



Commonwealth of the Northern Mariana Islands

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Commonwealth of the Northern Mariana Islands

Tinian Zero Waste Plan

October 15, 2024

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1 - Executive Summary

This document provides a plan for the Island of Tinian to implement zero waste principles and practices. It states the plan's purpose, goals and objectives. It presents the existing system, current waste composition, current policies, technical challenges, recommendations and progress monitoring and measurements towards the stated goals and objectives.

The primary waste streams are residential and commercial municipal solid waste and recycled material streams and that they are to be managed based on the recommendations discussed with Tinian DPW and the Tinian Mayor's Office through the Tinian Solid Waste Management Working Group. It is important to note that at the direction of OPD, waste streams from major Department of Defense (DoD) projects on Tinian were not considered in this plan, and these DOD projects may contribute significantly to future waste stream volumes and characteristics which will require consideration for a wholistic approach on the island.

The island of Tinian had a population was 2,044 in 2020. Annually, the island generates an estimated 683 tons of waste total.¹ This zero waste plan targets three broad material categories in order to protect Tinian's residents, safeguard the environment, and conserve economic resources. The three material categories are:

Fiber - The key strategies for managing fiber waste in Tinian focus on enhancing fiber recycling programs, reducing fiber waste generation, promoting recycling and composting, and implementing an effective public awareness campaign. By implementing these strategies, Tinian can significantly reduce landfill use and greenhouse gas emissions and improve the soil health of the island.

Plastics - The key strategies for managing plastic waste in Tinian focus on reducing plastic waste generation, enhancing plastic recycling programs, and promoting waste diversion opportunities. By implementing these strategies, Tinian can significantly reduce landfill use, reduce plastic pollution, protect wildlife, and promote sustainability within the community.

Organics – The key strategies for reducing organic waste in Tinian focus on enhancing edible food recovery/donation, composting programs, exploring small-scale anaerobic or aerobic digestion opportunities, and implementing an effective public awareness campaign. By implementing these strategies, Tinian can significantly reduce landfill use and greenhouse gas emissions, promote the use of renewable energy, and improve the soil health of the island

The Plan includes short-term (1-3 years), mid-term (4-5 years), and long-term (6-10 years) goals that address the prioritized material streams with prioritized short-term action items to achieve environmental compliance and provide a foundation for planning to achieve "zero waste" down the line. Foundational elements necessary for the effective implementation of a zero waste program on Tinian are also included in the Plan. These elements include:

- 1) Strong Governance,
- 2) Sustainable Funding,
- 3) Public Outreach and Education,
- 4) Monitoring, Measurement, and Reporting, and

¹ Due to limited Infrastructure, such as the lack of vehicle scales at the landfill, there are challenges to capturing waste tonnage data for the island of Tinian. MSW (residential and commercial) is estimated to be 520 TPY, with Yard Waste varying from 80 TPY up to 160 TPY and recycling being roughly 3 TPY

5) Infrastructure Development.

The estimated costs associated with implementing the recommendations can be found in Section 10 and there is a total of \$3.9 million dollars for 1–3-year short term recommendations, \$1.3 million dollars for mid-term 4–5-year recommendations, and \$3.6 million dollars for longer term 6-10 year recommendations.

2 - Introduction

2.1 - Introduction

The island of Tinian is a small community nestled in the heart of the Commonwealth of the Northern Mariana Islands (CNMI), a commonwealth to the United States located in the Western Pacific. Its vibrant population was 2,044 in 2020.² Despite its small size, Tinian Island is a prime example of a community where practicality reigns in all decisions, including the decision to embark on a journey towards zero waste planning. This document explores the challenge of “zero waste” on Tinian. It considers approaches to the challenge, focusing on this community's unique characteristics and the necessity of practical approaches to realize its vision.

Tinian's unique geographical characteristics, including its small population and a strong sense of community, present challenges and opportunities in implementing the zero waste principles and practices. The island's close-knit society facilitates collective action towards sustainable waste and materials management, aligning with the CNMI's theme of growing inclusive, cohesive communities to achieve shared visions and sustain CNMI (2021-2030 CNMI Comprehensive Sustainable Development Plan).³

This communal strength is valuable in educating and engaging residents about zero waste principles and practices. By investing in sustainable waste and material management infrastructure and practices today, Tinian is safeguarding its environmental heritage and ensuring current and future residents' prosperity, security, and health. This Tinian Zero Waste Plan intends to address immediate waste and material management needs and contribute to the island's broader economic diversification and job creation goals in the environmental sector.

The cultural and environmental heritage of Tinian is of paramount importance to its residents, and this Tinian Zero Waste Plan reflects this value by emphasizing the sustainable conservation and use of natural resources to meet current development needs without compromising the needs of future generations. This approach supports environmental conservation and contributes to economic diversification and job creation, ensuring a holistic and sustainable future for Tinian.

2.2 - Tinian Embarks on a Zero Waste Plan

In the spring of 2021, the Office of Planning and Development (OPD), in partnership with the Department of Public Works (DPW) and the Office of the Mayor of Tinian, sought proposals from qualified contractors to develop a Zero Waste assessment, pilot project, and Management Plan recommendations specific to “Zero Waste” for current and projected future waste streams for the Municipality of Tinian and Aguiguan.

The Tinian Zero Waste Plan aligns with the island's broader vision for sustainable development, as outlined in the 2021-2030 CNMI Comprehensive Sustainable Development Plan. This vision, which guides the planning strategy for Tinian, aims to secure a better quality of life for all residents of Tinian and future generations through planning, developing, and implementing cross-cutting actions that support the CNMI's sustainable development goals. Creating the first Tinian Zero Waste Plan represents a significant step towards achieving these goals, focusing on sustainable waste management practices that will contribute to

² US Census Bureau (2020). Source: <https://www2.census.gov/programs-surveys/decennial/2020/data/island-areas/commonwealth-of-the-northern-mariana-islands/population-and-housing-unit-counts/commonwealth-northern-mariana-islands-phc-table02.pdf>

³ The CNMI 2021-2030 Comprehensive Sustainable Development Plan is available online here: <https://opd.gov.mp/library/etc/sw-plan-docs/a6-cnmi-comprehensive-sustainable-development-plan.pdf>

the island's environmental conservation efforts and long-term sustainability, including efforts to combat climate pollution and marine debris.

This Tinian Zero Waste Plan is the result of a collaborative effort between the Tinian Solid Waste Management Working Group, including representatives from the Office of the Mayor of Tinian and Aguiguan, Tinian Department of Public Works, the Office of Planning and Development, feedback from the existing Inter-Island Integrated Solid Waste Management Taskforce (Taskforce)⁴, and supported by Gershman, Brickner & Bratton, Inc. (GBB), a solid waste management consulting firm that has worked in the Western Pacific for many years.

2.3 - Reduction and Reuse always come before Recycling

To begin thinking about achieving zero waste, Tinian must recognize the importance of waste reduction efforts as a crucial first step. By minimizing the amount of waste generated in the community, they can not only reduce their environmental footprint but also preserve their resources. This involves implementing education and awareness programs to promote sustainable practices among residents and businesses, as well as exploring innovative solutions/material bans to reduce packaging waste and encourage reusable and compostable alternatives. Examples include such as Guam’s plastic bag ban, American Samoa’s Styrofoam ban, or the Oahu and the Bahama’s single-use plastic bans.

Sustainable Materials Management Hierarchy

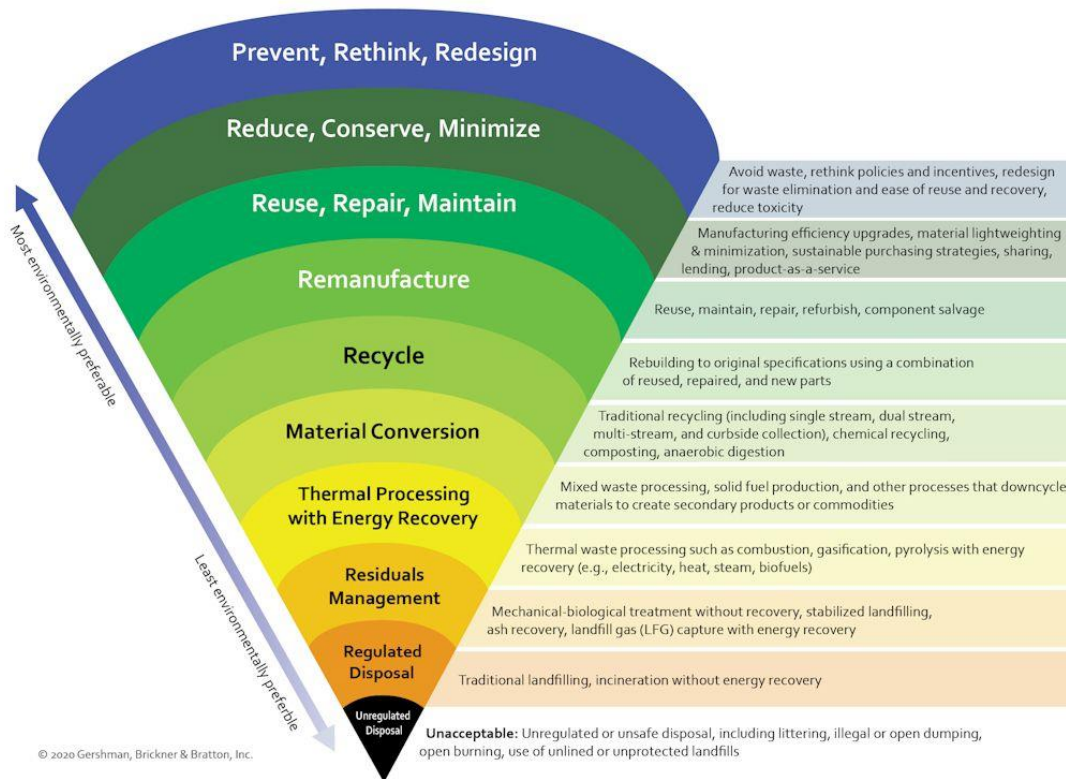


Figure 1 - Sustainable Materials Management Hierarchy

⁴ The Taskforce is comprised of participants from OPD, DPW, BECQ, CNMI Mayor's Offices, and the EPA.

The Sustainable Materials Management Hierarchy prioritizes waste prevention and reduction above all other methods of disposal, including composting, recycling, and landfilling. However, not all waste can be prevented, and the hierarchy also describes the most environmentally preferable methods of management, with composting and recycling at the highest of the material management options (see the “Recycle” level description in **Error! Reference source not found.**).

While some industries do exist in Tinian, the industries that typically would use mass amounts of recycled commodities in manufacturing do not. However, farming and ranching are present on the Tinan, and fortunately, composting is an on-island solution and farming go hand-in-hand. While maximizing the recyclability of materials is key to eventually being recycled, any traditional recycling efforts other than composting would require cooperation with nearby islands, Saipan and Rota, and may require export to other markets, both foreign and/or domestic.

By enhancing Tinian’s current recycling infrastructure (plastics and paper are accepted at its Transfer Station), including the additional collection of high-value metals, recyclable glass, and compostable materials, the community can aim to minimize the amount of waste sent to the landfill an increase waste diversion by up to 52% (assuming reasonable recovery of the most easily recyclable materials), thereby mitigating the waste’s environmental impact. This requires collaboration with local residents, businesses, agencies, and organizations to develop effective systems for the collection, sorting, processing, and shipping of recyclable materials.

Practicality is at the core of decision-making on Tinian Island. Being cognizant of limited resources and geographical constraints, the community understands that every action taken must be efficient and result oriented. This mindset must extend to an approach towards waste management as well. Instead of adopting lofty ideals without considering practical implications, Tinian Island must take concrete steps towards waste reduction, composting, and recycling, focusing on what is feasible and attainable within its local context.

The Plan includes short-term (1-3 years), mid-term (5 years), and long-term (10-years) goals with prioritized short-term action items to achieve environmental compliance and provide a foundation for planning to achieve “zero waste” down the line. Foundational elements necessary for the effective implementation of a zero waste program on Tinian are also included in the Plan. These elements include:

- 1) Strong Governance,
- 2) Sustainable Funding,
- 3) Public Outreach and Education,
- 4) Monitoring, Measurement, and Reporting, and
- 5) Infrastructure Development, as well as a consideration of the costs associated with all recommendations.

2.4 - The Scope of the Challenge: How much waste?

Underscoring Tinian’s challenges in waste management is the total production of waste, which is not much relative to other mainland areas. Typically, waste management planning models can assume certain economies of scale if enough waste is captured as a resource for a solid waste system. That is not the case for Tinian with its small population. Tinian generates approximately 683 tons of waste per year of MSW (not including C&D materials). Using the latest CNMI 2020 population data, this would be a generation rate of 1.8 pounds/person/day, 63% less than the most recent U.S. estimate of 4.9 pounds/person/day. (Source:

EPA, <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>).

Table 1 - Summary of Annual Waste Generation in Tinian

Major Material Category	Annual waste generation estimate per major material category
Fiber	139
Plastics	127
Glass	33
Metals	48
Organics	77
Others	96
Total	520

As described in Section 8.3 - , this Zero Waste plan suggests approaches to diverting more than 50% of the waste generated annually, which would support CNMI’s 10-year Sustainable Development Goal of diverting 50% of the recyclable waste stream from CNMI's waste management facilities by 2030.

2.5 - Funding Options

In Section 8 - , the plan discusses sustainable funding options for Tinian to retrofit and improve its current waste management infrastructure. Sustainable funding for waste reduction and safe waste management is critical to protect human health and the environment.

3 - Tinian's Zero Waste Plan Overview

3.1 - Purpose

The plan's purpose is to support Tinian's leadership in working towards sustaining an environmentally friendly and effective "Zero Waste" model that leverages the newly constructed transfer station, maximizes reuse and composting opportunities, ensures cost-effective management options for Tinian's residents, aligns with concurrent planning updates, and fills data gaps to support Tinian's policy and program development.

Tinian Leadership has identified the goal of working towards an environmentally friendly and effective "Zero Waste" model that leverages the newly constructed transfer station, maximizes composting opportunities, and ensures cost-effective management options for approximately 2,000 residents. The "Zero Waste" focus is in part due to geographic advantages, as the entire resident population of approximately 700-800 households is situated in an area of about three (3) square kilometers within seven (7) housing subdivisions.

It is important to note that "Zero Waste" is a framework goal to strive for while balancing the overall triple bottom line of economic, environmental, and social needs of the residents and businesses on Tinian. This Plan identifies opportunities to lessen waste to the benefit of the environment while supporting Tinian's economic realities, i.e., not dramatically increasing costs to the island's inhabitants, as much as possible.

CNMI faces significant economic challenges, with a per capita income of \$13,594 with 38% of people living below the poverty level and 48.7% of children under 18 living below the poverty level compared the U.S. per capita income of \$38,322, with 11.6% of the population below the poverty level and 15.8% of children under 18 living below the poverty level.^{5,6,7} This Plan identifies opportunities to lessen waste to the benefit of the environment while supporting Tinian's economic realities, i.e., not dramatically increasing costs to the island's inhabitants, as much as possible.

3.2 - Zero Waste Definition

"Zero Waste" has been defined by many communities nationwide and has been described differently by various entities. This Plan utilizes the definition of "zero waste" that was defined in the Office of the Governor's Proclamation⁸ in March 2023:

- Zero Waste International Alliance defines "Zero Waste" as the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.

⁵ U.S. Census Bureau (2022). 2020 Decennial Island Areas Censuses Demographic Profiles, Table DP3, Selected Economic Characteristics, Northern Mariana Islands Demographic Profile, accessed at: <https://data.census.gov/cedsci/table?t=Income%20%28Households,%20Families,%20Individuals%29&g=0400000US69&tid=DECENIALD PMP2020.DP3>

⁶ U.S. Census Bureau (2022). American Community Survey, 2021 Per Capita Income in the Past 12 Months, Table B19301, United States, accessed at: <https://data.census.gov/cedsci/table?q=per%20capita&g=0100000US&tid=ACSDT1Y2021.B19301>

⁷ U.S. Census Bureau (2022). Current Population Survey. 2022 Annual Social and Economic Supplement, Table POV01, Age and Sex of All People, Family Members and Unrelated Individuals: 2021 Below 100% of Poverty – All Races, accessed at: <https://www.census.gov/data/tables/time-series/demo/income-poverty/cps-pov/pov-01.html>

⁸ Office of the Governor Proclamation, March 2023. Source: <https://governor.gov.mp/news/proclamation-cnmi-zero-waste-week-march-27-2023-april-2-2023/>

- *This definition aligns with the peer-reviewed definition of zero waste.*
- Additionally, The CNMI's 2021-2030 Comprehensive Sustainable Development Plan (CSDP) describes a 10-year Sustainable Development Goal of diverting 50% of the recyclable waste stream from the CNMI's waste management facilities by 2030.

3.3 - Goals and Objectives

The Zero Waste Plan's objective is to include short-term (1-3 years), mid-term (3-5 years) long-term (5-10 years) goals with prioritized short-term action items to achieve Zero Waste and environmental compliance that at a minimum:

- Protect the environment by minimizing marine debris, reducing litter and illegal dumping, and reducing greenhouse gasses and other negative environmental impacts as a result of regular waste management activities.
- Increase diversion of organic materials to 50% by 2030
- Increase efficient and responsible management of waste collection, disposal, and general administration, including establishing a measurement program covering imports, disposal, and diversion (source reduction, reuse, recycling, and composting) to support and track monthly progress and publicly report annual progress
- Update to existing operational work plans and Standard Operating Procedures
- Outline and improve site maintenance, training, and public engagement
- Assess the financial feasibility of recommendations, including details regarding existing funding and opportunities to supplement program funding to achieve efficient and sustainable program costs. Include an initial cost-benefit analysis and implementation suggestions
- Reference model legislation and policies

Refer to Section 8.2 - for a description of the existing policies and what is necessary to establish a Zero Waste Policy Framework for the future.

In the next sections, we describe the existing solid waste management infrastructure and policies in Tinian to give the reader an understanding of what disposal facilities are currently available to residents and local businesses and how these facilities, along with the collection activities associated with waste and recycling, are governed.

4 - Tinian's Existing Solid Waste Management System

4.1 - Overview of Current Practices and Opportunities

Tinian's current solid waste management practices primarily involve handling municipal solid waste (MSW) from households and commercial businesses. These are by far the primary waste streams within the system. The key points are as follows:

4.1.1 - Background

Based on the estimates generated during the pilot, GBB estimated that Tinian generates less than 20,000 pounds (10 tons) of MSW weekly, or approximately 520 tons per year, which is inclusive of waste and recycling materials. A five-day waste characterization study analyzed 34 samples of waste materials, sorting them into 15 categories. The two largest categories in the MSW stream were Fibers (27%) and Plastics (25%), accounting for 52% of the total waste by weight. Potential recyclable or divertible materials included metals (9%) and glass (6%).

The waste evaluated in the recent field study focused on Tinian households and commercial businesses, excluding Department of Defense (DOD) military activities and most Construction and Demolition (C&D) materials. Notably, C&D waste, mainly wood and lumber, is being source-separated at the landfill, indicating potential for future use and underlining the importance of waste diversion.

4.1.2 - Opportunities for Improvement

A summary of the opportunities where Tinian can improve its solid waste management system include:

- **Regulatory Compliance:**
The current open dump facility, known as the *Puntan Diablo* land disposal facility, is unpermitted and does not comply with environmental regulations.
- **Equipment Issues:**
During the study period, most of the landfill and recycling equipment was non-functional, leading to problems with waste management, including difficulties in covering the waste and managing vectors like flies.
- **Limited Infrastructure:**
The lack of vehicle scales at the landfill makes it difficult to measure the amount of waste being disposed of accurately.
- **Collection System Inefficiencies:**
There is no formal collections nor collection truck equipment on the island. All waste and recyclables are brought by private citizens to the landfill or the transfer station (mostly the landfill). Some informal collections are performed by private citizens at certain commercial locations, and contractors bring their own C&D waste to the landfill.

We delve into these opportunities for improvement that are associated with specific materials in Section 0 of this plan.

4.2 - Current Practices & Infrastructure

4.2.1 - Disposal Facilities

There are three primary facilities used for managing waste and recycling in Tinian:

1. The Puntan Diablo Open Dump
2. The Tinian Transfer Station, and
3. The Yard Debris Lot

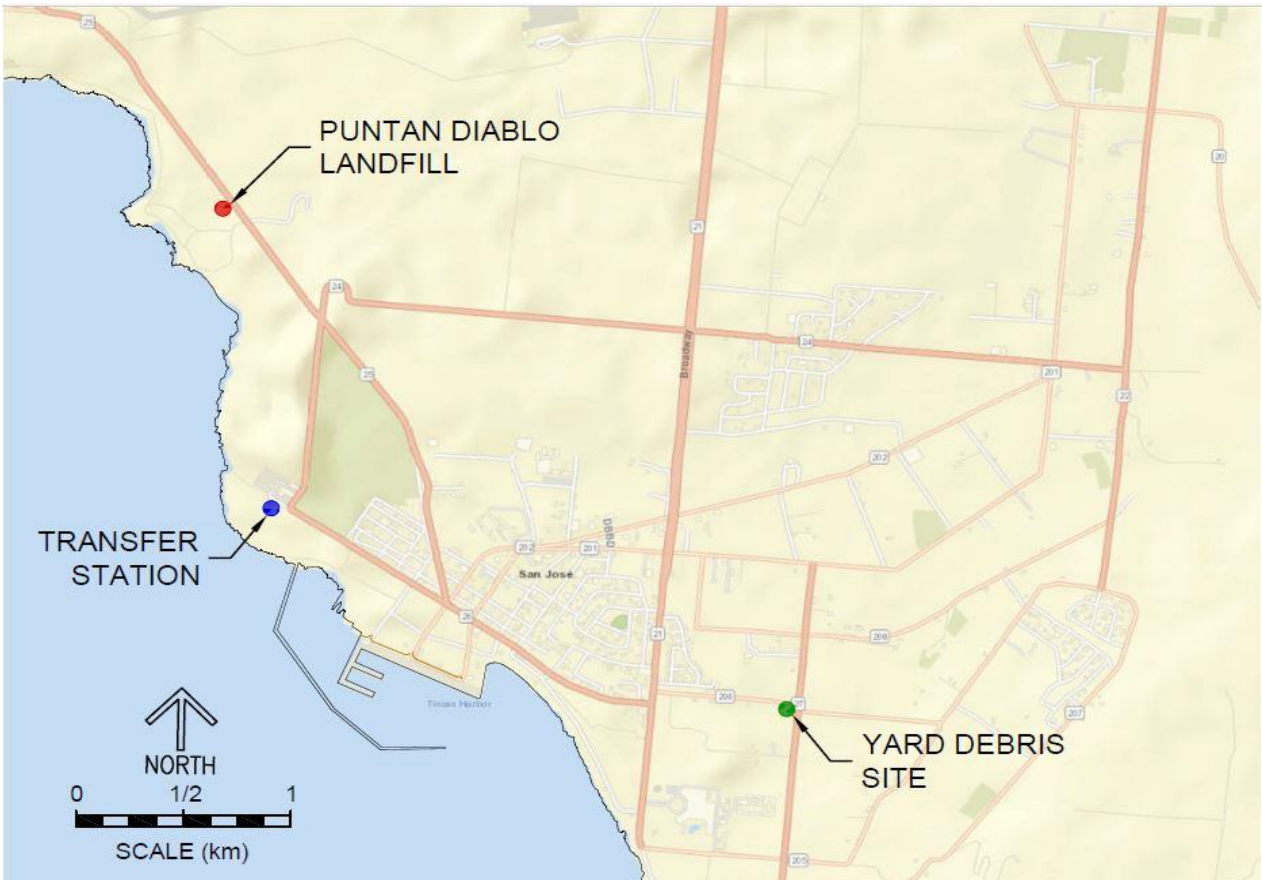


Figure 2 - Locations of the three primary facilities for waste management in Tinian

The Puntan Diablo Open Dump

Overview

Puntan Diablo is the only active land disposal facility in Tinian, which is referred to as a dump⁹. The dump is a non-RCRA D facility, meaning it is out of compliance with the U.S. EPA RCRA D landfill requirements. The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 and is the principal Federal law in the U.S. governing the disposal of solid waste and hazardous waste establishes the framework for a

⁹ The *Puntan Diablo Open Dump* is often called a “Landfill,” a “Sanitary Landfill,” or a “Sanitary Dump;” the terms are used interchangeably; however, the facility is currently an unpermitted open dump.

national system of solid waste control. Subtitle D of the Act is dedicated to non-hazardous solid waste requirements.

The facility is in the municipality of Tinian (Lot 204T 13, Latitude: Approximately 15.1234° N, Longitude: Approximately 145.6789° E) and opened in 1980.¹⁰ The site is about 26,095 square meters and accepts an estimated amount of less than 20,000 pounds (10 tons) of municipal solid waste (MSW) per week from Tinian Island residents and businesses, or approximately 520 tons yearly. The site also collects clean lumber, white goods and other metals, and tires in separate piles.



Figure 3 - Gated Entrance at the Dump

Operations and Management

Municipal waste accepted at the dump is pushed and spread out using a dozer. The Tinian Department of Public Works (DPW) manages the facility. The site is gated with a chain-link fence and includes a small, air-conditioned break room near the gate for an attendant. The facility is open from 8:00 AM to 4:00 PM (Monday through Saturday).

At the time of the assessment by GBB in March 2021, the number of employees and specific daily management activities, such as the frequency of daily cover application and compaction practices, still remain to be detailed. Additionally, information on waste segregation practices and the handling of hazardous or special waste is not provided by Tinian sources for this report. Additionally, the dump is under an Administrative Order issued by BECQ, since January 2010, and recently a Notice of Violation issued in 2021 to correct compliance issues with local environmental regulations. However, these information gaps and non-compliance issues are expected to be resolved upon the award of RFP24-OPD/DPW/MOTA-42400072, which involves assessing, designing, and permitting the *Puntan Diablo Small Community Exempt Landfill (SCEL)*. The transition of the dump into a properly managed and permitted sanitary landfill will be a great improvement for solid waste management on Tinian.

While this improvement may not necessarily lead the island toward the goal of “zero waste”, its importance should not be underestimated as there are environmental protections inherent in modernizing a dump to become a RCRA compliant landfill, such as greenhouse gas emissions reduction, litter prevention, vector reduction, and improvements in stormwater/runoff management and quality of life for those that live near the site.

Equipment

The dump currently has two pieces of equipment, though both were experiencing operational issues during the on-site visit. Details regarding the types of equipment used for daily operations, their maintenance schedules, and any associated operational challenges are still needed.

¹⁰ The year that the Puntan Diablo Open Dump opened was provided by Elizabeth S. Balajadia, P.E, CIP Administrator/State Hazard Mitigation Officer, Office of the Governor, supported by Bill Cing and Joaquin Borja.

Table 2 - Equipment at the Puntan Diablo Open Dump

EQUIPMENT TYPE	MAKE	MODEL	STATUS
Bulldozer	CAT	D6T XL	This equipment was inoperable for most of the time we were on-site until a part came in, and it was able to operate.
Wheel Excavator	CAT	M318D	This equipment was inoperable during the on-site visit due to massive hydraulic leaking. (The team tried to operate it, but it lasted about 30 minutes.)



Figure 4 - Bulldozer & Wheel Excavator (left to right)

Environmental and Safety Considerations

At the time of the site visit, there was no apparent landfill gas management, and there was no information on whether the facility experiences recurrent fires or has established safety protocols. Additionally, specifics on the remaining airspace capacity of the landfill are unknown at this time. There is also no apparent environmental monitoring programs, such as groundwater and surface water monitoring, or the presence and management of a leachate collection system.

Public health measures and safety protocols for nearby residents are not described, and the details of the landfill design features and compliance with environmental regulations are missing. Furthermore, there is a lack of information on closure plans and post-closure care for the landfill site. However, these information gaps are expected to be resolved upon the award of RFP24-OPD/DPW/MOTA-42400072, which involves assessing, designing, and permitting the *Puntan Diablo Small Community Exempt Landfill (SCEL)*.

Fees and Charges

To tip waste at the landfill, trucks or cars can be charged (but they are not presently charged) based on a specific fee structure (see Table 3 below). The absence of vehicle scales at the Tinian landfill complicates the accurate measurement of waste volume, presenting challenges for effective waste management and fee assessment. The tipping fees for organics, fibers, plastic, metals, and glass are outlined below. However, this information is most applicable to the Marpi Landfill in Saipan where they have a truck scale.

Table 3 - Tipping Fee Schedule at Puntan Diablo Open Dump

MATERIAL TYPE ¹¹	GENERAL VOLUME	TIPPING FEE
Organics (Green Waste - Residential)	Per load	\$10.00
Organics (Green Waste - Other Disposers)	Per ton	\$35.00
Fibers (Recyclables)		Free of charge during normal operating hours at the Lower Base Transfer Station Recycling Facility (Marpi Landfill, Saipan).
Plastic (Recyclables)		
Metals (Recyclables)		
Glass (Recyclables)		

While Tinian’s goal of Zero Waste is to reduce the amount of waste disposed of and achieve 50% waste diversion from the landfill, some waste will ultimately be disposed of no matter what. Until true “zero waste” can be realized, managing day-to-day waste in a safe, lawful, and environmentally preferable manner is very important. Litter management on the island and at the site is currently a concern.

The Tinian Transfer Station & Recycling Center

Overview: There is one waste transfer station and recycling center in Tinian, CNMI Bureau of Coastal and Environmental Quality Solid Waste Facility Permit No. SWMF-T-TS-01-20222, Tinian Transfer Station Facility, located south of the existing Commonwealth Utilities Corporation Power Plant in San Jose Village, which opened in 2022.



Figure 5 - Transfer Station Entrance

The transfer station is approximately three acres in size, and it accepts an estimated 234 pounds of plastic (PET) and 5,184.5 pounds of cardboard (OCC) per year from Tinian Island residents and businesses. The facility accepts PET and OCC and stores them for sale as commodities in the recycled materials market. The facility does not accept municipal solid waste.

¹¹ Source: CNMI Solid Waste Collection and Disposal Regulations, T155-30.1, 2019

Any municipal waste brought to the site is redirected to the dump for disposal. The site has a weigh station with an axel scale, but it is unknown whether the scale is functional or how materials are tracked. It is assumed that the facility markets its own materials.

The facility is managed by the Tinian Department of Public Works with oversight by the Bureau of Environmental and Coastal Quality. The site is gated with a chain-link fence and has a small office building, a small storage building, a two-bay transfer station with a recessed compactor bay, and a small three-bay recycling storage building. The facility's open hours are 8:00 AM to 5:30 PM (Monday through Saturday), with an hour for lunch.

The facility is managed by the DPW's Solid Waste Management Division, which consists of a SWMD Branch Manager, an Administrative Officer, an Administrative Assistant, and one Equipment Operator. There is a stormwater drainage system on-site and the station has a fire suppression sprinkler system. Currently, they do not charge for receiving recyclables at this facility.

Transfer Station Equipment:

- The Transfer Station seems to be a storage location for some rolling stock equipment and accessories, but the Agency ownership of some of the equipment is uncertain, however it is not abandoned equipment.
- Transfer Station has an operational electric/hydraulic WasteEquip Compactor – Model #345TP, which has two medium size compactor collection boxes.
- An operational, nearly new, roll-off/compactor collection hook truck for compactor boxes.
- A wheel loader that is not operational at the time of the assessment and may not be repairable.
- An operational forklift that was also brought to the landfill to help during equipment maintenance
- An operational vertical Old Corrugated Cardboard (OCC) baler
- An operational Bandit-brand horizontal chipper for yard waste-type debris. It does not look large enough for much of the debris at the Yard Debris site and is likely used for smaller utility clearing and other household clean-up of shrubs and brush.



Figure 6 – Top to bottom: Transfer Station Scale, Bays, and Lot (aerial view)

- Several yard and brush management tools and equipment are at the transfer station site; however, the ownership of these items and how they are utilized are uncertain. If the DPW owns/operates these items, it may be worthwhile relocating them to the Yard Debris site.
- It appears DPW needs to develop an inventory of equipment and keep it updated with operational status and decommissioning/disposition action.

Additional images of equipment at the Transfer Station:



Compactor



Compactor Plate



Roll-off Truck

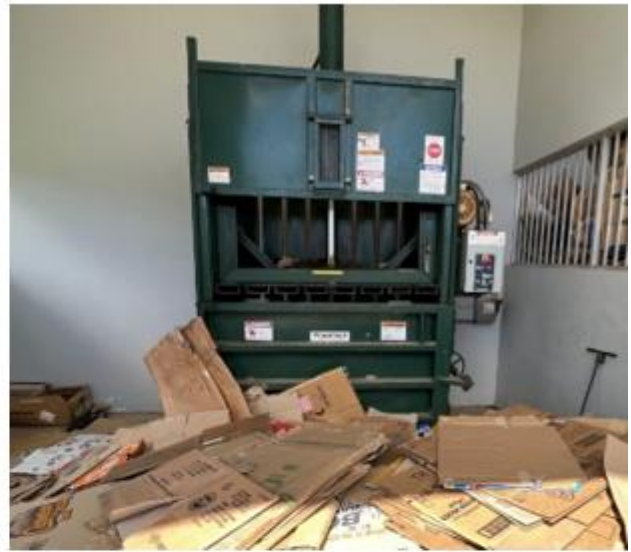


Wheel Loader

Figure 7 - Additional Transfer Station Equipment, Part 1



Forklift



OCC Baler



Chipper



Debris Lot Materials

Figure 8 - Additional Transfer Station Equipment, Part 2

The Yard Waste Debris Lot

Overview: There is one (1) yard waste debris site in Tinian, BECQ Solid Waste Facility Permit# SWMF-T-GWC-01-2022, named the Green Waste and Composting Facility but it is commonly referred to as the “Debris Lot”. It is located south of Route 206 and West of Route 27 at San Jose Village, and it opened in 2022. The debris lot is approximately 21,034 square meters in size, with a permitted green waste processing footprint of 0.9 acres. It accepts an estimated 645 cubic yards of waste per year from Tinian Island residents and businesses.

The facility is managed by the Tinian Department of Public Works with oversight by the Bureau of Environmental and Coastal Quality. The site is gated with a single-line gate cable and a metal framed entrance gate that is secured with a padlock and chain while the facility is closed. It has a small, non-air-conditioned break room (a steel container room) available near the gate for an attendant. It is open 8:00



Figure 9 - Debris Lot Entrance

AM to 4:00 PM (Monday through Saturday), with an hour and a half for lunch. The facility accepts yard waste and does not accept municipal solid waste (MSW).

The DPW currently lacks the necessary heavy equipment to chip raw green waste and manage compost piles. They also currently lack an adequate number of staff to collect tipping fees and to run and maintain equipment and equipment shelter/structure to properly compost the accepted material. The facility does not have a stormwater system. There

is a fire hydrant at the perimeter of the property, and the DPW has extended a two-inch water line into the property. Litter management at the site is currently a concern.

Debris Site Equipment: The Debris site did not have any equipment stored on-site at the time of the assessment.

Debris Site Opportunities for Improvement: As Tinian moves forward with composting to help achieve its waste diversion goal, this site will be an important part of the solution. Improving the site management by staffing it with team members who can accept yard waste, clean wood, and potentially food waste and food soiled paper, run the equipment to chip incoming materials, make, monitor and turn compost piles as needed, and screen the finished compost and make it available for the public would be a major step forward towards achieving zero waste.

The facility should be designed to be easily accessible to the public by vehicle to drop off organic waste, including yard waste, woody debris, and food waste. Elevating the management, capabilities, and capacity of this facility would help improve the image of composting and aid in its incorporation within the community. The facility has a sufficient footprint to grow in capacity.

When considering the collection of food waste in the future, it is recommended that drop areas be available in high traffic areas and accessible to various modes of transportation, including foot and bicycle.

The site has the potential to process 500 to 1,000 tons of organic waste in a year and this would be sufficient for Tinian's:

- Estimated 77 tons of organic waste in its MSW stream,
- Estimated 645 cubic yards of yard waste (or roughly 160 tons based on each cubic yard weighing 500 pounds) that the site currently receives annually, and
- Allow for growth or fluctuations in the amount of organic waste received, such as in the case of a natural disaster, which may help Tinian resume normal operations more quickly and generally help it be more resilient to climate change.

Collections

- All collections for green waste appeared to be from private collectors or from self-haul drop-off at the landfill site. Private collectors usually had a truck or flatbed for bringing materials. Construction debris came on flatbed trucks, some with a crane. There were no waste compactor trucks or equipment observed to come to the landfill.
- The transfer station was not being utilized for waste at the time of the pilot study.

Other Equipment:

- The Solid Waste Department does have at least one truck and one SUV, perhaps more. These are used for transportation and maintenance assistance but not collection, as far as was observed.

5 - Current Waste Stream Generation & Composition

In 2023, a weight-based data assessment of materials was conducted 7 from waste that was disposed of at the Tinian Landfill, and from a Pilot Waste Collection event.

The waste evaluated in this study was focused on Tinian households and commercial businesses (Municipal Solid Waste, or MSW) and did not include any of the DOD military activities that were occurring at the time, or from additional Construction and Demolition (C&D) materials that arrived at the landfill. Over the course of one five-day work week, thirty-four (34) samples of waste materials were sorted into one of fifteen (15) different categories (see Table 6).

The total amount of waste assessed in the study was 5,160 pounds of material. The key findings are as follows:

- The three largest combined categories of materials in the MSW waste stream were Fibers (27%), Plastics (25%), and Organics (15%), representing 67% of the measured waste by weight.
- Potential recyclable or divertible metals and glass were 9% and 6% respectively.
- It was estimated that the generation of MSW on the island is less than 20,000 lbs. (10 tons) per week.
- While not categorized, much of the C&D waste was wood or lumber that is being source-separated at the landfill location for potential alternative use in the future.

5.1 - Annual Waste Generation Estimates in Tinian

Informed by Tinian’s annual waste generation and the waste characterization data described below in Section 5.2, Tinian produces approximately ten (10) tons of residential and commercial MSW per week or 520 tons per year. If we break down that total according to the material categories, we get the annual waste generation estimates for each material category type as summarized in Table 4.

Table 4 - Annual Waste Generation Estimates by Material Category

No.	Rank	Category	Material	Composition Combining All Samples - Average %	Annual generation estimate (pounds)	Annual waste generation estimate (tons)	Annual waste generation estimate (tons) per major category
1	4	Fiber	Old Corrugated Cardboard (OCC)	10.5%	109,200	54.6	139.4
2	1		Other Fiber Materials	16.3%	169,520	84.8	
3	7	Plastic	PET (#1)	6.1%	63,440	31.7	127.4
4	14		HDPE (#2)	2.5%	26,000	13.0	
5	9		Mixed Plastics	4.6%	47,840	23.9	
6	3		Bags and Film	11.3%	117,520	58.8	
7	6	Glass	Glass and Ceramics	6.3%	65,520	32.8	32.8
8	8	Metals	Ferrous Metals	5.4%	56,160	28.1	48.4

No.	Rank	Category	Material	Composition Combining All Samples - Average %	Annual generation estimate (pounds)	Annual waste generation estimate (tons)	Annual waste generation estimate (tons) per major category
9	10		Non-Ferrous Metals	3.9%	40,560	20.3	
10	15	Organics	Yard Waste	2.3%	23,920	12.0	77.0
11	2		Other Organics	12.5%	130,000	65.0	
12	13	Other	C&D Debris	2.7%	28,080	14.0	95.7
13	5		Textiles, Leather and Rubber	8.6%	89,440	44.7	
14	11		Dirt and Other Fines	3.6%	37,440	18.7	
15	12		Other Bulky or Composite Items	3.5%	36,400	18.2	
Tota Annual				100%	1,041,040	521	521

Some of these categories are easily recyclable locally or off-island, whereas others are not. Of those that are relatively easy to recycle, we have reformatted the data to showcase the potential landfill diversion and added an assumed 80% capture rate and potential destinations of materials either “On Tinian” or “Off-island”, which means the processing of those materials happen locally or elsewhere.

Two opportunities to achieve Tinian’s Zero Waste goals could be through composting and glass crushing. With the proper investments in infrastructure and materials management practices and by recovering 80% of these materials, Tinian could locally recycle up to 36% of its waste stream and up to 36% recycled off-island (together 53% landfill diversion), which would be a successful outcome according to CNMI’s zero waste diversion goal of 50%. Of course, if other diversion programs were established or if markets arose for hard-to-recycle materials, like C&D debris, textiles, and plastic films, the diversion rate could be higher. This also assumes that the Puntan Diablo Open Dump is retrofitted to be a permitted sanitary landfill.

Table 5 - Easily Recoverable Materials for Landfill Diversion with annual generation estimates

No.	Rank	Material	Composition – Average Percentage	Est. Annual waste generation (tons)		Potential destination other than the landfill
				Total (Assumes 100% capture)	Assumes an 80% capture rate	
2	1	Other Fiber Materials	16.3%	84.8	67.8	Fiber Recycling Markets ¹² (off-island)
1	4	Old Corrugated Cardboard (OCC)	10.5%	54.6	43.7	
Fiber Subtotal			26.8%	139.4	111.5	
11	2	Other Organics	12.5%	65	52.0	Local Composting or AD (on Tinian)
10	15	Yard Waste	2.3%	12	9.6	
Organics Subtotal			14.8%	77	61.6	
3	7	PET (#1)	6.1%	31.7	25.4	

¹² A small portion of other fiber could go to Local Composting or Anaerobic Digestion (AD) if needed.

4	14	HDPE (#2)	2.5%	13	10.4	Plastic Recycling Markets (off-island)	
Plastics Subtotal			8.6%	44.7	35.8		
8	8	Ferrous Metals	5.4%	28.1	22.5	Metal recycling markets (off-island)	
9	10	Non-Ferrous Metals	3.9%	20.3	16.2		
Metals Subtotal			9.3%	48.4	38.7		
If glass-crushing equipment were installed on Tinian (For example, at Transfer Station)						Local beneficial reuse as a sand alternative (on Tinian)	
7	6	Glass and Ceramics	6.3%	32.8	26.2		
Glass Subtotal			6.3%	32.8	26.2		
Total				342.3	273.8		
Total Annual Waste Generation				521	521		
Estimated Waste Diversion from the Landfill				66%	53%		
Breakdown of waste diversion Processing of materials "On Tinian" or "Off-Island"				On Tinian	Off-Island	On Tinian	Off-Island
				21%	45%	17%	36%

Note: The 80% capture rate assumes that 80% of the recyclable materials are source-separated from the waste stream, and 20% of the materials are not source-separated into the recycling streams. The 80% capture rate is aspirational; however, with active engagement and education of residents and businesses, it may be possible.

5.2 - Waste Composition (All Sources) in Tinian

Tinian most recently conducted a waste composition study in March 2023 (for more details, see Attachment A - Tinian's Pilot Collection Goals and Planning). The full results of the sorts are shown in **Error! Reference source not found.** on the following page. These categories are standard MSW sampling categories used by GBB in most sorts, with the definition of each category described in Attachment A. As shown in **Error! Reference source not found.**, the largest material category is Fiber, representing 27% of the waste stream. The Fiber category includes Old Corrugated Cardboard (cardboard containers that are clean and dry enough to be recycled) and Other Fiber Materials (paper or composite material or other paper that is clean and dry enough to be recycled as a commodity when separated).

The other major categories were Plastic materials at 25%, Organics at 15%, which was mostly food waste, and Other Materials at 18%, which consisted of Construction and Demolition (C&D) waste, which included wood materials, Textiles, Leather, and Rubber, Dirt and Fines, and Bulky or Composite Items. Metals and Glass make up the remaining 9% and 6% respectively. The breakdown of the 15 individual categories and the results are shown in **Error! Reference source not found.** on the following page.

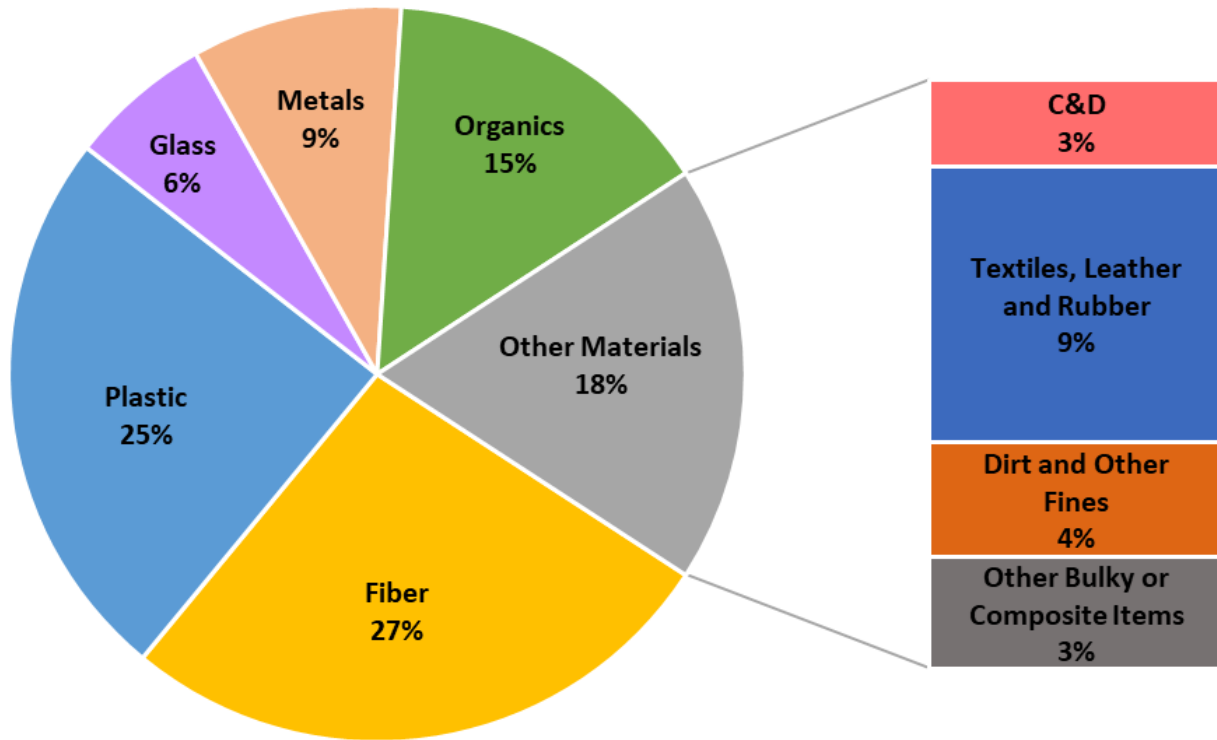


Figure 10 - Average Category Percentages – Tinian – All Generators

Table 6 - Composition of Waste Materials (Tinian)

No.	Category	Material	Composition Combining All Samples - Average %	Error +/- (90%)
1	Fiber	Old Corrugated Cardboard (OCC)	10.5%	±3.3%
2		Other Fiber Materials	16.3%	±1.7%
3	Plastic	PET (#1)	6.1%	±1.4%
4		HDPE (#2)	2.5%	±0.6%
5		Mixed Plastics	4.6%	±1.4%
6		Bags and Film	11.3%	±0.8%
7	Glass	Glass and Ceramics	6.3%	±1.5%
8	Metals	Ferrous Metals	5.4%	±1.0%
9		Non-Ferrous Metals	3.9%	±0.7%
10	Organics	Yard Waste	2.3%	±1.0%
11		Other Organics	12.5%	±2.1%
12	Other	C&D	2.7%	±1.5%
13		Textiles, Leather and Rubber	8.6%	±1.9%
14		Dirt and Other Fines	3.6%	±0.7%
15		Other Bulky or Composite Items	3.5%	±1.1%
Total			100.0%	-

The above data is the average of the material calculated on a per-sample basis and then averaged over the total number of samples, which is the standard for waste sort data. The raw lbs. collected over the course of the sampling week is included in the attachments.

The error helps show the range of materials over the total number of samples. For instance, an error of $\pm 3.3\%$ with OCC indicates that there was a wider range of weights per sample versus “Other Fiber Materials”, which seemed to be more consistent with an error of $\pm 1.7\%$ over the course of the study.

The top eight materials found in this study are presented in Figure 11. These top materials account for more than 76% of the total waste stream in this study. The top four material types by weight were Other

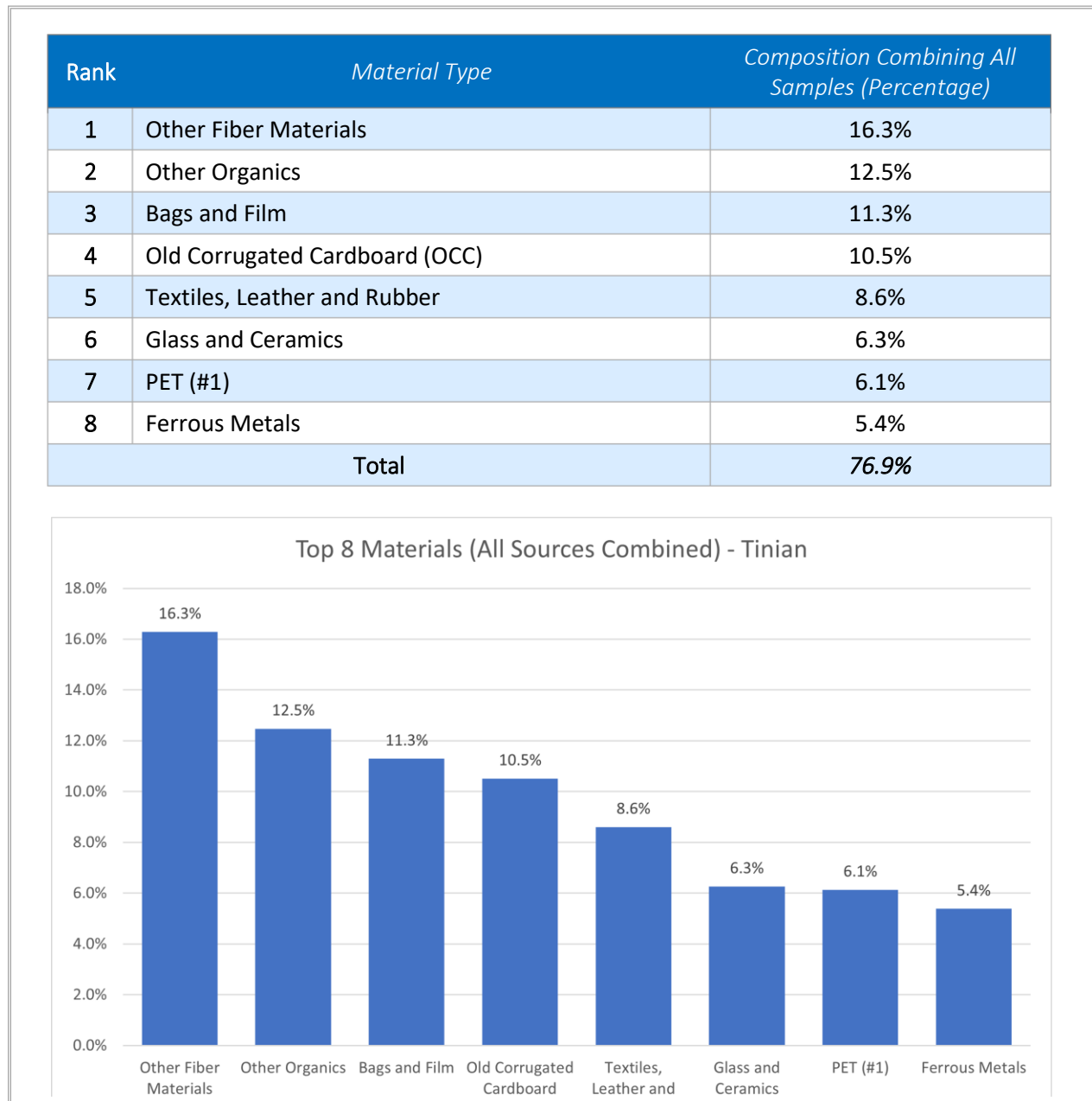


Figure 11 - Top 8 Materials at the Tinian Waste Sort (All Sources Combined)

Fiber Materials, Other Organics, Bags and Film Plastics, and OCC (Cardboard). The top four materials account for approximately 50% of the total waste that was sorted.

The 'Other Organics' category was nearly all food waste and some packaging that was difficult to separate from the food. Nearly all the components in this category could be processed in a food composting facility. In general, more than half of the 'Fines and Dirt' category, at 3.6%, was also food waste materials. It is reasonable to assume that the percentage of packaging in the organics would be similar in weight to the food left in the fines so that the total food waste percentage is still close to 12.5% overall¹³ and could be considered processable in a composting or anaerobic process.

Some of the "Other Fiber" category contained wet fibers that might be better handled in composting instead of recycling. Wet fiber seems to be because of the precipitation on the island and the containerization of the material where it is stored prior to collection. How wet fiber is dealt with will depend on the types of infrastructure implemented in the future, but it is something that should be considered when designing the next solid waste system.

Another large category was Film and Flexible Packaging. This category did not have a sub-sort to determine the breakdown of the different types of film and packaging. Most of the items were either black, white, or clear #4 LDPE bags, with some of the bags being what was used to collect the waste during collections. There was not a lot of stretch wrap-type film and a small percentage of ship wrappers and other flexible packaging. In previous studies by GBB, flexible packaging made up approximately 16% of the total Film and Flexible Packaging category, and it is safe to assume that there was a similar ratio in Tinian's waste stream.

Similar to Rota, the major difference between the Saipan waste data and Tinian is that there is distinctly less cardboard (OCC) in the Tinian waste stream. Saipan had an average of 20.3%, while Tinian was at 10.5%. However, there was a higher percentage of "Other Fibers" in Tinian at 16.3%, as opposed to 11.6% in Saipan. Bags and film are also greater in quantity than in Saipan, but this may be due to the inclusion of the black collection bags used in the retrieval of the waste. These bags may also be used for any curbside collections, so it is good to have this estimated data point. Examples of sorted materials are in the figures on the following pages.

The mixed plastics were frequently expanded polystyrene #6 (EPS) and plastic cutlery at 4.6% of the total waste stream. Most of this was associated with takeout containers from restaurants, so there exists the possibility of changing this packaging to a compostable option in the future.



Figure 12 - Commercial load (lots of cardboard) compared to residential load (limited cardboard)

¹³ Packaging in organics or food waste can typically be 10%-20% of the total weight. 15% of 12.5% is approximately 1.8%, or half of 3.6%, the percentage of the fines, so the math tends to work out in this case.

6 - Policies

In this section, we present the existing primary policies, regulations, and codes that govern solid waste management in Tinian, proposed law that may support zero waste planning, and discuss a Zero Waste Framework for the future.

6.1 - Existing Policies / Regulations / Codes

Four primary regulations/codes apply to waste management and zero waste planning activities in CNMI and the Municipality of Tinian and Aguiguan. Potentially, two more pieces of legislation are awaiting approval from the Governor of the Northern Mariana Islands that would ban single-use bags and Styrofoam food service containers in CNMI.

6.1.1 - Title 155: Department of Public Works

SubChapter 155-30.1 - Solid Waste Collection and Disposal Regulations

A. Purpose: To establish comprehensive regulations and management policies for solid waste within the Commonwealth, ensuring environmental protection and public health.

B. Applicability: This regulation applies to:

- Department of Public Works and its Division of Solid Waste Management
- All commercial waste haulers
- Residents of the Commonwealth of the Northern Mariana Islands (CNMI)
- Entities that generate or dispose of solid waste in the CNMI

C. Enabling Legislation: The creation of the *CNMI Solid Waste Collection and Disposal Regulations* is authorized by Public Law 6-30 (Commonwealth Solid Waste Management and Disposal Act of 1988), as amended by PL 11-103 (effective Sept. 29, 1999) and PL 13-42 (effective Dec. 19, 2002). Multiple amendments have been adopted over time, with the most recent in April 2019. This legislation governs the collection, disposal, and management of solid waste in the CNMI. Specifically, 2 CMC § 3514(a) empowers the Department of Public Works (DPW) to:

1. Collect and dispose of solid waste as provided in the Act
2. Assess fees by regulation for the collection and disposal of solid waste
3. Establish rules and regulations to enforce its powers

D. Previous Legal Instruments Superseded:

- Amendments Adopted 41 Com. Reg. 41616 (Apr. 28, 2019)
- Amendments Proposed 41 Com. Reg. 41351 (Feb. 28, 2019)
- Amendments Adopted 26 Com. Reg. 21773 (Jan. 22, 2004)
- Amendments Emergency and Proposed 25 Com. Reg. 20001 (Feb. 28, 2003)
- Various other amendments dating back to 1999 and 2000

E. Recycling-Related Activities and Solid Waste Management

- Part 001: General Provisions - Outlines the overall framework and objectives
- Part 100: Tipping Fees - Establishes fee structures for waste disposal

- Part 200: Solid Waste Revolving Fund - Manages financial resources for waste management

F. Fees: The CNMI Solid Waste Collection and Disposal Regulations establish a comprehensive fee structure for waste disposal at all CNMI Solid Waste Government Facilities, including those in Saipan, Rota, and Tinian. The following table outlines the tipping fees for various types of waste according to Title 155. As mentioned above, Tinian does not have a scale at the dump and is not currently collecting any tipping fees.

Table 7 - Tipping fees for various types of waste per Title 155

WASTE TYPE	FEE	APPLICABLE FACILITIES
Municipal and household waste	\$37.50 per ton	All CNMI Solid Waste Government Facilities
Garment waste	\$70.00 per ton	
Special Waste and Construction and Demolition Waste	\$70.00 per ton	
Dead Animal (small cats/dogs)	\$3.00 per carcass	
Dead Animal (large)	\$35.00 per carcass	
Tires OFF the Rim (less than 22.5")	\$2.50 per tire	
Tires ON the Rim (less than 22.5")	\$5.00 per tire	
Tires OFF the Rim (22.5" or larger)	\$8.00 per tire	
Tires ON the Rim (22.5" or larger)	\$15.00 per tire	
Tires-Heavy Equipment/Bulky	\$175.00 min. charge (<1 ton)	
E-waste (CRT Monitors)	\$25.00 per item	
E-waste (less than 1 ft in length)	\$1.00 per item	
E-waste (1 ft to 2 ft in length)	\$2.00 per item	
E-waste (2 ft and above)	\$3.00 per item	
Green Waste (residential)	\$10.00 flat fee per load	
Green Waste (all other disposers)	\$35.00 per ton	
Appliances / White Goods	\$25.00 per item	
Special handling fee (<i>Ozone-depleting substance and/or Freon</i>)	\$10.00 per item	
Recyclable waste (e.g., paper, plastic, metal)	\$20.00 per ton	
Green waste (e.g., yard trimmings, food scraps)	\$15.00 per ton	
Electronic waste (e.g., computers, TVs)	\$25.00 per item	

G. Waiver of Tipping Fees: The regulations provide for the waiver of tipping fees under specific circumstances. The Department of Public Works, Division of Solid Waste Management, is responsible for administering these waiver provisions. Tipping fees can be waived for the following:

1. Refuse generated as a result of a typhoon or other similar natural or man-made disasters or for the benefit of the Commonwealth of the Northern Mariana Islands.
2. Refuse collected from clean-up events sponsored by the government, private or nonprofit organizations or groups, organized for the express purpose of beautification or cleaning public areas.
3. Refuse collected by private landowners cleaning up illegally dumped waste on their property, not derived from a business, property lease, or rent.
4. Disposal of separated items that are deemed recyclable by the DPW.

6.1.2 - Title 65: Bureau of Environmental and Coastal Quality (BECQ); Chapter 65-80 – Solid Waste Management Regulations (inclusive of January 2024 amendments)

A. Purpose: To establish requirements and criteria for new and existing solid waste management activities and solid waste management facilities (SWMFs), including but not limited to municipal solid waste landfills, incineration, solid waste collection and transfer, materials processing, recycling, composting, and salvage, to ensure the protection of human health and the environment.

B. Applicability: This regulation applies to:

- Bureau of Environmental and Coastal Quality) and its Division of Solid Waste Management Authority
- All commercial waste haulers
- Residents of CNMI
 - Entities that generate, transport, or dispose of solid waste in the CNMI
 - Prohibition of open dumps

C. Enabling Legislation: These regulations were enacted on June 19, 2001. The CNMI Solid Waste Management Regulations are authorized by:

1. Commonwealth Solid Waste Management Act, 1989 (2 CMC §§ 3511 to 3521)
2. Commonwealth Environmental Protection Act (CEPA), 1982 (2 CMC §§ 3101 to 3134)
3. Commonwealth Environmental Amendments Act (CEAA), 1999 (PL 11-103)

D. Recycling Facility Requirements and Fees

Table 8 - Recycling Facility Requirements and Fees per Title 65

FACILITIES	REQUIREMENTS/FEEES
Recycling Drop-Off Facilities	Storing less than one ton of recoverable materials at any one time is exempt from permit requirements. Subject to a \$250 administrative fee for notification
Recycling Processing or Materials Recovery Facilities	Requires a permit: Subject to application fees ranging from \$250 to \$500, depending on the type of facility
Composting Facilities	Storing less than one ton of organic solid waste at any one time is exempt from permit requirements. Subject to a \$50 administrative fee for notification
Commercial Waste Haulers	Registration system established, Initial registration fee: \$50 per vehicle Annual renewal fee of \$25 per vehicle.

[Note: The following information was provided in January by BECQ regarding new fee requirements. It is not known at this time whether these have been codified by CNMI] *

Table 9 - Updated Recycling Facility Requirements and Fees, as per BECQ January 2024

FACILITY TYPE	REQUIREMENTS	APPLICATION FEE
Recycling Drop-Off Facility	Codified pending	\$250
Automotive, Scrap Metal, and White Goods Salvage Facilities	Codified pending	\$250
Recycling Processing or Recovery Facility	Codified pending	\$500
Transfer Station	Codified pending	\$500
Bioconversion Facility	Codified pending	\$500
Construction and Demolition Waste Landfill	Codified pending	\$1,000
Solid Waste Disposal Facility	Codified pending	\$1,000
Government agencies	Codified pending	Exempt

*Information in the table is based on January 2024 amendments provided by BECQ

E. Reporting from Permitted Facilities on Recyclables

Reporting Requirements:

- Frequency of Reporting: Permitted facilities must submit reports annually.
- Content of Reports: The reports must include the following information:
 - Types and quantities of recyclables collected, processed, and shipped.
 - Destination of recyclables.
 - Any issues or challenges encountered in the recycling process.
 - Recommendations for improving recycling operations.
- Recordkeeping: Facilities must maintain records of all reports submitted for a min. of five years.

6.1.3 - CNMI Zero Waste Week Proclamation¹⁴

Purpose: The purpose of this proclamation is to promote sustainable living and support the ongoing efforts to achieve Zero Waste in the CNMI.

¹⁴ Source: Office of Governor Arnold I. Palacios, Proclamation – CNMI Zero Waste Week – March 27, 2023 – April 2, 2023. Accessed at: <https://governor.gov.mp/news/proclamation-cnmi-zero-waste-week-march-27-2023-april-2-2023/>

Applicability/Effective Date: CNMI. The proclamation is dated March 30, 2023, and is signed by Governor Arnold I. Palacios and Lieutenant Governor David M. Apatang.

Key Points:

1. The Zero Waste International Alliance defines "Zero Waste" as the conservation of all resources through responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health
2. The CNMI's commitment to taking necessary action and expanding its efforts in ensuring wise resource use and combating climate change by reducing, reusing, and recycling waste, which will create more jobs and unlock economic development opportunities.
3. The CNMI's 2021-2030 Comprehensive Sustainable Development Plan (CSDP) supports the 10-year Sustainable Development Goal to divert 50% of the recyclable waste stream from the CNMI's waste management facilities by 2030.
 - The CNMI's Comprehensive Integrated Solid Waste Management Plan will outline strategies for the prevention, collection, and processing of residential and commercial waste, and benchmark metrics to track progress toward management goals.
4. The Tinian Zero Waste Study and Pilot Project will solidify a clear and realistic path forward for Tinian's leadership to follow in implementing Zero Waste management strategies.
5. The formation of the Inter-Island Solid Waste Management Taskforce, which aims to have a completed comprehensive integrated solid waste management plan that includes "Zero Waste" initiatives ready for incorporation into the next CSDP update by 2025.
6. The invitation for all community members of the CNMI to participate in upcoming visioning workshops, plan development, and implementation efforts to support the transition towards more sustainable resource management practices.

6.1.4 - Policy Directive 226: Recycling Business Rules and Regulations

Purpose: The purpose of Policy Directive 226, which was effective on May 1, 2003, is to improve and preserve the natural environment and extend the life of the Marpi Landfill through a community-wide recycling effort.

Applicability: This document serves as a 2003 Policy Directive to ensure that Executive Branch offices and autonomous agencies in the CNMI start recycling selected reusable materials.

Responsibilities:

1. Department Heads and Managers: Must develop a collection program for recyclable materials within their offices.
2. Division of Solid Waste Management, Department of Public Works: Provides detailed guidelines on suitable materials for recycling.
3. Collection and Pickup: Each office is responsible for collecting recyclable materials. The logistics and scheduling of pickups are coordinated by the Office of the Special Assistant for Administration.

6.1.5 - Summary of Legislation Awaiting Approval from the Governor

The following table summarizes the key information from two pieces of legislation awaiting approval from the Governor of the Northern Mariana Islands at the time of the development of this plan

Table 10 - Proposed Acts regarding waste prevention

Proposed Act	Purpose	Applicability	Key Information
SB 23-42 (Single-Use Plastics Act)	To ban the importation, production, distribution, and use of single-use plastic bags.	All businesses in the Commonwealth, with certain exceptions.	Prohibits single-use plastic bags; exceptions for prescription medication, food items, etc.; penalties for violations; allows reusable and paper bags; enforcement by Department of Commerce.
SB 23-44 (Prohibit Disposable Food Service Containers)	To prohibit the use of certain disposable food service containers made from expanded polystyrene (Styrofoam).	All food establishments in the Commonwealth.	Prohibits Styrofoam containers; exemptions for emergency situations and pre-packaged food; penalties for violations; effective January 1, 2025.

7 - Technical Opportunities by Major Recoverable Material Category

In this section, we describe some of the technical opportunities associated with processing and recovering these material streams for recovery and responsible disposal. However, to begin considering the technical opportunities, it is important to understand their scale by understanding just how much materials and waste must be managed.

7.1 - Fibers – Paper and Cardboard

As zero waste, climate, environmental, and efficiency priorities grow globally, reusable transport packaging and paperless systems are increasing and may significantly reduce this waste stream in the future.

In the ongoing effort to manage waste sustainably, repurposing materials such as old, corrugated cardboard (OCC) and mixed paper has become a crucial focus for many communities. In the United States, cardboard is the most recycled packaging material. More than 35 million tons of cardboard, which the industry calls corrugated, was recovered for recycling, with rates exceeding 82% since 2009¹⁵.

As shown in Figure 10, fibers constitute a significant component of Tinian's waste stream, accounting for at least 27% of the overall waste. Of this, OCC, which was observed to be *clean and dry enough for recycling*, makes up 10.5%. Other fiber materials, composed of composite materials and other recyclable papers, were also *observed to remain clean and dry when properly separated*, constituting 16.3% of the fiber waste¹⁶.

Table 11 - Tinian Fiber Composition and Generation

Type of Fiber	Percentage (%) of the waste stream	Description	Annual waste generation estimate (tons)
Old Corrugated Cardboard (OCC)	10.5%	Old, corrugated containers (cardboard) that are clean and dry enough to be recycled. Most shipping boxes are OCC	5.5
Other Fiber Materials	16.3%	Paper of composite material or other paper that is clean and dry enough to be recycled as a commodity when separated.	8.5

Recycling, beneficial reuse, composting, and other waste diversion opportunities for fibers underscore their significant impact on the overall waste stream. These practices are crucial for conserving natural resources and protecting the environment by significantly reducing landfill use and minimizing greenhouse gas emissions, thus contributing to a more sustainable future. Innovative programs in the United States and the Asia Pacific regions demonstrate how effectively managing these materials can yield substantial environmental and economic benefits. Implementing these successful models in Tinian can promote local sustainability and contribute to economic development.

¹⁵ Unpacking the 2021 Paper Recycling Rate | AF&PA. <https://www.afandpa.org/news/2022/unpacking-continuously-high-paper-recycling-rates>.

¹⁶ Gershman, Brickner & Bratton, Inc. Tinian Waste Characterization Fieldwork Technical Memorandum (May2024).

Opportunities for Sourcing and Managing Fiber in Tinian for Waste Diversion

Collecting cardboard and mixed paper (“fibers”) from any community for recycling can present several common opportunities for improvement. One of the main opportunities is ensuring sufficient participation and engagement in the source separation of the materials from the waste stream. This requires educating the community about the importance of recycling and composting, and the specific benefits of recycling cardboard and mixed paper.

Another opportunity for improvement is around the logistics for collection and transportation of cardboard and mixed paper. This is a major challenge for Tinian. While education can help residents and businesses understand the importance of separating these materials from the trash, the collection and transportation of the materials is the next step in the cycle of “recycling” that ends with remanufacture or processing into another useful product for use.

Setting up an efficient collection system that reaches all households and businesses in the community can be a complex task. On Tinian, this would require Office of the Mayor of Tinian and Aguiguan coordinating with DPW and BECQ along with the Department of Public Lands/Tinian governmental authorities to establish sites for collecting materials, ensuring there is policy in place to support the activities, selecting appropriate containers, establishing collection and maintenance protocols, hiring waste management companies as needed and engage community organizations to develop an effective route and schedule for collection, and ensuring there is oversight of all aspects of a program.

A third opportunity for improvement is contamination, wherein non-recyclable materials and moisture are commingled with cardboard and mixed paper. Contamination degrades the quality of the materials intended to be collected and complicates the recycling process, therefore reducing the value of recyclable materials as commodities.

To maximize the recycling potential of cardboard and mixed paper, it is crucial to collect clean, dry, and uncontaminated materials. If a load of cardboard is contaminated with, for instance, too much food waste or it is too wet for too long and does not have the ability to dry out, it could be substantially heavier and may begin to decompose. Collection areas should include ample printed education using visual references to showcase how to prevent contamination and illegal dumping and should provide areas with enough physical coverage from damp weather, particularly during the rainy season from July to December.

While many communities struggle with contamination, this is of particular importance to Tinian due to the need to store fiber materials before enough are collected to constitute a full load for shipment and the high humidity of the Tinian environment. This leads us to our fourth technical opportunity for recycling fibers: storage until enough fiber materials are collected. The sizing of shipping containers is also key here. They should be standard enough to allow for easy cargo shipping but not too big so that they take too long to fill. A standard 20' steel shipping container could be easily transported using the local ports and could store between 12-16 bales of OCC or roughly 6-10 tons of fiber. A 40-foot steel shipping container may be too large. There is plenty of room at the Tinian Transfer Station to place four (4) 20-foot shipping containers to hold bales of OCC and Mixed Paper, as well as room for containers to store other material types too, like plastics, metal, and glass, which are discussed later.

A fifth technical opportunity is with the upgrading of composting operations on the island, as discussed during the organics portion of this section. Depending on the commodity value of the fiber collected, there may be a justification to support Tinian’s future composting infrastructure with a portion of the collected fiber stream, such as lower-value mixed paper or soiled or wet OCC, which still have a high carbon-to-

nitrogen ratio of approximately 400:1 and can be useful in the composting process to balance a nitrogen-heavy feedstock, like food waste, yard waste, and seaweeds. Cardboard is being successfully composted in Palau, but composting requires tape and staples to be removed by residents and recycling center staff. The benefits of keeping the lower-commodity value fibers local by using them as a feedstock in the composting process may be higher than the value of those materials in the recyclable commodities market.¹⁷

Communities have also used flattened cardboard as “sheet mulch” by applying it directly to the land to stabilize and enrich the soil. Guam has used this method in the past and is again planning to use it due to limited recycling markets.

7.2 - Plastics

The very qualities that make plastics useful, combined with historically poor waste management/disposal practices, have created a global waste challenge that has become a critical focus for many Pacific Island communities which are often inundated with plastic marine debris. Plastics are ubiquitous in daily life, found in products ranging from water bottles and packaging materials to household goods and fishing gear. Their durability, while advantageous for multiple uses, poses significant challenges in waste management.

According to recent field studies, plastics constitute a significant component of Tinian's waste stream, accounting for 25% of the overall waste¹⁸. The vast majority of plastic wastes are disposed of in Tinian's *Puntan Diablo* sanitary open dump located in the municipality of Tinian (Lot 204T 13, Latitude: Approximately 15.1234° N, Longitude: Approximately 145.6789° E).¹⁹ The various types of plastics, categorized as macroplastics, observed in the field study²⁰ include the following:

Table 12 - Tinian Plastic Composition and Generation

Type of Plastic	Percentage of the waste stream	Description	Annual waste generation estimate (tons)
PET (#1)	6.1%	<i>Polyethylene terephthalate</i> materials. Only PET (#1) bottles and containers clearly marked with a triangle symbol were sorted and designated as 'PET #1'.	3.2
HDPE (#2)	2.5%	<i>High-density polyethylene</i> materials. Only HDPE (#2) bottles and containers clearly marked with a triangle symbol were sorted and designated as 'HDPE #2'.	1.3
Mixed Plastics	4.6%	Other plastic items that may be recovered. This includes items such as <i>expanded polystyrene</i> (#6 EPS) and plastic cutlery, mostly associated with takeout containers from restaurants.	2.4
Bags and Film	11.3%	All film plastic including trash bags, grocery bags, shrink wrap, plastic sheeting, etc.	5.9

¹⁷ Source for carbon-to-nitrogen ratio information for composting: <https://ucanr.edu/sites/newinyomonmg/files/323604.pdf>

¹⁸ Gershman, Brickner & Bratton, Inc., *Tinian Waste Characterization Fieldwork Technical Memorandum*. May 2024.

¹⁹ CNMI Department of Public Lands, Homestead Division. *Lot Showing Acknowledge and Certification*. January 2024.

²⁰ Gershman, Brickner & Bratton, Inc. *Tinian Waste Characterization Fieldwork Technical Memorandum*. May 2024.

Unlike Fibers and Organics, plastic does not readily decompose,²¹ and the degradation of plastic in the environment leads to secondary microplastics. The remoteness of the Pacific Islands exacerbates these challenges, making waste disposal and recycling uniquely problematic. On average, plastic waste constitutes about 20% of the total waste stream on the Pacific Islands. Over 76% (approximately 7 of the 9.2 billion tons) of plastic produced from 1950 to 2017 became plastic waste, ending up in landfills or being dumped. Moreover, plastic accounts for at least 85 percent of the total marine waste²².

Opportunities to Sourcing and Managing Plastics in Tinian for Waste Diversion

Recycling, beneficial reuse, and other waste diversion opportunities for plastics underscore their significant impact on the overall waste stream because they contribute to 25% of the overall waste stream. These practices are crucial for conserving natural resources and protecting the environment by significantly reducing landfill use and minimizing greenhouse gas emissions. Implementing effective plastic waste management practices can promote local sustainability and contribute to economic development.

As with the challenges of collecting fiber from any community for recycling, there are also common opportunities present for the collection of plastics in Tinian. Again, a primary opportunity for improving the management of plastics will be education and outreach to ensure sufficient participation by residents and businesses in source-separating materials from the waste stream. These activities are especially important for plastics because there is more diversity within the material category, from low-grade soiled plastic films to high-grade natural-colored HDPE (high-density polyethylene) jugs and clear PET (polyethylene terephthalate) bottles. To maximize the value and recyclability of the plastics, sorting is key, and as much source-separation as a community can muster and reduced contamination means a higher-value commodity for sale on the recycled scrap commodities market.

While plastics decay like paper and cardboard, they are often food-soiled, and cleanliness is particularly important for capturing these materials for waste diversion. Additionally, plastics can endure in the environment if littered or become land-born marine debris. Due to their flexible, lightweight nature, they can easily travel in the wind and stay afloat if they make it to water. They can act like nets and catch and suffocate animals and plants and may be confused as a food source by wildlife, all of which are contributing factors in species die-off. Also, plastic litter is a major source of pollution in the Pacific Ocean, as evidenced by plastic litter collecting along coastlines from Japan to California and as a result of studies of the Great Pacific Garbage Patch by The Ocean Cleanup . It is estimated that 2% of all plastic waste currently ends up in the hydrosphere, which includes all manner of bodies of water, such as creeks, rivers, ponds, aquifers, and oceans.

The majority of the population of Tinian lives very close to the ocean, which greatly increases the likelihood of wind or water born plastics making it to the sea. Proper steps for collections and disposal will help alleviate inadvertent losses of plastics into the water surrounding Tinian.

Additionally, with the prevalence of lightweighting of packaging, it seems the trend to package and ship materials in plastic is growing, leading to another challenge: the sheer volume of plastic waste being generated. The ever-increasing use of plastic products and packaging has led to a growth in plastic waste. Managing and collecting such a large quantity of waste requires significant resources, including manpower,

²¹ NOAA. *A Guide to Plastic in the Ocean*. <https://oceanservice.noaa.gov/hazards/marinedebris/plastics-in-the-ocean.html>.

²² SPREP. *Pacific Islands Take on Fight Against Plastic Pollution on Global Stage*. November 29, 2022. <https://www.sprep.org/news/pacific-islands-takes-on-fight-against-plastic-pollution-on-global-stage>.

infrastructure, and transportation. Without adequate resources, it becomes difficult to collect and process plastic waste for recycling efficiently.

Secondary and tertiary packaging for goods is necessary to bring these items to the island safely and to protect the products being transported. This means that Tinian infrastructure needs to be able to handle all of the packaging related to the incoming goods and not just the end product that is used by the consumer. This is unique to island shipping and needs.

Secondly, plastic waste is often widely dispersed, making it challenging to establish efficient collection systems. Plastic items are often discarded in various locations such as landfills, oceans, streets, and even remote areas. This makes it difficult to implement a cohesive and comprehensive collection system. Coordinating efforts among different stakeholders, including waste management agencies, local communities, and businesses, becomes crucial to ensure effective collection.

There was not a lot of illegal dumping sites on Tinian, with most of the plastic waste being transported eventually to the landfill site. The community seems to be very involved in keeping the island clean, so it is reasonable to assume having different collections and outlets for plastics would be able to capture most of the plastic packaging on the island.

Another challenge lies in the different types and forms of plastic waste. Plastic comes in numerous variations, including different types of polymers and packaging materials. Finding low-energy solutions for mixed plastics will be crucial for the success of diverting plastics on islands such as Tinian.

Sorting and separating the various types of plastic based on resin codes can be time-consuming and costly, adding to the complexity of managing plastic waste.

Contamination is yet another challenge that hampers the recycling process for plastic waste. Many plastic items are contaminated with other materials, such as food residue, dirt, or non-recyclable substances. This contamination not only affects the quality of recycled plastic but also hinders the efficiency of recycling processes. Proper cleaning and sorting measures need to be implemented to minimize contamination and ensure the quality of recycled plastic.

Furthermore, the lack of awareness and infrastructure in certain regions poses additional challenges. In some areas, there is a lack of recycling facilities and educational programs to encourage proper waste management practices. Limited access to recycling facilities and insufficient knowledge about recycling exacerbate the problem, as people may resort to improper disposal methods, such as burning or dumping plastic waste, further polluting the environment.

Lastly, the economic viability of recycling plastic waste is another obstacle. The low market value of recycled plastic compared to virgin plastic makes it less economically attractive for recycling businesses and the relatively low quantities of plastic generated will make it difficult to fill shipping containers with plastic bales before they degrade from sun exposure. This financial barrier can hinder the establishment and expansion of recycling operations, impeding the effective management of plastic waste.

Addressing these challenges requires a multi-pronged approach involving government regulations, industry collaboration, public awareness campaigns, and investment in recycling infrastructure. Effective plastics reduction, collection, and management strategies need to be developed to overcome logistical, operational, and economic hurdles. By addressing these challenges, we can pave the way for a more sustainable future, where plastic waste is managed responsibly and recycled efficiently.

7.3 - Organics

Organic waste presents unique challenges and opportunities for sustainable waste management. Organic materials, primarily food waste, yard trimmings, food-soiled paper and other biodegradable substances form a significant portion of the waste stream in many communities, including Tinian. Effective management of organic waste is critical for reducing landfill use, minimizing greenhouse gas emissions, and creating valuable products like compost.

Over one-third of the food produced in the United States is never eaten, and food waste is the single most common material landfilled and incinerated in the U.S.²³ Globally, food waste is a critical issue. According to the United Nations Environment Programme (UNEP), about one-third of all food produced globally is wasted, contributing to significant environmental and economic costs²⁴. Mismanagement of organic waste can lead to significant environmental issues, including methane emissions from landfills, odor problems, and pest attraction.

According to the waste characterization data for Tinian, Organic Waste constitutes approximately 15% of Tinian's waste stream, primarily food waste (the majority of the 'Other Organics' subcategory at 12.5%) and yard waste (2.3%). The 'Other Organics' category was nearly all food waste and some packaging that was difficult to separate from the food. Nearly all the components in this category could be processed in a food composting or anaerobic digestion facility. In general, more than half of the 'Fines and Dirt' category, at 3.6%, was also food waste materials. It is reasonable to assume that the percentage of packaging in the organics would be similar in weight to the food left in the fines so that the total food waste percentage is still close to 12.5% overall²². Nearly all the components in this category could be diverted from disposal by recovering edible food for donation or livestock feeding and processing green waste, clean wood and inedible food in a composting or anaerobic digestion facility.

Composting is a proven, low-tech on-island solution that has been effectively implemented in Guam, with multiple permitted private sector compost facilities, and Palau, with a public sector compost facility.

Recent waste characterization studies indicate that food waste and yard trimmings are the predominant components of the organic waste stream in Tinian. The various types of waste, categorized as Organics, observed in the field study²⁵ include the following:

Table 13 - Tinian Organics Composition

Type of Organic Waste	Percentage of the waste stream	Description
Other Organics	12.5%	Primarily all food waste and some organic packaging. Nearly all the components in this category could be processed in a food composting facility
Yard Waste	2.3%	Organic vegetative waste, including small branches, leaves, brush, grass clippings, hay, mulch, and Christmas trees.

²³ USEPA. *From Farm to Kitchen: The Environmental Impacts of U.S. Food Waste*. <https://www.epa.gov/land-research/farm-kitchen-environmental-impacts-us-food-waste>.

²⁴ UNEP. *Why the Global Fight to Tackle Food Waste has Only Just Begun*. September 26, 2022. <https://www.unep.org/news-and-stories/story/why-global-fight-tackle-food-waste-has-only-just-begun>.

²⁵ Gershman, Brickner & Bratton. *Tinian Waste Characterization Fieldwork Technical Memorandum*. May 2024.

Each community is different when it comes to waste generation. For reference, in Guam, organics represent approximately 27% of the total waste stream disposed at the Layon Municipal Solid Waste Landfill. A breakdown of organic wastes contributing to this waste category revealed that food waste accounts for 90%-99% of the single-dwelling, multi-dwelling, commercial, and military sectors²⁶.

²⁶ *Guam Environmental Protection Agency. Waste Characterization Report. January 2020.*

8 - Recommendations

8.1 - Background

The zero waste strategy in this Chapter is based on the findings from the Tinian Fieldwork Technical Report (2024) and relevant regulatory requirements.

The recommendations included herein support Tinian's goal of achieving a "Zero Waste" model that meets Section 3.3 - Goals and Objectives in this document and identifies opportunities to lessen waste to benefit the environment while maintaining the island's economic priorities. In addition, the strategy infuses elements of the strategic objectives and actions needed to create a stronger, more resilient, and cost-effective U.S. municipal solid waste recycling system as described in the *draft EPA National Recycling Strategy* (October 2020). By implementing these recommendations, Tinian has the opportunity to create a more sustainable waste management system that reduces waste and promotes environmental stewardship, economic viability, and social well-being for its residents.

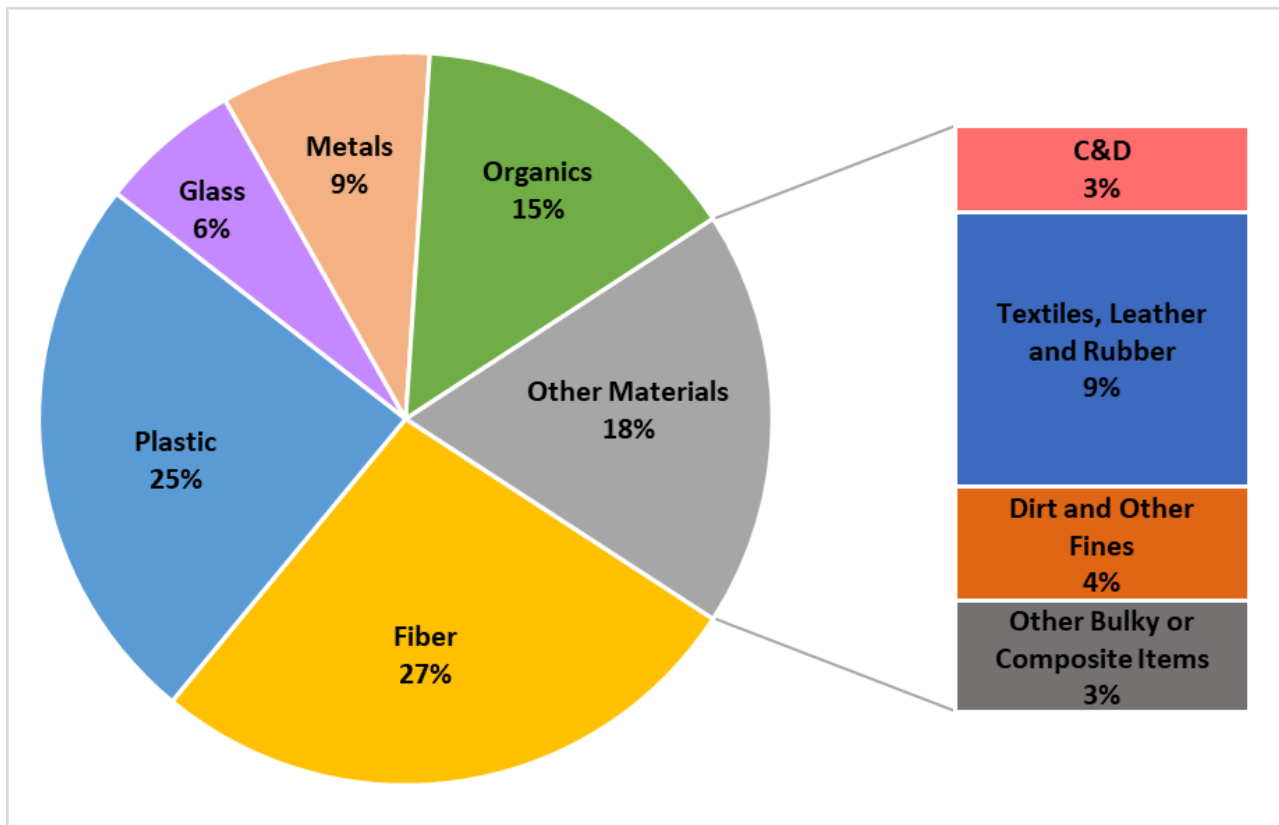


Figure 13 - Municipal Solid Waste Distribution by Major Material Categories

Based on the findings from the *Tinian Field Technical Report (2024)*, the breakdown of land disposed municipal wastes are divided into the categories represented in Figure 13.

The importance of waste diversion is three-fold:

- **Environmental Benefits:** Reduces the need for virgin materials, conserves natural resources, and reduces greenhouse gas emissions.
- **Economic Benefits:** Waste diversion from landfills can reduce disposal costs and generate potential revenue by selling recycled materials.
- **Regulatory Compliance:** Implementing effective waste diversion strategies can help meet local and national waste management regulations and sustainability goals (OPD CNMI-SSG-Guidance, 2018).

8.2 - Zero Waste Framework

In this section, we present the foundational elements necessary for the effective implementation of a zero waste program on Tinian including:

- Strong Governance,
- Sustainable Funding,
- Public Outreach and Education,
- Infrastructure Development, and
- Monitoring, Measurement, and Reporting (see Section 9 - *Monitoring and Progress Measurement*)

Within these overarching themes, the following strategies are recommended to put Tinian on a path toward Zero Waste.

8.2.1 - Establishing Strong Governance with Supportive Policies

Establishing robust governance is essential to achieve the goals set out in the Tinian Zero Waste Plan. Without regulatory authority, the journey toward zero waste becomes significantly more prolonged and challenging. Key elements necessary to build a strong governance foundation include:

1. **Establishing a Clear Regulatory Authority and Framework:** We recommend outlining the need for a clear and comprehensive regulatory framework. Legal authorities and policies must define categories for recyclable materials, green waste, and other waste types to streamline sorting and collection processes. The CNMI government should integrate specific regulations into existing statutory and regulatory frameworks to ensure efficient implementation of fiber, plastic, and organic waste recycling initiatives, including:
 - Differentiating green waste from treated lumber, OCC, and mixed paper to streamline composting and anaerobic digestion processes; Providing clear definitions and categories for recyclable materials to improve sorting and collection efficiency.
 - Integrating recycling initiatives into the current collection and disposal framework to leverage existing infrastructure.
2. **Establishing an Internal Governmental Reporting Structure:** A well-defined internal reporting structure within the government is important. The person in charge of the zero waste program must have the responsibility and the authority to implement necessary changes and enforce regulations. This authority enables them to act decisively and efficiently, ensuring that the program's objectives are met in a timely manner. Regular monitoring and reporting mechanisms should be implemented to track progress and identify areas for improvement.
 - For example, implement monitoring and reporting mechanisms to track the progress of recycling programs. Although regular reporting from waste management entities is required to perform measurement studies and identify areas for improvement, an additional mechanism may be needed to encourage timely compliance. Additional

mechanisms could include specific fines, permit revocation(s), or positive incentives such as annual recognition.

3. **Establishing Mandatory Policies and Incentive Programs:** Mandatory recycling policies for different waste types ensure high participation rates and a consistent supply of recyclable materials. Incentive programs such as tax incentives, rebates, or recognition opportunities can encourage businesses and residents to participate in recycling efforts. These policies and programs help build a culture of environmental stewardship and sustainability. Specific recommendations include:
 - Implement mandatory recycling policies for OCC (old, corrugated cardboard), mixed paper, and plastics to ensure high participation rates and a consistent supply of recyclable materials. Similar to Guam’s Mungnga Ma Ayek I Plastek Act of 2018, a phased approach and grace period are recommended. This allows residents to gradually adapt to the new requirements. Additionally, this phased approach can help alleviate the financial burden on businesses by providing them with adequate time to adjust their operations, phase out single-use plastics, and manage the costs associated with transitioning to the new regulations.
 - Create incentive programs to encourage participation in waste separation at the source, recycling, composting, and anaerobic digestion.

By weaving these regulatory recommendations into the governance structure, the Tinian Zero Waste Plan can establish a strong foundation for achieving its zero waste goals.

8.2.2 - A Zero Waste Policy Framework for the Future

Establishing a clear Zero Waste Policy Framework (hereinafter referred to as “Policy Framework”) is essential to pursuing a sustainable and resilient waste management system. The Policy Framework below focuses on the statutory and regulatory incentive-based tools required to achieve Tinian's zero waste goals. It encompasses mandatory recycling policies, incentive programs, and regulations supporting waste diversion and reduction. By providing these specific legal instruments, the Policy Framework focuses on creating a comprehensive regulatory environment that drives tangible progress towards zero waste goals in Tinian and ensures long-term commitment from all stakeholders.

The Zero Waste Framework (referred as “Framework”), detailed in this Section 8 (Recommendations) of the Tinian Zero Waste Plan, encompasses the foundational elements necessary to implement a zero waste program. This Framework emphasizes a holistic approach that integrates regulatory measures, community involvement, and continuous monitoring to create a sustainable system that reduces waste, promotes environmental stewardship, and supports the economic and social well-being of Tinian's residents. At its core, the active participation of the community is not just essential but a driving force.

Therefore, the Zero Waste Framework provides the overarching structure and guiding principles, while the *Policy Framework* offers the specific statutory and regulatory tools needed to operationalize these principles. Together, they form a comprehensive strategy to achieve zero waste goals, ensuring that policy measures are effectively implemented and supported by a strong governance structure and the active engagement of the community.

Below are the key elements of the Zero Waste Policy Framework, which provide the specific statutory and regulatory tools necessary to drive Tinian's progress towards achieving its zero waste goals.

a. Zero Waste Policies and Bans

1. Implement Mandatory Material Recovery

- Require the separation and recycling of paper, cardboard, food scraps, yard trimmings, and plastic materials.
- Establish centralized drop-off locations and community composting programs.
- Establish exemptions to support grassroots community and backyard composting.
- Create policies to support small-scale anaerobic digestion projects.
- Monitor and enforce compliance to ensure adequate material recovery.

2. Implement Bans on Single-Use Plastic Items Using a Phased Approach

- Phase out single-use plastic bags, straws, cutlery, and food containers based on waste disposal data from the landfill and on the coast.
- Provide incentives and education to support the transition.

3. Implement Government Green and Sustainable Purchasing Policy

- Adopt policies requiring the government to buy compostable products.
- Train procurement staff on the benefits of compostable materials.
- Track and report on the government's use of environmentally friendly, biodegradable products made from renewable resources or designed for reuse, such as returnable ink cartridges.

b. Tax Incentives and Preferred Purchasing Policies

• **Provide Tax Incentives for Sustainable Practices**

- **Tax Credits for Businesses:** Offer tax credits to businesses that implement zero waste practices, such as beneficial reuse of recovered materials in public projects. The Environmental Beautification Tax imposed a 0.42% rate ad valorem on consumer goods. Unfortunately, this has been temporarily suspended. Also, the Excise Tax Allocation provided 7% of excise tax revenue dedicated to solid waste management – this has also been suspended but represent to viable examples in the current tax structure to re-support waste reduction, recycling and solid waste management. Considering the island's base population, organic farms (ex., hot pepper growers) that serve as end-users for locally-made compost or digestate would be a good example.
- **Incentives for Composting and Recycling Facilities:** Offer tax incentives to companies that establish or expand composting and recycling facilities.

• **Establish Preferred Purchasing Policies for Compost and Mulch**

- **Government Procurement:** Mandate that government agencies prioritize the purchase of locally produced compost and mulch for landscaping and agricultural projects.
- **Public Projects:** To promote sustainable soil management practices, require the use of compost and mulch in all public landscaping and construction projects.
- **Incentives for the Private Sector:** Provide discounts or tax credits to private sector companies that purchase and use locally-made compost and mulch in their operations.

8.2.3 - Securing Sustainable Funding

Ensuring a reliable and sufficient funding stream for implementing the Tinian Zero Waste Plan is equally important as establishing a strong governance structure. Funding is essential to support the infrastructure, programs, and initiatives necessary to achieve zero waste goals. If the funding stream is based on a Resource Recovery Fund (RRF) type model, there may need to be additional legislation to keep

the funding stream solvent. Below are considerations for establishing and maintaining a reliable funding source:

1. **Resource Recovery Fund (RRF) Model:** Implementing a Resource Recovery Fund (RRF) provides a dedicated and stable funding source for waste management initiatives. This model ensures that funds are allocated explicitly for recycling, composting, and other waste diversion programs, thereby assuring the plan's financial stability.

Potential sources of funds for the RRF could include a portion of the landfill tipping fees (if they are ever collected) or grants. Another source could be a special fee associated with the annual vehicle registration funds, like Guam's Recycling Revolving Fund (Attachment C). To maintain the RRF's economic health, additional legislation may be necessary to authorize an entity to evaluate and adjust fees annually, as necessary, and manage fund allocations to foster innovation and sustainability. The legislation should also include provisions for regular audits and assessments to maintain transparency and accountability.

2. **Incentive Programs and Grants:** Establishing incentive programs can encourage businesses and residents to participate in recycling and waste reduction initiatives. These programs can include tax incentives, rebates, or recognition opportunities. Additionally, seeking grants can provide supplementary funding to support specific projects or pilot programs. Collaboration with government agencies, non-profit organizations, and private sector partners can enhance the chances of securing grants that promote community-based environmental protection.
3. **Public-Private Partnerships:** Developing partnerships with private sector entities can provide additional financial support and resources for waste management programs. These partnerships can involve co-funding projects, sharing expertise and technology, or providing in-kind contributions such as equipment or facilities through a build-operate-transfer (BOT) agreement, where a private company constructs and operates a facility for a set period before transferring ownership to the government.

The potential benefits of these partnerships are significant, including increased financial support, access to advanced technology, and the ability to leverage additional funding from external sources. Public-private partnerships can also demonstrate a commitment to collaborative and innovative solutions.

4. **Revenue Generation through Recyclable Sales:** Selling recyclable materials can generate revenue to support zero waste programs. Given the substantial amount of organic waste from vegetative growth, mulch and compost are among the more viable products in tropical environments, such as Tinian. Considering the island's base population, organic farms (e.g., hot pepper growers) that serve as end-users for locally made compost or digestate would be a good example. Establishing a market for high-quality compost can offer a more reliable income stream. By pursuing and developing relationships with on-island end-users, consistent quality and supply can be ensured, maximizing the financial benefits from these sales.
5. **Community Fees & Contributions:** The community plays a vital role in the success of any waste management initiative. Implementing a fee structure for waste disposal and recycling services

can provide a stable funding source. These fees can be based on the volume or weight of waste generated, encouraging waste reduction and recycling.

Community contributions, such as voluntary purchases for specific programs, can supplement the funding stream or help reduce costs. For example, a local recycling initiative could encourage residents to purchase home composting bins, thereby reducing program expenditures. By practicing home composting, the community can feel involved and responsible for the plan's success.

By weaving these funding strategies into the Tinian Zero Waste Plan, a reliable and sufficient funding stream can be established to support the long-term sustainability of zero waste initiatives. Securing sustainable funding, alongside a strong governance structure, waste ensures that Tinian has the tools to achieve its zero waste goals.

8.2.4 - Public Education & Outreach

The success of the Tinian Zero Waste Plan relies on the support and participation of a well-informed community. The Tinian and Aguiguan Mayor Edwin P. Aldan's Office has been leading Zero Waste community outreach since America Recycles Day 2022 (for further details, see Attachment B- Mayor Edwin P. Aldan's Office Zero Waste Community Outreach).

Developing and implementing a comprehensive 5-year Public Education & Outreach (PE&O) plan is crucial for the success of the Tinian Zero Waste Plan. Consistent and effective communication, along with integrating these initiatives into schools, is crucial. Educating the younger generation will ignite excitement and energy that they will bring home, fostering a culture of sustainability.

Below are elements of a recommended PE&O strategy:

1. **Build on past outreach success in close coordination with the Mayor's Office of Tinian, Tinian Department of Public Works, CNMI OPD and BECQ.**
2. **Develop a 5-Year Public Education & Outreach (PE&O) Plan**

Providing a roadmap for public education and outreach activities is of the utmost importance. The plan should outline the goals, strategies, and specific actions each year to raise awareness and engage the community in waste reduction efforts. Key components of the plan should include:

 - **Goals and Objectives:** Define clear, measurable goals for increasing public awareness and participation in zero waste initiatives.
 - **Target Audiences:** Identify key stakeholders, such as government leaders, residents, businesses, schools, faith-based organizations, and community organizations.
 - **Messages and Materials:** Develop consistent messaging and educational materials tailored to different audiences.
 - **Channels and Methods:** To reach a broad audience, utilize diverse communication channels, including social media, community events like fiestas, workshops, and school programs. This approach ensures engagement with a wide cross-section of the community.
 - **Evaluation and Adjustment:** Regularly assess the effectiveness of PE&O activities and make necessary adjustments to improve outcomes.
 - **Integrate PE&O into Schools: Educating** students about waste management, zero waste strategies, and sustainability is vital for long-term success. Schools provide an ideal platform for the younger generation to instill sustainable practices and values. Strategies include:

- **Curriculum Integration:** Work with educational authorities to incorporate zero waste principles into the school curriculum.
 - **School Programs:** Implement programs like tours, zero waste lunches, recycling clubs, composting projects, and environmental science projects.
 - **Interactive Learning:** Use hands-on activities, field trips, waste characterizations, and demonstrations to engage students and make learning about waste management fun and memorable.
 - **Expand Tinian’s school Stallion Battalion Program**²⁷<https://www.usarmyjrotc.com/stallion-battalion-promotes-recycling-project-to-community/>
 - **Student Ambassadors:** Encourage students to become zero waste ambassadors, promoting sustainability within their schools and communities. Online models can be tailored to meet local needs.
3. **Community Outreach and Engagement:** Engage the broader community through various outreach activities for the widespread adoption of zero waste practices. Strategies include:
- **Workshops and Seminars:** Organize educational workshops and seminars on recycling, composting, and sustainable living.
 - **Community Events:** Promote zero waste activities at local events and major festivals, such as the *Tinian Hot Pepper* and *Gineptin Ha’anen Taga* Festivals, to raise awareness and distribute educational materials. Village community cleanups and beautification competitions could be another strategy, such as American Samoa competition that resulted in cleanup of over 13,000 tons of materials (for more information, follow <https://talamua.com/2022/06/20/tufuiopa-wins-village-beautification-competition/>)
 - **Engaging community boards or banners:** to remind community members of initiatives. These boards or banners can be updated at regular intervals or as needed.
 - **Social Media Campaigns:** Use social media platforms to share tips, success stories, and updates on zero waste initiatives.
 - **Partnerships:** Collaborate with local organizations, businesses, and media outlets to amplify outreach efforts and reach a larger audience.
 - **Monitoring, Measurement & Reporting:** Accurate data collection is a crucial foundation for any source diversion initiative, including a Zero Waste Program, as it helps identify obstacles, opportunities, efficiencies, and progress. It is also vital for justifying future grant fund requests for the Zero Waste Program and providing community outreach on progress. Data collection and measurement are ongoing processes that start with establishing a baseline data set, which serves as a comparison point for future program evaluations²⁸. For detailed strategies and implementation steps, please refer to Section 8 – Monitoring and Progress Measurement.

8.2.5 - Infrastructure Development:

Any initiative to develop additional solid waste infrastructure, such as reuse systems, expanded recycling, or an advanced composting facility, to support Tinian’s zero waste strategy needs to be preceded by the establishment of a strong governance structure, sustainable zero waste program funding, and a strong public education and outreach program. Once these foundational elements are in place, the types of infrastructure needed and information necessary to justify the additional infrastructure needs/costs will be

²⁷ For more information, visit: <https://www.usarmyjrotc.com/stallion-battalion-promotes-recycling-project-to-community>

²⁸ Government of Guam. *Guam Zero Waste Plan*. June 2013.

more robust, and consensus-building among public and private stakeholders will be much easier to accomplish.

8.2.6 - Monitoring, Measurement and Reporting

See Section 9 - - Monitoring and Progress Measurement.

8.3 - Material-specific recommendations

Following the overarching strategies described in the Zero Waste Framework, specific waste categories require tailored approaches to maximize efficiency and sustainability. The sections below outline key recommendations and benefits for managing fiber, plastic, and organic wastes in Tinian. These strategies are designed to reduce landfill or dump usage, promote resource conservation, and foster community engagement through targeted interventions.

8.3.1 - Fiber

Fiber waste, including OCC and mixed paper, constitutes approximately 27% of Tinian's waste stream. Effective management of these materials is crucial for reducing landfill or dump usage, conserving natural resources, and minimizing greenhouse gas emissions.

a. Key Strategies:

1. Beneficial Reuse:

- Agriculture: Shredding and using old, corrugated cardboard (OCC) as animal bedding or sheet mulch offers sustainable reuse of fiber waste and supports local agriculture. By providing an alternative to conventional bedding materials, this approach promotes environmental sustainability and resource efficiency. Staples and tape would need to be removed for these uses.
- Education: Encourage schools and community centers to use scrap paper (e.g., office paper, old newspapers, old magazines, cardboard) for arts and crafts projects for students. This reduces waste and promotes creativity and sustainability within the community.

2. Composting:

- **Commercial or Community Composting at the Yard Debris Lot:** If proper composting methods can be established at the yard Debris Lot, the site can operate at a Community Composting-scale operation due to Tinian's low population. Clean, non-glossy, non-treated mixed paper, like newspaper, can be used as a carbon source in compost piles. Cardboard can also be shredded and composted if staples

Best Practice Example: Community Composting in California

California has led the way for many zero waste infrastructure expansions in America, particularly with respect to composting. The California Alliance for Community Composting (CACC) provides technical and financial assistance to 105 community-based organizations in six priority regions participating in CalRecycle's pilot grant program, "Community Composting for Greens Spaces" (CCGS). The second round of the program (CCGS-2) scheduled for April 2023 to April 2025. CCGS creates local green jobs, improves local soil health for local food production, and supplements local capacity and knowledge to meet zero waste goals.



Example materials accepted list for a community compost hub in California.

Image and description source:



Example materials accepted list for a community compost hub in California.

Image and description source:

<https://www.biocycle.net/community-composting-california/>

and tape are removed. These materials help balance the high nitrogen content from green waste, resulting in more effective composting. The resulting compost can improve soil structure, water retention, and plant nutrition.

- **Backyard Composting:** Encourage home composting of clean cardboard. Cardboard has a high carbon-to-nitrogen ratio (approximately 400:1), and it can help balance the high nitrogen content of food waste and some yard wastes. Cardboard can also be used to suppress weeds in the garden and transform yards into grow beds.
 - **Repurpose shredded OCC and mixed paper** (non-glossy, non-treated mixed paper) as garden mulch to improve soil moisture retention and reduce weed growth. This practice, known as lasagna composting, involves using a layer of cardboard or newspaper on the soil with mulch on top, benefiting gardening and landscaping efforts.
3. **Other Waste Diversion Opportunities or Optimizations**
- Provide increased access to recycling by establishing two covered small community drop-off locations to collect fiber scrap. These locations should have physical protection from the elements with a roof. They would need not be elaborate, but they would need to be large enough to hold several wheeled carts or small dumpsters, accessible to the community, serviceable by a waste hauler, kept tidy, and provide education on how to reduce waste, sort correctly, and prevent litter. This idea is explored in more detail under “Plastics”.
 - Explore the potential for combining small amounts of fiber waste with other nutrient-rich organic waste feedstocks (like food waste and yard wastes) for anaerobic or aerobic digestion. Anaerobic digestion produces biogas and soil amendments, and aerobic digestion can produce soil amendments. This method offers a sustainable waste management

Best Practice Example: A Microdigestion Facility

In 2021, the Town of Tusten, New York, a small rural community with 1,405 residents (2020), developed a High-solids Organic-waste Recycling System with Electrical output (HORSE). This anaerobic microdigester could process up to two tons of food waste from community food waste generators per month (for instance, small grocers and cafes). The facility demonstrated that this technology is possible in very small communities. Microdigestors like the Tusten HORSE can be scaled in size to serve communities as small as 50 people to as large as 50,000 or process as little as 25 tons or as much as 4,500 tons per year.¹



Ribbon cutting on April 22, 2021, for the Tusten HORSE. The plan was for food waste to be collected in five-gallon food-grade buckets from seven different local food establishments. The microdigester, at full capacity, would handle 4000 lbs. (2 tons) of food waste per month, or 66 buckets per week.

Image source: <https://riverreporter.com/stories/a-traveling-horse,61864>

solution and a renewable energy source for Tinian. Further studies are needed to assess the economic viability of this technology.

- Use and maintain a baler at the transfer station to reduce the volume of fiber for recycling. Compressing fiber scrap intended for the market helps make the recycling process more economically viable.

b. Benefits:

1. Reduction In Dump use and Associated Costs.

Diverting fiber waste from the *Puntan Diablo* open dump reduces overall waste volume. Waste diversion not only extends the operational life of the existing land disposal unit, providing additional time to construct a new RCRA Subtitle D-compliant sanitary landfill site, but it also decreases the frequency and cost of waste collection.

2. Improving Soil Health and Fertility.

Using shredded OCC and mixed paper (non-glossy, non-treated mixed paper) as carbon sources in composting produces nutrient-rich compost that enhances soil structure, water retention, and plant nutrition. Additionally, repurposing fiber waste as mulch improves soil moisture retention and weed suppression, benefiting local farms and potential community gardens and promoting sustainable agriculture and food security.

3. Enhanced Community Engagement and Economic Development.

Recycling fiber waste fosters a culture of environmental stewardship and sustainability, and nature-based innovation, encouraging community participation and responsible behavior. Supporting local artists, farmers, and businesses through repurposing initiatives contributes to a vibrant and resilient local economy.

**Best Practice Example:
Community Recycling Drop-off Centers**

At [recycling and transfer stations](#), Hawaii Island residents may drop off a variety of recyclables in these community-based centers. Hawaii County opens the recycling bins at 8 a.m. and closes them at 4 p.m., and most are open every other day to accommodate efficient routing so the materials do not sit uncollected for long.

Residents are advised not to bag their recyclables and to flatten all clean corrugated cardboard before placing it in the cardboard/paper bags bin. Non-deposit glass is also collected at all drop-off centers. Select centers accept other recyclables and donatable goods.



Example roofed area at a Drop-off site in Hawaii – This is the Reuse Shed that is used for donatable items with useable life left that the public can drop off or take home with them.

**Best Practice Example:
The “Plastic Free July” Campaign**

The [Plastic Free July](#) campaign originated in Australia with several participants in 2011 but has since grown to millions worldwide. The campaign challenges participants not to use any plastic during the month of July. This campaign integrates effective strategies, avoids common mistakes and models good norms as detailed in the full report published online at www.campaignsthatwork.org.

The key strategies for managing fiber waste in Tinian focus on enhancing fiber recycling programs, reducing fiber waste generation, promoting waste diversion opportunities, and implementing an effective public

awareness campaign. By implementing these strategies, Tinian can significantly reduce landfill use and greenhouse gas emissions, promote the use of renewable energy, and improve the soil health of the island.

8.3.2 - Plastics

Plastics, including PET, HDPE, and mixed plastics, constitute approximately 25% of Tinian's waste stream. Effective management is essential to reducing environmental pollution, conserving natural resources, and supporting sustainable development.

a. Key Strategies:

1. Reduce Plastic Waste Generation:

Reduce the amount of plastic waste generated by implementing bans or restrictions on single-use plastic disposables (like Styrofoam, bags, and straws) and promote reusable and compostable alternatives. This approach encourages sustainable consumption habits and reduces the overall environmental impact of plastic litter.

2. Enhance Plastic Recycling & Reuse Programs:

To make recycling and reuse more accessible to residents, expand the number of collection points (community drop-off locations) for residential recyclables by two. Establish two small community drop-off locations to collect recyclable plastic scrap (resin codes 1 and 2) and other recyclable commodities, providing increased access to recycling and reuse for those that live furthest

from the Transfer Station. These locations should have physical protection from the elements with a roof. They do not need to be elaborate, but they would need to be large enough to hold several wheeled carts or small dumpsters, accessible to the community, serviceable by a waste hauler, kept tidy, and provide education on how to reduce waste, sort correctly, and prevent litter.

3. Coordinate a public awareness campaign

to educate the community on the importance of reducing plastic waste, recycling eligible plastics, and proper sorting methods. Partnerships with recycling companies, grocers, and retail stores, who are willing to help distribute the campaign, may help ensure its impact in the community and bring awareness to the issue of plastic waste that is incorrectly disposed of, either by littering, illegal dumping, or not recycling acceptable plastics in Tinian.

4. Waste Diversion Opportunities:

Promote the beneficial reuse of plastic waste and repurpose certain types of plastic for art and craft projects and construction materials.

Best Practice Example: DC's \$0.05 Bag Usage Fee

On January 1, 2010, the District of Columbia began collecting \$0.05 bag usage fees (with certain exemptions) under the [Anacostia River Clean Up and Protection Act of 2009](#) – known as the “bag law”. The law was the first of its kind in the U.S., with a goal to change consumer behavior by discouraging the use of disposable bags, thereby reducing trash pollution in waterways. The Alice Ferguson Foundation monitors trash in District waterways and [reported](#) a 72% reduction in the number of bags found during its stream clean-ups. Substantial reductions in plastic bags have improved the water quality and wildlife habitat of the Anacostia River, restoring it as a cultural and economic resource for DC residents.



Food and alcohol retailers in DC show a small sign at their registers to explain the \$0.05 bag fee.

b. Benefits:

- **Reduction In Landfill/Dump Use and Associated Costs.**

Diverting plastic waste from the *Puntan Diablo* sanitary open dump reduces overall waste volume, leading to lower tipping fees and disposal costs. Waste diversion not only extends the operational life of the existing land disposal unit, providing additional time to construct a new RCRA Subtitle D-compliant sanitary landfill site, but also decreases the frequency of landfill trips, resulting in substantial savings for the waste management system.

- **Reduction In Pollution and Protection of Wildlife.**

Proper management of plastic waste reduces environmental pollution and protects wildlife from the dangers of plastic ingestion or entanglement. Minimizing plastic waste helps preserve natural habitats, leading to cleaner ecosystems and improved biodiversity.

- **Enhanced Community Engagement and Public Health.**

Recycling and diverting plastic from land disposal fosters a culture of environmental stewardship and sustainability within the community, encouraging responsible behavior and increased participation. Public education initiatives raise awareness about the benefits of recycling, empowering residents to make informed choices that contribute to a cleaner environment. Reducing plastic waste also minimizes pollution, which can have significant health benefits by reducing the incidence of respiratory issues and other health problems associated with plastic pollution ingestion and from burning or the additives that break down in leachate.

The key strategies for managing plastic waste in Tinian focus on enhancing plastic recycling programs, reducing plastic waste generation, and promoting waste diversion opportunities. By implementing these strategies, Tinian can significantly reduce landfill use, reduce plastic pollution, protect wildlife, and promote sustainability within the community. For detailed strategies and implementation steps, refer to the "Tinian Zero Waste Plan: White Paper - Plastics."

8.3.3 - Organics

Organic waste, primarily food waste and yard trimmings, represents approximately 15% of Tinian's waste stream. Proper management can reduce landfill use and greenhouse gas emissions and create valuable products like compost and biogas.

a. Key Strategies:

1. **Food Waste Reduction:** Examples include donations from schools, restaurants, community events, etc. for both human consumption and livestock feed.
2. **Composting:**
 - **Commercial/Community-scale composting at the Yard Debris Lot:** As described previously, Tinian should modernize its composting methods and operations at the Yard Debris Lot to allow for commercial/community composting of food wastes and yard wastes using proven techniques to achieve a Process to Further Reduce Pathogens (PFRP) and create a Class A compost that can be made available to the community.²⁹
 - If composting is not possible at the Yard Debris lot for any reason, Tinian should support the establishment of **small-scale neighborhood composting sites** to divert

²⁹ Explanation of PFRP by the U.S. EPA: <https://www.epa.gov/biosolids/examples-equivalent-processes-pfrp-and-psrp>

- organic materials from the Puntan Diablo open dump in order to reduce waste volume and create valuable compost.
- **Backyard Composting:** In cooperation with the local Agricultural Extension Office for Tinian, hosted by the Northern Marianas College, and the local Parks department, backyard composting should be promoted as a hyperlocal way to reduce food waste disposed of in the open dump.
 - All composting activities on Tinian sites will support local agriculture and horticulture by providing nutrient-rich soil amendments, improving soil health, and promoting sustainable farming and gardening practices.
3. **Anaerobic or Aerobic Digestion:** As introduced in the Fibers sections above, organic waste is an ideal feedstock for a small-scale anaerobic or aerobic digestion facilities. Tinian could consider implementing a microdigester pilot to recycle food and yard waste and to produce biogas, a renewable energy source, and a nutrient-rich digestate that can be used as fertilizer and soil amendment. This approach reduces the amount of organic waste sent to the dump and generates renewable energy and valuable byproducts, contributing to a circular economy.
 4. **Public Awareness Campaigns:** Educate the community on the benefits of composting and anaerobic digestion through targeted campaigns to increase participation and awareness. These campaigns will highlight the environmental and economic advantages of organic waste management, encouraging residents to adopt sustainable practices and contribute to the community's zero waste goals.

The U.S. EPA has compiled resources for American communities to implement composting campaigns at no additional cost to them (beyond their own coordination and deployment of the campaigns). The campaign templates can be downloaded after filling out a simple online survey on the EPA's website that asks about how the campaign templates will be used.³⁰

³⁰ The URL for the campaign template usage survey is <https://www.epa.gov/sustainable-management-food/forms/composting-food-scraps-your-community-social-marketing-toolkit#download>. After completing it, visitors will be taken to a webpage where they can download free campaign graphics. The usage guidelines include:

- Agency-specific logos, branding, and URLs on the templates can be replaced with those from another agency/organization.
- The message and overall concept on the materials will remain intact.
- They will not be used for commercial use.
- If Metro Vancouver's materials are used, attribution to Metro Vancouver will be given on your website, posters, or where space allows.



Figure 14 - Screenshot of the downloadable compost campaign templates from US EPA

b. Benefits:

1. **Reduction in Landfill Use and Pollution:** Diverting organic waste from the *Puntan Diablo* sanitary open dump reduces the overall waste volume, lowering tipping fees and disposal costs. The diversion of organic waste from land disposal also decreases the production of leachate and methane emissions from landfills, reducing pollution and protecting the environment.
2. **Reduction in Greenhouse Gas Emissions:** Proper management of organic waste through composting and anaerobic digestion significantly reduces methane emissions, a potent greenhouse gas. By minimizing these emissions, Tinian can contribute to climate change mitigation and promote cleaner ambient air for residents.
3. **Production of Renewable Energy and Improvement in Soil Health:** Anaerobic digestion of organic waste produces biogas, a renewable energy source and nutrient-rich digestate that can be used as fertilizer. Composting also produces nutrient-rich compost that improves soil structure, water retention, and plant nutrition, supporting local agriculture and promoting sustainable land use practices.

The key strategies for reducing organic waste in Tinian focus on enhancing composting programs, exploring small-scale anaerobic or aerobic digestion opportunities, and implementing an effective public awareness campaign. By implementing these strategies, Tinian can significantly reduce landfill use and greenhouse gas emissions, promote the use of renewable energy, and improve the soil health of the island.

8.4 - Potential Grant Funding Sources

The Environmental Protection Agency (EPA) offers several grant programs that provide funding for recycling programs to US territories and local governments.

8.4.1 - SWIFR Grant Program

This program provides grants to states and territories to support their long-term planning and data collection needs. The grants can also be used for equipment and construction costs to implement plans. The program aims to help states and territories demonstrate progress toward the National Recycling Goal and Food Loss and Waste Reduction Goal. The grants also support the Justice40 Initiative, which aims to ensure that 40% of the benefits of these federal investments flow to underserved communities. The Bipartisan Infrastructure Law provides \$275 million for this program from 2022 to 2026. In 2023, the EPA made \$30 million available for states and territories and has a SWIFR Communities program Tinian is eligible to apply for. Territories and local governments are eligible to use SWIFR funding for construction and equipment to reduce waste. (Source: <https://www.epa.gov/infrastructure/solid-waste-infrastructure-recycling-grant-program>).

8.4.2 - Consumer Recycling Education and Outreach Grant Program

This program is also available to US territories, including Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of Northern Mariana Islands. Other eligible entities include local governments, federally recognized tribal governments, nonprofit organizations, and public-private partnerships. (Source: <https://www.epa.gov/infrastructure/consumer-recycling-education-and-outreach-grant-program>)

8.4.3 - Environmental Justice Funding and Technical Assistance Programs

EPA has multiple Environmental Justice grant and technical assistance programs open to underserved local governments and Community Based Organizations. In many cases, zero waste or circular economy programs as well as solid and hazardous waste management programs are provided as eligible examples. (Source: <https://www.epa.gov/environmentaljustice/environmental-justice-grants-funding-and-technical-assistance>)

8.4.4 - Pollution Prevention Grants

Pollution Prevention or “P2” grants can fund programs to reduce solid waste through policy changes or programs, including bans or reuse programs. Recycling and composting programs are not eligible for funding. (Source: <https://www.epa.gov/p2/grant-programs-pollution-prevention>) Other federal funding sources include:

- USDA Composting and Food Waste Reduction Grants and Rural Development Water & Waste Disposal (including reuse, recycling, and composting projects grants which can be used to fund waste reduction to reduce water pollution.
- (Sources: <https://www.usda.gov/topics/urban/coop-agreements> and <https://www.rd.usda.gov/programs-services/water-environmental-programs/water-waste-disposal-loan-grant-program>)
- All federal grants can be searched at <https://www.grants.gov>.
- Other funding sources may exist from federal and private sources, such as The Recycling Partnership.

9 - Monitoring and Progress Measurement

Effective monitoring and progress measurement are critical components of a successful zero waste management strategy. This section outlines the key aspects of progress tracking and establishing benchmarks to ensure the effective implementation and continuous improvement of waste management initiatives for organics, fibers, and plastics, as detailed in the respective White Papers (See Appendices).

9.1 - Progress Tracking

- **Regular Data Collection:**
 - Conduct regular waste audits to quantify the amount and types of waste diverted from landfills. The audits should include detailed tracking of organics, fibers, and plastics.
 - Expand data collection to include export data of recyclables to consolidators to improve accuracy and reporting by on-island recycling companies as required by permit.
 - Evaluate various technologies to determine their practicality for Tinian. While innovative solutions such as smart bins with sensors that monitor fill levels and types of waste are available, these technologies may not be suitable for Tinian due to the quantities of recyclables generated. Instead, focus on implementing standardized reporting formats to ensure data collection and analysis consistency.
- **Reporting and Documentation:**
 - Develop a comprehensive reporting system to document progress. This system should include quarterly and annual reports that detail the amounts of waste collected, processed, and diverted.
 - Ensure transparency by making these reports accessible to stakeholders, including the community, local government, and partnering organizations online.
 - Regularly update and maintain records to track the performance of various programs and initiatives.
- **Community Feedback and Participation:**
 - Engage the community through online surveys and feedback mechanisms to gather input on the effectiveness of zero waste and other solid waste management programs and to identify areas for improvement.
 - Conduct public informational meetings and workshops to discuss progress and gather suggestions from residents. Additionally, leverage events such as the Tinian Hot Pepper Festival to set up interactive booths to survey participants or engage the youth to conduct e-surveys, ensuring broader community input.
 - Utilize social media and other digital platforms to facilitate ongoing communication and engagement, ensuring that a broad and representative cross-section of the community is reached.
- **Evaluation and Adjustment:**
 - Perform regular evaluations of waste management strategies to assess their effectiveness and make data-driven adjustments.
 - Utilize performance metrics such as diversion rates, contamination rates, and participation levels to gauge success and identify areas needing improvement.
 - Implement a continuous improvement cycle where programs are regularly reviewed and refined based on feedback and performance data.

9.2 - Benchmarks

For the three primary recyclable material streams generated on Tinian, the following sample benchmarks have been described. See the next section for a full implementation timeline and budgetary estimates. The following sample benchmarks help Tinian establish clear, measurable goals for waste diversion specific to organics, fibers, and plastics, aligned with broader sustainability objectives such as reducing landfill use, minimizing greenhouse gas emissions, and promoting the circular economy. Setting these initial benchmarks, based on baseline data collected from waste audits and characterization studies, is essential for planning and implementing waste management initiatives. Benchmarks are vital for measuring success, identifying areas for improvement, and ensuring that zero waste strategies are practical and sustainable.

- **Short-Term Benchmarks (1-3 Years)**
 - **Fibers:**
 - Implement mandatory recycling policies for OCC and mixed paper.
 - Achieve a 20% diversion rate for fiber waste within the first three years.
 - **Plastics:**
 - Expand collection points to increase plastic diversion rates.
 - Launch pilot programs to reduce single-use plastic waste by 30%.
 - **Organics:**
 - Increase community composting participation by 25%.
- Mid-Term Benchmarks (4-5 Years)
 - **Fibers:**
 - Expand composting programs to include all community gardens and local farms.
 - Achieve a 50% diversion rate for fiber waste.
 - **Plastics:**
 - Integrate plastic waste diversion into the existing waste management framework and achieve a 50% reduction in plastic waste sent to landfills.
 - Strengthen public-private partnerships to enhance recycling infrastructure.
 - Implement a single-use plastics ban on single-use plastic bags, straws, cutlery, and food containers based on waste disposal data from the landfill and on the coast.
 - **Organics:**
 - Increase composting programs and achieve a 50% diversion rate for organic waste.
 - Implement anaerobic digestion programs and begin biogas production.
- Long-Term Benchmarks (6-10 Years)
 - **Fibers:**
 - Establish a comprehensive fiber recycling program.
 - Maintain a diversion rate of at least 75% for fiber waste from land disposal.
 - **Plastics:**
 - Increase bans on single-use plastic products.
 - Improve waste diversion activities
 - Achieve an 80% reduction in plastic waste land disposal.
 - **Organics:**
 - Fully integrate composting and anaerobic digestion into the waste management system and achieve an 80% diversion rate.
 - Continuously improve compost quality and increase local use in agriculture.

10 - Recommendation Implementation Timeline & Budgetary Estimates

The capital and labor estimates for the recommendations above are described below. While the development of these budgetary estimates did not have the benefit provided by insight into the current waste management budget/expenditures for solid waste management on Tinian, its leadership can compare the following estimates to what it currently manages to understand its costs and benefits.³¹

Table 14 - Recommendation Implementation Timeline & Budgetary Estimates

Category	Waste & Recycling Streams	Priority High: Yrs 1-3, Mid: Yrs 4-5 Low: Yrs 6-10	Years	Recommendation Description	One-time Cost Estimates					Ongoing Annual Cost Estimates		
					Equipment	Land Acquisition	Add'l FTEs	Employee Labor (\$)	Contracted Services / Delivery	Add'l FTEs	Employee Labor (\$)	O&M / Contracted Services
Programs & Infrastructure	All (Fiber, Waste, Plastics, Organics, Metal, Glass, HHW, Bulky, C&D)	High: Years 1-3	Year 1	Confirm landfill diversion goals specific to individual material types	\$0		0.25	\$16,250			\$0	
			Year 2	Procurement of a contractor to perform Transfer Station Upgrades			0.25	\$16,250	\$40,000		\$0	
			Year 2	Undergo Transfer Station Upgrades (Contracted services of a Design/Build firm) Upgrades - Organic Processing, Reuse and recycling			1.25	\$81,250	\$250,000		\$0	
				Compactor & Roll-off Truck Tune-up so that they are operational			0.10	\$6,500	\$25,000		\$0	
				Six (6) 20-foot shipping containers to store recyclable commodities and loading/hauling of them to the port for shipping, assumed to be up to 12 hauls per year at \$500 per haul. Initial delivery of each container, estimated at \$300 each. Includes additional FTE support for managing the storage of materials	\$30,000			\$0	\$2,000	0.1	\$6,500	\$6,000
				Additional carts/containers at the Transfer Station to hold additional source-separated commodities and waste streams, such as Food Waste and Glass (up to 10 containers at \$5,000 each and 1 person to help direct visitors to which bins to use), Initial delivery of each container, estimated at \$300 each.	\$50,000	NA		\$0	\$3,000	1	\$65,000	\$1,000

³¹ Note: Labor estimates are based on a \$65,000 salary per year per FTE, therefore actual Labor estimates may be more or less based on individual salaries or hourly rates for staff "FTE" stands for Full Time Equivalent employees, "Add'l" stands for Additional, and "O&M" stands for Operations & Maintenance.

Category	Waste & Recycling Streams	Priority High: Yrs 1-3, Mid: Yrs 4-5 Low: Yrs 6-10	Years	Recommendation Description	One-time Cost Estimates					Ongoing Annual Cost Estimates		
					Equipment	Land Acquisition	Add'l FTEs	Employee Labor (\$)	Contracted Services / Delivery	Add'l FTEs	Employee Labor (\$)	O&M / Contracted Services
Programs & Infrastructure	All (Fiber, Waste, Plastics, Organics, Metal, Glass, HHW, Bulky, C&D)			Facility retrofits to provide HHW drop-off, stabilization, and transfer (all housed within a separate shipping container (not under same roof with Transfer Station) with \$10,000 work of customizations as necessary. Includes an FTE estimate, training for long-term HHW program management, and annual special waste disposal services	\$80,000	NA		\$0	\$100,000	0.25	\$16,250	\$6,000
				Facility retrofits to provide bulky waste acceptance and transfer to landfill (need one roll-off container for Bulk Waste, they already have the space for it), hauling services to the landfill assumed to be \$300 each haul and twice per month, includes additional FTE support for Bulky Waste program management. Initial delivery of each container, estimated at \$300 each.	\$50,000			\$0	\$300	0.2	\$13,000	\$7,200
				Facility retrofits to provide- drop-off and pick-up of usable goods (a "Donation Shed") within a separate area at the Transfer Station, there is currently room for it. The shed is estimated at \$25,000. Initial delivery of a pre-fabricated shed estimated at \$5000. Installation of the shed estimated at \$10,000. Includes additional FTE support for Donation Shed program management and annual repairs	\$25,000			\$0	\$12,000	0.2	\$13,000	\$1,000
				Install a two-ram baler for plastics and metals (assumed to be NEW, includes shipping to Tinian)	\$300,000		0.10	\$6,500			\$0	
				Glass crushing equipment and storage for sand for local beneficial reuse. (1000 -1500 lbs per hr)	\$40,000		0.10	\$6,500			\$0	
				Tune-ups and annual maintenance of all large equipment (such as balers, loaders, trucks, compactors and crushers) at the Transfer Station. Includes additional FTE support to anticipate and coordinate maintenance needs				\$0		0.25	\$16,250	\$100,000
				Other site improvements, such as security, parking, signage, utilities	\$300,000			\$0	\$100,000		\$0	
				Year 2	While the Transfer Station is being upgraded, establish a detailed plan for marketing and shipping of recyclable commodities and beneficial reuse of materials (such as crushed glass on Tinian) on Tinian, within CNMI, or to foreign markets.			0.25	\$16,250		\$0	

Category	Waste & Recycling Streams	Priority High: Yrs 1-3, Mid: Yrs 4-5 Low: Yrs 6-10	Years	Recommendation Description	One-time Cost Estimates					Ongoing Annual Cost Estimates		
					Equipment	Land Acquisition	Add'l FTEs	Employee Labor (\$)	Contracted Services / Delivery	Add'l FTEs	Employee Labor (\$)	O&M / Contracted Services
Programs & Infrastructure	All (Fiber, Waste, Plastics, Organics, Metal, Glass, HHW, Bulky, C&D)	Mid: Years 4-5	Year 2	While the Transfer Station is being upgraded, establish a detailed plan for two small drop-off centers ("recycling convenience centers") for recyclables, compostables, and used goods that can be donated near neighborhoods furthest from the Transfer Station.			0.50	\$32,500			\$0	
			Year 3	Build two recycling convenience centers that will open with limited acceptance during the upgrades of the Transfer Station and Yard Debris Lot	\$100,000	\$50,000	0.25	\$16,250			\$0	
			Year 4	After the Transfer Station Upgrade is complete, initiate pilot programs to collect and process recyclables from the convenience centers and increased recycling at the Transfer Station.	\$0	\$0	0.25	\$16,250				
		Low: Years 6-10	Year 4	After the Transfer Station Upgrade is complete, begin marketing recycled commodities on the recycled commodities market			0.20	\$13,000			\$0	
			Year 5	After Pilot programs are completed (assumed to be 1 year), roll-out Island-wide recycling pilot programs.			0.25	\$16,250			\$0	
			Years 6-10	Evaluate the results of the program roll-outs, adjust strategies as needed, and begin scaling up successful initiatives.				\$0		0.1	\$6,500	
			Years 6-10	Evaluate the effectiveness of mandatory recycling policies and make necessary adjustments.				\$0		0.1	\$6,500	
			Years 6-10	Scale up successful recycling, composting, and reuse initiatives to cover the entire island.				\$0		0.25	\$16,250	
		High: Years 1-3	Year 1	Conduct a feasibility study for composting and biogas production using organic wastes as the primary feedstocks and mixed paper and FOG as secondary feedstocks at the Yard Debris Lot/			0.25	\$16,250	\$75,000		\$0	

Category	Waste & Recycling Streams	Priority High: Yrs 1-3, Mid: Yrs 4-5 Low: Yrs 6-10	Years	Recommendation Description	One-time Cost Estimates					Ongoing Annual Cost Estimates			
					Equipment	Land Acquisition	Add'l FTEs	Employee Labor (\$)	Contracted Services / Delivery	Add'l FTEs	Employee Labor (\$)	O&M / Contracted Services	
Programs & Infrastructure	Organics, Fiber, FOG		Year 1	Based on the feasibility study's results, develop a defined plan and budget for Yard Debris Lot Upgrades to allow for increased acceptance of organics (food waste, yard waste, woody biomass), site upgrades, accurate weighing and tracking of feedstocks, easier access for residents, signage (wayfinding, education), chipping, mulching, composting and/or anaerobic digestion, screening, storage, and sale/give-away of compost back to residents.				\$0	\$30,000	0.25	\$16,250		
			Year 2	Procurement of a contractor to perform Yard Debris Lot Upgrades			0.25	\$16,250	\$30,000		\$0		
			Year 2	Undergo Yard Debris Lot Upgrades			1.00	\$65,000		\$0			
				Install a function large chipper for incoming woody debris, assumed to be NEW condition, includes shipping	\$250,000			\$0		\$0			
				Function loader and forklift for moving materials, assumed to be NEW condition, includes shipping, Includes additional FTE support to manage the equipment at the facility	\$175,000			\$0	0.5	\$32,500			
				Large Drum screener, includes shipping	TBD			\$0		\$0			
				Other site improvements, such as security, parking, signage and per the feasibility study	\$200,000			\$0		\$100,000		\$0	
				Year 3	While the Yard Debris Lot is being upgraded, establish a plan for pilot projects for the composting and/or anaerobic digestion (biogas production) of feedstocks, including collection types, processing needs, participants, and timelines.			0.50	\$32,500	\$50,000		\$0	
			Year 3	After the Yard Debris Lot upgrades are complete, initiate pilot programs			0.50	\$32,500	\$20,000		\$0		
			Mid: Years 4-5	Year 4	After Pilot programs are completed (assumed to be 1-year), roll-out Island-wide organics management program for primary feedstocks (food waste, yard waste, and woody biomass), with FOG and mixed paper as secondary feedstocks.			0.50	\$32,500	\$20,000		\$0	
				Year 5	Monitor the progress of composting and anaerobic digestion projects and make necessary improvements.			0.25	\$16,250			\$0	
			Low: Years 6-10	Years 6-10	Continue Organics Management Program on Tinian, continue long-term monitoring and reporting mechanisms.				\$0		0.25	\$16,250	

Commonwealth of the Northern Mariana Islands
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Category	Waste & Recycling Streams	Priority High: Yrs 1-3, Mid: Yrs 4-5 Low: Yrs 6-10	Years	Recommendation Description	One-time Cost Estimates					Ongoing Annual Cost Estimates			
					Equipment	Land Acquisition	Add'l FTEs	Employee Labor (\$)	Contracted Services / Delivery	Add'l FTEs	Employee Labor (\$)	O&M / Contracted Services	
Programs & Infra-structure	MSW	High	Year 1	Review current policies and plan a long-term litter and illegal dumping cleanup program			0.25	\$16,250			\$0		
			Years 2-10	Implement Tinian-wide litter and illegal dumping outreach and cleanup programs				\$0		0.25	\$16,250	\$25,000	
	MSW, C&D		Years 1-2	Establish a plan for and perform a feasibility study for retrofitting the current dumpsite into a permitted sanitary landfill	Not estimated at this time								
			Year 3	Procure a contractor to implement Landfill Upgrades and Permitting									
	Mid		Years 4-5	Landfill permitting									
	Low		Years 6-10	Transform the current dump site into a RCRA D compliant permitted sanitary landfill									
Education & Engagement	Organics	High: Years 1-3	Year 1	Cooperate with Agricultural Extension office, DPW, and Parks to educate residents on the importance and convenience of backyard composting and gardening, including at community gardens. Includes ongoing collaboration as necessary			0.25	\$16,250		0.1	\$6,500		
	All		Year 1	Develop a comprehensive 5- to 10-year public education programs on the benefits of recycling and proper sorting practices.			0.25	\$16,250				\$0	
			Year 1	Develop initial partnerships with local stakeholders and secure funding for pilot programs.			0.25	\$16,250				\$0	
			Year 2	Initiate public education and outreach campaigns to raise awareness and encourage participation.			0.50	\$32,500				\$0	
			Year 2	Establish incentive programs to encourage recycling and reuse/repair efforts.			0.25	\$16,250				\$0	
			Year 3	Initiate an incentive program to encourage recycling and reuse/repair efforts.			0.25	\$16,250				\$0	
			Year 3	Expand and roll-out full education plan upon the completion of the Yard Debris Lot Upgrades and Transfer Station Upgrades			0.25	\$16,250				\$0	
			Mid: Years 4-5	Years 4-5	Continue public education efforts				\$0		0.25	\$16,250	\$50,000
	Years 4-5		Continue initiative programs to encourage recycling and reuse/repair efforts				\$0		0.25	\$16,250	\$10,000		
	Years 4-5		Strengthening public-private partnerships and continuing community engagement.				\$0		0.25	\$16,250			

*Commonwealth of the Northern Mariana Islands
Tinian Zero Waste Plan*

Category	Waste & Recycling Streams	Priority High: Yrs 1-3, Mid: Yrs 4-5 Low: Yrs 6-10	Years	Recommendation Description	One-time Cost Estimates					Ongoing Annual Cost Estimates		
					Equipment	Land Acquisition	Add'l FTEs	Employee Labor (\$)	Contracted Services / Delivery	Add'l FTEs	Employee Labor (\$)	O&M / Contracted Services
		Low: Years 6-10	Year 6-10	Foster continuous collaboration with DPW and other agencies to enhance waste management practices.				\$0		0.25	\$16,250	
Monitoring & Reporting	All	High	Year 1	Establish monitoring and reporting mechanisms to track progress.			0.25	\$16,250	\$5,000		\$0	
			Year 2	Start monitoring and reporting mechanisms to track progress.			0.25	\$16,250			\$0	
		Mid	Years 3-10	Fully integrate monitoring and reporting mechanisms into all existing collection and disposal frameworks.				\$0		0.25	\$16,250	\$1,000
Strong Governance	All	High	Year 1	Review and update island zero waste policies with Infrastructure upgrades in mind			0.25	\$16,250			\$0	
			Year 2	Plan for community-wide announcements about infrastructure upgrades			0.10	\$6,500			\$0	
			Year 3	Implement community-wide announcements about infrastructure upgrades and reuse, recycling, and composting policies			0.10	\$6,500			\$0	
			Years 3-10	Begin implementation of mandatory policies for high-value recyclables commodities (OCC, Mixed Paper, Plastics Metals) and Organics				\$0		0.25	\$16,250	

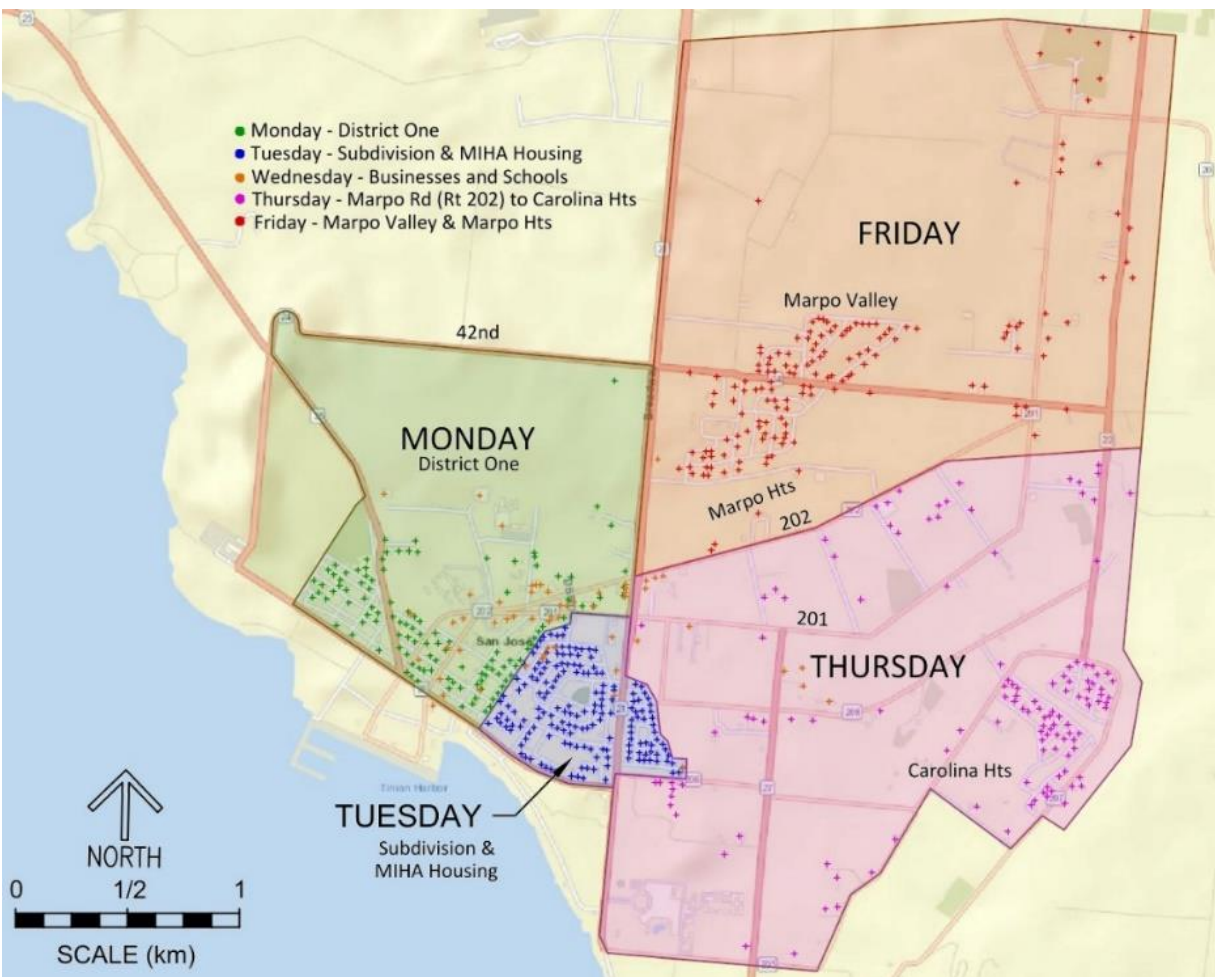
Table 15 - Additional Budgetary Estimates for each year (Years 1-5 and 6-10)

Additional Budgetary Estimates for Each year (Years 1-5)										
Priority Level	High (Short Term)						Medium (Mid Term)			
Program Year No.	1		2		3		4		5	
FY	2026		2027		2028		2029		2030	
	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)
Yearly Estimates (in 2024 Dollars)	\$110,000	\$130,000	\$2,203,550	\$422,500	\$427,200	\$386,750	\$227,200	\$344,500	\$207,200	\$331,500
Inflation Multiplier <i>(Accounts for Inflation and assumes a flat 3% inflation rate annually)</i>	1.030		1.061		1.093		1.126		1.159	
Yearly Totals by Category (with inflation)	\$113,300	\$133,900	\$2,337,746	\$448,230	\$466,813	\$422,612	\$255,716	\$387,738	\$240,202	\$384,299
Yearly Totals combined (with inflation)	\$247,200		\$2,785,976		\$889,425		\$643,453		\$624,501	
Total By Priority Level	\$ 3,922,602						\$ 1,267,954			

Additional Budgetary Estimates for Each year (Years 6-10)										
Priority Level	Low (Long Term)									
Program Year No.	6		7		8		9		10	
FY	2031		2032		2033		2034		2035	
	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)	Equipment / Land Acquisition / Contracted Services	Labor (Staff)
Yearly Estimates (in 2024 Dollars)	\$207,200	\$357,500	\$207,200	\$357,500	\$207,200	\$357,500	\$207,200	\$357,500	\$207,200	\$357,500
Inflation Multiplier <i>(Accounts for Inflation and assumes a flat 3% inflation rate annually)</i>	1.194		1.230		1.267		1.305		1.344	
Yearly Totals by Category (with inflation)	\$247,408	\$426,874	\$254,830	\$439,680	\$262,475	\$452,870	\$270,349	\$466,456	\$278,459	\$480,450
Yearly Totals combined (with inflation)	\$674,281		\$694,510		\$715,345		\$736,805		\$758,910	
Total By Priority Level	\$3,579,852									

Attachment A – Tinian’s Pilot Collection Goals and Planning

The goals of the pilot collection were to assess the effectiveness of the collections of waste from Tinian households, the timing required to collect this waste, and the composition of the waste collected. There are no vehicle scales at the landfill, but estimates on the amount collected could still be accomplished. Materials for sampling were collected directly from Tinian households as well as from incoming waste to the landfill facility from private haulers. The following map illustrates the areas where the study’s waste material came from the figure below and what days that region had waste collected from the households or commercial locations.



Map of Collection Dates and Locations

Note: The dots in the figure are not representative of the locations for all waste containers in Tinian but simply from where waste was collected during the week of the sort.

Collection Methodologies

Timing

The project's onsite waste sort fieldwork was conducted from Monday, March 06, 2023, to Friday, March 10, 2023. Flyers and online announcements were distributed prior to the collection event to educate the populace on the upcoming event and to hopefully encourage participants to set out household trash on the date of collection in their area. The collection districts were divided up into areas by approximate household numbers and easy to understand boundaries. All households could be covered in four days of collections, with one day (Wednesday) for collections from commercial locations. This covered all major waste-producing locations except for the airport and military functions. The landfill is also open on Saturday, but it was determined that the type and composition of waste brought to the site on that day did not differ significantly from any other day.

It was assumed from the interpretation of the RFP that seven (7) days referred to a week-long pilot collection and composition study. Once some calculations on the number of households and businesses within the collection zones were completed, it was determined that the household collections could be accomplished within four (4) days and that the commercial collections could be accomplished within a day, for a total of five (5) days over the normal work week. This constitutes the majority of MSW generators on the island of Tinian. GBB understands that it would be impossible to know ahead of time how many days would be necessary to collect MSW from Tinian locations, but five (5) days turned out to be sufficient for both the collections and the composition study.

A total of thirty-four (34) samples were taken from the waste, and more than 5,000 lbs. of material was sorted (which reflects at least a quarter of the estimated weekly generation of waste). The 34 samples provided statistically relevant data, and additional sorting from more days of collections would not change the results in a noticeable manner. With composition studies, it is not the number of sort days that is important, but rather the number of samples, the consistency of materials, and having enough samples from a broad range of generators. In this case, nearly all generators were included in the collections, yielding sufficient and relevant data.

Collection

The collection team³² The collection team utilized a trailer to collect waste from the designated areas and was provided with large black bags. In most circumstances, the waste was not set out at the curb but in metal barrels in various locations at each property. The collection team averaged two or three (2 or 3) trips per day, depending on how full the trailer became during collections.

At the start of the day, the collection team headed out to collect from the designated location for that day, as shown in the figure above. The team was supplied with heavy-duty trash bags to collect unbagged items when safe. They were also supplied with gloves and instructed not to collect from any location where it was deemed unsafe or not out in the open.

The first day of collections was also the closest to the dump to help judge the travel needs of the collection team. Despite the handing out of fliers and the announcements, few households set their trash out for collection on the specified days. The collection team would collect the waste from household bins when

³² *Sorting and Collection vehicles, tent, tables, and laborers were provided by Tinian Landscaping and Custodial Services (TLC)*

appropriate. Once the trailer was moderately full, the team would return and drop off a sample at the sorting station and dispose of the rest at the landfill drop site. Once emptied, the team would head out for another round of collections.

In the mornings, while awaiting the first collection trailer to return, the landfill team would either sort material that was left overnight from the previous day's final collection or would gather material from incoming citizen private haulers to sort.



Collecting Household Waste



Collection Trailer w/ Collected Load

Approximate Volumes/Tonnages

The trailer held approximately six (6) yards of waste material but was not always full on each collection trip. There were fifteen (15) total collection trips over the five (5) days. If the average capacity of the trailer (in volume) was 75% full for most loads, this equated to roughly 70 yards of loose material gathered over the course of the collections from each location within the designated collection map. This volume does not count material brought in by private haulers.

The total weight of the sorted materials collected during the sampling was 4,325 lbs. This does not count any samples taken from incoming private haulers (836 lbs.). It was estimated by the Project Manager that roughly one-third of the materials collected were sampled. If this were the case, then the pilot collection effort collected approximately 13,000 lbs. (or 6.5 tons) of MSW over the week. (As a check, 70 cubic yards of material at a density of 200 lbs. per cubic yard, which is reasonable for this type of waste, is 14,000 lbs. or 7 tons.) If the same logic was used for private haulers, where it is assumed about one-quarter of the incoming MSW materials were sampled, this would total approximately an additional 3,500 lbs. (or 1.75 tons).

While these are rough calculations, some assumptions can likely be made from them. Namely, it is likely that the island generates less than 20,000 lbs. (or 10 tons) of MSW per week (not counting Construction and Demolition (C&D) materials). If this becomes a goal, this can be used to estimate collection vehicle needs for future collections.

Waste Composition Sorting

Understanding the composition of waste streams is critical for effective solid waste management. By comprehending the characteristics of the current waste materials on-island, opportunities for improvement, such as increased reuse, recycling, and waste reduction, can be identified.

Sorting

The sorting methodology was similar to the previous sorting at the Marpi location conducted by GHD/GBB in 2019. The GHD/GBB team based all waste composition studies on the U.S. National Standard for Municipal Solid Waste (MSW) sampling, ASTM D5231. This standard has a protocol for randomly selecting garbage trucks and dividing the pile from the trucks into random sections. A 200-pound sample is then taken from that section to be sorted into categories. The goal weight is 200 lbs. per sample, although this can vary depending on factors such as moisture content and material type.

To ensure randomness in this collection study, the Project Manager collected random representative materials from the incoming collections trailer as well as random samples from incoming private haulers (see table below). To accomplish the characterization study, the GBB Project Manager and a team of up to six (6) laborers sorted thirty-four (34) samples of MSW materials from both the collection and incoming citizen drop-offs. This material was then classified into one of the fifteen (15) material types as defined in on the next page.



Collected Sample for Sorting

Fieldwork Material Types and Definitions

Category	Material Type	Definition
Fiber	Old Corrugated Cardboard (OCC)	Old, corrugated containers (cardboard) that are clean and dry enough to be recycled. Most shipping boxes are OCC.
	Other Fiber Materials	Paper or composite material or other paper that is clean and dry enough to be recycled as a commodity when separated.
Plastic	PET (#1)	Polyethylene terephthalate materials. For this study, only PET (#1) bottles and containers clearly marked with a triangle symbol were sorted and designated as "PET #1".
	HDPE (#2)	High-density polyethylene materials. For this study, only HDPE (#2) bottles and containers clearly marked with a triangle symbol were sorted and designated as "HDPE #2".
	Mixed Plastics	Other plastic items that may be recovered.
	Bags and Film	All film plastic including trash bags, grocery bags, shrink wrap, plastic sheeting, etc.
Glass	Glass and Ceramics	All containers are made from glass (bottles, jars) of all colors, shapes, and sizes.
Metals	Ferrous Metals	Materials include steel and iron.
	Non-Ferrous Metals	Materials include copper, aluminum, and brass.
Organics	Yard Waste	Organic, vegetative waste, typically consisting of small branches, leaves, brush, grass clippings, hay, mulch, grass clippings, Christmas trees, and similar material.
	Other Organics	Organic waste is any material that is biodegradable and comes from either a plant or an animal. Biodegradable waste material that can be broken into carbon dioxide, methane, or simple organic molecules. This waste is inclusive of Yard Trim and Food Scraps as defined.
Other	Construction and Demolition (C&D)	Materials include treated and painted wood, gypsum/drywall, asphalt shingles, concrete, bricks and stone.
	Textiles, Leather and Rubber	Any textile, leather, or rubber items such as tires or padding.
	Dirt and other Fines	Any material that is less than two inches in diameter, such as the debris that is left on the sorting tables after all other material that can reasonably be separated has been sorted.
	Other Bulky or Composite Items	Any other items that don't fit into the described categories and items that are comprised of two or more inseparable material types. Includes electronic waste (batteries, televisions, computers, cell phones/tablets, personal electronics) and household hazardous waste (containers with contents meeting the definition of hazardous, including paint solvents, used oil, sharps, etc.).
Wood	Clean Lumber	Also known as timber. Wood that has been processed into beams and planks, a stage in the process of wood production that has NOT been painted, stained or is free of metal or other added materials.
	Plywood and Pallets	Sheet material made of thin veneers of wood that are laid with wood grains in alternating direction, glued, heated, and pressed together. Interior plywood is generally glued with urea formaldehyde-based glues; exterior plywood and marine plywood use phenolic formaldehyde glues and are water resistant. And pallets of rough cut, unfinished wood that creates a flat structure with dimensions.
	Treated and Painted Wood	Wood of any species that has been chemically impregnated, painted or similarly modified to prevent weathering and deterioration.

Study Sample Source

Sample Source	# of Samples ²
Collection Route (Commercial)	7
Collection Route (Households)	20
Private Direct Haul ¹	7
Total	34

- (1) Private Direct Haul MSW could originate from either households or commercial locations
- (2) Multiple samples were taken from single collection efforts, as the total number of collection loads was 15

The physical arrangement of the sort-area layout consisted of two sorting tables surrounded by the category containers designated (labeled) to receive each of the specifically identified and sorted materials. A portable tent was used to protect the sort-team and materials from weather hazards such as sun, wind, and rain. The sorting tent and tables were set-up just inside the gate at the Tinian landfill location. Here the Site Supervisor could direct residential drop-off vehicles to either dispose at the landfill or to drop the waste at the sorting station. The team was on-site when the gates were opened at 8:00 AM and stayed through until about 4:00 PM (close) depending on the amount of samples for the day. At the end of the sorting the team loaded all of the containers into the TLC trailer for safekeeping.



Sorting Bins



Sorting Sample Waste on Table

The Project Manager discussed the overall objectives of the waste characterization sort, reviewed material categories and how to use sort equipment, and described standard sorting procedures with the waste sort laborers. Materials larger than 2"x2" were categorized as a material type and then sorted into durable plastic buckets, bins, and totes by the fieldwork sorters. Large or bulky items were individually weighed and recorded.

Materials smaller than 2" in size were categorized as dirt and/or fines. These materials were sampled by sweeping and collecting the small materials off of the sorting tables and placed in the Fines bin. Although small, fines by weight can represent a significant percentage of an MSW waste stream. The Project Manager visually estimated samples to be approximately 200 pounds in size. When all the material from the sample was segregated into the individually marked receptacles, the sort team weighed the sample by bringing each material category bin to the scale while the Project Manager recorded the bin's weight.

For each sample, the Project Manager recorded material and container weights using a portable commercial scale with an accuracy within 0.2 kg. Sample weights of each material type were later entered and calculated using spreadsheet software by removing the tare weights from the containers. Once the weights of the categorized and sorted materials were recorded on the Data Sheet, the team disposed of the materials at the landfill site. Wood waste and construction and demolition (C&D) waste brought to the landfill were not sampled or sorted.

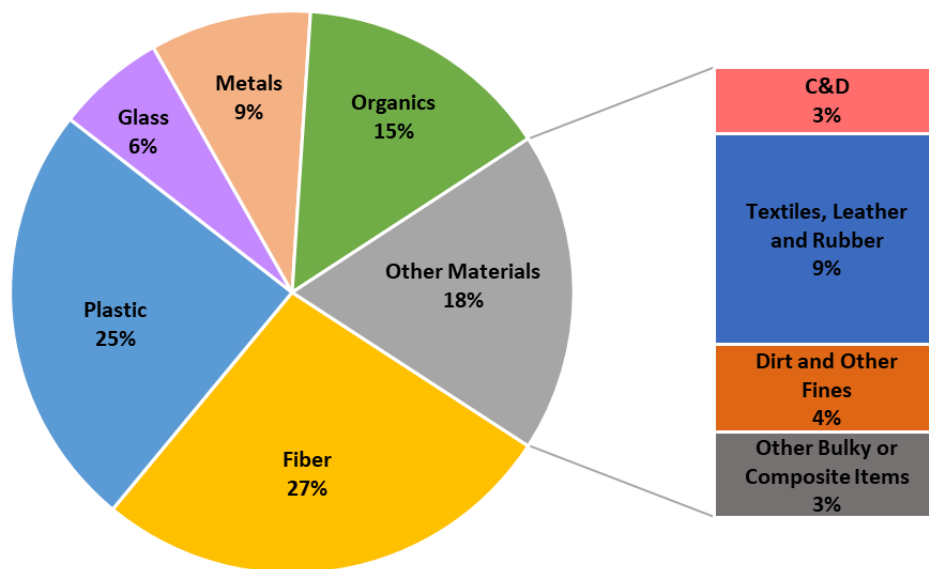
Safety

GBB's Project Manager guided the project fieldwork site hazards and protocols safety training when the temporary labor sort team arrived at the project site location. The project's hazards included COVID-19 risks, slips, trips and falls, sharps, working near heavy mechanical equipment traffic, and heat issues. All laborers and GBB staff were required to wear closed-toe boots and all other required Personal Protective Equipment (PPE), especially double layering on gloves. No safety incidents were reported during this study.

Composition Results – All Sources

In total, 34 samples were collected and sampled, and 5,160 pounds of material were sorted. Due to the variation of the materials sorted, the sample size weights ranged from approximately 67 lbs. to over 326 pounds, with an average of 152 pounds per sample. The overall percentage was calculated using the average of the individual material percentage from each sample so that differences in sample size do not skew the data.

The full results of the sorts are shown in the table on the following page. These categories are standard MSW sampling categories used by GBB in most sorts, with the definition of each category described in Attachment A. As shown in Average Category Percentages pie chart below, the largest material category is Fiber, representing 27% of the waste stream. The Fiber category includes Old Corrugated Cardboard (cardboard containers that are clean and dry enough to be recycled) and Other Fiber Materials (paper of composite material or other paper that is clean and dry enough to be recycled as a commodity when separated)



Average Category Percentages – Tinian – All Generators

The other major categories were Plastic materials at 25%, Organics at 15%, which was mostly food waste, and Other Materials at 18%, which consisted of Construction and Demolition (C&D) waste, which included wood materials, Textiles, Leather, and Rubber, Dirt and Fines, and Bulky or Composite Items. Metals and Glass make up the remaining 9% and 6% respectively. The breakdown of the 15 individual categories and the results are shown in the Composition of Waste (Tinian) table below.

Composition of Waste Materials (Tinian)

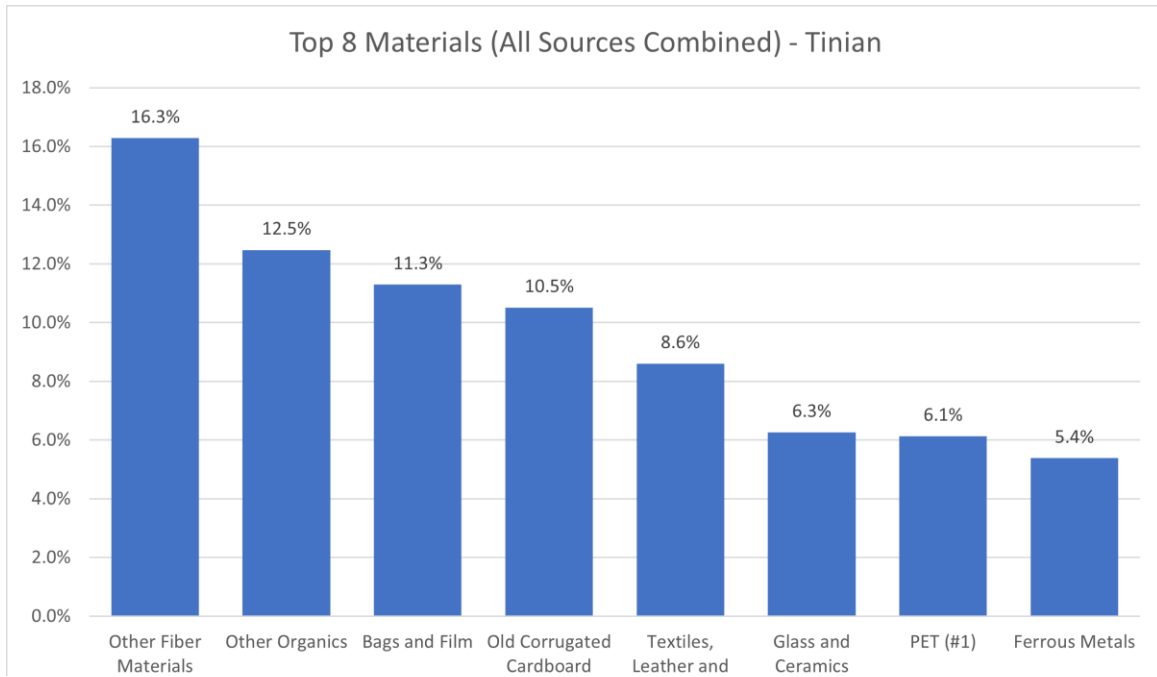
No.	Category	Material	Composition Combining All Samples - Average %	Error +/- (90%)
1	Fiber	Old Corrugated Cardboard (OCC)	10.5%	±3.3%
2		Other Fiber Materials	16.3%	±1.7%
3	Plastic	PET (#1)	6.1%	±1.4%
4		HDPE (#2)	2.5%	±0.6%
5		Mixed Plastics	4.6%	±1.4%
6		Bags and Film	11.3%	±0.8%
7	Glass	Glass and Ceramics	6.3%	±1.5%
8	Metals	Ferrous Metals	5.4%	±1.0%
9		Non-Ferrous Metals	3.9%	±0.7%
10	Organics	Yard Waste	2.3%	±1.0%
11		Other Organics	12.5%	±2.1%
12	Other	C&D	2.7%	±1.5%
13		Textiles, Leather and Rubber	8.6%	±1.9%
14		Dirt and Other Fines	3.6%	±0.7%
15		Other Bulky or Composite Items	3.5%	±1.1%
Total			100.0%	-

The above data is the average of the material calculated on a per-sample basis and then averaged over the total number of samples, which is the standard for waste sort data. The raw lbs. collected over the course of the sampling week is included in the attachments.

The error helps show the range of materials over the total number of samples. For instance, an error of ±3.3% with OCC indicates that there was a wider range of weights per sample versus “Other Fiber Materials”, which seemed to be more consistent with an error of ±1.7% over the course of the study.

The top eight materials found in this study are presented in the Top 8 Materials at the Tinian Waste Sort (All Sources Combined) table and chart below. These top materials account for more than 76% of the total waste stream in this study. The top four material types by weight were Other Fiber Materials, Other Organics, Bags and Film Plastics, and OCC (Cardboard). The top four materials account for approximately 50% of the total waste that was sorted.

Rank	Material Type	Composition Combining All Samples (Percentage)
1	Other Fiber Materials	16.3%
2	Other Organics	12.5%
3	Bags and Film	11.3%
4	Old Corrugated Cardboard (OCC)	10.5%
5	Textiles, Leather and Rubber	8.6%
6	Glass and Ceramics	6.3%
7	PET (#1)	6.1%
8	Ferrous Metals	5.4%
Total		76.9%



The 'Other Organics' category was nearly all food waste and some packaging that was difficult to separate from the food. Nearly all the components in this category could be processed in a food composting facility. In general, more than half of the 'Fines and Dirt' category, at 3.6%, was also food waste materials. It is reasonable to assume that the percentage of packaging in the organics would be similar in weight to the

food left in the fines so that the total food waste percentage is still close to 12.5% overall³³ and could be considered processable in a composting or anaerobic process.

Some of the “Other Fiber” category contained wet fibers that might be better handled in composting instead of recycling. Wet fiber seems to be because of the precipitation on the island and the containerization of the material where it is stored prior to collection. How wet fiber is dealt with will depend on the types of infrastructure implemented in the future, but it is something that should be considered when designing the next solid waste system.

Another large category was Film and Flexible Packaging. This category did not have a sub-sort to determine the breakdown of the different types of film and packaging. Most of the items were either black, white, or clear #4 LDPE bags, with some of the bags being what was used to collect the waste during collections. There was not a lot of stretch wrap-type film and a small percentage of ship wrappers and other flexible packaging. In previous studies by GBB, flexible packaging made up approximately 16% of the total Film and Flexible Packaging category, and it is safe to assume that there was a similar ratio in Tinian’s waste stream.

Similar to Rota, the major difference between the Saipan waste data and Tinian is that there is distinctly less cardboard (OCC) in the Tinian waste stream. Saipan had an average of 20.3%, while Tinian was at 10.5%. However, there was a higher percentage of “Other Fibers” in Tinian at 16.3%, as opposed to 11.6% in Saipan. Bags and film are also greater in quantity than in Saipan but this may be due to the inclusion of the black collection bags used in the retrieval of the waste. These bags may also be used for any curbside collections, so it is good to have this estimated data point. Examples of sorted materials are in the figures on the following pages.

The mixed plastics were frequently expanded polystyrene #6 (EPS) and plastic cutlery at 4.6% of the total waste stream. Most of this was associated with takeout containers from restaurants, so there exists the possibility of changing this packaging to a compostable option in the future.



Commercial load (left) with lots of cardboard compared to a residential load (right) with limited cardboard content

³³ Packaging in organics or food waste can typically be 10%-20% of the total weight. 15% of 12.5% is approximately 1.8%, or half of 3.6%, the percentage of the fines, so the math tends to work out in this case.

Other Wastes Coming to the Landfill

Construction and Demolition Waste (C&D)

The waste study looked only at traditional commercial and residential MSW. Construction and Demolition (C&D) waste was not part of the collection study but certainly was observed at the landfill facility. Most of the C&D waste that was brought to the landfill was lumber or other wood, and this was collected separately in a large pile (see images below). Some loads also had metal items that were piled in the metal piles. Other C&D materials were limited and were generally dumped with the MSW items. There are a number of abandoned or derelict concrete structures on the island, but it seems these were rarely demolished and removed from property sites. This may change in the future, but currently, there does not seem to be a large portion of concrete waste coming to the landfill. There is a pile of concrete material across the road from the landfill, but it does not look like it is used often and was not utilized during the week of the study.



Images of Tinian's Construction and Demolition (C&D) Hauling Truck and Wood Pile

In general, it seemed that having a solution for wood waste from C&D disposal would reduce the volume and tonnage of landfilled materials, at least in the future. Unfortunately, these wood piles have burned unintentionally in the past. GBB does not know the plan for the current wood pile, nor did it seem there was a market for the wood if it were ground or otherwise processed.

Other Waste and Recyclables

Household Hazardous Waste (HHW) is always of interest in composition studies. For this study, HHW would fall under the Other Bulky and Composites category and would be noted if observed in the notes. Very little HHW was observed, with the notation indicating one load that had medical waste of some sort that could be considered HHW. The main item seen during the sorting was empty steel fuel canisters. These items tend not to be fully empty of flammable material and could be considered HHW in many cases in the states. There were a significant number of these items found in the waste, and it could be problematic for the recovery of metals for recycling, especially if these items were baled for transport.³⁴ These items would have to be properly and safely punctured prior to baling to allow for safe transport and recovery. There are

³⁴ A number of steel mills may also reject loads with these fuel canisters included as a safety concern in the milling process.

special machines capable of processing these cans in a safe manner, but the cans would have to be collected separately for this process to safely occur.

White goods and other large (mostly steel) metals were collected separately on the site, although it was unclear how often they are collected for recycling and what the process is for recovery. Smaller metals are not recovered at this time. Some OCC, PET bottles, and aluminum cans were collected at the transfer station site, but the movement of this material seemed intermittent at best. Yard waste type materials are collected at a separate location on the island. Loose tires are also collected separately at the landfill.



Image of Ferrous Metals with Fuel Cans



Top to bottom: White Goods and Metals, Tires at Landfill



Images of Separated Recyclable Materials - Plastic Bottles (Left) and Cardboard (Right)

Unlike Saipan, there did not seem to be a number of locations that were obvious on the island where there was illegal dumping, except for just outside of the landfill. This is likely materials that were dumped when private haulers brought materials to the landfill, but the gates were closed. If the landfill begins to charge fees for use, illegal dumping is likely to increase.



Image of dumped materials outside of the landfill's gate

Pilot Conclusions

Overall, both the pilot collection and the waste composition study on Tinian were successful. The pilot collection study showed that one collection vehicle, a smaller packer truck, could likely collect residential and commercial sites in the urban area over a one-week period. The key would be educating the populace on setting materials to the curb during their collection day to allow for timely and safe collections and having the proper containers to store the waste in for collections. (The metal barrels are not safe to move by the citizens nor to load into a truck by the solid waste collectors). It was estimated that there were less than 10 tons of MSW produced on the island per week (excluding C&D).

The waste sampling and characterization successfully found statistically significant data on the percentages of MSW materials being disposed of. Still, the percentages indicate that the materials are similar in nature to the other islands, so any programs to divert materials at one island should also work at the other islands, provided that the programs can be scaled appropriately.

To achieve the goal of 50% diversion, it makes sense to look at the materials that can be most easily diverted from the characterization data. Looking at the traditional recyclables of metals and certain plastics (PET and HDPE), collecting and recycling these materials would divert approximately 17.9% of waste from the landfill, assuming all items could be recovered. This means other materials would also need to be diverted to reach the 50% goal. The table below shows that if the fibers (OCC And Other Fiber Materials) were diverted for recovery along with Other Organics (food waste), the total diversion could reach 57.1%.

Recoverable Materials for Landfill Diversion

Rank	Material	Composition – Average Percentage
1	Other Fiber Materials	16.3%
2	Other Organics	12.5%
3	Old Corrugated Cardboard (OCC)	10.5%
	Subtotal	39.3%
12	PET (#1)	6.1%
15	HDPE (#2)	2.5%
	Subtotal	8.6%
10	Ferrous Metals	5.4%
14	Non-Ferrous Metals	3.9%
	Subtotal	9.2%
	Total	57.1%

Other materials, such as Glass and Ceramics, as well as Textiles, could also be diverted from landfill, depending on the programs implemented. This data helps give some insight into which programs might impact landfill diversion most.

Another aspect of diversion might be to help find outlets for the wood collected from C&D disposal. This was the largest component of the C&D materials coming to the landfill that were not measured in the MSW composition study. There are generally outlets for clean ground wood and lumber that can be utilized in composting operations and mulching. However, painted and stained wood (and wood with oil or diesel for use in concrete construction) does not generally have an outlet. The percentages of the type of wood would have to be estimated to calculate how much might be diverted.

Another aspect of the site visit was also to observe the current landfill situation on Tinian. The landfill did have some equipment, but unfortunately, all the rolling stock was broken during the week of the waste sorting. Luckily, the dozer was fixed near the end of the week so that the material that had been piling up over the week was pushed and spread out and partially covered by the landfill operators. Some cover material was used to help bury the waste, but not enough was available to fully cover the waste, leading to many flies during the day. Although there is a person hired to help with flies and other vectors, it can only be so effective, especially when the equipment is not operational.

Lastly, even with diverting 50% of the waste, the department will still need adequate functioning equipment and access to proper cover material to manage the remaining waste at the current landfill location or another location on the island in the future.

Attachment B – Mayor Edwin P. Aldan’s Office Zero Waste Community Outreach

The Tinian and Aguiguan Mayor Edwin P. Aldan’s Office has been leading community Zero Waste Outreach since America Recycles Day 2022, engaging community members and students. Below, Mayor of Tinian and Aguiguan Edwin P. Aldan hands over a reusable bag to a Tinian community member during a roadside waving that was held after a CNMI Recycles Week ceremony held on November 15, 2022, in Tinian.³⁵



Image of Mayor Edwin P. Aldan with Tinian Community Members

³⁵ Source: <https://myemail.constantcontact.com/Islands-Zero-Waste-Newsletter.html?soid=1139120015293&aid=EJNquv5eN-I> & https://www.mvariety.com/news/stallion-battalion-promotes-recycling-project-to-community/article_614e6246-6891-11ed-9781-8b7dce826009.html



Images of Tinian Mayor Edwin Aldan donating recycling bins to JROTC cadet's recycling project at Tinian's America Recycles Day celebration, November 2022.

Photos: C/PV2 Adriel Lenteja.



Image of Tinian Mayor's Office America Recycles Day waving event with community and JROTC Project Based Learning class (November 2022).

Attachment C – Guam’s Recycling Revolving Fund



Office of the Governor of Guam

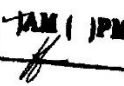
P.O. Box 2950 Hagåtña, Guam 96932
TEL: (671) 472-8931 • FAX: (671) 477-4826 • EMAIL: governor@mail.gov.gu

Felix Perez Camacho
Governor

Kaleo Scott Moylan
Lieutenant Governor

Office of the People's Speaker
vicente (ben) c. pangelinan

JAN 02 2004

TIME: 9:59 (1-1AM) (1) PM
RECEIVED BY: 

31 DEC 2003

The Honorable Vicente C. Pangelinan
Speaker
I Mina' Bente Siete Na Liheslaturan Guahån
Twenty-Seventh Guam Legislature
155 Hesler Street
Hagåtña, Guam 96910

Dear Speaker Pangelinan:

Transmitted herewith is Bill No. 96 (COR), "AN ACT TO CREATE A RECYCLING REVOLVING FUND TO FUND THE RECYCLING OF AUTOMOBILES, TRUCKS, HEAVY EQUIPMENT, AND WHITE GOODS AS PROVIDED FOR IN THE INTEGRATED SOLID WASTE MANAGEMENT PLAN AS ADOPTED IN PUBLIC LAW 25-175, BY *ADDING* NEW ARTICLE 5 TO CHAPTER 51 OF DIVISION 2 OF PART 2 OF TITLE 10, AND BY *AMENDING* §7161 OF TITLE 16, GUAM CODE ANNOTATED," which I have signed into law on November 13, 2003, as Public Law No. 27-38.

I would like to commend Senator Rory Respicio and *I Mina' Bente Siete Na Liheslaturan Guahån* on the enactment of Bill No. 96. The measure establishes an advance disposal fee to set up a government-recycling program. Creation of this funding source to support the government's aggressive plans to manage our solid waste is a much-needed vehicle to ensure the government goes forward with its efforts.

Please note, however, the inconsistencies in the measure and take the corrective measures necessary to ensure its implementation.

1. The definition of "recycling" cites to 10 G.C.A. § 51102(18). This section defines "generator." The definition of "recycling" is cited in Section 51102(35) and reads "method by which recovered resources are converted for use as raw material or feedstock to make new products." This is inconsistent with the language contained in Section 51501(b) of Section 2 of the measure.
2. The Street Light Fund provides that effective April 1, 2004 the former fee will be increased by Fifteen Dollars (\$15.00) however the effective date for the section is January 1, 2005.

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~~534~~ 

3. In Section 51505 of Section 2, the Guam Economic Development Authority should be replaced with Guam Environmental Protection Agency.

I hope these issues can be addressed in order to avoid any unnecessary delay in its implementation.

Sincerely yours,



Felix P. Camacho
I Maga'låhen Guåhan
Governor of Guam

Attachment: copy attached of signed bill

cc: The Honorable Tina Rose Muna-Barnes
Senator and Legislative Secretary



MINA' BENTE SIETE NA LIHESLATURAN GUÅHAN
TWENTY-SEVENTH GUAM LEGISLATURE
155 Hessler Place, Hagåtña, Guam 96910

November 4, 2003

The Honorable Felix P. Camacho
I Maga'lahaen Guåhan
Ufisinan I Maga'lahi
Hagåtña, Guam 96910



Dear *Maga'lahi* Camacho:

Transmitted herewith are Bill No. 76(LS), and Substitute Bill Nos. 63(COR), 67(LS), 80(COR), 96(COR), 100(COR), 144(LS), 152(COR) and 153(COR) which were passed by *I Mina' Bente Siete Na Liheslaturan Guåhan* on October 31, 2003.

Sincerely,

TINA ROSE MUNAS BARNES
Legislative Secretary

Enclosures (9)

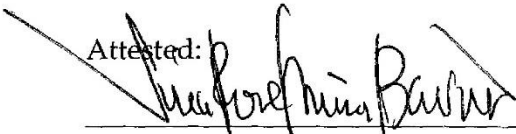
CFI-1103-3636

I MINA'BENTE SIETE NA LIHESLATURAN GUÅHAN
2003 (FIRST) Regular Session

CERTIFICATION OF PASSAGE OF AN ACT TO I MAGA'LAHEN GUÅHAN

This is to certify that Substitute Bill No. 96 (COR) "AN ACT TO CREATE A RECYCLING REVOLVING FUND TO FUND THE RECYCLING OF AUTOMOBILES, TRUCKS, HEAVY EQUIPMENT, AND WHITE GOODS AS PROVIDED FOR IN THE INTEGRATED SOLID WASTE MANAGEMENT PLAN AS ADOPTED IN PUBLIC LAW 25-175, BY ADDING NEW ARTICLE 5 TO CHAPTER 51 OF DIVISION 2 OF PART 2 OF TITLE 10, AND BY AMENDING §7161 OF TITLE 16, GUAM CODE ANNOTATED", was on the 31st day of October, 2003, duly and regularly passed.

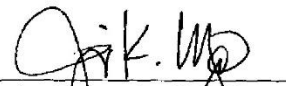
Attested:



Tina Rose Muña Barnes
Senator and Legislative Secretary

vicente (ben) c. pangelinan
Speaker

This Act was received by *I Maga'lahen Guåhan* this 4th day of November, 2003, at 2:50
o'clock P.M.



Assistant Staff Officer
Maga'lahi's Office

APPROVED:



FELIX P. CAMACHO
I Maga'lahen Guåhan

Date: 11/13/03

Public Law No. 27-38

**I MINA'BENTE SIETE NA LIHESLATURAN GUÅHAN
2003 (FIRST) Regular Session**

Bill No. 96 (COR)

As substituted by the Author and
amended on the Floor.

Introduced by:

R. J. Respicio
J. M.S. Brown
Toni Sanford
F. B. Aguon, Jr.
T. R. Muña Barnes
F. R. Cunliffe
C. Fernandez
Mark Forbes
L. F. Kasperbauer
R. Klitzkie
L. A. Leon Guerrero
J. A. Lujan
v. c. pangelinan
J. M. Quinata
Ray Tenorio

**AN ACT TO CREATE A RECYCLING REVOLVING FUND
TO FUND THE RECYCLING OF AUTOMOBILES, TRUCKS,
HEAVY EQUIPMENT, AND WHITE GOODS AS
PROVIDED FOR IN THE INTEGRATED SOLID WASTE
MANAGEMENT PLAN AS ADOPTED IN PUBLIC LAW 25-
175, BY ADDING NEW ARTICLE 5 TO CHAPTER 51 OF
DIVISION 2 OF PART 2 OF TITLE 10, AND BY AMENDING
§7161 OF TITLE 16, GUAM CODE ANNOTATED.**

1 **BE IT ENACTED BY THE PEOPLE OF GUAM:**

2 **Section 1. Legislative Findings.** *I Mina'Bente Siete Na*
3 *Liheslaturan Guåhan* finds that the Integrated Solid Waste Management

1 Plan, as adopted in Public Law No. 25-175, provides for government
2 support of recycling as an essential means to protect the environment,
3 manage the municipal solid waste stream generated by the community,
4 and extend the life-span of any new landfill to be built. *I Mina' Bente*
5 *Siete Na Liheslaturan Guåhan* further finds that it is in our island's best
6 interest to divert discarded materials from the island's dump or landfill
7 by creating an economic value upon such materials so that they can be
8 collected and shipped off-island by recycling companies. Sections 7.10.1
9 and 7.10.4 of the Integrated Solid Waste Management Plan specifically
10 call for the imposition of disposal fees on automobiles and white goods
11 to fund the recycling and disposal of these goods. With respect to
12 Section 7.10.4, the Integrated Solid Waste Management Plan finds that
13 junk cars are a particular hazard to the environment. *I Mina' Bente Siete*
14 *Na Liheslaturan Guåhan* further finds that the existing funding
15 mechanism for junk car removal, the Abandoned Vehicle and Streetlight
16 Fund, is insufficient for this purpose inasmuch as only ten percent (10%)
17 of the proceeds of this fund go to junk car removal. Therefore, an
18 alternate funding source should be identified for this purpose and to
19 support general recycling operations. *I Mina' Bente Siete Na Liheslaturan*
20 *Guåhan* further finds that Sections 7.10.1 and 7.10.4 of the Integrated
21 Solid Waste Management Plan must be implemented and expanded
22 upon in order to address the island's worsening solid waste
23 management problems.

24 **Section 2. Establishment of Recycling Revolving Fund and**
25 **Recycling Fees.** A new Article 5 is *added* to Chapter 51 of Division 2 of

1 Part 2 of Title 10, Guam Code Annotated, to read as follows:

2

" Article 5

3

§51501. Definitions.

4

§51502. Recycling Revolving Fund.

5

§51503. Continuing Appropriation.

6

§51504. Levy of Recycling Fees.

7

§51505. Collection of Recycling Fees.

8

§51506. Recycling Fees.

9

§51507. Authorization for Guam Environmental Protection

10

Agency ('GEPA') to contract with recycling

11

companies.

12

Recycling Revolving Fund.

13

§51501. Definitions. For purposes of this Article, and

14

except as otherwise provided, the following words and phrases,

15

together with all of the common derivatives thereof, shall have the

16

meaning ascribed to them as follows:

17

(a) 'GEPA' shall mean the Guam Environmental

18

Protection Agency.

19

(b) 'Recycling' means the process by which recovered

20

resources are transformed into new products in such a

21

manner that products lose their initial identity, as defined in

22

Section 51102(18) of Chapter 51 of Title 10 of the Guam Code

23

Annotated.

24

(c) 'Recycling fee' shall mean a fee imposed on goods

25

for the recycling and disposal of said goods.

1 (d) 'Enameled white goods' shall mean appliances for
2 home or commercial use including, but not limited to,
3 refrigerators, water heaters, air conditioners, washers,
4 dryers, and stoves.

5 (e) 'Recyclable materials' means materials which still
6 have useful physical or chemical properties after serving a
7 specific purpose for the same or other purpose. Recyclable
8 materials are as follows:

- 9 (1) batteries (i.e., lead-acid, portable computer
10 batteries, nickel-cadmium, sealed types for
11 power backup);
- 12 (2) automobiles, buses, and trucks or any form of
13 motorized vehicle;
- 14 (3) tires (passenger/commercial);
- 15 (4) enameled white goods;
- 16 (5) home appliances (other small appliances that are
17 not considered enameled white goods);
- 18 (6) glass and plastic bottles;
- 19 (7) foam padding;
- 20 (8) lead;
- 21 (9) metals (ferrous/non-ferrous);
- 22 (10) organic material (i.e., tree trimmings, palm
23 fronds, grass, food waste, soiled cardboard);
- 24 (11) paper products;
- 25 (12) wood pallets and scrap wood;

- 1 (13) construction and demolition debris ('C&D');
2 (14) x-ray film;
3 (15) automobile oil and fluids;
4 (16) Freon and other refrigerant gases;
5 (17) electronic waste (i.e., computers, circuit boards,
6 televisions, and portable phones);
7 (18) heavy equipment; and
8 (19) other recyclable materials deemed recyclable by
9 GEPA pursuant to the Rules and Regulations.

10 (f) 'Recycling company' means any business licensed
11 by the Department of Revenue and Taxation, and issued a
12 permit, as required in §51104 of Chapter 51 of Title 10 of the
13 Guam Code Annotated, from the Guam Environmental
14 Protection Agency to conduct business on Guam.

15 (g) 'Administrator' shall mean the Administrator of
16 the Guam Environmental Protection Agency, or his or her
17 designee.

18 (h) 'Municipal Solid Waste' is material which was
19 produced locally or imported into Guam for use by
20 businesses and residents but has been discarded, thus
21 requiring disposal, processing, recycling, or storage.

22 **§51502. Recycling Revolving Fund.** There is hereby created
23 separate and apart from other funds of the government of Guam,
24 a fund known as the Recycling Revolving Fund which shall be
25 maintained separate and apart from any other funds, including

1 the General Fund of the government of Guam, and independent
2 records and accounts shall be maintained in connection therewith.
3 All revenue deposited in the Recycling Revolving Fund shall *not*
4 be commingled with General Fund monies and shall be kept in a
5 separate bank account. All proceeds from fees collected in
6 accordance with §51504 of Title 10 of the Guam Code Annotated
7 shall be deposited in the Recycling Revolving Fund and used
8 exclusively for the purposes authorized in §51507 of Title 10 of the
9 Guam Code Annotated. The Administrator of GEPA shall
10 administer the Recycling Revolving Fund and shall encumber all
11 amounts available in the Fund as expeditiously as possible for the
12 purposes stated in this Section. The Recycling Revolving Fund
13 shall be subject to audits by the Public Auditor.

14 **§51503. Continuing Appropriation.** All revenues from the
15 Recycling Revolving Fund are hereby appropriated to the Guam
16 Environmental Protection Agency to fund recycling operations as
17 authorized in §51507 of Title 10 of the Guam Code Annotated.

18 **§51504. Levy of Recycling Fees.** There is hereby levied, and
19 shall be paid and collected in the manner hereinafter provided,
20 and by persons taxable under the provisions of §28105 of Chapter
21 28 of Division 2, Title 11 of the Guam Code Annotated, a recycling
22 fee upon the use or consumption of all automobiles; buses; heavy
23 equipment; trucks; tires; batteries for a motorized boat,
24 automobile, bus, truck, or heavy equipment; and enameled white
25 goods subject to the levy of the Use Tax authorized by §28103 of

1 Chapter 28 of Division 2, Title 11 of the Guam Code Annotated.

2 §51505. **Collection of Recycling Fees.** The Guam Customs
3 and Quarantine Agency shall collect the Recycling Fees mandated
4 by this Article on:

5 (a) property taxable under the Use Tax Law in
6 Chapter 28 of Division 2, Title 11 of the Guam Code
7 Annotated, which comes in at the Jose D. Leon Guerrero
8 Port Authority of Guam, or any other seaport in Guam, with
9 any tax for which an exemption is not claimed, to be
10 collected prior to release;

11 (b) property taxable under the Use Tax Law in
12 Chapter 28 of Division 2, Title 11 of the Guam Code
13 Annotated, which comes in as freight or unaccompanied
14 baggage at the A. B. Won Pat International Airport, or any
15 other airport in Guam; and

16 (c) property taxable under the Use Tax Law in
17 Chapter 28 of Division 2, Title 11 of the Guam Code
18 Annotated, which comes in as freight or accompanied
19 baggage at the A. B. Won Pat International Airport, or any
20 other airport in Guam.

21 The Guam Economic Development and Commerce
22 Authority, on behalf of the government of Guam, is authorized to
23 promulgate rules and regulations in accordance with the
24 Administrative Adjudication Law to enforce the intent of this Law
25 within ninety (90) days of enactment of this Section.

1 **§51506. Recycling Fees.** The Recycling Fees authorized in
2 §51504 are hereby imposed as follows:

3 (a) Two Hundred Dollars (\$200.00) for each
4 automobile, bus, and truck;

5 (b) Three Dollars (\$3.00) for each tire;

6 (c) Five Dollars (\$5.00) for each enameled white
7 good with a retail value of more than Fifty Dollars (\$50.00)
8 but less than Three Hundred Dollars (\$300.00) in accordance
9 with the provisions of Chapter 28 of Division 2 of Title 11 of
10 the Guam Code Annotated;

11 (d) Fifty Dollars (\$50.00) for each enameled white
12 good with a retail value of Three Hundred Dollars (\$300.00)
13 or more in accordance with the provisions of Chapter 28 of
14 Division 2, Title 11 of the Guam Code Annotated;

15 (e) Five Dollars (\$5.00) for each battery for a
16 motorized boat, automobile, truck, bus, or heavy equipment;

17 (f) Two Hundred Dollars (\$200.00) for each item of
18 heavy equipment with a retail value of Five Thousand
19 Dollars (\$5,000.00) or more in accordance with the
20 provisions of Chapter 28 of Division 2, Title 11 of the Guam
21 Code Annotated.

22 (g) Consumers who return to a recycling center any
23 item upon which a recycling fee has been imposed shall
24 receive a refund for such return in a percentage amount as
25 determined by the Rules and Regulations established by

1 §51505 of this Article.

2 **§51507. Authorization for GEPA to contract with recycling**
3 **companies.** (a) GEPA is authorized, in accordance with the
4 applicable procurement laws, to enter into contracts with recycling
5 companies for the collection, recycling, and disposal of
6 automobiles, buses, heavy equipment, trucks, batteries, tires,
7 white goods, and other recyclable materials. GEPA shall submit
8 any proposed requests for proposals to *I Liheslaturan Guåhan*
9 within three (3) months of the enactment of this Article.

10 (b) Successful offerors for contracts authorized under this
11 Section shall perform all work under this Article in compliance
12 with all applicable laws, including those of this Chapter, and rules
13 and regulations of GEPA as may be established. At a minimum,
14 GEPA shall ensure that all offerors include, as part of their
15 processing, a plan to remove collected recyclable materials,
16 including abandoned vehicles, from Guams' waste stream.

17 (c) GEPA shall promulgate the necessary Rules and
18 Regulations, in accordance with the Administrative Adjudication
19 Law, to properly implement this Article."

20 **Section 3. Replacement of the Abandoned Vehicle and Street**
21 **Light Fund with a dedicated Street Light Fund.** §7161 of Title 16,
22 Guam Code Annotated, is *amended* to read:

23 "§7161. **Street Light Fund.** (a) There is established within
24 the Treasury of Guam a fund to be known as the Street Light Fund
25 which shall be maintained separate and apart from any other

1 funds including the General Fund of the government of Guam and
2 independent records and accounts shall be maintained in
3 connection therewith. Money in the Street Light Fund shall be
4 used to pay for the installation and operation of public street
5 lights. All revenue deposited in the Fund is appropriated to the
6 Guam Power Authority for payment for operation and installation
7 of public street lights. The Treasurer of Guam shall transfer funds
8 to the Guam Power Authority pursuant to this Section at the end
9 of each month.

10 (b) In addition to all other fees imposed by law, an
11 additional Twenty-Five Dollars (\$25.00) annual fee is imposed
12 upon any vehicle subject to registration under this Title which
13 shall be deposited in the Treasury of Guam to the credit of the
14 Street Light Fund. This fee shall be collected at the same time and
15 in the same manner as the annual license and registration fee
16 provided for in this Title.

17 (c) Effective April 1, 2004, the fee established in the
18 preceding subsection shall be amended and increased by Fifteen
19 Dollars (\$15.00), to be adjusted to a total of Forty Dollars (\$40.00),
20 with the proceeds to be deposited in said Fund.

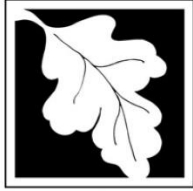
21 (d) Effective January 1, 2005, the fee established in the
22 preceding subsections (b) and (c) shall be adjusted to a total of
23 Thirty-Six Dollars (\$36.00), with the proceeds to be deposited in
24 said Fund.”

25 **Section 4. Effective Date.** Section 2 and Section 3 of this Act

1 shall take effect January 1, 2005.

2 **Section 5. Severability.** *If* any provision of this Act or its
3 application to any person or circumstance is found to be invalid or
4 contrary to law, such invalidity shall *not* affect other provisions or
5 applications of this Act which can be given effect without the invalid
6 provisions or application, and to this end the provisions of this Act are
7 severable.

Attachment D – Massachusetts Pay-As-You-Throw



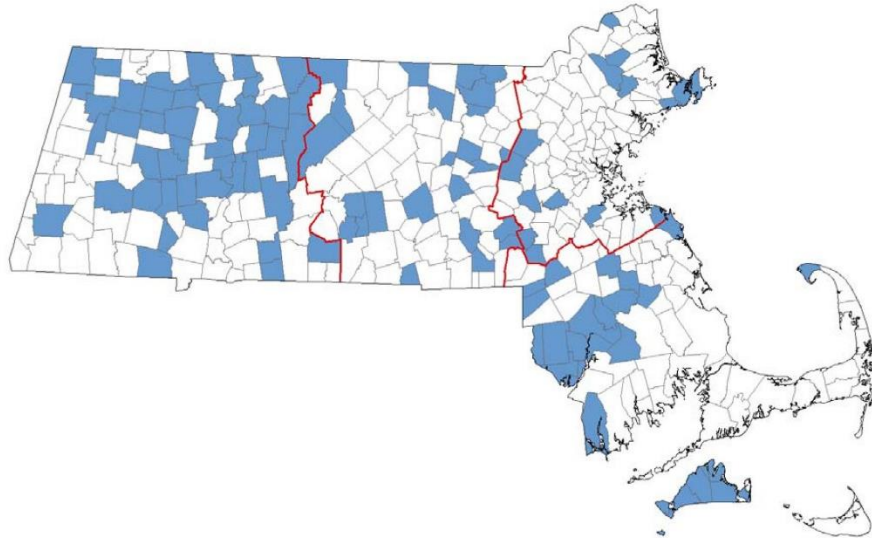
Massachusetts
Department
of
ENVIRONMENTAL
PROTECTION

The Commonwealth of Massachusetts
Department of Environmental Protection

Pay-As-You-Throw:

An Implementation Guide for Solid Waste Unit- Based Pricing Programs

January 2004



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Special thanks also goes to: the U.S. Environmental Protection Agency (EPA) for permission to use portions of the texts entitled *Pay-As-You-Throw: Lessons Learned About Unit Pricing* (EPA530-R-94-004), *Pay As You Throw Tool Kit* (EPA530-R-96-013) and *Rate Structure Design: Setting Rates for a Pay As You Throw Program* (EPA530-R-99-006); the East Central Iowa Council of Governments; and the Iowa Department of Natural Resources for permission to reprint text from *Pay-As-You-Waste: State of Iowa Implementation Guide for Unit-Based Pricing*.

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ABOUT THIS GUIDE

This guide provides an overview of solid waste unit-based pricing and assists local decision-makers and citizens in implementing programs in their communities. It explains the process of planning, developing, and implementing unit-based pricing with emphasis on successful strategies employed by selected Massachusetts communities. The guide is divided into six major sections:

SECTION I: TYPES OF SOLID WASTE USER FEES describes the different types of solid waste user fees.

SECTION II: ADVANTAGES OF UNIT-BASED PRICING PROGRAMS discusses the specific advantages of unit-based pricing.

SECTION III: THE ELEMENTS OF UNIT-BASED PRICING PROGRAMS describes the design options and program elements of successful unit-based pricing programs.

SECTION IV: STRATEGIES FOR DESIGNING AND IMPLEMENTING A SUCCESSFUL UNIT-BASED PRICING PROGRAM provides an overview of the design and implementation considerations associated with establishing a unit-based pricing program.

SECTION V: ISSUES TO RESOLVE discusses issues that should be addressed before program implementation.

SECTION VI: STEPS FOR BUILDING CONSENSUS FOR PAYT describes the important process of building consensus for unit-based pricing and educating the public.

While this guide provides an overview of unit-based pricing, more extensive reports available from DEP and US EPA contain worksheets for setting rates and other important information beyond the scope of this guide. Planners should consult **Section 12** of the companion document, *Information, Case Studies, & Sample Documents for PAYT in Massachusetts* to learn how they can obtain these materials. Planners interested in implementing unit-based pricing also are encouraged to speak with people in communities that have successfully adopted programs. The list of "mentors" cited in **Section 7** of the companion document listed above, is provided for this purpose; these individuals welcome your inquiries.

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EXECUTIVE SUMMARY

This guide provides an overview of solid waste unit-based pricing, the system in which residents pay for municipal solid waste (MSW) management services per unit of waste discarded rather than solely through a fixed fee or property tax. It explains the process of planning, developing, and implementing a unit-based pricing program with emphasis on successful strategies employed by Massachusetts communities. The Department of Environmental Protection (DEP) developed this guide to help local decision-makers and citizens implement unit-based pricing in their communities.

Cutting Costs, Saving Money

One hundred and six communities in Massachusetts have adopted solid waste unit-based pricing. Across the country, more than 6,000¹ municipalities have such programs. Unit-based pricing is catching on in Massachusetts and across the nation because it makes sense!

Communities with unit-based pricing save money through reduced disposal costs. They also gain control over their waste management budgets and provide secure funding sources for additional programs, such as recycling and composting. Since residents pay directly for disposal services in proportion to the amounts they use, they have a strong financial incentive to throw away less, while recycling and composting more.

In Massachusetts, communities with unit-based pricing have much higher recycling rates, on average, than those without it. In fact, over one-half of the communities with unit-based pricing showed a recycling rate of 40 percent or greater in the Calendar Year 2002 Municipal Recycling Rates published by DEP. The average recycling rate for municipalities with unit-based pricing (44%) was 13 percent higher than compared to the average recycling rate (31%) for municipalities without unit-based pricing programs. DEP consider unit-based pricing to be a primary vehicle for increasing Massachusetts' recycling rate.

Designing a Program

Pay-As-You-Throw: An Implementation Guide for Solid Waste Unit-Based Pricing Programs provides "nuts and bolts" advice on designing and implementing a program in your community. This publication takes you through each of the key steps and provides suggested timelines for performing them. The guide presents both the advantages and possible disadvantages of the different program types currently being used in Massachusetts, including: bag, sticker, punch card, subscription and "any container" programs. The guide also provides an overview of the different rate programs used in Massachusetts: proportional, variable, two-tiered, and multi-tiered systems.

The guide addresses many issues of particular concern to municipal officials: public perceptions that unit-based pricing is just a new tax, worries about increased illegal dumping, and the challenges of integrating multi-family dwellings into unit-based pricing. Many

¹ This data taken from Lisa Skumatz, Skumatz Economic Research Association, *Variable-rate or "Pay-As-You-Throw" Waste Management: Answers to frequently asked questions*, July 2002; page 5. Website address: <http://www.rppi.org/ps295.pdf>.

Massachusetts towns and cities with unit-based pricing in place have already successfully addressed these concerns.

Gaining Local Support

The guide also covers how to build consensus for unit-based pricing at the local level, including how to identify and gain the support of key decision-makers. Techniques for gathering public input and performing education and outreach about the program also are provided.

The guide makes suggestions for designing a program that will maximize the potential for waste reduction and recycling while gaining community support. Options are given for phasing-in a program over a period of time so residents can grow accustomed to paying directly for waste disposal.

Learning from the Experiences of Other Communities

The guide contains numerous case studies that spotlight Massachusetts communities with successful unit-based pricing programs. Additional program details and information about how implementation hurdles were overcome can be found in the guide's companion document, *Information, Case Studies, and Sample Documents for PAYT in Massachusetts*.

One hundred six (106) Massachusetts communities now have unit-based pricing. A summary chart describes the type of program in place in each community, and provides contact names and numbers. Other features include a list of "mentors" - individuals who have launched successful programs and now are willing to make themselves available for one-on-one consultations with other communities. These people are your best source of practical, field-tested information. Appendices also include samples of items used in communities with successful programs, including flyers, stickers and various other program samples. These samples can help you design similar materials for your community.

How the State Can Help

DEP is another valuable source of information and assistance on implementing unit-based pricing programs. DEP has established a grant program to assist communities with "pay-as-you-throw" program startup costs. The guide provides information on eligibility and describes the application process. Also included in the guide are a list of free publications, reports, and videos on unit-based pricing, full cost accounting and other relevant information, and an order form for those publications.

INTRODUCTION

Municipalities across Massachusetts are developing strategies to better manage solid waste in a cost-effective manner. Motivated by increased disposal costs, state waste diversion goals, and demand from environmentally aware citizens, nearly all Massachusetts communities have implemented recycling and composting programs. These programs have been highly successful in achieving a 34 percent statewide municipal solid waste (MSW) recycling rate.

One strategy that has contributed to this success and gained widespread popularity involves changing the way waste management services are financed to provide residents with an economic incentive to reduce the amount of waste they discard. Generally referred to as "unit-based pricing," this strategy helps municipalities lower waste management costs and increases recycling and composting. Unit-based pricing coupled with convenient recycling and aggressive education has emerged as the state's top program for increasing recycling and reducing waste generation.

What is Unit-Based Pricing?

Unit-based pricing, also known as "variable rate pricing" or "pay-as-you-throw (PAYT)", is a system in which residents pay for municipal solid waste (MSW) management services per unit of waste discarded rather than solely through a fixed fee or property tax. It is equivalent to putting a price tag on each container of trash that is placed at the curb or taken to the landfill or transfer station for disposal. When residents pay directly for waste disposal services, they are provided with a financial incentive to reduce their waste through recycling, composting, and source reduction.

Unit-Based Pricing in Massachusetts

One hundred six communities (106) in Massachusetts have successfully adopted unit-based pricing programs to manage their MSW services. Across the country, more than 6,000² municipalities have such programs. Unit-based pricing programs in Massachusetts have been implemented in communities with fewer than 300 residents and in large urban communities with close to 200,000 residents. These communities save money through reduced waste disposal costs and the typically lower cost of processing recyclable materials. For example, Worcester cut its annual waste management costs by \$1.2 million and increased its recycling rate from 3 percent to 36 percent with the introduction of Pay-As-You-Throw and a comprehensive curbside recycling program.

DEP considers unit-based pricing to be a primary vehicle for attaining the state's recycling goal. The data speak for themselves. Of the 106 communities that currently have unit-based pricing programs, 55 percent achieved recycling rates of 40 percent or higher on their 2002 Recycling Rates issued by DEP. By contrast, only 21 percent of communities without unit-based pricing achieved a rate above 40 percent.

² This data taken from Lisa Skumatz, Skumatz Economic Research Association; see footnote 1.

To encourage municipalities to adopt unit-based pricing, DEP had a grant program to assist with the start up costs of new "pay-as-you-throw" programs (see Section 3 of the PAYT companion document).



SECTION I: TYPES OF SOLID WASTE USER FEES

There are three primary types of solid waste user fees. **Tax based** fees are those that are collected through local property taxes and are not distinguished from other property tax revenues. **Flat fees** are collected from residents for waste management services on an annual or semi-annual basis. Alternatively, fees can be **unit-based**, meaning they are assessed according to the volume or weight of trash disposed. Unit-based pricing or Pay-As-You-Throw (PAYT) is the focus of this guide. Communities are encouraged to establish unit-based pricing systems because they provide the greatest incentive for residents to reduce waste and recycle more. **Flat** fees and **unit-based** fees are different from **tax-based** fees because they are made explicit to residents.

Finding the right system depends on the characteristics, budget, goals, and needs of your community. The following is an overview of the types of municipal solid waste user fees currently being used in Massachusetts.

Shifting From Tax-Based Fees

Many municipalities utilize tax-based fees. By shifting to a unit-based program the municipality may be able to reduce taxes or divert taxes to other programs. Many communities may use this extra money towards new programs that may not have been possible without PAYT. For example a community could use this money towards a new bulky waste program, hazardous waste program, or a range of other initiatives.

Flat Fees

According to our most recent data (CY 2002), at least 33 communities in Massachusetts finance waste management services through flat fees. Residents are billed directly for services on a periodic basis or are required to purchase an annual pass to bring waste to landfills or transfer stations. Flat fees range from \$1 dollar to \$300 per year. Flat fees help educate residents about the cost of waste management services. However, since all residents pay the same amount regardless of how much garbage they produce, there is no incentive for residents to reduce or recycle their waste.

Communities with flat fee programs are in a good position to shift to unit-based pricing. Residents are already aware that waste management services are not "free" and may welcome a system that empowers them to control their own costs. Some communities in Massachusetts, such as Seekonk, have used flat fees as a way to ease into unit-based pricing. With the flat fee, residents become aware of the inequity of charging all residents the same amount.

Unit-Based Fees (PAYT)

Unit-based fees are determined according to the amount of trash that the individual household leaves at the curb or takes to a drop-off site. Just as they do when buying water, electricity, or telephone service, residents pay for the level of service they receive. Under this system, residents who discard more garbage pay higher fees. In this way, the unit-based pricing system provides a financial incentive for residents to reduce the amount of garbage they discard and to increase recycling and composting.

Almost all unit-based pricing programs in Massachusetts are volume-based, meaning residents are charged according to the volume, not weight, of what they throw away. Most programs require residents to purchase special bags, stickers, wheeled carts, or trash barrels for their waste. While more communities in Massachusetts have bag programs, stickers are gaining popularity because they are cheaper to produce, require less storage space, and residents can attach them to the containers of their choice. Wheeled carts and trash barrels are also being used more frequently. A complete description of program design options and the pros and cons of each is provided in Section III.



SECTION II: ADVANTAGES OF UNIT-BASED PRICING PROGRAMS

In addition to educating residents about the costs of waste management services and providing them and their municipalities with an opportunity to reduce trash costs, unit-based pricing programs also promote:

- Increased Source Reduction, Recycling, Composting, and Reuse
- Cost Control
- Equity (Fairness)
- Environmental quality.

Increased Source Reduction, Recycling, Composting, and Reuse

Communities experience increased recycling, composting, source reduction, and reuse when they implement unit-based pricing programs. As residents come to understand that trash disposal costs more than recycling, they want to recycle, compost reduce and reuse more, and throw away less. And, as participation in recycling programs goes up, waste disposal costs go down.

According to EPA, communities can expect a 25 percent to 45 percent reduction in waste being disposed as residents change their purchasing and waste disposal habits. Residents recognize the links among waste reduction, recycling, and lower costs for themselves and their community. In Massachusetts, municipalities with unit-based pricing programs have shown an average .37 tons per capita disposed by residents in comparison with municipalities without unit-based pricing programs, which shown an average .42 tons per capita disposed.³ Table 1 shows disposal rates for communities before and after the start of their PAYT programs. The Tellus Institute estimated a reduction of 43,130 tons of waste in Massachusetts, in 1997, solely due to Pay-as-you-Throw. EPA's *Source Reduction Program Potential Manual: A Planning Tool* can help you determine the potential of a source reduction program in your community (See Section 12 of the PAYT companion document).

Communities can anticipate an increase in recycling and composting with the start of unit-based pricing, especially if curbside recycling begins at the same time. For example, the recycling rate in the town of Shutesbury increased from 2% to 52% after the start of their unit-based pricing program. A study of nine communities in Massachusetts, as seen in Tables 1 and 2, showed as high a 28% increase in recycling in the first year. All nine municipalities have continued to maintain higher recycling rates in comparison with their recycling rate prior to implementing unit-based pricing programs. The Tellus Institute estimated that, in 1997, PAYT led to an increase in recycling of 29,130 tons in Massachusetts⁴.

³ Tons per capita rates based on CY2002 disposal information from the Municipal Recycling Data Sheets.

⁴ Tellus Institute *Massachusetts Source Reduction Report* (June 1999)

Table 1: Percent Change in Per Capita Waste Disposal for Municipalities After Implementing PAYT

MUNICIPALITY	Start Date	Program	Percent Change in Per Capita Disposal	
			Year 1	Year 2 ⁵
Brockton	October 2001	Curbside	-31%	N/A *
Cohasset	July 2001	Drop-Off	-25%	N/A *
East Brookfield	August 2001	Curbside	-26%	N/A *
Holliston	October 1999	Curbside	N/A *	-31%
Medway	July 2000	Curbside	-26%	-20%
Needham	June 1998	Drop-Off	-41%	-37%
North Attleborough	September 1998	Curbside	-44%	-35%
Shutesbury	July 2000	Curbside	1%	-20%
Topsfield	November 1998	Curbside	-15%	-20%

⁵ Year 2 percentage change for tons per capita of waste disposed was calculated as a cumulative change from the program's base year (before unit-based pricing).

* These communities started programs recently therefore they have no data for year 2.

Table 2: Recycling Rates for Municipalities Before and After PAYT

MUNICIPALITY	Start Date	Program	Before PAYT	After Implementing PAYT		
				Year 1	Year 2	Year ⁶
Brockton	October 2001	Curbside	13%	30%	N/A	N/A
Cohasset	July 2001	Drop-Off	30%	44%	N/A	N/A
East Brookfield	August 2001	Curbside	29%	39%	N/A	N/A
Holliston	October 1999	Curbside	29%	N/A	49%	42%
Medway	July 2000	Curbside	44%	58%	45%	N/A
Needham	June 1998	Drop-Off	37%	50%	47%	54%
North Attleborough	September 1998	Curbside	28%	55%	39%	38%
Shutesbury	July 2000	Curbside	25%	52%	51%	N/A
Topsfield	November 1998	Curbside	28%	40%	40%	46%
Recycling Rates = waste diversion over waste generation. Data taken from DEP Municipal Recycling Data Sheets						

⁶ * These communities started programs recently therefore they have no data for year 3 and sometimes for year 2.

Cost Control

Unit-based pricing programs are an excellent way to control costs through reducing waste. Waste reduction translates into direct savings for residents and municipalities. Residents accustomed to paying flat fees for unlimited trash disposal can lower the amount they pay for trash services simply by recycling or composting more waste. While they previously had no control over what they were paying, unit-based pricing empowers them to lower their waste disposal bills.

Municipalities also realize savings from waste reduction and recycling. Waste disposal costs decline as the amount of waste sent to disposal facilities decreases. For example, Worcester saved \$1.2 million in avoided disposal and reduced labor costs during the first year of its program. While the city spent an additional \$500,000 to implement curbside recycling with unit-based pricing, it realized a net savings of \$700,000 even with these added services.

Equity (Fairness)

Unit fee systems are more equitable than flat fee systems because residents pay only for the level of service they use. Households generating less trash pay less than households that generate more. Once unit-based pricing is implemented, low-volume users such as the elderly no longer subsidize those who generate higher volumes of trash. The Town of Boxford used the issue of fairness to sell residents on the unit-based pricing concept. When the town gave residents a choice between flat fees and unit-based pricing, they voted overwhelmingly for unit-based pricing because it was a more equitable system and offered them the potential to save money by adjusting their waste disposal behavior.

Environmental Quality

By diverting waste through recycling, composting, reduction and reuse, unit-based pricing extends the lives of landfills, decreases greenhouse gas emissions and other pollution from disposal facilities, and reduces the need for new disposal facilities. As communities turn to reuse and recycling, natural resources such as land, air, and water are protected and preserved.

Almost all human activities today have some effect on global warming and climate change, and waste management is no exception.

- When organic wastes decompose in a landfill or synthetic materials such as plastics are burned in incinerators, greenhouse gasses are emitted. These impacts are all reduced with the introduction of a PAYT program.
- Increased paper recycling from a PAYT program will reduce the harvest of trees. Trees are instrumental in taking carbon dioxide out of the atmosphere and storing it.
- Recycled materials typically take less energy to produce. This increase in efficiency reduces fossil fuel use, which again reduces greenhouse gases. For example, producing an aluminum can from recycled aluminum instead of virgin materials (bauxite) requires 12-20% less energy, and produces 95% less air pollution⁷.

⁷ U-Mass Office of Waste Management, [Environmental Benefits of Recycling](http://www.umass.edu/recycle/environmental_benefits.html) web page: http://www.umass.edu/recycle/environmental_benefits.html. Also see the Ohio Department of Natural Resources website: <http://www.dnr.ohio.gov/recycling/awareness/facts/aluminum.htm>.

Based on calculations conducted using the Northeast Recycling Council's Environmental Benefits Model⁸, DEP estimated the benefits of increased recycling for two Massachusetts communities. The below table summarizes these results for the first year of implementing PAYT in Brockton and Needham.

Municipality	Reduction in Greenhouse Gas Emissions (metric tons of Carbon equivalent)	Energy Savings: In Terms of # of Households Powered for a Year	Energy Savings: In Terms of Gallons of Gasoline
Brockton	3,400	820	693,000
Needham	72,000	680	580,000

All types of communities, regardless of their size or solid waste management practices, can design unit-based pricing programs that will help them achieve waste reduction and recycling goals while keeping costs to a minimum. There are a number of different volume-based programs that can be established to allow for flexibility in implementation and administration.

⁸ To access the NERC Environmental Benefits Model, go to the NERC web page at www.nerc.org.



DEP Recycling Participation Study
June, 2000 Pay-As-You-Throw Program Results

Recycling Patterns - Recycling participation for individual materials is noticeably higher in PAYT communities:

Material	“Always Recycle” - Statewide	“Always Recycle” - PAYT
Newspaper, magazines	82%	94%
Glass bottles, jars	72%	86%
Plastic containers	71%	82%
Metal cans	71%	84%
Corrugated cardboard	53%	73%
Paperboard	45%	60%
Regular paper	41%	50%

- Residents in PAYT communities are more likely to report “doing all they can” compared to results statewide. In PAYT communities, 70% of residents are “doing all they can,” compared to 50% statewide. Just 14% of residents in PAYT communities are “not participating” compared to 27% statewide.

Category	Statewide	PAYT
Doing all they can ¹	50%	70%
Doing nearly all they can ²	10%	11%
Making an effort ³	13%	5%
Not participating ⁴	27%	14%

¹recycle four target materials, ²recycle 3 target materials, ³recycle 1-2 materials, ⁴not recycling or only recycling deposit items. Target materials: newspaper, glass, metal cans, and plastic.

Attitudes Towards Recycling

- Residents in PAYT communities are significantly more likely to say that their household is committed to recycling as compared to residents from the rest of Massachusetts (82% versus 64%)
- Residents from PAYT communities do not have significantly different views about the benefits of recycling.
- Residents of PAYT communities find recycling easier, more convenient, less of a hassle and are less likely to need reminders to recycle than respondents from other parts of Massachusetts.
- Respondents from PAYT communities are significantly more likely to think that it is clear what is recyclable, storing recyclables is not a problem, getting information on recycling is easy.

*Overall survey sample – 750, minimum of 100 respondents from PAYT communities. Study can be found at <http://www.state.ma.us/dep/recycle/files/recsrvey.doc>.



SECTION III: THE ELEMENTS OF UNIT-BASED PRICING PROGRAMS

Once you have determined that unit-based pricing makes sense for your community, the next step is to decide what type of program is best. When deciding what type of program makes the most sense, it is important to remember that any program can and should be modified to suit your community's specific circumstances. Pre-paid unit-based pricing programs that require residents to purchase special bags or stickers are most common in Massachusetts, largely because they reduce billing and collection costs and can be adapted to fit a variety of municipal needs.

Program Design Options

There are six program design options currently in use in Massachusetts: bags, stickers, “any containers”, punch cards, subscription service, and basic service. Each system has possible advantages and disadvantages in terms of perceived equity, the level of economic incentive provided, and revenue stability. In addition, the systems are not mutually exclusive and can be combined to meet a community’s needs.

- **Specially Marked (Imprinted) Trash Bags**

Fifty-five communities in Massachusetts use a bag system for their PAYT program. Residents purchase colored plastic bags imprinted with the name or seal of the municipality. The price of each bag covers both the cost of the bag itself and part or all of the cost of transportation, and disposal. Residents set these special bags out at the curb for collection or bring them to the landfill or transfer station. Waste haulers are instructed to pick up only the specially marked trash bags.

Some municipalities elect to sell their bags at town hall or municipal offices. Others make arrangements with local supermarkets and convenience stores to sell the bags at a small mark up or at no additional cost as a public service. A variety of bag sizes and prices can be offered to allow additional flexibility for low-volume trash generators, such as the elderly. For example, the Town of Colrain charges 75 cents for a fifteen-gallon bag and \$1.50 cents for a 33-gallon bag. See Table 4 for a full description of the advantages and concerns of this system.



Table 4: Bag Systems			
<i>Households pay a fee by purchasing “official” distinctively marked, standard-sized trash bags, typically ranging from 10 to 30 gallons in capacity. Residents purchase bags from municipal offices and/or retail stores. Only garbage in “official” bags is collected.</i>			
Advantages	Concerns	Massachusetts communities using this system	
<p>Residents find bag systems easy to understand. They just need to buy bags, which they need anyway, instead of a sticker plus a bag.</p> <p>Volume limits are more easily assured with bags than with stickers.</p> <p>Bag systems offer the potential for a stronger waste reduction incentive when small sized bags are used. This flexibility with smaller bag sizes benefits low-volume users, such as senior citizens.</p> <p>Bag collection tends to be faster and more efficient than sticker systems and subscription systems because bags are easy to see and remove.</p> <p>Items that are not in compliance are easily noticed.</p> <p>Bag systems provide the opportunity to offset costs by selling advertising on “official” bags.</p>	<p>Bags are more expensive to produce than stickers.</p> <p>If bags are sold in municipal offices, extra staff time will need to be committed.</p> <p>Residents might view a requirement to buy and store bags as an inconvenience.</p> <p>There may be potential difficulty with retailers who may object to selling the bags and/or insist on a markup.</p> <p>Unlike cans, bags are not reused, adding to the amount of solid waste entering the waste stream.</p> <p>Residents using containers may object to having to switch to bags.</p> <p>The weight of bags after stuffing might be a problem unless weight restrictions are instituted and enforced.</p> <p>Bag systems have greater revenue uncertainty than subscription systems, since the number of bags residents purchase can fluctuate significantly.</p> <p>Animals can tear bags and scatter trash, or bags can tear during lifting.</p>	<p>Ashby Ashfield Belchertown Berkley Bernardston Bridgewater Brimfield Brockton Brookfield Buckland Charlemont Cohasset Colrain Deerfield Dighton East Bridgewater East Brookfield Groton Hadley Halifax Hampden Hawley Huntington Lakeville Leverett Lunenburg Medway Millis</p>	<p>Natick Needham New Ashford New Salem North Adams North Attleborough North Brookfield Northborough Orange Pepperell Petersham Provincetown Russell Savoy Scituate Seekonk Shutesbury Somerset Southampton Spencer Sudbury Swansea Taunton Webster Wendell Williamstown Worcester</p>

Sources: U.S. Environmental Protection Agency. 1994. *Pay-As-You-Throw: Lessons Learned About Unit Pricing*, EPA530-R-94-004; U.S. Environmental Protection Agency. 1999. *Rate Structure Design: Setting Rates for a Pay-As-You-Throw Program*, EPA530-R-99-006; Skumatz, Lisa A. 1993. *Variable Rates for Municipal Solid Waste: Implementation Experience, Economics, and Legislation*; State of Iowa, Department of Natural Resources. 1995. *Implementation Guide for Unit-Based Pricing*.

The City of Worcester has had tremendous success with its bag program. Residents purchase yellow bags imprinted with the city's unit-based pricing slogan "Pay a Little, Save a Lot." The brightly-colored bags are easy to spot, which ensures fast and efficient collection. In addition, trash that is not in a specially imprinted bag is easily noticed.

Worcester's experience with bags, discussed in more detail in Section 1 of the PAYT companion document, highlights the importance of working closely with retailers. Retailers who carry the special bags should benefit through increased store traffic. However, bags carry disadvantages for retailers since they take up shelf space and often must be paid for in advance. Some retailers will be willing to sell bags because they are providing a public service and will benefit from increased store traffic and PAYT program advertising. If not, you may want to allow retailers to charge a markup on the bags. In any case, if retailers are to be involved in distributing bags, they must be invited into the planning process early on.

- **Specially Marked Stickers**

Unit-based pricing programs that use stickers are also common in Massachusetts, with 34 communities using this method. Residents purchase specially marked labels and affix them to trash bags or barrels of their choice. Different colored stickers may be purchased depending on the volume of trash disposed. For example, a six-gallon container (bag or barrel) may require a blue sticker costing 75 cents, a 15-gallon container may require a red sticker costing \$1.30, and a 30-gallon container may require that a resident affix a yellow sticker costing \$2.25. In Concord, residents may pay a lump sum for a sticker that they place on a barrel. This sticker entitles them to pickup of that barrel for 6 months. This option is a unit-based system, but is closer to the system that is already in place in most communities. Alternatively, residents may be instructed to attach a certain number of stickers to their containers depending on the sizes

As with bag programs, this variation allows low-volume users to save money on waste management services and provides an incentive for higher-volume users to reduce their costs through greater source reduction, recycling, and composting. The Massachusetts Department of Revenue has issued a ruling that no sales tax will be charged on the sale of either bags or stickers. In addition, as with bags, waste collection workers are instructed to collect only those containers that are marked with the appropriate label. Bags or barrels without stickers are not collected. By printing sequential numbers on each sticker, municipalities can keep track of the number of stickers used. Some communities also require stickers for bulky items, such as appliances and furniture. Each type of bulky item must bear a predetermined number of stickers based upon its size and level of handling difficulty. See Table 5 for a full description of the advantages and concerns of sticker systems.

Table 5: Sticker Systems

Households pay a fee by purchasing “official” stickers. The stickers are attached to a specific size container. Stickers are purchased from municipal offices and/or retail stores. Only containers with the “official” stickers are collected.

Advantages	Concerns	Massachusetts communities using this system
<p>Sticker systems are less expensive to implement than bag systems because the cost of producing stickers for sale to residents is lower than for bags.</p> <p>Selling stickers at local retail establishments and municipal offices offers lower distribution, storage, and inventory costs than subscription systems and less resistance from retailers than bags.</p> <p>Stickers can be used to indicate payment for bulky items or white goods.</p> <p>Residents can choose between bags or cans BUT size and type of can or bag still have to be restricted to a specified size/type.</p>	<p>To avoid confusion among residents, the municipality must establish and clearly communicate the size limits allowable for each sticker.</p> <p>It is more difficult for residents to visualize size limits with stickers than with bags.</p> <p>If stickers are sold in municipal offices, extra staff time will need to be committed.</p> <p>Residents might view a requirement to buy and store stickers as an inconvenience.</p> <p>Stickers sometimes do not adhere to containers in rainy or cold weather.</p> <p>Extra time might be needed at the curb for collectors to enforce size limits.</p> <p>Stickers are not as noticeable as bags or other prepaid indicators and may slow down collection.</p> <p>There is greater revenue uncertainty than with subscription systems, since the number of stickers residents purchase can fluctuate significantly.</p>	<p>Ayer Becket Bolton Boxford Chester Clinton Concord Dalton Dunstable Gill Gloucester Great Barrington Hatfield Holliston Manchester Maynard Mendon Merrimac Milton Montague Norfolk Northampton Oak Bluffs Plainville Raynham Royalston Shelburne Tisbury Topsfield Upton Warwick Westhampton Whately Wilbraham Worthington</p>

Source: See Table 4.

Stickers have an advantage over bags in that they require less storage space. This may make them more desirable to retailers and municipalities with limited storage capacity. A disadvantage with stickers is that there is less control over the total volume of waste disposed. Bags have definite volume limits, whereas stickers can be placed on bags or barrels of varying sizes. Haulers may find it difficult to ensure that a certain volume of trash has the correct sticker. To encourage the use of appropriate containers, communities may want to establish weight limits along with the volume requirements. Containers over the weight limit would require two stickers or else will not be collected.

Another disadvantage of stickers is that they are not as easy to identify as specially marked bags. In order to make stickers more visible, town residents could use stickers that attach to the neck of tied bags or to the handle of trash barrels. The stickers are easy for the waste haulers to identify.

Some communities have mixed both bags and stickers in their program. Within Massachusetts, Cheshire and Foxborough have this type of program. This can be used as an alternative option for residents who wish to use their own container instead of town bags. This program may increase administrative or implementation costs due to the added complexity, but the added flexibility may outweigh these costs.

- **“Any Container” Systems**

In Massachusetts, eight drop-off communities have unit-based programs that allow for containers supplied by the resident. Instead of requiring bags or stickers, the residents bring containers to the drop-off site and pay per container. These containers are assumed to be an average size, though they in fact vary in size. For example the Martha’s Vineyard Refuse Disposal District, which includes Aquinnah, Chilmark, Edgartown, and West Tisbury, has this type of system for their residents. This is a weight based system which is different than the volume-based system that most of Massachusetts uses. The residents pay by the number of containers they bring. These containers must be approximately 32-gallon containers, which equals about 40 lbs. of trash. The residents can either pay \$4.00 in cash at the site for each container or buy coupon books in advance for a certain number of containers. The largest problems they have had involve weight limitations. They have a maximum weight of 40 lbs. per trash barrel, but residents often fill trash barrels with more weight than allowed. Because these landfills do not have scales there is no clear way of verifying weights. However residents located within the disposal district may exercise the option of using the scale located at the Edgartown transfer station at a disposal cost of \$141 per ton of solid waste. This system works well for the areas with many seasonal residents.

Table 6: “Any Container” Systems		
<i>Households can use container of their choosing assumed to be an average size. These containers are brought to a drop-off facility and the resident is charged per container</i>		
Advantages	Concerns	Massachusetts communities
<p>Revenues are stable and easy to forecast.</p> <p>Containers generally will not tear and can prevent animals from scattering waste.</p> <p>New containers may not be necessary when residents already own cans of roughly uniform volume.</p> <p>Enforcement can be assisted with address labels on the container.</p> <p>Easier for use with automated and semi-automated equipment (34 gallon wheeled cart).</p>	<p>May have higher implementation costs particularly if new containers must be purchased.</p> <p>Limited incentive for reduction of waste due to the same price for a container whether it is full or not and no savings below smallest size trash can.</p> <p>Complex billing systems are required to track residents’ subscription level.</p> <p>Non-automated collections can make it more difficult than collecting waste in bags.</p>	<p>Aquinnah (also known as Gay Head)</p> <p>Chilmark</p> <p>Edgartown</p> <p>Hudson</p> <p>Phillipston</p> <p>Rehoboth</p> <p>West Tisbury</p>

Source: See Table 4

- **Punch Card Systems**

Five communities in the state use punch cards as the mechanism to charge residents on a per-unit basis for the amount of waste they discard. Residents purchase a card which can be used a set number of times for a particular amount of waste. For example, in Granville, a card costs \$60 and can be used for thirty 30-gallon containers. This system is convenient for communities that offer drop-off waste management services. The card is punched by a landfill or transfer station attendant when the container is brought to the drop-off center.

Granville has been extremely pleased with its punch card program. Residents can choose from among four different punch cards: they can purchase the \$60 card for thirty 30-gallon punches, a \$25 card for 52 five-gallon punches, a \$64 card for sixteen 55-gallon drums (ideal for businesses), and a card good for one, two, or three pickup loads for \$50 a load. Granville requires residents to recycle and charges \$25 annually for a recycling card. However, residents who participate in the punch card program do not have to pay the \$25 recycling fee since recycling costs are included in the cost of the punch cards. Residents who use private haulers for curbside trash service and do not participate in the punch card program must purchase recycling cards and bring their recyclables to the community’s transfer station.

Table 7: Punch Card Systems		
<i>Households purchase a card that can be used a set number of times to discard a pre-determined amount of waste. A community will typically sell a variety of cards that can be used for a range of disposal amounts. Waste containers (bags or barrels) are brought to a landfill or transfer station and the card is punched by an attendant.</i>		
Advantages	Concerns	Massachusetts communities
<p>Punch card systems are easy to implement and easy for residents to understand.</p> <p>Punch cards require very little storage and are inexpensive to produce.</p> <p>Punch cards can be used over and over again until all the punches are used. This cuts down on waste.</p> <p>Residents can use any type of container as long as containers comply with volume and weight restrictions.</p> <p>Selling punch cards at local retailers and municipal offices offers low distribution and storage costs and less resistance from retailers than bags.</p>	<p>Punch cards can only be used at the landfill or transfer station where an attendant is available to punch the card.</p> <p>To avoid confusion among residents, the municipality must establish and clearly communicate the size limits allowable for each card type.</p> <p>If punch cards are sold in municipal offices, extra staff time will need to be committed.</p> <p>Residents might view a requirement to buy punch cards as an inconvenience.</p>	<p>Chesterfield Goshen Granville Plainfield Westport</p>

Source: See Table 4

- **Franchise Systems**

With a franchise system, households sign up for collection and disposal of a specific number or size of containers of garbage based on the amount of waste they generate per billing period. The municipality or the private hauler then bills residents depending on the type of program to which they subscribe. Households generating garbage above their subscribed level of service must purchase stickers and attach them to additional containers if they want them to be collected. Two municipalities in Massachusetts have a franchise system.

Franchise systems require a billing and tracking system. Communities can avoid the problems associated with complex billing by requiring residents to contract directly with haulers. This is the method in place in the Town of Amherst. Residents are required to have weekly waste management services and must contract with one of the two private haulers approved by the Board of Health. Local regulations require that waste haulers offer residential customers a unit-based fee, which covers all waste collection and disposal costs. Residents can subscribe for one trash barrel per week for \$325 per year, two trash barrels per week for \$350 per year, and three trash barrels per week for \$377 per year.

Table 8: Franchise Systems		
<i>Households sign up for collection of a specific size or number of containers of garbage per billing period. Charges are based on the amount of service chosen, with higher service levels costing more. Bags or stickers are required above the subscription level.</i>		
Advantages	Concerns	Massachusetts communities
<p>Revenues are fairly stable and easy to forecast.</p> <p>If residents already own containers of roughly uniform volume, new containers may not be required.</p> <p>Containers may be labeled with addresses to assist in enforcement.</p> <p>This system does not add more plastic (garbage bags) to the landfill.</p> <p>Municipalities can easily amend subscription systems to include bags or stickers for additional units of trash.</p> <p>This system also works well with automated collection programs.</p>	<p>Subscription systems often have higher implementation costs, including the purchase and distribution of containers.</p> <p>Customers have a limited incentive to reduce waste. Since residents are usually charged on a subscription basis, there is no incentive not to fill containers already purchased. In addition, no savings are possible below the smallest size trash container.</p> <p>Relatively complex billing systems are needed to track a resident's selected subscription level and bill accordingly.</p> <p>At the outset, residents may find it difficult or confusing to select a subscription level. There may be disputes with residents on the number of containers set out.</p>	Amherst Georgetown

Source: See Table 4

Maximum Weight Requirement Option

Regardless of the PAYT program type, DEP strongly recommends placing a maximum weight requirement as well as the volume-based requirement. A weight restriction will keep residents with trash compactors from unfairly benefiting. Also, a weight restriction protects the bags from being overfilled and breaking open. Also many haulers require through contract a limit on the weight their employees lift because of Workmen's Compensation requirements of 50 lbs. maximum. When determining the rate for your program, the average weight per bag is determined. Setting a maximum weight will help in keeping this weight down and therefore preventing collection amounts from exceeding estimates.

This maximum weight requirement may seem difficult to enforce. Drop-off communities can install scales at the transfer station, although this may be costly and slow down traffic in and out of the station. If a scale is not an option or the municipality runs a curbside collection then the best enforcement is instructing the collectors to watch for overstuffed bags. If a bag is noticeably heavier than the weight limit, it is not accepted or picked up. For curbside collections a notice can be left giving the reason the bag was not collected (See Section 9 of the PAYT companion document). After notifying the resident of the maximum weight, the resident will often make an effort not to stuff as much in the bags.

Convenient Recycling Options

Convenient and comprehensive recycling must be part of any unit-based pricing program. The cost of the recycling program can be covered through the flat fee or the unit-based fee. By allowing "free" recycling, residents who choose to recycle are rewarded for their efforts through lower disposal costs. In fact, without convenient and inexpensive alternatives to managing trash, a program could potentially fail. For example, when the town of Chelmsford added a separate fee for recycling one year after instituting a unit-based pricing program, the recycling charge was overwhelmingly rejected by residents and the entire unit-based pricing program was subsequently repealed.

- **Add-on Program Elements: Bulky Items, Composting and Source Reduction**

Communities with unit-based pricing programs should also provide source reduction programs and convenient collection of yard waste and bulky items, such as refrigerators, major appliances (also referred to as white goods), and furniture. Special stickers (with additional fees) can be printed and used for those items that will not fit in bags or barrels. This type of program can encourage the reuse of bulky items, especially if a swap shop is located in town and provides for free drop-off of these items. Some communities collect bulky items for at additional cost, while others charge a nominal fee. The provision of a free bulky waste program helped Worcester build support for its unit-based pricing program and has contributed to a decrease in illegal dumping. Maynard also offers bulky waste pickup, but requires that residents attach five stickers to each bulky item (for a total cost of \$10). Both communities consider these "add-ons" to be integral components of their unit-based pricing programs. Bulky wastes are a large part of any illegal dumping that occurs during unit-based pricing. These programs are considered to be very helpful in reducing this type of illegal diversion.

Communities also can inform residents of on-site management methods of organic materials such as backyard composting, mulching and grasscycling (leaving grass clippings on the lawn). Brochures on home composting and grasscycling are available from DEP and may be mailed or handed out to residents. Communities can encourage increased composting by providing residents with the opportunity to purchase rodent-resistant home composting bins.

These bins can be made available to residents at a discounted rate with the assistance of DEP grants. These bins could be sold for as little as \$15 to \$20 and are simple for any resident to use. Residents can compost nearly 50 percent of their waste including yard trimmings, food scraps and certain paper products. To help reduce waste, promotion of residential on-site composting should be a part of every unit-based pricing program. To learn about the bins available through the state, please refer to the DEP publication, *Compost! Make a World of Difference!*

Section 12 of the PAYT companion document lists a manual released by the EPA that can help with a source reduction program.

- **Apartment Buildings and Yard Waste PAYT Program**

Residential housing comprised of multiple units can be a challenge to communities implementing unit-based pricing. This is particularly true in apartment buildings where households dispose of trash in large centrally-located dumpsters, and trash removal is paid for by the landlord, not the residents. This makes it difficult to charge individual households per unit of trash disposed unless a bag or sticker program is used. Moreover, when there are many families in a building, it is easy for a single household to try to "cheat the system" by disposing of trash without the requisite bag or sticker. When this happens, it is difficult to determine who is responsible.

Multi-family dwellings with six or fewer units do not present this problem to the extent that large apartment buildings do. Residents in dwellings of six or fewer units generally receive the same waste management service received by residents in single-family or two-family homes. These residents usually do not use centrally-located dumpsters to dispose of trash, due to the smaller number of units within the dwelling. In addition, these residents are less likely to try to "cheat the system" because they don't have the same level of anonymity as residents of large buildings. As a result, households in multi-family dwellings with six or fewer units should generally be included in unit-based pricing programs.

Several Massachusetts communities with unit-based pricing include multi-family dwellings in their programs. Some communities make special arrangements to ensure compliance by residents in these dwellings, while others do not. For example, Worcester includes residents living in dwellings of six or fewer units, but makes no special arrangements. Since these residents are included in the municipal trash and recycling collection programs, they are expected to purchase the special yellow bags.

While many communities choose to exclude apartment buildings and condominiums from unit-based pricing programs, this example demonstrates that it *is* possible to include these residents, particularly those in smaller buildings. Communities might also consider a phased-in approach to dealing with apartment buildings. For example, single-family houses and multi-family dwellings comprised of six or fewer units could be included in the first year, while larger apartment buildings can be brought on board once the program is running smoothly. Condominiums can also be allowed to participate by allowing the condo association to distribute stickers or bags.

- **Seasonal/Transient Populations**

Communities with large seasonal or transient populations, such as coastal or college communities, may be concerned that these populations will not comply with their unit-based pricing programs. While these communities face additional implementation hurdles, they can be overcome with proper planning and education.

Generally populations comprised of students present less of a problem because students are more amenable to the environmental arguments in support of unit-based pricing. Communities with large off-campus student populations must reach out to these groups in their outreach efforts. For example, Worcester officials contact the 10 colleges in the city and mail brochures to departments in charge of off-campus populations in August, before the students return to campus. The brochures describe the pay-per-bag program and inform

students where they can purchase bags and pick-up recycling bins. Communities with large student populations may also arrange a place on campus, such as the college bookstore or a convenience store, where students can purchase bags or stickers, and prepare area retailers for the times of year when they will need to stock up.

Seasonal residents on vacation present an educational barrier because they tend to visit for short periods of time and have no prior knowledge of waste management practices in the community. Nonetheless, they should be responsible for participating in the program, just as they are expected to recycle and properly dispose of the trash they generate while on vacation.

In communities with unit-based pricing, the obligation for educating tourists falls on the owners and agents who rent property to tourists. This is the case in Gloucester, a coastal community where the population swells by 6,000 in the summer months. Rental agents inform tourists of the unit-based pricing program and often provide them with two stickers per week. Tourists are instructed on how the program works, how to recycle, and where to purchase additional stickers if needed. As a result, Gloucester has not experienced any compliance problems with summer residents.



SECTION IV: STRATEGIES FOR DESIGNING AND IMPLEMENTING A SUCCESSFUL UNIT-BASED PRICING PROGRAM

Developing a unit-based pricing program takes time and commitment, as the program needs to be tailored to the specific needs of your community. This means determining whether a bag, barrel, or sticker program makes the most sense, designing a rate structure, developing an implementation schedule, and gathering the key support necessary for approval of unit-based pricing. This section provides an overview of design and implementation considerations that will maximize the potential for waste reduction and recycling while gaining community support. Planners can accomplish this by taking certain steps, such as adopting a hybrid system and designing a rate structure that is revenue-neutral. See Section 5 of the PAYT companion document for a chart of procedures required to fully design a unit-based pricing program.

At the design stage, you should also refer to EPA's *Pay-As-You-Throw Tool Kit*. This guide contains fact sheets, worksheets and other valuable information to help you implement a unit-based pricing program from beginning to end. There are a set of 7 worksheets that are very helpful in designing a program. The worksheets cover various aspects of the program from the planning stage through until the monitoring stage, including:

- **Worksheet 1:** Program Goals
- **Worksheet 2:** Potential Barriers
- **Worksheet 3:** Public Outreach
- **Worksheet 4:** Container & Pricing Choices
- **Worksheet 5:** Rate Structure Design
- **Worksheet 6:** Implementation Checklist
- **Worksheet 7:** Monitoring & Evaluation

These worksheets and other sections of the tool kit can be downloaded individually at <http://www.epa.gov/payt/tools/toolkit.htm>.

Another useful tool is the EPA's *Rate Structure Design: Setting Rates for a Pay-As-You-Throw Program*. It contains valuable information on what is necessary to determine proper fees and rates. (See Section 12 of the PAYT companion document for information on ordering a free copy of these publications.)

Design a Unit-Based Pricing Rate Structure

One of the most important elements in designing a unit-based pricing program is establishing an appropriate rate structure. Along with raising sufficient revenues to cover the fixed and variable costs of the solid waste program, unit-based rates should send clear price signals that will encourage residents to throw away less. The three major rate systems are proportional, variable, and hybrid rates. The hybrid rate system is considered by the DEP to be the most effective unit-based pricing system.

• **Proportional Rate System**

The simplest type of system is a proportional rate system. The proportional system simply includes one uniform charge per container set out. This system provides a large incentive to reduce waste and keeps administrative costs low. However with proportional rates, the correct rate is often difficult to determine, as residents recycle more and throw away less. Revenues may decrease as the program is implemented so the rates may need to be set somewhat higher initially to account for this decreased revenue. These decreases will be due to a much higher recycling rate. The rate may be decreased later as long as it is still possible to cover MSW costs. If the rates are set too high the municipality risks increased program opposition.

Table 9: Proportional Rates		
<i>This is a simple pricing system with uniform container sizes and prices.</i>		
Advantages	Concerns	Massachusetts communities
Strongest incentive for reducing waste due to price of each bag	Not based on MSW costs, but based on quantity of trash discarded.	Aquinnah Ashby Brimfield Chilmark Edgartown Taunton Webster West Tisbury
Simple to manage due to purchase of bags from municipality or retail outlets.	Will cause uncertain revenue due to unknown response from residents	
Possibly lowers MSW program costs because no billing mechanism required.	Revenues likely to be too high or too low, may not meet solid waste costs Possibility of storage of bags may cause fluctuations in revenue.	

Source: See Table 4.

• **Variable Rate System**

Variable rates are more complicated but are also more flexible. This system includes different costs for different containers. There are various options that fit within a variable system.

- The first option is charging different costs for different container sizes, For example, Halifax charges \$1.20 per 15-gallon container and \$1.80 per 30-gallon container.
- Another option is to charge different amounts for the second or third size container. For example the first 30 gallon container may cost \$1.00, but the next 30 gallon container may cost \$1.50.
- The final option would be supplying basic service, which is supplying the first bag at no cost to the resident and then charging for each additional bag. The Town of Maynard provides one container per week for free and then charges \$2.00 for each additional container.

The majority of municipalities in Massachusetts with this system selected disposal amounts of approximately 15 and 30 gallons.

Table 10: Variable Rates		
<i>This system charges residents different amounts for different amounts of garbage depending on either size of container or number of containers.</i>		
Advantages	Concerns	Massachusetts communities
<p>Allows the municipality to control the incentive level to reduce waste.</p> <p>The price for additional containers may be higher if the municipality wishes to create a stronger incentive, or, if there is a problem with illegal dumping the municipality may lower the cost for additional containers.</p>	<p>Managing different subscription levels could increase municipal administrative costs.</p> <p>There may be more work for the haulers including counting set outs during collection, which may also increase costs.</p>	<p>Amherst Bridgewater East Bridgewater East Brookfield Georgetown Granville Halifax Maynard Somerset</p>

Source: See Table 4.

- **Hybrid Pricing System**

The final system is a hybrid system, which can be categorized into a two-tiered or multi-tiered system. The two-tiered hybrid system is the most common rate system in Massachusetts. DEP recommends some form of hybrid rate system as the preferred Unit-Based Pricing Program. A hybrid pricing system combines a flat fee to cover the fixed costs of trash collection and a unit-based fee to cover costs that vary by the amount of trash that is disposed. To cover the variable costs, a municipality can use either a proportional rate to create a two-tiered system or a variable rate to create a multi-tiered system (more than 2 tiers).

The flat fee provides revenue stability and ensures that fixed costs (direct and indirect) such as the capital costs of equipment, collection costs, employee salaries, administrative costs, insurance, and overhead are covered. The unit-based fee provides the proper price signal to residents. Many municipalities with hybrid systems offer a basic level of service, such as the collection of one container of trash per week, as part of the flat fee. Any additional containers must bear the appropriate bag or sticker and are charged on a unit basis. Other municipalities with hybrid systems require residents to purchase a bag or sticker for each trash container, but have a flat fee in place to cover fixed costs. Also, hybrid systems provide the flexibility to combine design options such as bags for regular trash and stickers for bulky items.

Communities are encouraged to design hybrid systems for a number of reasons. In addition to providing revenue stability, a hybrid system helps eliminate the incentive to illegally dump trash. Since residents are already paying something for the service, they are more inclined to use it. Furthermore, a hybrid system is often easier to sell politically since it can diffuse some of the resistance to unit-based pricing, especially in communities that are unable to reduce property taxes to compensate for additional trash charges. In addition, the per-unit cost of bags or stickers will be lower because a portion of waste management services will be financed from property taxes or flat fees.

Table 11: Two-Tiered or Multi-Tiered Hybrid Rates			
<p>DEP strongly recommends hybrid systems. <i>This system is useful for revenue stability. The 'first-tier' includes a basic level of service that is covered by a flat fee paid through taxes or separate bills, the next tier(s) is a unit-based fee. These additional charges could either be a proportional rate system, which would mean a two-tiered rate, or variable rate system that would be a multi-tiered rate.</i></p>			
Advantages	Concerns	Massachusetts communities with two-tiered rates	Massachusetts communities with multi-tiered rates
<p>Ensures revenue stability regardless of how much waste is reduced.</p> <p>Offers communities a transition from the traditional financing system to a proportional or variable rate option.</p> <p>Provides more flexibility to mix and match design components, such as bag and sticker programs.</p> <p>Does not "lock in" a community to a specific system and enables customers and officials to become familiar with unit-based pricing.</p> <p>Can be implemented quickly, inexpensively, and easily and can later be replaced or modified into a full subscription, bag or sticker system.</p> <p>Incentive for illegal dumping decreased.</p> <p>When fixed fee is in property taxes, residents may continue to deduct this amount from federal taxes.</p> <p>Generally easier to "sell" to public officials.</p>	<p>Could possibly lower incentive for reduction of waste.</p> <p>Much of the cost is hidden in taxes or flat fees, which do not show the residents the total cost of trash services.</p> <p>Customer understanding can be reduced with the necessity to pay two fees for garbage disposal.</p>	<p>Ashfield Becket Bernardston Bolton Boxford Brookfield Buckland Charlemont Cheshire Chester Clinton Cohasset Concord Deerfield Dighton Dunstable Gill Gloucester Goshen Hampden Hawley Holliston Hudson Huntington Lunenburg Manchester Mendon Merrimac Millis Milton</p> <p>Montague New Salem Norfolk North Brookfield Northampton Northborough Oak Bluffs Orange Pepperell Petersham Phillipston Plainville Provincetown Raynham Rehoboth Royalston Savoy Seekonk Shelburne Shutesbury Tisbury Topsfield Upton Wendell Westport Whately Wilbraham</p>	<p>Ayer Belchertown Berkley Brockton Chesterfield Colrain Dalton Foxborough Great Barrington Groton Hadley Hatfield Lakeville Leverett Medway Natick Needham New Ashford North Adams North Attleborough Plainfield Russell Scituate Southampton Spencer Sudbury Swansea Warwick Westhampton Williamstown Worcester Worthington</p>

Source: See Table 4.

Section 4 of the PAYT companion document contains more information about the different rate system options available and how to design a rate.

Develop an Implementation Schedule

Many tasks need to be performed during unit-based pricing design and implementation. While the details may vary from community to community based on program design and local conditions, certain tasks pertain to everyone. These include: gathering public support for the program (discussed in section VI), procuring containers, assisting groups with special needs, launching complementary programs, and establishing enforcement procedures.

Organizing the many steps involved in designing and implementing a unit-based pricing program into a clear schedule is essential. While the schedule should be viewed as flexible, establishing an overview of the entire process will help eliminate the possibility of any serious omissions and help ensure a more timely and smoother implementation process. (Section 5 of the PAYT companion document presents a detailed sample timeline as well as examples of implementation schedules from Needham and Merrimac.)

The dates presented in the timeline are based on the experiences of communities that have implemented unit-based pricing. Local conditions and needs will inevitably affect the exact timing of your program's development. Many factors can come into play: equipment needs, contractual changes, financing requirements, and political developments. While most steps can be completed fairly routinely in nine months, some communities need a longer phase-in period to gain greater support among residents and municipal officials and ensure the program's success.

Options for Phasing-in a Unit-Based Pricing Program

- **Provide Basic Service, One “Free” Bag, Sticker, Wheeled cart or Trash Barrel Per Week**

Communities can ease residents into unit-based pricing by providing one free bag or sticker per week. This can be used both during phase-in for the first year, or can be permanent throughout the program. The cost for the first container can come out of the flat fee or general tax levy. The DEP equipment grant program can assist by providing municipalities with a supply of stickers or bags for the first year of the unit-based pricing program. Municipalities can pass along the savings to residents by providing them with one “free” bag or sticker per week.⁹ After the first year of the program, the number of “free” stickers or bags may be decreased from 52 to 40, then from 40 to 30 the following year. By decreasing the amount of stickers provided each year, the program will continue to provide a signal to residents to reduce waste.¹⁰

In the Town of Topsfield residents receive one annual decal for free to place on a barrel. This decal is good for a full year and allows them one bag of waste per week with no sticker needed. The price of this decal is included in the property taxes paid by the resident. After

⁹ The disposal costs for the “free” container must still be paid for by the resident, either in the tax base or the flat fee.

¹⁰ If a community chooses to adopt this strategy, the impact on low-income households that generate more than one container per week must be addressed, either through “lifeline” rates or reduction in the tax or flat fee.

the first bag the resident must purchase stickers at \$1.50 each and place them on each additional bag of trash.

- **Switch to Flat Fee Pricing as a Possible First Step**

Communities that have stopped paying for waste management services from property taxes and instead charge residents flat user fees on an annual or semi-annual basis have an easier time selling the idea of unit pricing. Residents become aware of the costs of waste management services and of the fact that they may be subsidizing their neighbors if they are all paying the same but using the service to varying degrees. This strategy also allows residents to get accustomed to the idea of paying directly for waste management services. Seekonk used this strategy to implement its unit-based pricing program. (See Section 1 of the PAYT companion document for more information on the Seekonk program.)

Communities that charge flat user fees for waste management services are moving in the right direction in terms of making costs known to the users. Switching to flat fee pricing as an interim measure is preferable to financing waste management services through a "hidden" charge in the general tax levy. Communities that already finance trash services through flat fees should consider providing residents with the option of adopting a hybrid unit-based pricing program. They should demonstrate how unit-based pricing can reduce the flat user fees that residents all have to pay no matter how much waste they produce. At the very least, communities unable to switch to flat fees or unit-based pricing should consider placing solid waste costs as a separate line item on tax bills. This step will increase residents' awareness and pave the way for future acceptance of unit-based pricing.

Accounting System Options

Communities can track solid waste management costs in a variety of ways. Many communities manage these costs as a line item within the overall municipal budget. Increasingly, however, communities are revising the way in which solid waste management costs are tracked and budgeted through the use of full cost accounting such as revolving and enterprise funds. Also, Massachusetts General Law, Chapter 40: Section 8H, allows a recycling fund to be set up. This fund may include:

- Appropriation of funds for recycling programs
- Any income that comes in through the sale of recyclables

This recycling/MSW fund, can also be used to deposit funds received through the sale of bags, stickers or any other revenue coming in to the MSW/PAYT program.

- **Full Cost Accounting**

Full Cost Accounting (FCA) is an accounting practice that can help local governments identify and manage the actual costs of municipal solid waste services. Through FCA, decision-makers systematically identify, analyze, and report all the monetary costs of resources associated with municipal solid waste management, such as acquisition of equipment, landfill closure, and administrative costs.

FCA is different from cash flow accounting, a common government accounting practice which is based on cash outlays (when the cash flows), not on costs (when the resource is used). Cash flow accounting can give a distorted picture of the actual costs of municipal solid waste management because it does not include *all* costs, such as future costs that are directly related to current activities. Full cost accounting, on the other hand, accounts for all monetary costs at the time resources are used or committed.

FCA can help communities establish an equitable unit-based rate structure that will generate the revenues needed to cover the costs of providing solid waste services. This type of accounting helps a community ensure that enough revenue will be generated to cover the complete costs of the unit-based pricing program. With FCA, communities can more accurately set the per bag, sticker, wheeled cart or trash barrel rates, track expenses and revenues, and track the overall success of the program over time. The EPA has many publications regarding FCA, see Section 12 of the PAYT companion document for a list of various FCA publications.

- **Enterprise and Revolving Funds**

Another way for communities to better account for solid waste management costs is to set up an **enterprise or a revolving fund**. These are independent, self-sustaining funds established to account for program operations. These funds are usually established when a community wants to:

1. Demonstrate to the public the portion of the total costs of a service that are recovered through user charges, or
2. Allow the retained earnings generated by the operation to remain in the fund rather than revert to the general fund.

With an **enterprise fund**:

- Costs and revenues of the unit-based pricing program are treated as though the program is run as a private business
- Costs and revenues of the unit-based pricing program are accounted for under a separate budget.
- All activities must be approved annually.
- Any interest earned in an enterprise fund is kept for that fund
- This fund budget, however, needs to be approved yearly by town meeting. Massachusetts municipalities can establish enterprise funds by following the procedures set out in Chapter 44, Section 53 ½ F of the Massachusetts General Laws.

A **revolving** account is similar to an enterprise fund in that it is a separate budget from the general revenue.

- The major difference is that after the initial approval a revolving fund does not need the budget approved annually at town meeting.
- This difference gives revolving funds more flexibility compared with enterprise funds.
- Any interest earned in a revolving account returns to the general account.
- The procedures set out for revolving funds for Massachusetts municipalities can be found in Chapter 44, Section 53 ½ E of the Massachusetts General Laws.

While these types of accounting systems are not required of communities that want to adopt unit-based pricing programs, they can help municipal officials better manage their solid waste finances and provide an improved basis for rate setting. (See Section 12 of the PAYT companion document for information on how to order documents that describe full cost accounting and enterprise funds, including the EPA's *Full Cost Accounting for Municipal Solid Waste Management: A Handbook* as well as the EPA's *Rate Structure Design: Setting Rates for a Pay-As-You-Throw Program*.)



SECTION V: ISSUES TO RESOLVE

Effective unit-based pricing programs are not achieved without considering and resolving a number of issues. Although these issues often turn out to not be major problems, it is still important to address them. These issues include: the program's impact on large and/or low-income families, the potential for illegal dumping, increased administrative costs, coordination with multi-family dwellings and apartment buildings, the effect of mechanical trash compactors, and customer confusion or resistance to change. These issues are explained below, along with suggestions for addressing them.

Effects on Low-Income Households

Because unit-based fees for trash service represent a higher percentage of a low-income family's income, steps should be taken to minimize the impact on these households. Just as electric, gas, and water utilities provide special rates for low-income users, a solid waste unit-based pricing program may include "lifeline" rates. Lifeline rates could be discounted rates, such as reduced flat fees, free bags or stickers, or a combination. Many municipalities provide "Basic Service" to all residents, which is a certain number of free stickers or bags per year. This basic service is useful for all residents, but can help diminish the costs to low-income households. The cost of the free stickers is included in the flat fee charges that are separate from the sticker cost. The town of Seekonk can reduce or waive the flat fee portion of the hybrid system for residents who demonstrate hardship. Residents must still pay the per-bag fee of 60 cents for a 15-gallon bag and \$1.00 for a 30-gallon bag, so the incentive exists to save even more by cutting down on what they throw away.

Illegal Dumping

Many solid waste managers perceive that unit-based pricing will lead to illegal dumping. They fear that residents charged a fee for waste disposal will improperly discard their waste in commercial waste bins or public trash cans to avoid paying fees. Studies of communities in Massachusetts and around the nation with unit-based pricing programs indicate that increased illegal dumping is typically *not* a major problem and can be easily addressed. Composition analysis of illegally dumped materials shows that the largest components are commercial construction and demolition debris. The primary household component is bulky waste. Therefore, it is important to have a bulky goods program in place.¹¹



When a hybrid pricing system is in place, the incentive to illegally dispose of trash is practically eliminated. Since residents are paying a portion of the service from property taxes or flat fees, they are more inclined to use it and less inclined to discard trash illegally. And, potential violations can be averted through advanced preparation, such as establishing fines,

¹¹ Additional information on illegal dumping can be found in: Skumatz, Lisa A., Hans Van Dusen, and Jennie Carton, *Illegal Dumping: Incidence, Drivers, and Strategies*, Skumatz Economic Research Associates (SERA) Research Report 9431-1, Seattle, Washington, November 1994 as well as EPA *Illegal Dumping Prevention Guidebook*, EPA905-B-97-001 (March 1998)

hiring enforcement officials, and notifying commercial establishments to lock dumpsters. In fact, municipal officials in Taunton feel that illegal dumping has become less of a problem due to the city's public awareness campaign and the threat of fines.

According to the EPA, the major factors that contribute to illegal dumping are demographics, physical characteristics of local land area, lack of alternative disposal and lack of codes and ordinances. The problem of demographics can include low-income families that cannot afford to pay for disposal. When setting the rates for the unit-based program there may need to be money set-aside for subsidizing these low-income families. Problematic areas include open lots or unlit areas, which can cause problems regardless of how the program is financed. The unit-based pricing program can be combined with ordinances prohibiting illegal dumping, which can include a series of fines for non-compliance. The Commonwealth of Massachusetts released a guide to help write these codes titled, *A Guide for Using Non-Criminal Disposition for Bylaw Enforcement*. These codes combined with education and outreach can greatly reduce illegal dumping. EPA also publishes a guide on illegal dumping that can be of assistance to municipalities when trying to deal with this problem (See Section 12 of the PAYT companion document).

Administrative Costs

Unit-based pricing programs can create additional administrative costs for a municipality. For instance, the distribution of bags or stickers may require inventory control and new accounting mechanisms. Additional staff time may be needed to accomplish these tasks. Communities should consider administrative expenses when setting rates to ensure that any additional costs are recovered. Worcester's administrative costs increased substantially, but overall the program saved the municipality money (See Section 1 of the PAYT companion document). While it is common to incur additional up front costs, these costs are generally recovered in the long run through cost savings associated with increased recycling and reduced waste disposal. DEP grants can also help to cover or at least greatly reduce startup costs. These grants can be used for a variety of items including educational materials, stickers or bags, and the salaries of selected personnel required to coordinate the unit-based program implementation (See Section 3 of the PAYT companion document).

Mechanical Trash Compactors

Households that have trash compactors can unfairly benefit from volume-based unit pricing. Because trash compactors allow more waste to fit into a single bag, these households may be able to dispose of more trash without paying additional fees. Communities have minimized this problem by establishing strict weight limits on containers of refuse (See Section 9 of the PAYT companion document). Trash haulers can be enlisted to enforce these limits, although they generally don't require extensive enforcement.

Customer Confusion/Resistance to Change

This is the most important set of issues to deal with when implementing and operating a unit-based program. These issues must be dealt with both before approval of the program as well as once the program has been implemented. As an example, the Town of Norton started a

program, which was voted down shortly afterwards due to misinformation on the program. Some of the potential areas of customer confusion or resistance to change are:

- **Perception that the existing MSW program is free**

The majority of solid waste collection programs are simply funded out of the tax-base and therefore do not appear as a cost to the resident. Residents must be made aware that this does not mean that their waste is collected and disposed at no charge to them. Some municipalities have set up enterprise or revolving funds for solid waste management that segregate these funds from the general revenue. Williamstown was the first community in Massachusetts to do so and thus begin to address this perception. In 1987, they set up enterprise funds for their municipal solid waste program as well as other municipal programs. This helped them ensure that enough money was being raised to support these programs. It also helped with the implementation of their PAYT program in 1991. With an enterprise and revolving fund in place, costs are tracked much more carefully, surplus funds are much simpler to handle, and full cost accounting can be used. These funds are simple to set up and are discussed later in this guide.

- **Perception that fee is a “tax”**

At times, unit-based pricing programs are regarded as a new tax. To avoid this perception, communities should consider making the program *revenue-neutral*. With a revenue-neutral system, property taxes or flat fees are reduced by the amount that unit-based fees are expected to generate. Seekonk went revenue-neutral when designing their program. The amount of revenue generated from the PAYT program was reduced from the tax-base. As a result, residents do not view unit-based trash fees as taxes. In fact, many residents will find that they pay no more for trash services than they previously paid through property taxes or flat fees. For many residents, the program actually provides them with a way to reduce their expenses. Either way, residents assume control over their waste management bills and pay according to their waste disposal habits only.

A community may not be able to design a revenue-neutral rate structure because tax dollars previously earmarked for waste management may be needed for more pressing municipal needs. In this situation, the community can make the case that by implementing unit-based pricing it can hold the line on property taxes or provide additional services. For example, this is how Seekonk "sold" its two-tiered bag program to residents. Before unit-based pricing, financing for the \$500,000 solid waste program came from the general fund. After the program, the \$500,000 was redirected to the school department where it was badly needed. Residents understood and appreciated that the new trash fees enabled the redistribution of tax dollars within the levy limit imposed by Proposition 2-1/2. Similarly, Worcester reduced the solid waste budget as a result of the \$700,000 net savings with unit-based pricing and then allocated the savings to other important municipal projects.

- **Purpose/Benefits of the Program**

Residents may resist the program simply due to a lack of knowledge about why PAYT is needed or how PAYT benefits them. This may occur either when the community is to vote on the program, or after the program starts. In either case, residents must be informed on why

the program is being implemented or voted on. Every municipality has different reasons to implement PAYT. Some can be due to the closure of a town landfill, others to reduce disposal costs. Sometimes this program is implemented as a way to keep residents within the municipal program as opposed to them using private haulers. Seekonk experienced this problem with a large percentage of residents moving to private haulers. By implementing a unit-based program, they were able to create a program that would cost less for residents than the private haulers. Residents must also be informed of the various benefits of a PAYT program, including environmental benefits, cost reduction, and equity (See Section II).



SECTION VI: STEPS FOR BUILDING CONSENSUS FOR PAYT

Building consensus is the most important component of a successful unit-based pricing program. Key players from the municipal government and from the community at large must be identified and involved from the beginning of the planning process. Taking the time and committing the resources to build support within both the government and the community up front will reduce unnecessary obstacles to successful implementation later in the process.

Step 1: Establish an In-House Unit-Based Pricing Advisory Committee

To gather support for the proposed program, you should assemble an advisory committee comprised of key players in the community, including:

- The town administrator or city manager
- Representatives from the Mayor's office, City Council, or Selectman's office
- Public works and/or solid waste management staff
- Members of the finance/budget department/committee
- Members of the recycling committee
- Community activists and other residents.

It is critical to gain support among these individuals before the program is brought to a vote at town meeting or by the city council. Since the proposed unit-based pricing plan will need to go through multiple stages of review, the advisory committee should be formed and key players consulted at least nine months before an expected vote.

The advisory committee should designate working groups to perform the initial research and program analysis required to develop the program and gain support. Members of a solid waste advisory committee or recycling group, or municipal officials involved in solid waste issues, will likely take the lead in these working groups, researching such issues as cost savings with unit pricing, concerns about illegal dumping, and effects on low-income households.

Step 2: Sell the Program to Key Decision-Makers

Specific actions that the advisory committee and working groups might take to "sell" the program to key decision makers include:

- Discussion of EPA's three E's, Environment, Equity, and Economy;
- Preparing implementation plan and briefing documents to analyze costs and address potential concerns;
- Charting out the approval process; and
- Developing a number of program options from which to choose.

These steps are described below. Once support among key decision-makers has been established, steps should be taken to build community awareness and support for the unit-based pricing program.



◆ **Discussion of EPA's three E's, Environment, Equity and Economy¹²**

- Environmental sustainability
PAYT has shown decreases in waste through source reduction and increased recycling. This can help alleviate many environmental problems including global warming and increased extraction of natural resources (See Section 10 of the companion document for a factsheet about the relationship between PAYT and climate change).
- Economic sustainability
PAYT reduces costs for residents as well as the municipality. Overall waste disposal costs can be reduced because there will be less waste, which means less paid out in tipping fees.
- Equity
PAYT keeps costs in the open and enables residents to control their own disposal costs. They will not have to pay more because other residents dispose more.

◆ **Prepare Implementation Plan and Briefing Documents**

Next, prepare an implementation plan for municipal officials and other key stakeholders. This implementation plan can include a budget, a timeline, information on the type and cost of program and information on the number of households the program will serve (See Section 5 of the PAYT companion document for samples). This plan is critical to help guide the process for all parties involved. An implementation plan of this type is required when applying to the DEP for a Unit-Based Pricing Assistance Grant.

DEP also recommends creating a series of briefing documents. These briefing documents should include the cost per unit of trash managed, an overall cost analysis that includes any savings that may result, examples of communities similar to yours that have successful unit-based pricing programs, and key concerns of the community and how they will be addressed. For example, since illegal dumping is often perceived as a potential problem, information on proposed enforcement policies should be presented. The briefing documents also should address the effects the proposed program will likely have on a typical household, the elderly, and low-income families. By addressing these issues up-front, planners can show that the program has been well thought-out. (Section 8 of the PAYT companion document provides some examples of the types of documents that have been prepared for this purpose.)

◆ **Chart Out the Approval Process**

Because each municipality is different, it will be necessary to consult municipal by-laws or ordinances to determine how a unit-based pricing plan should be presented for approval. Municipalities may require that such proposals be approved solely by board of selectmen, board of health, or DPW commissioners or addressed at town meetings for changes in solid waste management budgets.

¹² This information was taken from EPA at www.epa.gov/payt/intro.htm

Once the approval process is understood, the key decision-makers can be identified and included in program planning. Later, when a proposed unit-based pricing plan has been finalized, decision-makers will be familiar with the concept and be able to make more educated decisions about whether unit-based pricing makes sense for your community.

◆ **Develop a Number of Program Options**

The plan initially presented to key officials should be flexible enough to invite comments and/or modifications. Providing options helps convey the message that their input/feedback is important in designing and implementing the plan. For example, instead of deciding that a sticker program best suits the needs of the community, planners could propose two options - stickers or bags - but recommend that one of them be adopted (See Section 9 of the PAYT companion document for examples).

◆ **Other Steps to Involve Key Players**

In addition to providing key players with implementation plans, there are a number of educational and promotional activities that can help further the understanding of the proposed unit-based pricing program. For example, locally relevant information can be used to show how unit-based pricing can help lower waste disposal costs and reach a higher rate of recycling. The task force should calculate the current and projected average waste generation levels of typical households and present the information at meetings. Details about the cost savings and cost control expected as a result of the plan should be stressed. And, if a municipality has an ordinance that mandates recycling or sets recycling goals, planners should show how unit-based pricing can make these goals more attainable.

Demonstrations and visits to communities with unit-based pricing programs can also help individuals understand the implications for your municipality. Field trips on trash pick-up days can help decision-makers visualize PAYT programs in practice. Other field trips to landfills and combustion facilities can help them understand what happens to trash and how the solid waste management budget is spent.

Step 3: Gather Public Input

Community awareness and support is a key to your ultimate success. Without the public "on board," unit-based pricing has little or no chance of becoming a reality. After all, citizens will make the program work by following the rules, and where town meeting approval is required residents determine whether PAYT will be passed in the first place. Therefore, citizen input is crucial in developing a successful program.

An effective public outreach campaign will create opportunities for an open dialogue with residents and key neighborhood and association representatives. These groups should be approached early in the process, soon after key public officials have approved the concept of PAYT, to ensure that their concerns are addressed in the final recommendations. For example, elderly residents may express interest in smaller-sized bags to maximize their cost savings. Consequently, program planners may decide to add a smaller bag, in addition to the "standard" 15-18 gallon or 30-33 gallon bags. Your community's Advisory Committee

should play a major role in this process. Specific strategies for gathering public input include the following:

- ◆ **Solicit Comments from the Public:** Before embarking on a public education campaign, municipal officials should solicit feedback from key residents and opinion leaders about the concept of solid waste unit pricing. There are numerous ways to introduce the idea and solicit public comments. For example, the proposed program can be introduced in solid waste or recycling newsletters or in "stuffers" that come with utility bills. Comments received will help identify misperceptions about unit-based pricing and reasons for opposition, and put program planners in touch with the pulse of the community.
- ◆ **Hold Public Hearings:** Public hearings can provide an additional avenue for residents to voice their concerns and raise new issues. These should be well publicized and held approximately six months before the anticipated program startup date.
- ◆ **Discuss the Program with Community Groups and at Community Events:** Individual briefings are suggested for key community leaders, such as those representing elderly and low-income groups and other such stakeholders. In addition, presentations should be given to civics groups such as the chamber of commerce, Rotary Club, women's club, and others active in the community. These briefings and meetings should be held early enough so that stakeholders have the opportunity to suggest modifications to the program. Support from these groups will help build the backing needed to make unit-based pricing a success.

Step 4: Educate the Public

The final step in the process of building local support for unit-based pricing is to educate the public about program specifics. Explaining the objectives and offering information on waste reduction and recycling are important elements of this effort. If residents believe the pricing structure is arbitrary and are unaware of ways to reduce their costs, the program is likely to fail. If your community already has a well-established recycling program, be prepared to inform residents about the need to further reduce waste and encourage them to use the unit-based pricing program in conjunction with recycling, composting, and source reduction. By getting the public to support your program and explaining how people can save money by discarding less garbage, you can influence long-term changes in behavior.

Many methods exist to disseminate program specifics to the public and create a dialogue with residents. Community mailings, public notices, and public meetings are good ways to "get the message out." Local newspaper articles, cable television, and radio programs also should be used to educate citizens about the PAYT program and how it will benefit them. Several outreach strategies are discussed in more detail below.

- ◆ **Obtain media coverage:** Submit articles to the local papers explaining the proposed unit-based pricing program and notifying residents of public hearings. Explain the program to newspaper editors and encourage them to write positive editorials.

Develop media spots for local radio and cable television and arrange for coverage of the public hearings on local cable access.

- ◆ **Establish a telephone hotline:** A telephone hotline with detailed program information can provide residents with immediate answers to their questions. Larger communities with multilingual populations can produce the hotline in a number of different languages to ensure access.
- ◆ **Develop posters and flyers for distribution in public places throughout the community:** Flyers and posters can be distributed in stores, libraries, schools, and even door-to-door. Support from retail stores will be especially valuable if the program plans to use bags, wheeled carts, trash barrels or stickers that will be distributed through those outlets.
- ◆ **Develop a Brochure to be sent to all households in the community:** These brochures should describe the new program, its benefits and what it means to citizens. Communities that are awarded a PAYT start-up grant from DEP will receive a customized educational mailer for residents.

Some communities opt to conduct public education campaigns using existing in-house staff or volunteers. Others hire one or more qualified individuals or pay public relations firms to perform public outreach. This decision is typically based on the size of the community, the scope of the program, and the resources available. For example, Worcester opted for hiring a public relations firm and worked out a deal with the firm where for every dollar spent, Worcester received two dollars in service. Through this agreement, Worcester spent \$50,000 on a high-profile public outreach campaign. On the other hand, Taunton assembled a core group of volunteers to take the lead.

Public education is an ongoing process and will continue well into the maintenance phase of the unit-based pricing program. A continuous flow of information will maintain public interest and address important issues and changes that arise as the program develops. It will also be important to continue to raise awareness about new ways to prevent or reduce wastes.

Included in DEP's startup grants are education brochures to be mailed to residents. These brochures include necessary information about the new program (see Section 9 of the PAYT companion document for examples of grant funded education brochures).