6.51% by total weight of the sorted samples. These items plastic items included clear sachets, plastic bags, laminated sachets, sacks, tarpaulins, and some straws (Figure 36).

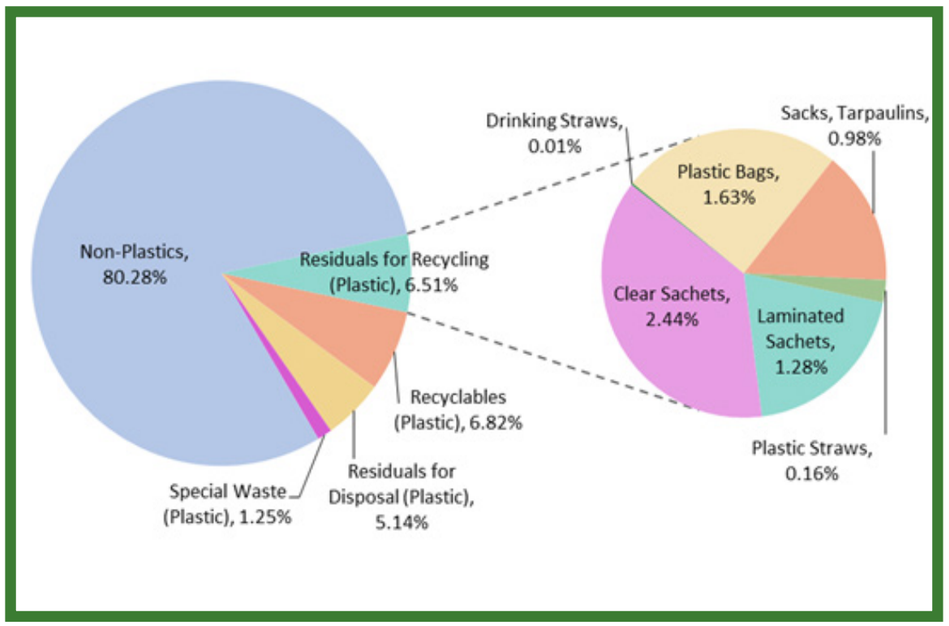


Figure 36. Port-Generated Residual Plastic Wastes with Potential for Recycling

Residual plastic wastes for disposal such as heavily soiled plastics, diapers, and napkins were also collected and were found to be at 5.14% by total weight of the sorted samples (Figure 37).

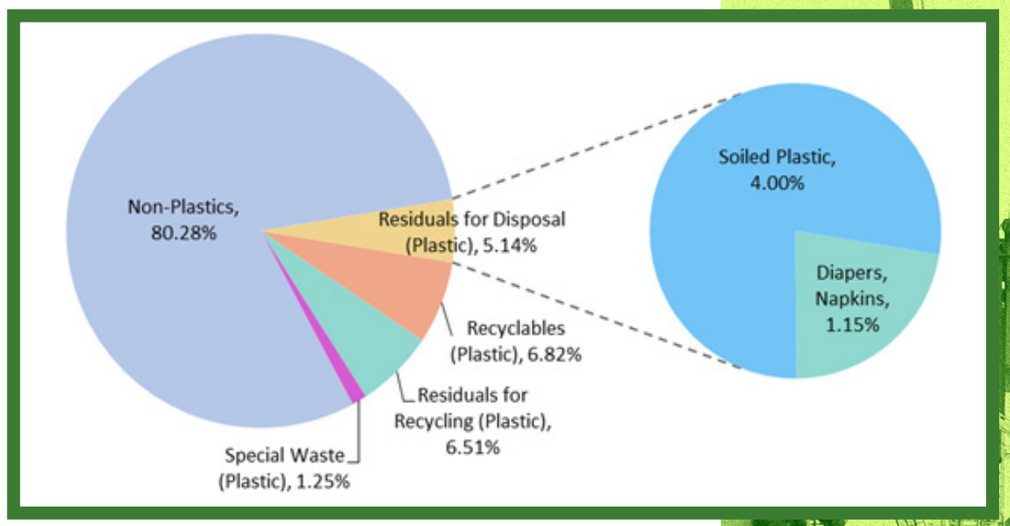


Figure 37. Port-Generated Residual Plastic Wastes for Disposal

Special plastic wastes were also collected from the port facilities and were found to be at 1.25% by total weight. These wastes ranged from healthcare wastes such as face masks to hazardous wastes such as pesticides and consumer electronic products (Figure 38).

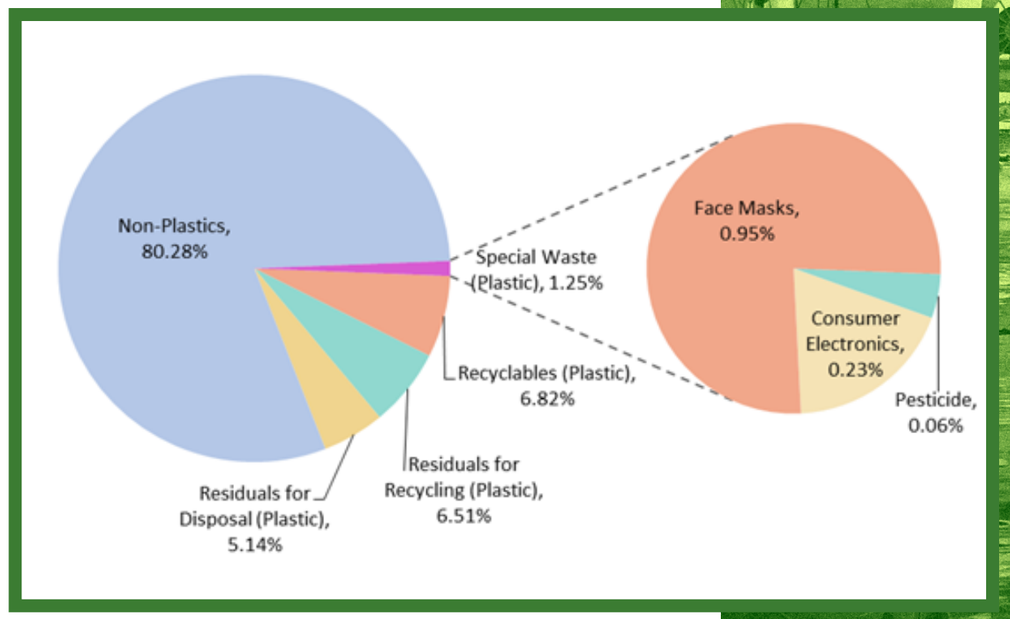


Figure 38. Port-Generated Special Plastic Wastes

Vessel Generated Waste

Collection of vessel-generated wastes were conducted daily at collection points located near the pier and wharf (Section III.C.3) of the port. Based on the vessel data collected from the WOBVIFs and the waste density data from the sorted wastes, the generation rates for the vessels were calculated to be at 873.33 kg/day in total. Correlating with data from the PPA Statistics pre-covid data, the waste generation on a pre-COVID-19 was computed to be at 2,756.81 (Table 14).

Comparison of vessel generation rates between the COVID-19 and pre-COVID-19 scenario shows the effect of the pandemic on the amount of wastes received by ports from the vessels. The vessel -generated waste in a day has decreased by 68% during the pandemic considering the reduced number of vessel traffic in the Port of Batangas.

Table 14. Vessel Waste Generation Rate for the Port of Batangas

Vessel Type	Pre-COVID-19	COVID-19 (Current)			
	Daily Generation Rate (kg/day)	Daily Generation Rate (kg/day)	Per Vessel (kg.vessel/day)	Per Vessel Tonnage[25] (kg/gross tonnage/day)	Per Passenger[26] (kg/passenger/day)
RoRo (Passengers)	1,577.86	499.85	5.00	0.00165	0.10379
Container	1,112.91	352.56	29.38	0.00154	-
Others (Tanker)	66.04	20.92	10.46	0.00015	-
Total	**2,756.81**	**873.33**	**-**	**-**	**-**

With regards to waste composition, 17.27% of vessel-generated waste were biodegradable (Figure 39). The most abundant biodegradable waste were food wastes at 7.59% of the total wastes sampled. Garden waste and sweepings followed food wastes at 2.51%. These garden wastes may generally come from plants aboard the passenger and/or cruise ships. Merchant ships may not have plants considering the provisions in other countries. Wet paper and wood were also found during sorting.

25 Calculated using the gross tonnage of vessels listed on WOBVFIs (Annex F).
26 Calculated using the average passenger on board data from the statistic of PPA Statistics between 2020 and 2021 (Philippine Ports Authority, 2021).

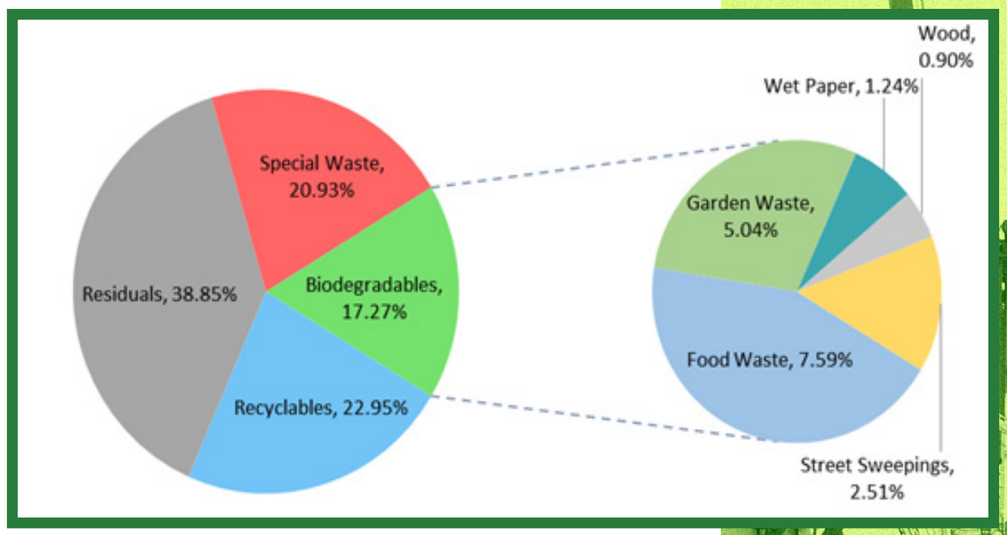


Figure39. Vessel-Generated Waste Composition of Biodegradables

Recyclables comprised 22.95% of vessel-generated waste with plastics being the highest (Figure 40). Papers, metals, and glasses were also collected.

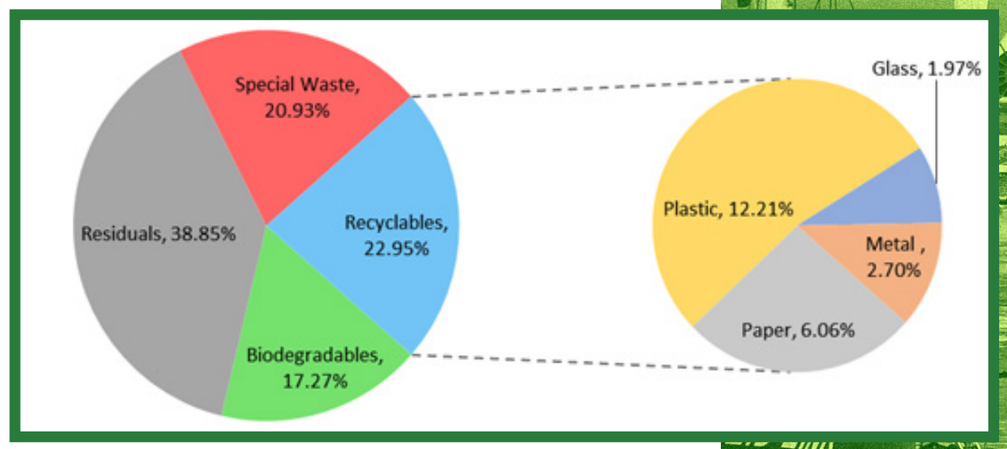


Figure 40. Vessel-Generated Waste Composition of Recyclables

Residual waste were at 38.85% of vessel-generated waste, the highest among the general categories (Figure 41). 22.99% of total wastes were residuals with potential for recycling. These included textiles, clear and laminated sachets, and plastic bags. The remaining residual wastes were for disposal, which comprised 15.86% of the total waste. These included paper cups, soiled plastics, diapers and napkins and tissue papers.

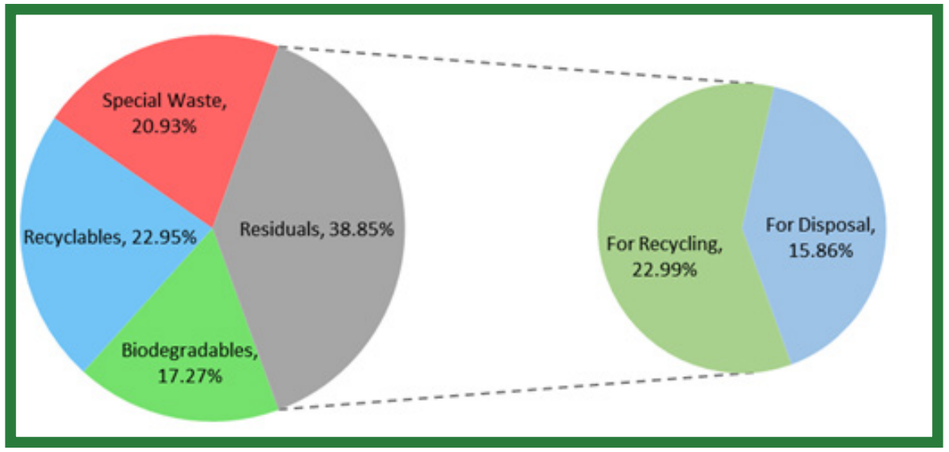


Figure 41. Vessel-Generated Waste Composition of Residuals

Special wastes composed 20.93% of the waste sampled (Figure 42). Majority of these wastes, at 11.67%, were hazardous waste and consisted of paints and consumer electronics. Bulky waste were at 8.09%; while, healthcare waste, which included face masks, was found at 1.17%.

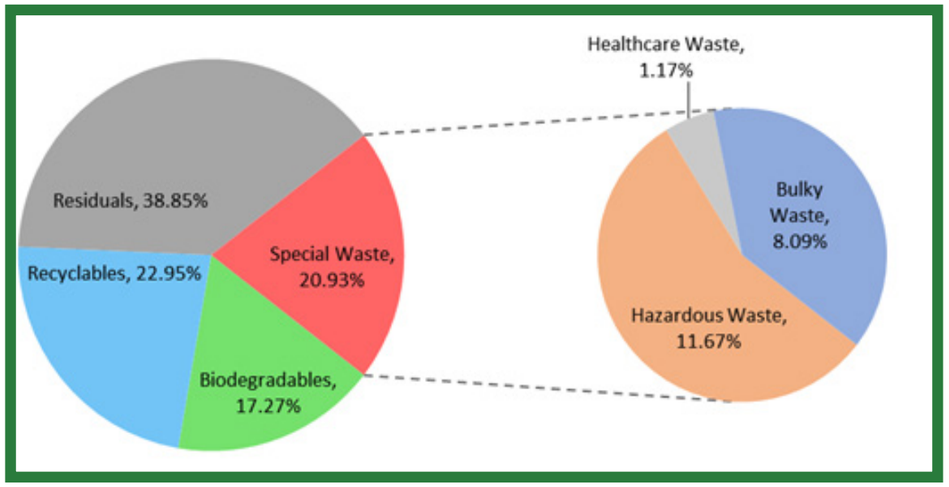


Figure 42. Vessel-Generated Waste Composition of Special

Of the collected wastes from the vessels, 12.21% by total weight accounted for recyclable plastic wastes in which polyethylene terephthalate (PET) and polypropylene (PP) type of plastics constituted the largest. Polystyrene (PS), high-density polyethylene (HDPE), and low-density polyethylene (LDPE) plastic types were also present in the collected samples (Figure 43).

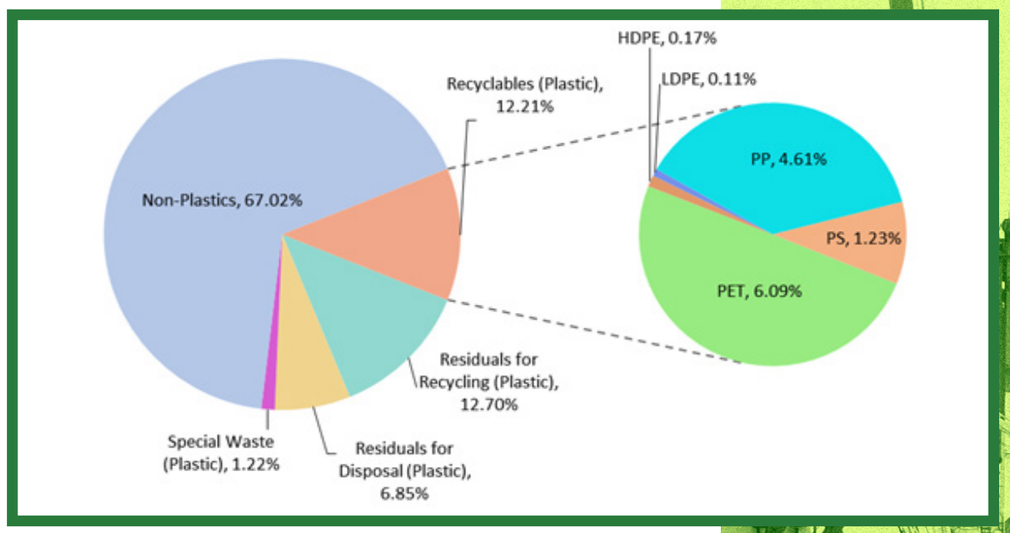


Figure 43. Vessel-Generated Recyclable Plastic Wastes

Residual plastic wastes with potential for recycling were observed to be at 12.70% by total weight of the sorted sample. These items plastic items included clear sachets, plastic bags, and laminated sachets. Plastic straws, sacks, tarpaulins, and foam were also observed (Figure 44).

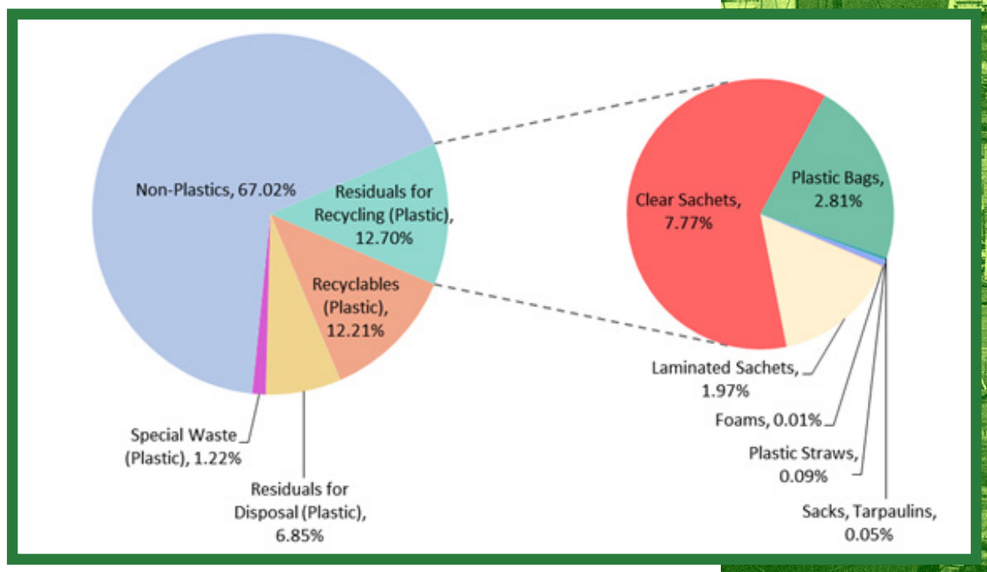


Figure 44. Vessel-Generated Residual Plastic Wastes with Potential for Recycling

Residual plastic wastes for disposal, such as heavily soiled plastics, diapers, and napkins, were also collected and were found to be at 6.85% by total weight of the sorted samples (Figure 45).

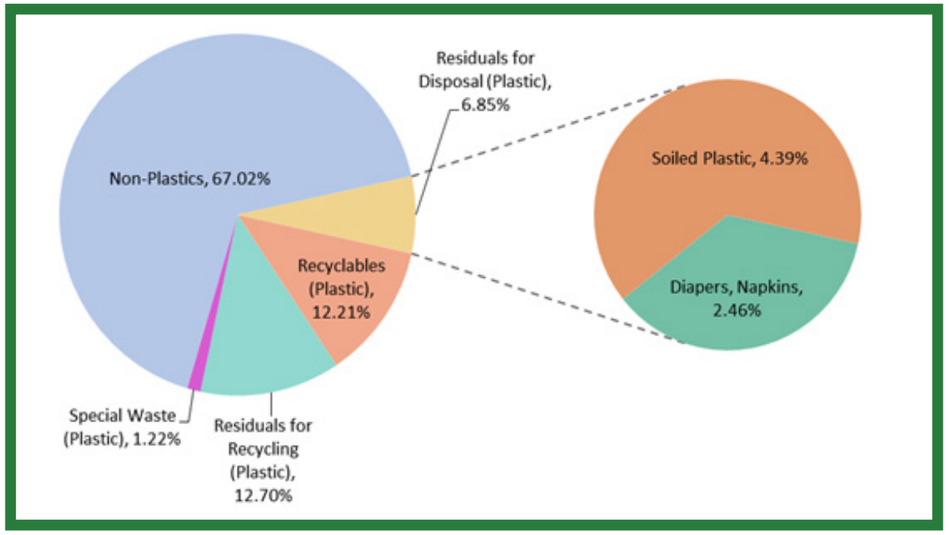


Figure 45. Vessel-Generated Residual Plastic Wastes for Disposal

Special plastic wastes were also collected from the port facilities and found to be at 1.22% by total weight. These items comprised primarily of face masks at 1.15% of the total weight. Some hazardous wastes such as consumer electronics, and gadget batteries were also noticed (Figure 46).

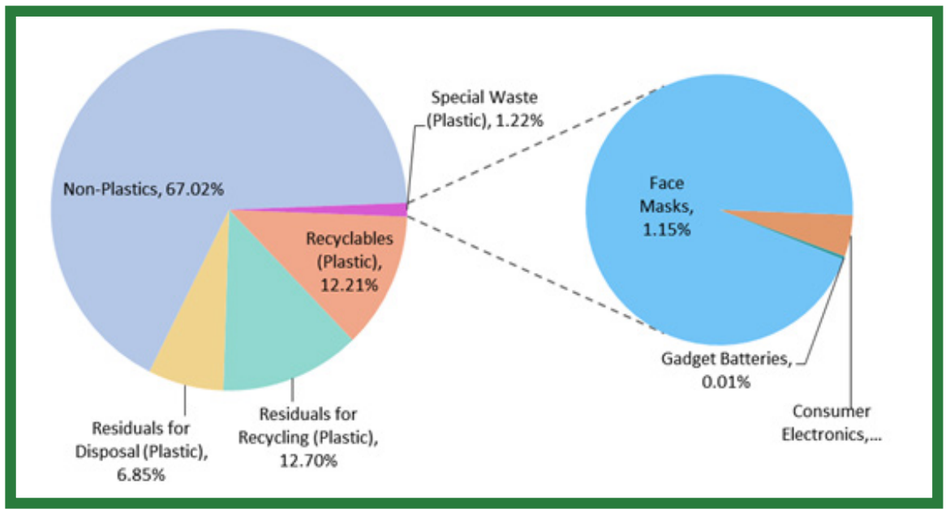


Figure 46. Vessel-Generated Special Plastic Wastes

Plastic Leakage

There are no uncollected wastes since all wastes generated from port facilities and vessels end up in a disposal facility. There are only unmanaged wastes that leak out from the solid waste management system – both intentionally and unintentionally especially during the collection, transportation, and disposal of waste – with some of the wastes entering the storm drains.

The calculated plastic leakage factors for both port-generated and vessel-generated are assumed to be the same (Annex G).

Leakage from Collection Service

Plastic leakage from collection services describes the plastic which escapes the waste management system while it is being stored waiting for collection service, being loaded on to the collection vehicle; and, on primary transportation.

The leakage potential for collection containers[28] was determined to be on a medium level which has a factor of 1. The containers stored at collection points in the port area were available in most, but not all, establishments. The wastes, however, are generally unsealed at the collection points (Figure 13).

The capacity of the bins is generally sufficient for the quantity of waste but some waste inside the collection container were observed to be exposed to the environment (Figure 13). Service is occasionally delayed beyond the minimum frequency since they only collect the port-generated wastes if the temporary storage at the collection point is observed to be at full capacity.

The leakage potential for loading method was determined to be high with a factor of 1. All the waste are manually loaded to vehicles by the waste collectors (Figure 14). Wastes are also transferred to the collection vehicle from a fixed collection container.

27 Collection containers are storages or receptacles where solid wastes in garbage bags are being stored before being collected by the collection trucks.

All primary transportation vehicles are closed and covered, preventing exposure to the environment (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2020); hence, the leakage potential is low at a factor of 0. The collection truck used by WasteCon during observation for port wastes has advanced features including compaction; while, the dump truck used by iPrudential for vessel wastes stays within truck capacity by volume and is covered by tarpaulin at all times (Figure 15).

The leakage potential for the multiple handling of wastes is assessed to be low at a factor of 0. Collected waste is adequately transferred between multiple vehicles/people. There are also dedicated facilities for the transfer of waste with high levels of waste containment. Wastes are also transferred directly into secondary transportation vehicles; and, the waste leaking during the transfer were swept at the end of the collection.

A total of 2% of the plastic wastes are leaked during collection when all influencing factors for leakage are combined.

Leakage during Transportation

Plastic leakage during transportation refers to the plastic items lost when the material is being transported by the collection vehicles to its final destination. This indicator only considers the amounts of plastic leaked during the action of transportation (GIZ, 2020).

The leakage potential of capacity versus load is determined to be low at a factor of 0.1. The load in most of the collection vehicles for both port wastes and vessel wastes does not exceed the capacity (Figure 15).

Most of the port-generated and vessel-generated waste are contained in garbage bags which are not opened during transport. This has a low leakage potential with a factor of 0.1 (Figure 10).

Most of the collection vehicles in the port are fully enclosed. This has a medium leakage potential at a factor of 0.1.

A total of 0.001% of plastic wastes are leaked during transportation.

Figure 47. Fully Enclosed Collection Vehicle at Passenger Terminal Collection Point last September 25, 2021

Leakage from Disposal Facilities

Leakage of plastic from disposal facilities describes plastic that leaks from disposal sites carried either by either the wind (windblown) or by water/ landslides (GIZ, 2020).

The site where landfilling occurs is located near an area with a steep slope which may pose environmental hazard such as landslide. The leakage potential is assumed to be medium at a factor of 10.

The site is rarely exposed to heavy and persistent winds or run-off. This gives a low leakage potential with a factor of 0.1.

Wastes are generally discharged in active cells. Waste pickers are also observed to be present on site. Compaction or management of waste can still be improved as no soil compactor is utilized nor is recovery done before dumping. The leakage potential for waste handling, therefore, is high at a factor of 0.95.

Waste is covered by soil typically daily, which gives a low leakage potential at a factor of 0.1. Burning of waste is not practiced which gives a very high leakage potential of 1. There is a fence surrounding the perimeter of the facility, but several parts need repairs.

The calculated percentage of plastic waste that leaked to the open environment is about 10.005% considering all these leakage factors from the disposal site.

Leakage from Storm Drains

Plastic in storm drains to water systems refers to the amount of plastic which is transferred through storm drain systems and enters water systems. Leakage is computed from two influencers – frequency of rainfall and storm events and drain cleaning.

Rainfall is highly seasonal in the area where the site is located and is often impacted by monsoon rains. This has a medium level leakage potential with a factor of 60.

Most storm drains are well maintained – regularly cleaned several times a year. Litter traps are used on most drain outlets.

This gives a very low leakage potential with a factor of 0.8. Hence, 52% of leaked plastic wastes in drains are transferred to water bodies.

Figure 48. Storm Drain near Passenger Terminal Collection Point last September 25, 2021

Waste Flow Diagram

A Waste Flow Diagram is generated using the calculated quantities in different stages of the solid waste management in the Port of Batangas (Table 15 and Figure 50).

Table 15. Amount of Waste per Stage

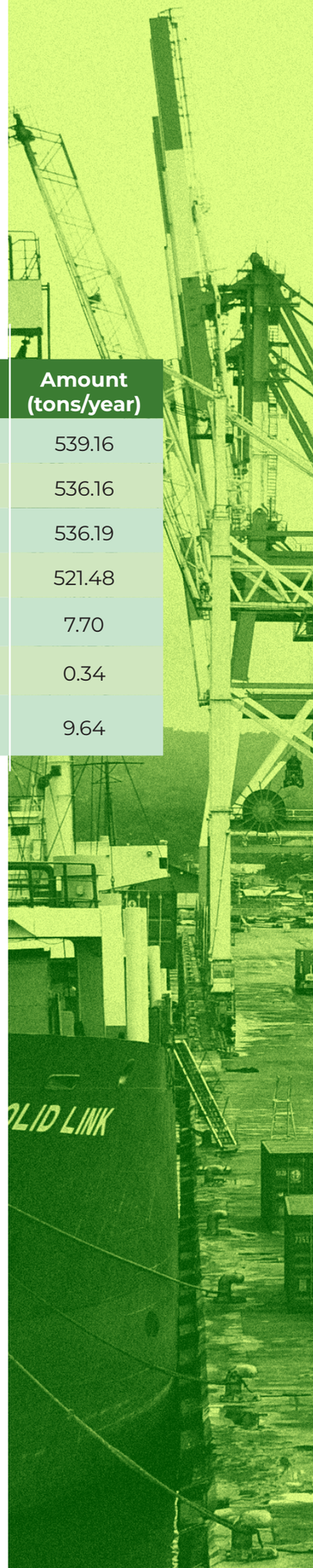
Stage		Amount (kg/year)	Amount (tons/year)
Generated Waste		539,160.00	539.16
Collected Waste		539,160.00	536.16
Transported Waste		536,188.50	536.19
Disposed Waste		521,483.50	521.48
Unmanaged Plastic Waste	Retained on Land	7,701.00	7.70
	Leaked to Drains	336.50	0.34
	Leaked to Waterways	9,639.00	9.64

About 539,160 kg of wastes is projected to be generated every year (Figure 50). 59% of these wastes are generated from vessels while the remaining 41% are from port facilities.

The collection rate is determined to be 100% based on interview, site visit, and tailgating activity. All generated wastes are collected by the compactor and dump trucks every year. However, there are observed leakages during the collection and transportation of waste to the disposal site resulting to the slight decrease of waste of about 535,188.5 kg ending up to disposal site (Section V.C).

About 521,483.5 kg of waste are disposed in the landfill every year. There is no waste recovery before disposal, hence, most of the generated waste that are collected are transported directly to the landfill.

For plastic waste flow analysis, about 148,604 kg or 28% of the annual generated wastes are



attributed to plastics (Figure 51). 98% of these generated plastic wastes are collected by service providers while the remaining 2% or 2,972 kg of plastic waste are calculated as leakage from the collection. There is also an estimated 1.5 kg of plastic waste that are being leaked during transportation. About 130,927.5 kg or 88% of the plastic waste are disposed to landfill (Section V.C).

The remaining 11.8% are the unmanaged plastic waste or the combined leakages from the collection, transportation, and disposal. 6.4% or 9,639 kg of the plastic waste are leaked to water while 5.2% or 7,701 kg retained to land and 0.2% or 336.5 kg are leaked to drains every year (Section V.C and Figure 51). Higher leakage rate in the disposal area were due to the presence of a water body near the landfill site which makes it prone to flooding.

A WFD without the effect of COVID-19 pandemic is generated to provide comparison on the amount of waste flow per stage of the waste management system (Figure 52). Generated waste per year in a pre-covid scenario is around 1,423,283 kg wherein 71% of the wastes comes from the vessels and the remaining 29% from the port facilities. Collection of recyclables by janitorial services was practiced during those times. The amount of recyclables sold to junkshops, with an average of 1,488 kg per year, were also accounted for in the waste flow diagram. Similar to the current solid waste management system, majority of the generated waste are collected, transported, and directly disposed to the landfill. 1,374,038.2 kg of wastes are landfilled (Figure 52).

With regards to plastic waste, same values from the WACS results were used to estimate the plastic waste generated of about 414,483 kg per year (Figure 53). This is relatively higher than the present amount of plastic waste generated considering the COVID-19 situation. 98% of the plastic wastes are collected and transported to the landfill while the few plastic wastes amounting to 516 kg per year are brought to junkshop with the assumption that the janitorial services are allowed to collect and sell recyclables.

About 367,722.2 kg or 88% of the total plastic waste generated of plastic wastes are landfilled. The remaining 12% are identified as unmanaged plastic wastes. The unmanaged plastics are suspected to be retained on land at 5.2%, leaked to drains at 0.2%, and entered water systems at 6.6% based on the assessment done using the WFD criteria of the UN Habitat.

Port and vessel-generated waste flow diagrams for both COVID-19 and pre-COVID-19 scenario are also generated and presented in the annex of this report (Annex H). The plus symbol at certain values in the waste flow diagrams indicate the amount of waste that is at its endpoint of its corresponding site or location (Figure 50, Figure 52, and Annex I).

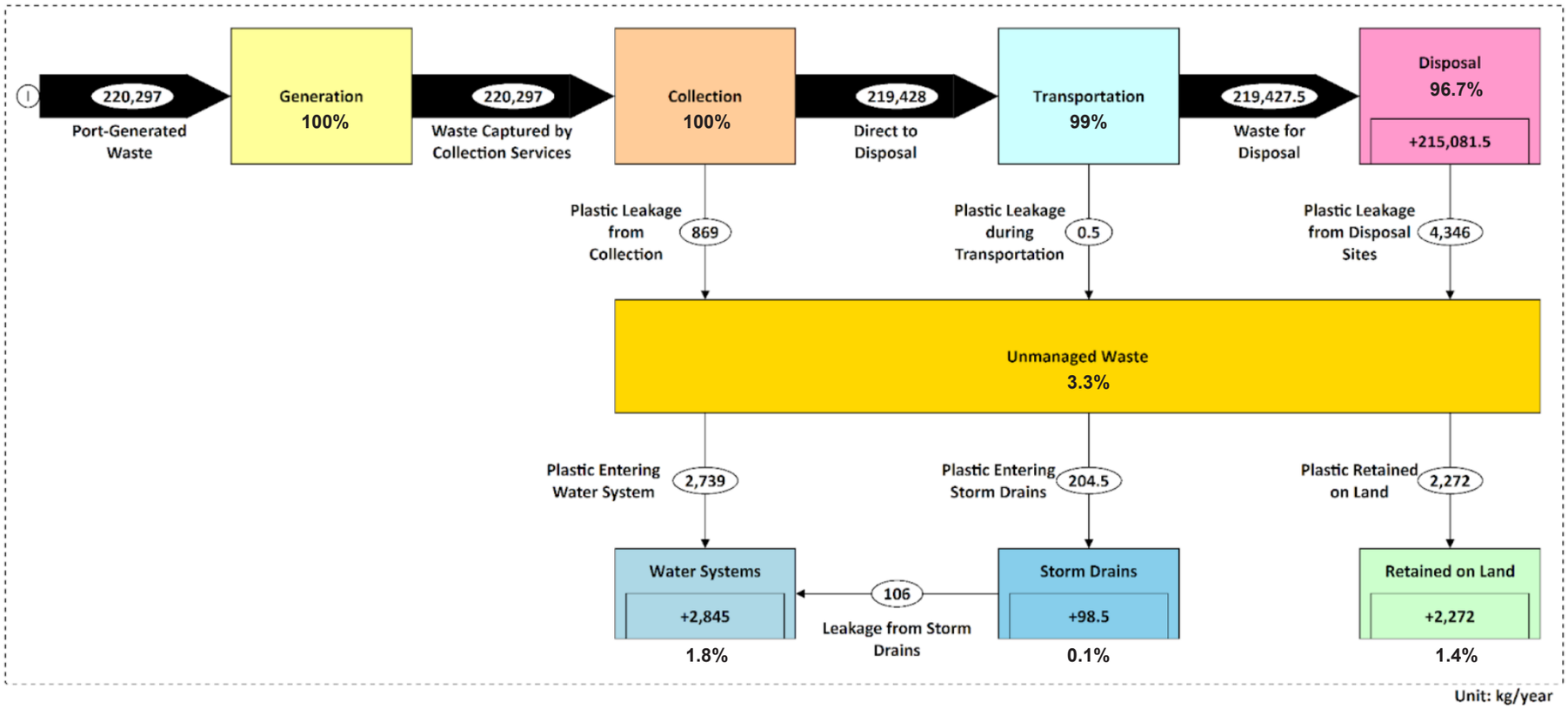


Figure 49. Solid Waste Flow Diagram for the Port of Batangas

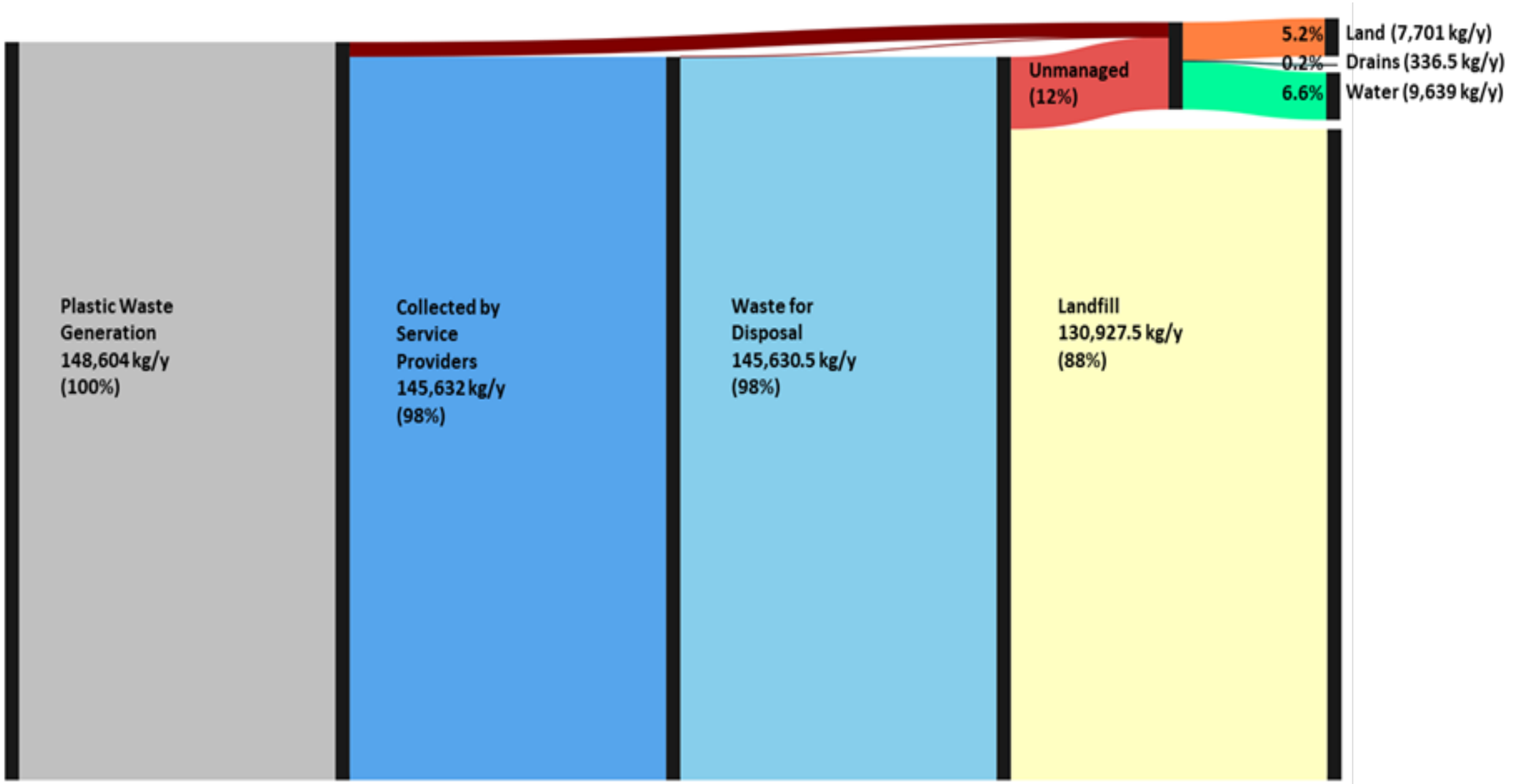


Figure 50. Waste Flow of Plastics in the Port of Batangas

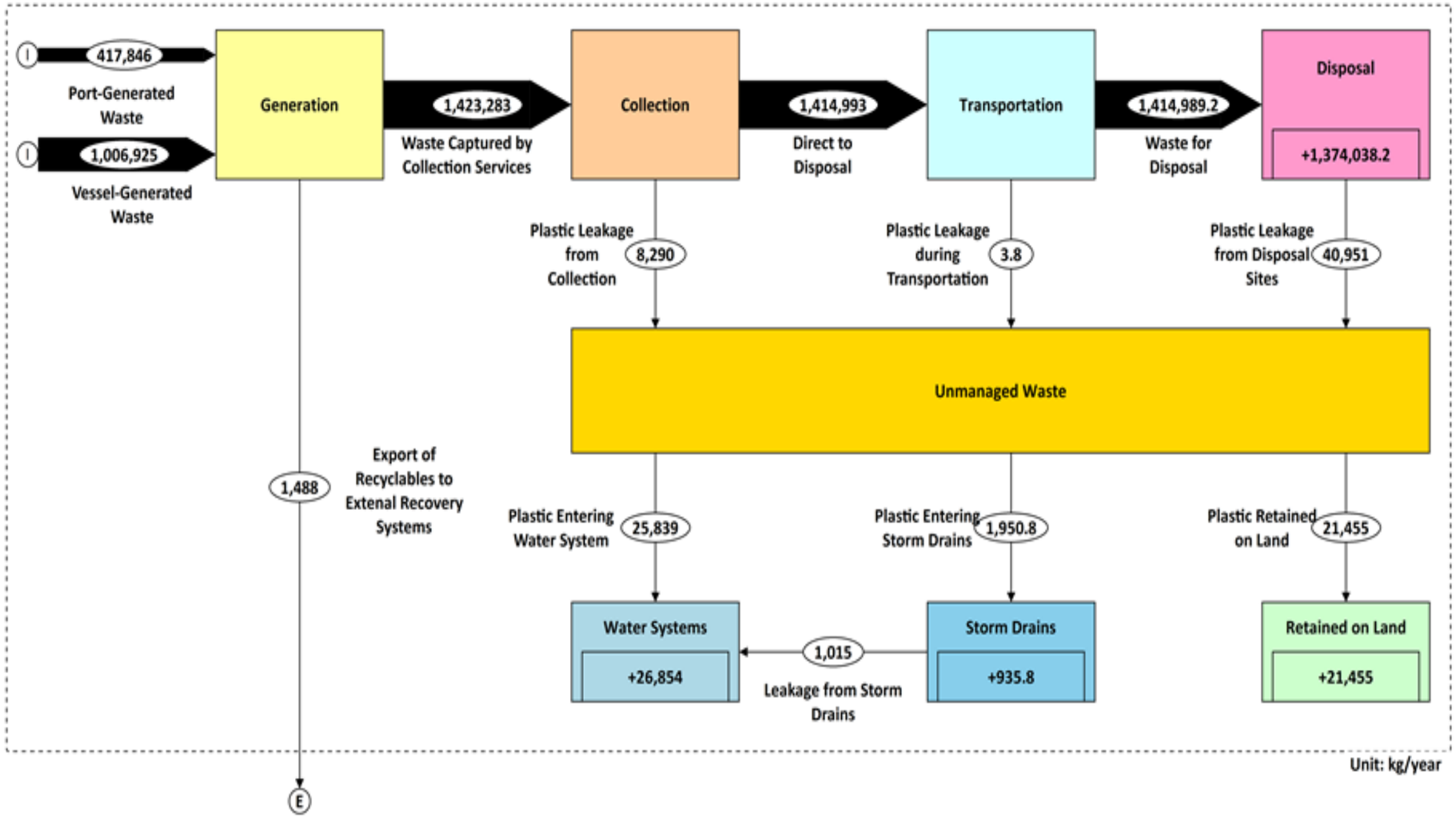


Figure 51. Solid Waste Flow Diagram in a Pre-COVID-19 Scenario in the Port of Batangas

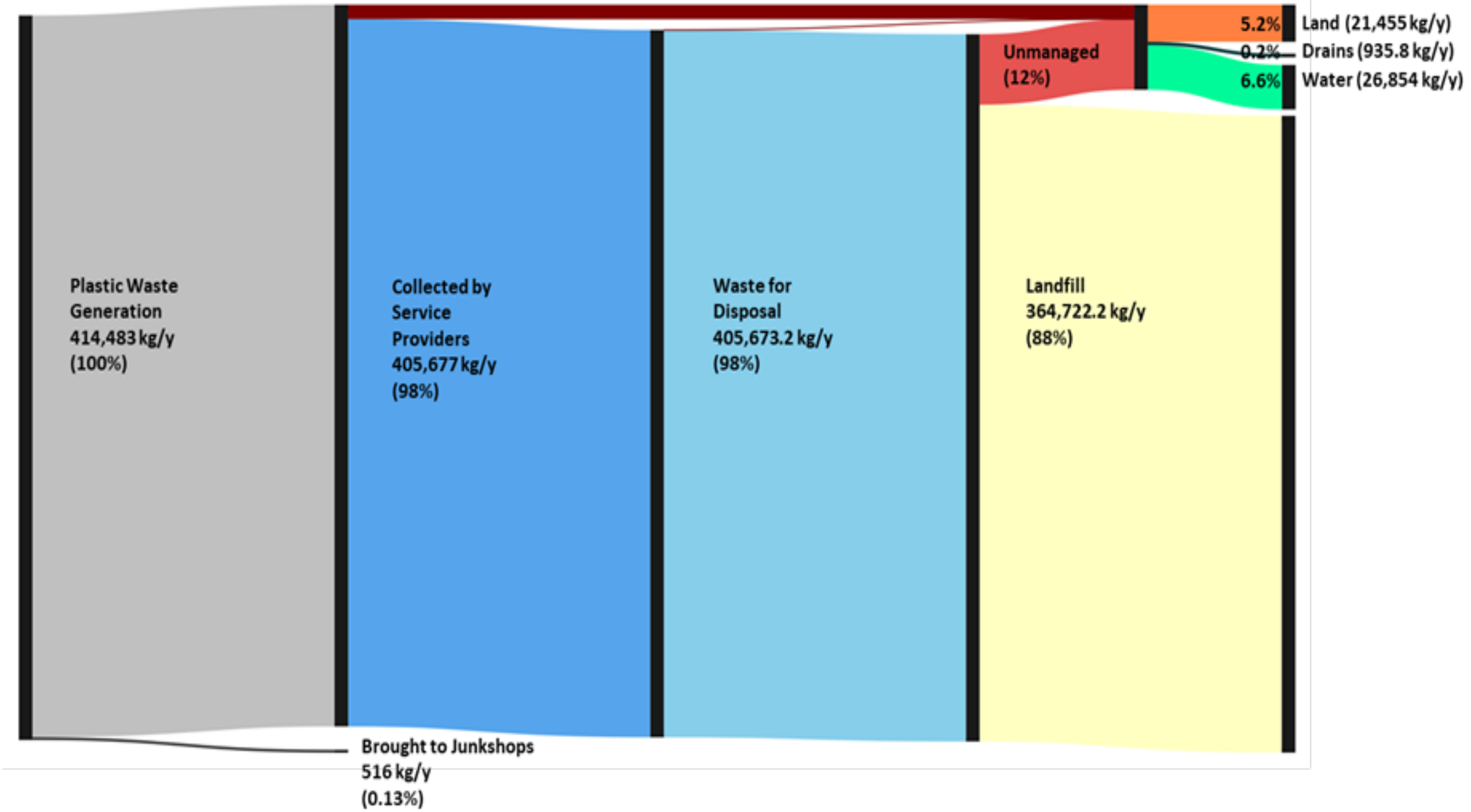


Figure 52. Waste Flow of Plastics in the Port of Batangas in Pre-COVID-19 Scenario

OBSERVATIONS

There are several good practices and items for improvement observed at the Port of Batangas.

Good Practices

Good practices were observed at the different stages of the waste management system of the Port of Batangas (Table 16). Most of which were observed during collection with the disinfection of the collection bins before and after the collection of wastes as part of the preventive measures for the spread of COVID-19 as one of the notable and commendable practices during this pandemic.

Table 16. Summary of Good Practices in terms of Waste Management at the Port of Batangas

Stage	Port	Vessel
Generation	Port Management has existing policies on **preventing usage of single-use plastic bags.** PMO regularly **reports the estimated waste generation** of their port facilities to PPA.	Follows regulations stated in **MARPOL Annex V.** Available documentation of **waste generated by volume** through **Waste On-Board Vessel Information Form.**
Segregation	**Color-coded waste segregation bins** separating biodegradable (green), recyclable (red), non-biodegradable non-recyclable (blue), and medical wastes (yellow) Separating **hazardous wastes** such as contaminated oil. Most of the wastes in the collection points are contained in **black garbage bags.**	Mandated to use **containers of wastes that are kept sealed** except when adding or removing wastes. **Appropriate containers** are available to separate non-biodegradable from the biodegradable wastes.
Collection	Usage of **compactor trucks** in collecting wastes. There are **three designated collection points** for port generated wastes. **Regularly records** the amount of waste collected by trucks through weigh bridge. There is a **separate collection** for **hazardous wastes.** After collection, the waste collectors properly **clean the area** around the collection point. The waste collection points are **properly fenced.**	**Disinfects the collection bins** before and after waste collection. Waste collectors wear **proper protective equipment** throughout the conduct of waste collection. Dump truck has a **cover** for collected wastes and does not fill the container beyond its capacity. After collection, the waste collectors properly **clean the area** around the collection point. The waste storage bins are **properly enclosed** and is not easily accessible to animals.

Stage	Port	Vessel
Recovery	**Sorters** are given **livelihood** through access to waste disposal area.	
Disposal	Wastes are **covered by soil.** The whole facility is **fenced.** **Gas vents** are installed in closed cells of the landfill. There are **security personnel** to prevent unauthorized access.	

Items for Improvement

There are also items for improvement observed at the different stages of the waste management system of the Port of Batangas that, when resolved, shall strengthen, and improve the currently implemented solid waste management system in the Port of Batangas. Suggested interventions to solve them are presented in the following table (Table 17).

Table 17. Summary of Items for Improvement and Suggested Solutions for the Waste Management System of the Port of Batangas

Stage	Issues	Suggested Solution
Generation	Waste generated per vessel data **lacks accuracy** due to absence of measuring device for volume and tonnage of waste	Use of **weighing scale** and measure in terms of **weight instead of volume.** The WOBVIF and other forms can be accomplished digitally for easier collation and documentation of information, which might be helpful when looking for potential partners and getting more insight.
Segregation	**Lack of waste segregation** in truck collection points.	Construct a **collection receptacle** that has **divisions** designated for different types of wastes. Use of **color-coded** trash bags. Conduct **IEC Campaign** about proper waste handling and segregation. **Labels of trash bins** in the port can be improved. They should be intuitive, easy to read, and attached to all trash bins.
Collection	**Mixing of wastes** in compactor and dump trucks.	When using compactor trucks, make sure that the **wastes are homogeneous.** Use of **color-coded** trash bags.
Recovery	**Lack of Materials Recovery Facility** that is fully functional, has sorting area and works on waste recovery.	There should be a **centralized MRF** within the port which will process all the recyclable and biodegradable wastes.
Disposal	**Soil covering** is done the day after the waste is dumped on active cells due to **lack of equipment.** **Fencing** can be improved. Waste pickers inside the landfill are **not wearing PPEs.** Dirt road in landfill is **dusty** during dry weather which may **pose health hazards** to people working in the landfill.	Procurement of **additional equipment** such as compactors for faster covering of wastes. Repair **damaged fences.** Supply waste pickers with **PPEs.** Water the dirt road to **minimize dust particles/ debris.**

Control Level of Recovery and Disposal Facilities

The disposal site is found to be of basic control since there is no gas and waste utilization and post closure plan yet (Section III.C.5). The collection service level at the port, on the other hand, is assessed to be of basic control[29] in accordance with the Waste Wise Cities Tool.

There are no recovery facilities observed on site; hence, no assessment was made (Section III.C.4).

28 Basic collection refers to receiving municipal solid waste collection service with basic frequency and regularity of at least once a week. There is also no separation of fractions during collections with designated collection points within 200 m served with basic frequency and regularity (UN Habitat, 2021).

RECOMMENDATIONS

Utilization of plastic wastes, installation of centralized MRF within the Port of Batangas, conduct of IEC campaigns, stricter implementation of plastic ban, and among others are recommended for the Port of Batangas.

Utilization of Plastic Waste

About 27% of the generated wastes from ports and vessels are plastics based on the WACS results (Figure 50 and Figure 51). The most abundant type of plastics are the clear and single-layer sachets (Figure 37 and Figure 45). These are followed by PET and PP recyclables (Figure 36 and Figure 44). Utilizing these wastes may include bayong-making using clear or laminated sachets, upholstery and decorative items from PET bottles and other plastics. Recyclables may also be sold to junkshops which can be a good source of income.

Use of shredders, plastic densifiers, molders, and other innovative technologies may also be applied to increase waste diversion rate and reduce plastic leakage to environment.

Installation of Centralized MRF inside the Port

A Centralized MRF may optimize the waste diversion process for the biodegradables and recyclables in which the facility should not only serve as a storage area but allot space for sorting and composting (Section III.C.4). Waste technologies such as shredders, plastics, molders should also be present in the facility. The establishment of the MRF can be better achieved through partnerships with both private and public entities such as the Batangas City LGU, DOST, DENR, PPA, MARINA, San Jose Sico Cooperative, NGOs and other environmental groups (Figure 3).

The Centralized MRF may also be placed outside the port facility, if feasible, to address the massive shortage of operational MRFs in the country. By placing it outside the Port of Batangas, communities and barangays with no operational MRF can also utilize it without being restricted by the security policies of the Port.

While waiting for the Centralized MRF of the port to be put in place, it is recommended to bring the recyclables first to the nearest junkshop or existing MRF of the LGU during transportation to minimize the waste ending up in the sanitary landfill.

Conduct of Information, Education and Communication Campaigns

IEC campaigns can help strengthen the establishment of waste management plans and related mandates in the port facilities and vessels. Port facility employees and regular passengers are the target audience for IEC campaigns within the port area, which can mainly focus on segregation since segregated trash bins are already available in the passenger terminals. The target audience can also be more knowledgeable of mandates of the PPA to food vendors operating in the port area, such as single-use plastic bans. This helps vendors and establishments abide by the mandates with ease in the long run. Both vendors – inside the port area and onboard the vessels – can be encouraged to participate in educational seminars. Existing alternatives to plastics that are relevant to their businesses can also be shared with them. PPA or port management may use policy incentives such as command-and-control regulations, social-psychological incentives like certification and recognition, and economic incentives to prompt the establishments and businesses to use alternative products for plastics.

Stricter Implementation of Plastic Bans

The Batangas City LGU has already implemented the ban on plastic bags and Styrofoam. Stricter imposition and expansion of these current plastic ban and regulations in the area can help reduce the plastic waste generation and can also assist in promoting the use of environmentally-friendly alternative in the Port of Batangas. There shall be less to nil use of single use plastics such as clear and laminated sachets and disposable products such as PET bottles, PP containers, plastic utensils evident in the WACS results, as the consumers are more inclined to buying the alternatives with proper enforcement of plastic-related regulations.

The alternatives should be made available and that an analysis of the target population – including purchasing power – be made before banning a plastic product. Incentives or subsidy from the government may be looked in detail to address the purchasing power issue.

Improvement of Collection and Transportation System

Two percent (2%) of the plastic wastes are calculated to leak during collection (Figure 50). This can be improved by ensuring that garbage bags are properly sealed and kept indoors to minimize the effects of external factors such as animal access, winds, and heavy rains. For future innovations, using automated systems for waste loading can be considered.

There is also a 0.001% percent leakage during transportation (Figure 51). This can be minimized by ensuring that all collection vehicles for both port and vessel-generated wastes are compactor trucks that are fully covered.

Improvement of Disposal Facility

About ten percent (10%) of the plastic wastes are calculated to leak during disposal (Figure 51). The landfill can be analyzed for slope stability to determine the risk of a landslide and to recommend mitigating measures. Rehabilitation of fencing and acquisition of proper compacting equipment are improvements to significantly reduce plastic leakage in the disposal facility.

Monitoring of Plastic Leakage

PPA, in coordination with DENR, shall be the overall head for the monitoring of the unmanaged waste and to ensure the continuity of solutions that will be put in place. The port management shall be in-charge of the waste retained on drains and in land; while, the PCG shall monitor waste leakage on the waterbodies. The service providers shall be responsible in monitoring the leakages during collection and transportation while the landfill operators during disposal.

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ANNEX A. SUMMARY OF MARPOL ANNEX V PROVISIONS

Waste Type	All Ships Except Platforms		Regulation 5 Offshore platforms located more than 12 nm from nearest land and ships when alongside or within 500 meters of such platforms
	Regulation 4 Outside special areas and Arctic waters (Distances are from the nearest land)	Regulation 6 Within special areas and Arctic waters (Distances are from nearest land, nearest iceshelf or nearest fast ice)	
Food waste comminuted or ground	≥3nm, en route and as far as practicable	≥12 nm, en route and as far as practicable	Discharge Permitted
Food waste not comminuted or ground	≥12 nm, en route and as far as practicable	Discharge Prohibited	Discharge Prohibited
Cargo residues not contained in washwater	≥12 nm, en route and as far as practicable	Discharge Prohibited	Discharge Prohibited
Cargo residues contained in washwater		≥12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)	Discharge Prohibited
Cleaning agents and additives contained in cargo hold washwater	Discharge permitted	≥12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)	Discharge Prohibited
Cleaning agents and additives in deck and external surface washwater		Discharge permitted	Discharge Prohibited
Animal Carcasses (should be split or otherwise treated to ensure the carcasses will sink immediately)	Must be en route and as far from the nearest land as possible. Should be >100nm and maximum water depth	Discharge Prohibited	Discharge Prohibited

Waste Type	All Ships Except Platforms		Regulation 5 Offshore platforms located more than 12 nm from nearest land and ships when alongside or within 500 meters of such platforms
	Regulation 4 Outside special areas and Arctic waters (Distances are from the nearest land)	Regulation 6 Within special areas and Arctic waters (Distances are from nearest land, nearest iceshelf or nearest fast ice)	
All other garbage including plastics, synthetic ropes, fishing gear, plastic garbage bags, incinerator ashes, clinkers, cooking oil, floating dunnage, lining, and packing materials, paper, rags, glass, metal, bottles, crockery and similar refuse	Discharge Prohibited	Discharge Prohibited	Discharge Prohibited

**nm - Nautical Miles*

ANNEX B. COBSEA REGIONAL ACTION PLAN ON MARINE LITTER ANNEX 2

	Key Actions	Lead Authority
Action 1. Preventing and Reducing Marine Litter from Land-Based Sources		
1.1 Legal and Economic Instruments		
1.1.1.	Encourage and assist countries to enhance leadership, implementation, and quality of government efforts.	Secretariat
1.1.2.	In countries where many government agencies and departments are involved in waste management efforts, COBSEA members may wish to consider, as necessary, establishing a policy making mechanism and supporting agency, or strengthening it if already existing, for the implementation of solid waste management policies.	Countries
1.1.3.	Encourage and assist countries to develop and adopt legal and economic instruments to assist the management and prevention of marine litter from land-based sources and moving towards circular economy models, including harmonization of standards and regulations in the region. This could include: - addressing single-use product consumption (through, for example, fiscal and economic instruments such as a tax on plastic bags and packaging and phase out of single-use plastic items in stores); - establishment and/or further development of deposit refund systems for bottles, containers and cans (e.g., glass, plastics and aluminium).	Secretariat/ Countries
1.2 Integrated Waste Management		
1.2.1.	Enter into dialogue with the industry on waste management practices that impact on the marine environment and identify incentives/measures to promote sustainable practices.	Secretariat/ Countries
1.2.2.	Implement adequate waste reduction, reuse, and recycling measures, as well as other relevant approaches such as product replacement, in order to reduce the amount of litter, particularly the fraction of plastic waste that goes to landfill or incineration without energy recovery. Where incineration with energy recovery is used, this should use modern technology with controls on combustion condition capable of meeting stringent emission standards.	Countries
1.2.3.	Organize the front and middle end of the waste system by building a modern waste collection and separation system, including recognizing and integrating waste pickers in formal systems of waste management and accelerating recycling, while ensuring non-processed waste is disposed of safely in sanitary landfills at the back of the chain.	Countries
1.2.4.	Take the necessary measures to address illegal dumping, including closing existing illegal dump sites on land and strengthening enforcement measures to combat illegal dumping, such as littering on the beach and illegal solid waste or sewage disposal in the coastal zone and rivers, in accordance with national legislation.	Countries
1.2.5.	Seek cooperation with River Authorities, if necessary, municipalities and other relevant authorities in order to address impacts of litter on the marine environment from riverine inputs, including through introduction and improvement of trash traps at river and drainage areas, floating booms and barriers.	Secretariat/ Countries
1.3 Removal of existing litter and its disposal		
1.3.1.	Develop and implement, in collaboration with relevant stakeholders, programmes and initiatives for identification, removal and sound disposal of accumulations of landbased marine litter, e.g., in combination with existing efforts such as coastal clean-up activities, where economically feasible and ecologically advantageous.	Secretariat/ Countries
Action 2. Preventing and Reducing Marine Litter from Sea-Based Sources		
2.1 Legal and Economic Instruments		

Key Actions		Lead Authority
2.1.1.	Encourage and assist countries to develop and adopt legal and economic instruments, which are consistent with the relevant international instruments such as the United Nations Convention on the Law of the Sea (UNCLOS) and the International Convention for the Prevention of Pollution from Ships (MARPOL) and its Annexes, to assist the management and prevention of marine litter from sea-based sources.	Secretariat/ Countries
2.1.2.	Reinforce the implementation and enforcement of existing national legal instruments in compliance with marine litter related international conventions and agreements such as the MARPOL convention and its Annex V, the London convention and its Protocol, the Basel Convention, and the Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries.	Countries
2.1.3.	Provide assistance in the implementation of the requirements of Annex V to the MARPOL Convention to provide and improve reception facilities for all types of ship-generated waste in ports, harbours, terminals and marinas	Secretariat
2.1.4.	Develop sectoral guidelines on the prevention and reduction of marine litter from sea-based sources, particularly for fisheries and marine/coastal tourism.	Secretariat
2.1.5.	Develop and/or strengthen existing legislation requiring all fishing gear to be identified/marked to contribute to reducing fisheries-related marine litter.	Secretariat/ Countries
2.2 Removal of existing marine litter and its disposal		
2.2.1.	Develop and implement, in collaboration with relevant stakeholders, programmes and initiatives to locate, remove and dispose of accumulations of sea-based marine litter, where economically feasible and ecologically advantageous.	Secretariat/ Countries
Action 3. Monitoring and Assessment of Marine Litter		
3.1 Expert Group		
3.1.1.	Establish a Marine Litter Monitoring Expert Group under the COBSEA Working Group on Marine Litter.	Secretariat
3.2 Regional and National Marine Litter Monitoring Programmes		
3.2.1.	Prepare regional guidance on the development of harmonized National Marine Litter and Microplastic Monitoring Programmes, in line with globally established guidelines, e.g., Group of Experts on the Scientific Aspects of Marine Environmental Protection Working Group on plastics and microplastics in the ocean (GESAMP WG 40) Guidelines for the Monitoring and Assessment of Plastic Litter in the Ocean, and in consultation with relevant ongoing regional monitoring programmes.	Secretariat
3.2.2.	Conduct regional training on the development and implementation of harmonized National Marine Litter and Microplastic Monitoring Programmes, also addressing associated data management needs and reporting	Secretariat
3.2.3.	Work towards developing and implementing National Marine Litter and Microplastic Monitoring Programmes, based on respective national policies, approaches and circumstances.	Countries
3.2.4.	Prepare regional reports on marine litter and microplastic and delivery against Sustainable Development Goal target 14.1, and other relevant Goals and targets, based on National Marine Litter and Microplastic Monitoring Programmes.	Secretariat
3.2.5.	Explore development of a regional marine litter and microplastic monitoring metadatabase/portal, as appropriate building on available global infrastructure, to facilitate the preparation of periodic regional reports.	Secretariat
Action 4. Activities Supporting the Implementation of COBSEA RAP MALI		
4.1 Regional and International Cooperation and Reporting		

Key Actions		Lead Authority
	4.1.1. Establish a COBSEA Working Group on Marine Litter, to include national focal points and experts. This group will promote implementation of the COBSEA Regional Action Plan on Marine Litter, advising and assisting the COBSEA Intergovernmental Meeting and the COBSEA Secretariat. Terms of Reference for the group is provided in Appendix 3 of RAP MALI.	Secretariat
	4.1.2. Establish institutional cooperation with relevant global and regional entities in relation to implementation of the COBSEA Regional Action Plan on Marine Litter and relevant global multilateral environmental agreements, e.g. the MARPOL Convention and its Annex V, the London Convention and its Protocol, the Basel Convention, the Convention on Biological Diversity, Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) as well as the FAO Code of Conduct for Responsible Fisheries and Voluntary Guidelines on Gear Marking.	Secretariat
	4.1.3. Establish partnerships with cities, to provide effective transfer of knowledge and innovation, and promote collaboration between cities/countries.	Secretariat/ Countries
	4.1.4. Convene regional conferences for stakeholder engagement and partnerships and coordinate ongoing efforts with relevant regional and international partners and frameworks, such as the Association of Southeast Asian Nations (ASEAN).	Secretariat
4.2 National Planning and Policy Frameworks		
	4.2.1. Develop and implement National Action Plans on Marine Litter or equivalent planning or policy documents (where relevant building on existing efforts such as development of or updating GPA national programmes of action to strengthen the management and mitigation of land-based pollution), or similar initiatives that contribute to addressing land-based and sea-based sources of pollution.	Countries
	4.2.2. Develop regional sectoral guidelines on the prevention and reduction of marine litter from land-based sources, particularly for sectors of waste management, tourism and plastic manufacturing.	Secretariat
	4.2.3. Develop, at the regional level, a reporting format on national planning and policy frameworks.	Secretariat
4.3 Research Activities		
4.3.1.	Support research and development including of technology and approaches, as well as the consideration of social and behavioral sciences, to prevent marine litter input from land-based sources and promote environmentally sound production and waste management technologies.	Secretariat/ Countries
4.3.2.	Develop and carry out research on the impact of marine litter on the marine and coastal environment and economy (including economic costs and impacts on human health and safety).	Secretariat/ Countries
4.3.3.	Develop and support research on the effectiveness of market-based instruments related to marine litter	Secretariat/ Countries
4.3.4.	Undertake marine litter trajectory modelling in the COBSEA region, to identify sources and accumulation zones for marine litter. Such models will assist participating countries in tracking progress towards Sustainable Development Goal target 14.1.	Secretariat/ Countries
4.3.5.	COBSEA participating countries to consider undertaking analysis of plastic flows into the region and their relative contribution to marine litter generation.	Countries
4.4 Information, education, outreach, and involvement of stakeholders		
4.4.1.	Encourage and assist the appropriate involvement of various stakeholders including local authorities, civil society and private sector in implementation of the COBSEA Regional Action Plan on Marine Litter.	Secretariat/ Countries

	Key Actions	Lead Authority
4.4.2.	Support the implementation of marine litter clean-up campaigns on a regular basis, including: - organization of clean-ups as a tool in educating and involving local stakeholders, communities, and media, in combination with public awareness campaigns; - encouraging and assisting entities with a particular interest in or responsibility for certain coastal areas, such as tourist resorts and port authorities, to undertake regular clean-ups; - encouraging stakeholder engagement in relevant international initiatives, such as the International Coastal Cleanup (ICC) campaigns, Clean Up the World (CUW) campaigns, Green Fins, Project Aware and similar campaigns, or programmes.	Secretariat/ Countries
4.4.3.	Formulate and implement awareness raising campaigns and activities, in line with the Clean Seas campaign and other relevant campaigns, for the general public, various sectors, municipal authorities, local communities and particularly vulnerable groups, school children and youth and other groups.	Secretariat/ Countries
4.4.4.	Develop suitable information material on the COBSEA Regional Action Plan on Marine Litter and translate it into national languages.	Secretariat
4.5 Training and Capacity Building		
4.5.1.	Develop and implement regional education and training for different target groups (across sectors and stakeholder groups) to enhance understanding of marine litter generation pathways, impacts, and preventive action, and to facilitate the application of technical sectoral guidelines.	Secretariat
4.5.2.	Provide technical training and capacity building to staff from national and municipal governments, port authorities and the shipping industry on the prevention and reduction of marine litter from land-based and sea-based sources through regional workshops and training courses.	Secretariat

ANNEX C. SCHEDULE OF ACTIVITIES CONDUCTED IN PORT OF BATANGAS

Activity	September								October		
	23	24	25	26	27	28	29	30	1	2	3
Travel to Batangas City and Fieldwork Team Meeting											
Tour of the Port of Batangas and Interviews with Stakeholders											
Site Visit of WasteCon Landfill and Interviews with Stakeholders											
Orientation of Sorters in San Jose Sico Cooperative											
WACS Day 1 for Port- and Vessel-Generated Waste											
WACS Day 2 for Port- and Vessel-Generated Waste											
WACS Day 3 for Port- and Vessel-Generated Waste											

ANNEX D. INTERVIEW DATES WITH STAKEHOLDERS

Stakeholders	Date of Interview
Norwegian Training Institute	June 16, 2021
Philippine Liner Shipping Association	June 22, 2021
iPrudential Batangas	June 23 and September 24, 2021
2GO	June 30, 2021
Royal Caribbean	July 8, 2021
WasteCon	July 15 and September 25, 2021
Asian Terminal Inc.	August 17 and September 24, 2021
Port of Batangas Phase II Janitorial Service	September 24, 2021
Passenger Terminal 3 Janitorial Service	September 24, 2021
Passenger Terminal 2 Food Vendor	September 24, 2021
Passenger Terminal 2 Dry Goods Vendor	September 24, 2021
Montenegro Shipping Lines, Inc.	September 24, 2021
San Jose Sico Cooperative	September 25, 2021
Starlite Enterprise	September 29, 2021

ANNEX E. CONTROL LEVEL OF RECOVERY FACILITIES

Control Level	Other Recovery Facilities (Without Incineration)
Full Control	☐ Built to and operating in compliance with current national laws and standards ☐ Pollution control compliant to environmental standards ☐ Protection of workers' health and safety ☐ The nutrient value of biologically treated materials utilized for separate organic waste (e.g., in agriculture/horticulture) ☐ Materials are extracted, processed according to market specifications, and sold to recycling markets ☐ Weighing and recording of incoming loads conducted ☐ All outgoing loads registered by weight and type of destination
Improved Control	☐ Engineered facilities with effective process control ☐ Pollution control compliant to environmental standards ☐ Protection of workers' health and safety ☐ Evidence of materials extracted being delivered into recycling or recovery markets. ☐ Weighing and recording of incoming and outgoing loads conducted
Basic Control	☐ Registered facilities with marked boundaries ☐ Some environmental pollution controls ☐ Provisions made for workers' health and safety ☐ Weighing and recording of incoming and outgoing loads conducted
Limited Control	☐ Unregistered facilities with distinguishable boundaries ☐ No environmental pollution controls ☐ No provisions made for workers' health and safety ☐ Weighing and recording conducted
No Control	☐ Unregistered locations with no distinguishable boundaries ☐ No provisions made for workers' health and safety ☐ No environmental pollution control

ANNEX F. CONTROL LEVEL OF DISPOSAL FACILITIES

Control Level	Other Recovery Facilities (Without Incineration)
Full Control	☐ Waste daily covered ☐ Waste compacted ☐ Site fenced and full 24-hour control of access ☐ Properly sited, designed, and functional sanitary landfill ☐ Leachate containment and treatment (naturally consolidated clay on the site or constructed liner) ☐ Landfill gas collection and flaring and/or utilization ☐ Site staffed ☐ Post closure plan ☐ Weighing and recording conducted ☐ Protection of workers' health and safety
Improved Control	☐ Waste periodically covered ☐ Waste compacted ☐ Site fenced and control of access ☐ Leachate containment and treatment ☐ Landfill gas collection (depending on landfill technology) ☐ Site staffed ☐ Weighing and recording conducted ☐ Protection of workers' health and safety
Basic Control	☐ Some use of cover ☐ Waste compacted ☐ Sufficient equipment for compaction ☐ Site fenced and control of access ☐ No fire/smoke existence ☐ Site staffed ☐ Weighing and recording conducted ☐ The slope of the landfill is stable, landslides not possible ☐ Protection of workers' health and safety
Limited Control	☐ No cover ☐ Some compactions ☐ Some equipment for compaction ☐ Some level of access control/fencing ☐ No leachate controls ☐ Some fire/smoke existence ☐ Site staffed ☐ Weighing and recording conducted ☐ The slope of the landfill is unstable with high possibility of a landslide
No Control	☐ No cover ☐ No compaction ☐ No/ limited equipment ☐ No fencing ☐ No leachate controls ☐ Fire/smoke existence ☐ No staff ☐ The slope of the landfill is unstable with high possibility of a landslide

ANNEX G. GROSS TONNAGE OF VESSELS AT PORT OF BATANGAS

Vessel Name	Gross Tonnage (cbm)
Annapolis	3328.08
Aquarius 77	63117.49
Archer	7711.75
Archer	7711.75
Baleno 1	1225.673
Baleno 1/Besta Shipping Lines Inc.	1225.673
Baleno 5	1332.8734
Cn Androusa	114731.03
Crane Regulars	12384.08
Fastcat M15	2060.24
Fastcat M18	2046.09
Fastcat M20	2428.14
Grand Unity	1825.35
Jewel Faith	2459.27
Lewek Hydra	8945.63
Ma. Wynona	2578.13
Ma. Yasmina	560.9909
Ma. Zenaida	1782.3057
Ma. Zeneda	1782.3057
MT Maringal	5753.39
MT Maunlad	3152.62
MT Sandro	19971.31
MT Yoona Faith	6741.06
MT Tapilon	2753.59
MV Masbate City	6888.22
Pacific	1411.4908
Reina de Luna	1938.55
Reina del Rosario	5923.19
Reina delas Flores	2793.21
Reina Immaculada	3636.55
Roro Master 2	2258.34
Roro Master 5	2204.57
Salve Regina	8331.52
Santa Brigida	2416.82
Santa Carmelita	1941.38
Santa Soledad	1938.55
Saturn	7641
SCF Alpine	36246.64
Site Incheon	28348.11
St. Ignatius of Loyola	7994.75
Stella Maria	8487.17
Stella Maris	8487.17
Sto. Domingo	2309.28
Subaru	27046.31
Venus	14616.95
Viva Marian Queen	2648.88

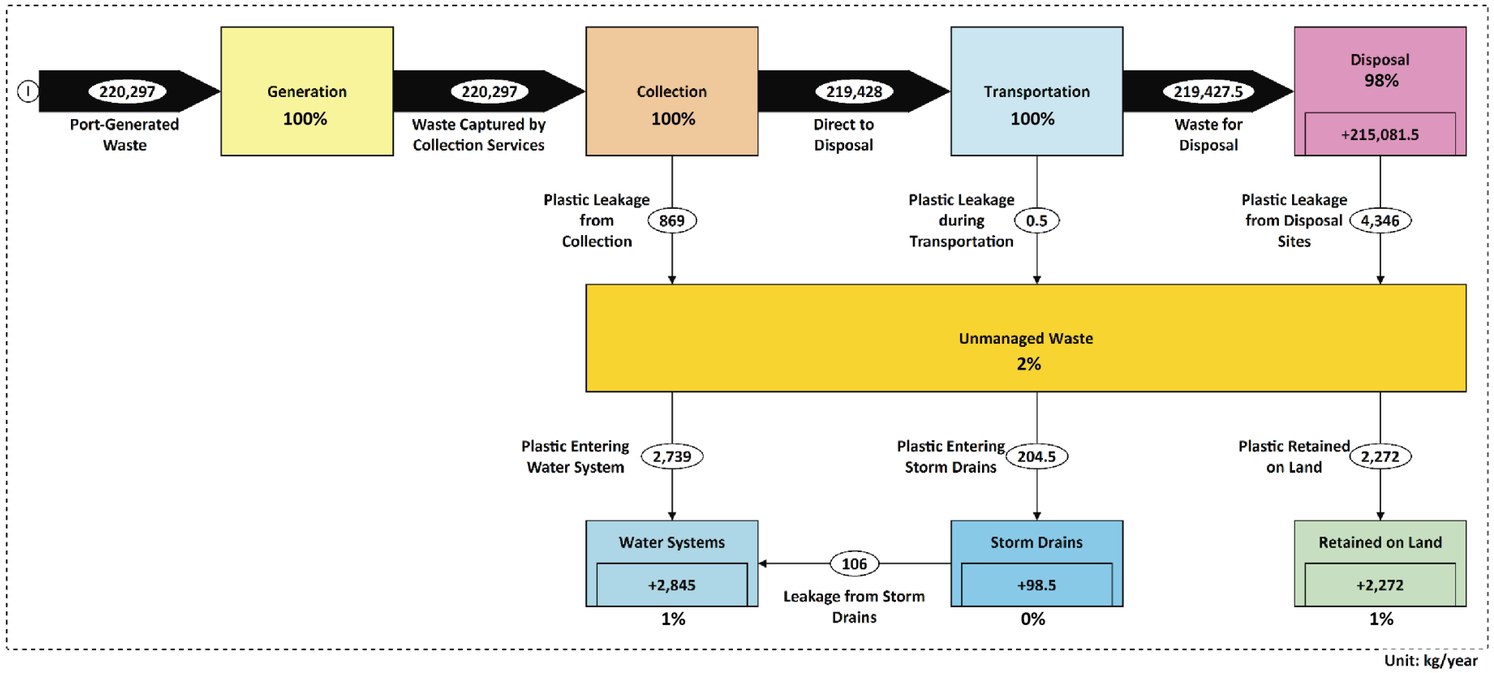
ANNEX H. WASTE FLOW DIAGRAMS LEAKAGE CALCULATIONS FROM LEAKAGE INFLUENCERS AND FATES OF PLASTIC

Leakage Influencer	Grade	Value	Percentage	Port-Generated Waste (kg/year)	Vessel-Generated Waste (kg/year)
Leakage from Collection Services					
Collection Containers	Medium	1.0	2.000%	869	2,103
Loading Method	High	1.0			
Primary Transportation	Low	0.0			
Multiple Handling / Waste Transfer	Low	0.0			
Leakage during Transportation to Disposal					
Capacity vs Load	Low	0.1	0.001%	.5	1
Waste Containment	Low	0.1			
Vehicle Cover	Medium	0.1			
Leakage from Disposal Facilities					
Environmental Hazards	Medium	10.0	10.005%	4346	10,357
Exposure to Weather	Low	0.1			
Waste Handling	High	0.95			
Coverage	Low	0.1			
Burning	Very High	1.0			
Fencing	Medium	0.5			
Leakage in Storm Drains Entering Waterways					
Frequency of Rainfall / Storms	Medium	60.0	52.000%	106	257
Drain Cleaning	Very Low	0.8			

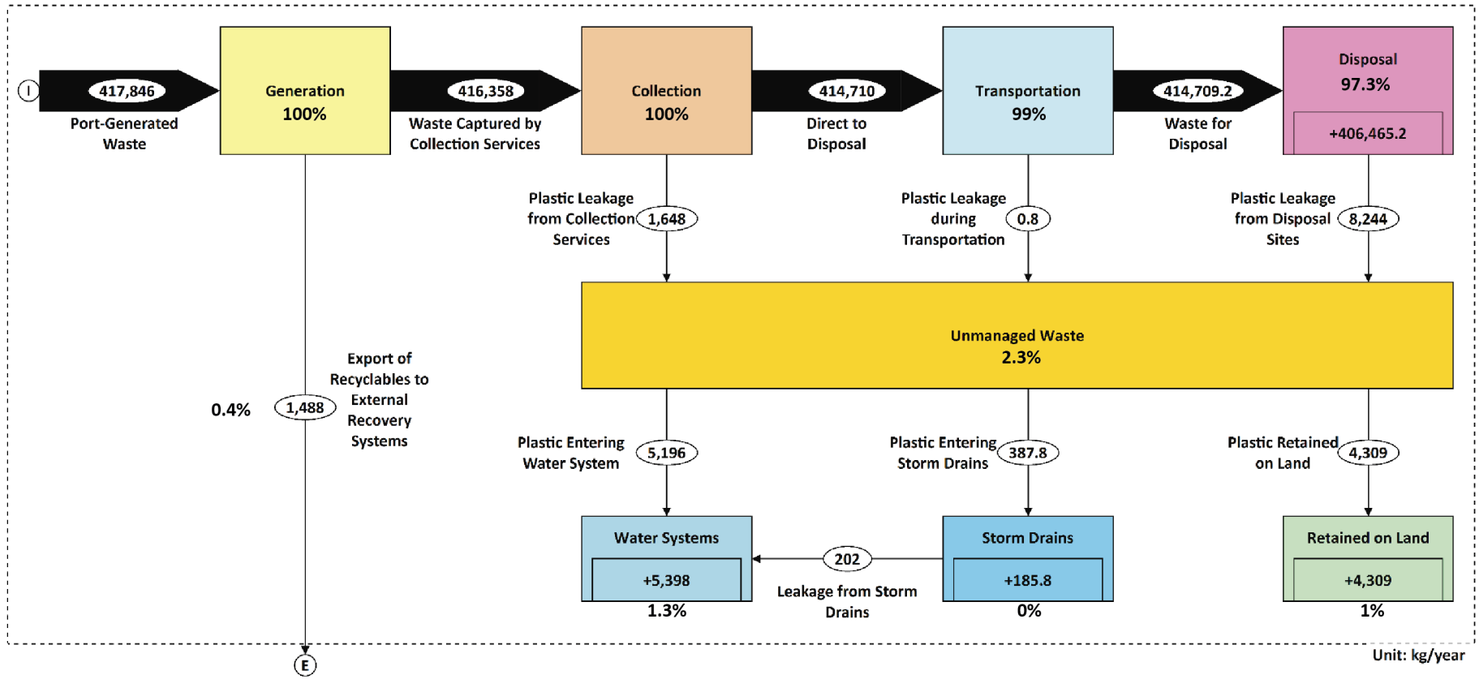
Item	Grade	Value	Percentage
Fate of Plastic Leaked during Collection			
Level of Plastic to Land	Low	0.40	47.06%
Level of Plastic to Drains	Low	0.20	23.53%
Level of Plastic to Water Systems	Very High	0.25	29.41%
Fate of Plastic Leaked during Transportation			
Level of Plastic to Land	Low	0.40	47.06%
Level of Plastic to Drains	Low	0.20	23.53%
Level of Plastic to Water Systems	Very High	0.25	29.41%
Fate of Plastic Leaked from Disposal Facilities			
Level of Plastic to Land	Medium	0.60	42.86%
Level of Plastic to Drains	None	0.00	0.00%
Level of Plastic to Water Systems	Very High	0.80	57.14%

Fate of Plastic Leakage	Port-Generated Waste (kg/year)	Vessel-Generated Waste (kg/year)
Plastic Retained on Land	2,272	5,429
Plastic Waste Entering Storm Drains	204.5	238
Plastic Entering Water Systems	2,739	6,794

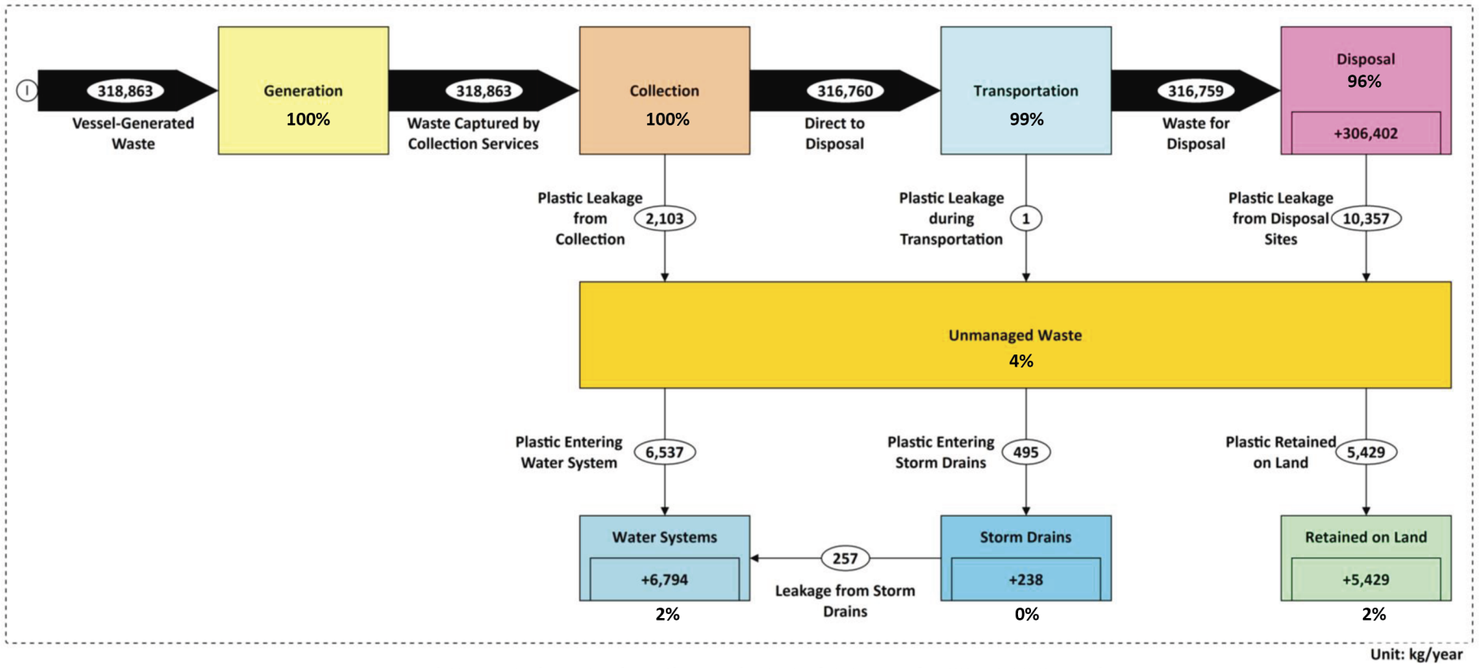
ANNEX I. PORT AND VESSEL-GENERATED WASTE FLOW DIAGRAMS FOR COVID-19 AND PRE-COVID SCENARIO



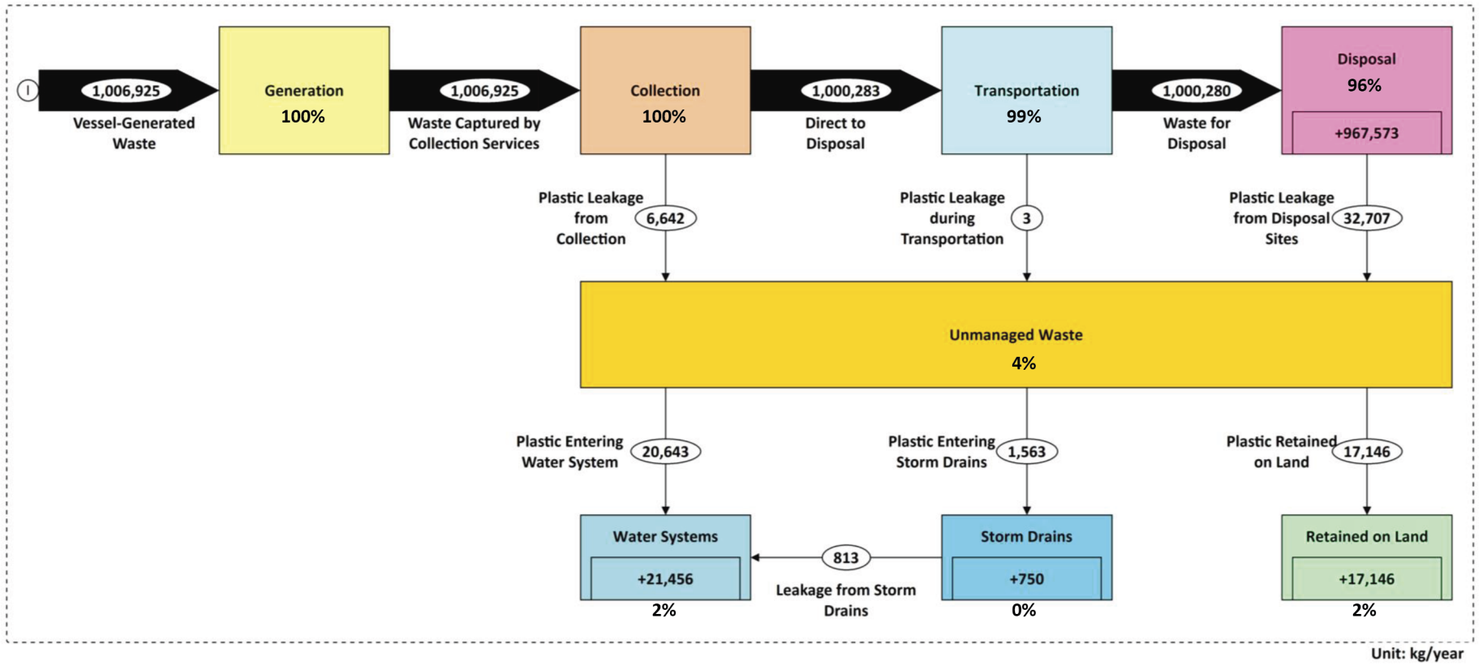
Port-Generated Waste Flow Diagram in Port of Batangas for COVID-19 Scenario



Port-Generated Waste Flow Diagram in Port of Batangas for Pre-COVID-19 Scenario



Vessel-Generated Waste Flow Diagram in Port of Batangas for COVID-19 Scenario



Vessel-Generated Waste Flow Diagram in Port of Batangas for Pre-COVID-19 Scenario

WWF-Philippines

November 2021