



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



VOLUME I:

GUAM ZERO WASTE PLAN



Please see the next page.

REACHING FOR ZERO: A BLUEPRINT FOR ZERO WASTE IN GUAM



JUNE 2013

This study was prepared under contract with the Government of Guam, with financial support from the Office of Economic Adjustment, Department of Defense. The content reflects the views of the Government of Guam and does not necessarily reflect the views of the Office of Economic Adjustment.

This document was prepared as an electronic document to support Zero Waste. A limited number of paper copies were printed on 100% Recycled Post-Consumer Waste – Process Chlorine Free



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



EXECUTIVE SUMMARY

EXECUTIVE
SUMMARY

GUAM ZERO WASTE PLAN

Please see the next page.

EXECUTIVE SUMMARY

The Chinese philosopher Lao-tsu said “A journey of a thousand miles begins with a single step.” This “Blueprint for Zero Waste” provides a critical first step as well as a path to help the Government of Guam (GovGuam) and people of Guam realize a vision of Zero Waste to preserve the environment for Guam’s children and the future.

Visioning

The most important part of any long journey is having a vision for the future. On February 7, 2012 representatives of the Office of the Governor of Guam and key public and private-sector solid waste stakeholders met at the Ricardo J. Bordallo Governor’s Complex in Adelup for a Zero Waste Visioning Session. During the Visioning Session stakeholder input was sought regarding solid waste diversion opportunities and Zero Waste options with respect to the development of an overall Zero Waste Plan for Guam.



Key Strategies

During the Visioning Session, Stakeholders emphasized the importance of implementing the following key strategies.



- **Develop targets:** Work with the Guam Legislature, GovGuam agencies and **Guam** Council of Mayors to put a framework in place to achieve Zero Waste.
- **Walk the talk:** One of the most important keys to achieving the goal of Zero Waste is leadership. Legislation and policies that favor Zero Waste should be adopted.
- **Use incentives in the right place:** A continuous and constantly adapting flow of initiatives, solutions and ideas are going to be required to achieve the goal of Zero Waste.
- **Develop infrastructure for recycling and resource recovery:** Although some initial help will be needed for

GovGuam to get a Zero Waste Program operational, If the incentives are in the right place the private-sector and markets will assist in building and operating the infrastructure.

- **Implement a marketing campaign:** Publicize the Zero Waste Program to educate, engage and inspire the community.
- **Develop an effective enforcement process:** Fund the necessary enforcement personnel, educate volunteers and follow through with fines and penalties.

Zero Waste Implementation Strategy

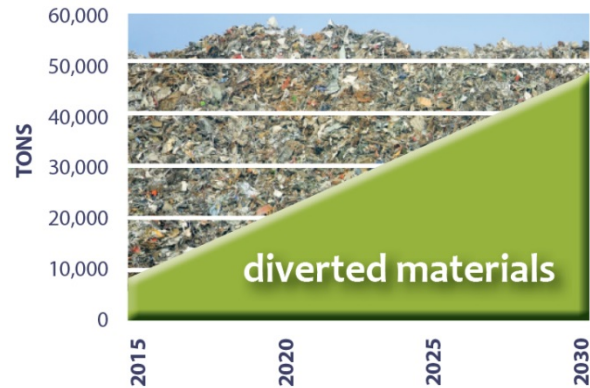
Fifteen Zero Waste initiatives selected from an initial list of a wide variety of upstream, midstream, and downstream source diversion options suggested by stakeholders on Guam are evaluated in this Zero Waste Plan. From a practical perspective, the legislation, policies, programs and infrastructure needed to implement the fifteen initiatives described in this document cannot be implemented all at once. Therefore, the use of a phased approach over a 20-year planning period is recommended to implement an island-wide Zero Waste Program.



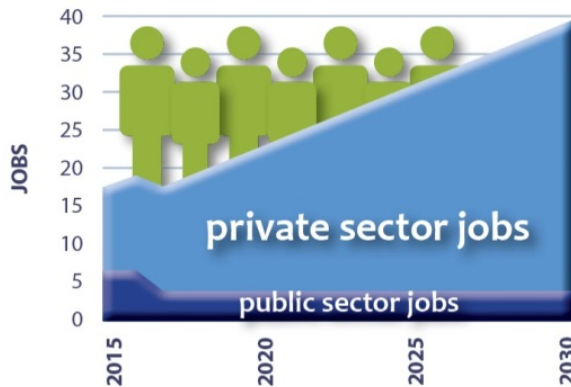
The recommended phased approach focuses on an initial phase (Phase I: Present through 2015) for implementing those initiatives that will allow GovGuam and industry stakeholders to build a strong Zero Waste foundation, followed by subsequent phases (Phase II: 2016 through 2020; Phase III: 2021 through 2025; and Long-Term: 2025 and Beyond) that provide additional time to foster public/private partnerships, raise funds, and allocate staffing in support of additional initiatives. The development of a well-integrated Zero Waste system on Guam will be an evolving process, and there will be political, technical, marketing, financial, and educational issues to address at each step.

Landfill Diversion Potential

Diversion of landfill waste, which is an over-arching goal of Guam's Zero Waste Plan, will be achieved with the implementation of the initiatives detailed in this plan. Typically, diversion successes increase as new or expanded programs mature due to increased operational efficiencies, greater public participation/acceptance, and established markets. A conservative estimate of the materials diverted from landfilling ranges from approximately 8,700 tons in 2015 (a 21% diversion rate) to 48,400 tons in 2030 (a 37% diversion rate). In the United States, the national landfill diversion rate is 34%. Many communities have achieved over 50% landfill diversion and San Francisco, a leading Zero Waste community, has achieved 80% landfill diversion. Achievement of similar percentages on Guam are likely to be tempered by low overall quantities (which increases unit costs and limits market leverage), limited local markets and high over-seas transportation costs.



Job Creation Potential and Small Business Opportunities



Zero Waste is an economic development tool as well as an environmental tool. Reuse, recycling, composting, and source reduction offer direct and substantial development opportunities. Both public and private sector jobs, many of which are small business opportunities, will be created with the implementation of a Zero Waste Program for Guam. Up to 4 full-time equivalent (FTE) GovGuam (i.e., public sector) jobs will be created for the duration of the Zero Waste planning period; as many as 7 FTEs may be needed during the first two years of implementing the Zero Waste Program. In the private sector, as many as 7 new FTEs will

be created in 2015 with up to 37 FTEs by 2030 for materials processing on Guam. Additional off-island jobs will also be created for secondary processing and remanufacturing.

Economic Impacts

Programmatic-level economic impacts from the implementation of a Zero Waste Program on Guam using the initiatives evaluated in this plan were developed and are shown in Table ES-1. Costs estimated included potential expenses for program development and implementation, potential revenues generated from materials resale, and avoided landfill disposal costs. While the avoidance of landfill disposal costs does not represent a tangible revenue stream, these savings go directly to the bottom line of any solid waste management program, and are one of the primary long-term benefits of implementing a Zero Waste Program. The economic impacts shown in Table ES-1 are feasibility-level estimates for planning purposes only and will vary depending on implementation timing, sequencing of initiatives, and actual economic conditions existing in the marketplace at the time of implementation.

TABLE ES-1. PROGRAMMATIC-LEVEL ECONOMIC IMPACTS (ALL COSTS SHOW IN 2013 \$) ^{NOTE 1}

	Baseline	2015	2020	2025	2030
PHASE I (Present through 2015)					
Estimated Potential Revenues	\$-0-	\$134,600	\$179,800	\$273,700	\$226,700
Estimated Avoided Landfill Costs	\$-0-	\$1,204,000	\$2,512,200	\$4,027,400	\$4,411,900
Estimated Program Costs	\$1,476,700	\$725,800	\$739,200	\$746,700	\$746,700
Net Estimated Revenue (Cost)	↓\$1,146,700	↑\$612,800	↑\$1,593,200	↑\$3,554,400	↑\$3,891,900
PHASE II (2016 through 2020)					
Estimated Potential Revenues	\$-0-	\$-0-	\$106,700	\$263,700	\$347,100
Estimated Avoided Landfill Costs	\$-0-	\$-0-	\$155,600	\$384,900	\$412,900
Estimated Program Costs	\$-0-	\$-0-	\$3,383,500	\$677,400	\$1,010,600
Net Estimated Revenue (Cost)	\$-0-	\$-0-	↓\$3,123,100	↓\$28,800	↓\$250,600
PHASE III (2021 through 2025)					
Estimated Potential Revenues	\$-0-	\$-0-	\$-0-	\$65,000	\$187,300
Estimated Avoided Landfill Costs	\$-0-	\$-0-	\$-0-	\$308,500	\$602,700
Estimated Program Costs	\$-0-	\$-0-	\$-0-	\$151,100	\$87,400
Net Estimated Revenue (Cost)	\$-0-	\$-0-	\$-0-	↑\$92,400	↑\$328,000

¹ Feasibility-level costs for planning purposes only. Summary revenues/costs of all Zero Waste initiatives by Phase and Milestone Year. Detailed information regarding suggested phasing of initiatives presented in Volume I, Section 5. Detailed cost estimates for each Zero Waste Initiative provided in Volume II.

The information presented in Table ES-1 clearly demonstrates that when both potential estimated revenues (i.e., material sales) and avoided landfill costs are considered, the aggregated initiatives expected to be implemented by GovGuam in Phase I and III are revenue positive throughout the planning period, with the exception of initially capitalizing on large initiative. The Phase II initiatives, which will most likely be developed by the private and non-profit sectors will need to off-set capital and annual cost expenditures with facility tip fees, grant funding and other resources.



Funding Strategy

The long-term savings and economic benefits from implementing a Zero Waste program will eventually dwarf the initial investment. However, while the long-term savings of Zero Waste programs may be significant, many of the program initiatives require several years of investment before savings can be achieved.

The use of a combination of internal (i.e., GovGuam) and external (i.e., federal and private foundation) funding sources to build a sustainable financial strategy is recommended. Initially, from a practical perspective, a combination of a landfill tipping fee surcharge and a Gross Receipts Tax (GRT) Rate surcharge is a potentially reasonable approach to funding a Zero Waste Program for Guam. Over time, the use of a more diversified funding strategy, which potentially includes the addition of revenues generated by the various Zero Waste initiatives implemented and grant awards, should be phased-in.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ES-1
1. INTRODUCTION	1
About Zero Waste.....	1
Guam’s Zero Waste Story So Far	1
What the Rest of the World is Doing with Zero Waste	2
Organization of this Plan	2
2. VISION FOR THE FUTURE.....	3
Stakeholders	3
Strategic Vision.....	3
From Waste Management to Waste Elimination.....	4
Key Strategies	4
3. SUMMARY OF INITIATIVES.....	5
4. EXISTING CONDITIONS AND FUTURE PROJECTIONS.....	8
Overview of Solid Waste Management Programs and Infrastructure	8
Projected Population Growth.....	9
Solid Waste Quantity Estimates	9
Secondary Material Market Conditions	11
On-Island Markets.....	11
Off-Island Markets	11
Opportunities and Constraints	12
5. THE BLUEPRINT.....	13
Recommended Implementation Strategy	13
Phase I	14
Phase II	17
Phase III	18
Long Term.....	19
Suggested Implementation Timeline	20
Benefit 1. Landfill Waste Diversion Potential.....	20
Benefit 2. Job Creation Potential and Small Business Opportunities.....	23
Benefit 3. Revenue Generation from Material Recovery Sales.....	25

Benefit 4. Avoided Landfill Disposal Costs (Savings)	27
Benefit 5. Human Health and Environmental Impacts.....	29
Impact 1. Estimated Economic Costs.....	29
Impact 2. New Legislation, Regulations & Policies Needed	32
Impact 3. Impact of Increased Diversion on Annual Tip Fee Revenues	33
Funding Strategy.....	35
6. EDUCATION, OUTREACH AND PUBLIC AWARENESS.....	37
7. MEASURING SUCCESS AND NEXT STEPS.....	40
Measuring Success	40
Next Steps.....	41
8. REFERENCES	42
ACRONYMS.....	43

TABLES

ES-1	PROGRAMMATIC-LEVEL ECONOMIC IMPACTS	ES-4
3.1	SUMMARY OF FIFTEEN INITIATIVES EVALUATED IN THE PLAN.....	5
4.1	PROJECTED SOLID WASTE GENERATION (TONS/YEAR).....	10
5.1	ESTIMATED WASTE DIVERSION POTENTIAL FOR ZERO WASTE INITIATIVE IMPLEMENTATION	21
5.2	ESTIMATED REVENUE GENERATION FROM MATERIAL RECOVERY SALES	26
5.3	ESTIMATED AVOIDED LANDFILL DISPOSAL COSTS (SAVINGS)	28
5.4	ESTIMATED COSTS FOR ZERO WASTE INITIATIVE IMPLEMENTATION	30
5.5	SUMMARY OF GSWA'S SPRING 2012 RATE SETTING MODEL RESULTS	34
5.6	POTENTIAL ZERO WASTE PROGRAM FUNDING FROM LANDFILL TIPPING FEE SURCHARGE.....	36
5.7	POTENTIAL ZERO WASTE PROGRAM FUNDING FROM GRT RATE INCREASE.....	37

This study was prepared under contract with the Government of Guam, with financial support from the Office of Economic Adjustment, Department of Defense. The content reflects the views of the Government of Guam and does not necessarily reflect the views of the Office of Economic Adjustment.



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



1. INTRODUCTION



GUAM ZERO WASTE PLAN

Please see the next page.

1. INTRODUCTION

As with all successful endeavors, once you know where you are going, the rest is relatively easy. Zero waste is no longer a fringe concept that only a few radical activists are promoting – it's a permanent and key part of the international sustainability movement. The purpose of this "Blueprint for Zero Waste" is to provide a recommended path to help the government and people of Guam realize a vision of Zero Waste to preserve the environment for Guam's children and the future.

About Zero Waste

Zero Waste is a goal – like the manufacturing goal of Zero Defects and the safety goal of Zero Accidents. The aim of Zero Waste is to reduce waste generated and materials discarded by effectively managing resources before they become waste. Many communities across the world have established a Zero Waste path that starts



out modestly and builds as resources, awareness and commitment grow. Guam can do the same. It's time to move solid waste management practices on Guam in a different direction. As Governor Calvo and Lieutenant Governor Tenorio noted in Blueprint 2020 "...if we limit ourselves to what we've always known, then we tie the

next generation to the problems we've been facing for years." Fortunately, Zero Waste isn't something that we need to invent from scratch. One of the longest-running, most successful Zero Waste models of all is Nature, in which the by-product of one system is feedstock for another system and nothing is wasted.

Zero Waste is a holistic approach to addressing the problem of unsustainable resource flows. Zero Waste encompasses waste eliminated at the source through product design and producer responsibility, and waste reduction strategies further down the supply chain such as recycling, reuse and composting. Communities and governments that implement Zero Waste Programs are striving to switch from long-term waste management through disposal or incineration to value-added resource recovery systems that will help build sustainable local economies.

Guam's Zero Waste Story So Far

In 2011, the Government of Guam (GovGuam) began a planning process to identify new policies, programs, and facilities needed to implement a Zero Waste Program. This process was initiated by both necessity and desire. The necessity is due to a solid waste management system in crisis with limited landfill space, high disposal costs, and an impending significant population increase due to the United States (U.S.) Department of Defense (DOD) plans to build-up the military's presence on the island. The desire comes from a deeply-rooted regard that the people of Guahan have for nature and planet earth, and a determination to preserve the environment for their children and the future.

Recognizing that no single initiative or strategy can be put into place to achieve Zero Waste, GovGuam decided to initiate the development of a “Master Plan” to chart a course toward waste minimization and environmental sustainability for the island. With that decision, the development of a Zero Waste Plan with multiple strategies and initiatives aimed at developing a Zero Waste Program for Guam began in earnest.



What the Rest of the World is Doing with Zero Waste

Zero waste has spread around the globe to all levels of society – from nongovernmental organizations (NGOs) and recycling coalitions to municipal, state, regional and national governments and to major international businesses. Zero waste policies and programs have been adopted by governments from Africa and Australia to Europe and the United States. Major international businesses that have adopted and achieved Zero Waste targets include Toyota, DuPont Inc., Honda Motor Corporation, Hewlett-Packard, Kimberley Clark and Xerox Corporation.

Organization of this Plan

This Blueprint for Zero Waste is organized into two volumes and the following primary sections:

Volume I

- Section 1 presents the purpose of the Zero Waste Plan (Plan or Blueprint) and describes the document organization.
- Section 2 provides an overview of the Visioning process and results.
- Section 3 provides a summary of the Zero Waste Initiatives evaluated in detail during the development of the Plan.
- Section 4 summarizes existing conditions relevant to developing and implementing a Zero Waste Program on Guam.
- Section 5 presents a “blueprint” of key steps recommended to create a successful Zero Waste Program on Guam.
- Section 6 summarizes marketing and communication strategies that can be implemented to get the word out about Guam’s Blueprint for Zero Waste.
- Section 7 presents a number of important ancillary activities that should be considered to improve the efficiency and success of Guam’s Zero Waste Program.
- Tables and figures supplement information presented in text and are located throughout the document.

Volume II

- Volume II contains technical memoranda and white papers referenced in Volume I.



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



2. VISION FOR THE FUTURE



GUAM ZERO WASTE PLAN

2. VISION FOR THE
FUTURE

Please see the next page.

2. VISION FOR THE FUTURE

On February 7, 2012 representatives of the Office of the Governor of Guam and key public and private-sector solid waste stakeholders met at the Ricardo J. Bordallo Governor's Complex in Adelup for a Zero Waste Visioning Session. The purpose of the Visioning Session was to seek stakeholder input on solid waste diversion opportunities and Zero Waste options with respect to the development of an overall Zero Waste Plan for Guam.

Stakeholders

In January 2012, an invitation was issued by the Governor's Office to key public and private sector solid waste stakeholders on Guam to participate in a Visioning Session. Over 90% of the participants invited attended the session. Attendees included representatives of the:

- Federal and Territorial Government: Guam Legislature, Governor's Office/Guam Military Buildup Office, Guam Environmental Protection Agency (GEPA), Guam Solid Waste Authority (GSWA), Mayors' Council of Guam (MCOG), Guam Economic Development Authority, Guam Department of Public Works (GDPW), U.S. Environmental Protection Agency, Region 9 (USEPA), DOD's Office of Economic Adjustment (OEA), U.S. Navy and U.S. Air Force;
- Universities and Schools: University of Guam and Guam Community College;
- Community Organizations and Nonprofits: Recycling Association of Guam, Guam Chamber of Commerce, Guam Contractors Association and i*Recycle; and
- Secondary Materials Handlers and Waste Disposal Facilities.



**Zero Waste Visioning Session
Guiding Principles**

- 1** We believe that **resource management** (reuse, recycling and organics diversion) should both replace Guam's focus on waste management and become an inherent part of the island's zero waste culture.
- 2** We believe that **we are stewards of the environment and waterways** both now and in the future, and that moving toward zero waste is critical to preserving that environment for our children.
- 3** We believe that effective and **sustainable expansion of resource recovery practices** are needed to protect public health and restore the natural beauty of our island, and that zero waste practices will bring sustainability to our island.
- 4** We believe that our ability to manage waste as a resource will require **respectful collaboration with partners of many kinds** – public and private, lay and technical, for-profit and non-profit, individuals and groups – including the existing waste management sector.
- 5** We believe **community education and participation is indispensable** for the success of any zero waste plan and that **it is our responsibility to communicate the importance of resource conservation and the reduction of local pollution to the public, and to encourage them to share with us the stewardship role.**

The Stakeholders were well informed about the status and availability of solid waste diversion options that currently exist on Guam. An overwhelming majority favored source reduction, recycling, and composting and expressed a desire for increased development of these programs based on the positive environmental and economic benefits.

Strategic Vision

A strategic vision with long term goals and objectives was developed for the Zero Waste Plan by representatives from the Governor's Office, GEPA and USEPA. This strategic vision was translated into guiding principles utilized by Stakeholders to facilitate and influence the discussions which occurred throughout the Visioning Session.

Throughout the Visioning Session, the Stakeholders engaged in Interactive “brainstorming” sessions to discuss new and/or expanded solid waste diversion opportunities and Zero Waste options that could potentially be implemented on Guam.

From Waste Management to Waste Elimination

The focus of the Visioning Session was to come up with viable options that could be implemented to reduce the volume of solid waste being disposed of and create a sustainable Zero Waste Program on Guam through:

- Upstream Source Reduction Options;
- Midstream Reuse Options; and
- Downstream Recycling and Organics Diversion Options.

A complete list of the upstream, midstream and downstream options that were identified during the Visioning Session by Stakeholders is provided in Volume II, Technical Memorandum 1. These options were subsequently screened by representatives of the Governor's Office, GEPA and USEPA to develop a focused list of fifteen Zero Waste initiatives to be evaluated in a Zero Waste Plan. The list of initiatives selected for evaluation is summarized in Section 3.0.



Key Strategies

The most important part of any long journey is having a vision for the future. During the Visioning Session, Stakeholders emphasized the importance of implementing the following key strategies.

- **Develop targets:** Work with the Guam Legislature, GovGuam agencies and Guam Council of Mayors to put a framework in place to achieve Zero Waste.
- **Walk the talk:** One of the most important keys to achieving the goal of Zero Waste is leadership. Legislation and policies that favor Zero Waste should be adopted.
- **Use incentives in the right place:** A continuous and constantly adapting flow of initiatives, solutions and ideas are going to be required to achieve the goal of Zero Waste.
- **Develop infrastructure for recycling and resource recovery:** Although some initial help will be needed for GovGuam to get a Zero Waste Program operational, If the incentives are in the right place the private-sector and markets will assist in building and operating the infrastructure.
- **Implement a marketing campaign:** Publicize the Zero Waste Program to educate, engage and inspire the community.
- **Develop an effective enforcement process:** Fund the necessary enforcement personnel, educate volunteers and follow through with fines and penalties.
- **Plan for success:** Involve the community, build broad public and political support, employ the right people to turn the Plan into action, and celebrate your success!



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



3. SUMMARY OF INITIATIVES



GUAM ZERO WASTE PLAN

Please see the next page.

3. SUMMARY OF INITIATIVES

As previously discussed in Section 2, a complete list of the upstream, midstream and downstream Zero Waste options originally identified during the Visioning Session by Stakeholders is provided in Volume II, Technical Memoranda 1. The suggestions that came out of the Visioning Session were subsequently screened by representatives of the Governor's Office, GEPA and USEPA to develop a focused list of fifteen zero waste initiatives that were subjected to a detailed analysis and evaluation during the development of this Plan. Table 3-1 presents a summary of the fifteen initiatives evaluated in the detailed analysis.

TABLE 3-1. SUMMARY OF FIFTEEN INITIATIVES EVALUATED IN THE PLAN

Initiative	Summary Description	Volume II
UPSTREAM		
Green/Environmentally Preferable Purchasing (EPP) 	Implement a Green/Environmentally-Preferable Purchasing Program for GovGuam agencies that initially focuses on the acquisition of environmentally-preferable office paper and electronic office equipment, and expands later to include additional materials. Pilot projects and a green meeting policy are also recommended.	White Paper A
Extended Producer Responsibility (EPR) 	Develop an effective EPR Program on Guam that focuses initially on electronics and packaging waste, and expands later to include additional items.	White Paper B
Pay-As-You-Throw (PAYT) 	Implement a PAYT trash pricing structure and collection system for bundled trash and recycling curbside collection service to Guam's single-family residents, and expands later to multi-family homes.	White Paper C
Plastic Bag Disposal Ban 	Implement a disposal ban that restricts single-use, disposable plastic bags by retail and wholesale businesses.	White Paper D
MIDSTREAM		
Used Building Material Facility 	Develop a UBM facility to help divert household items and used building materials generated from construction and demolition projects on Guam.	White Paper E
"3R" Requirements for Public Buildings 	Establish "reduce-reuse-recycle" requirements for the demolition, renovation and/or operation of public buildings on Guam.	White Paper F
Greening Roadway Pavement Systems 	Implement "Green" roadway pavement systems requirements on Guam by encouraging the modification of highway specifications to prioritize use of recycled materials (e.g., tires, glass, mulch and compost) in highway construction and erosion control activities.	White Paper G

TABLE 3-1. SUMMARY OF FIFTEEN INITIATIVES EVALUATED IN THE PLAN (CONTINUED)

Initiative	Summary Description	Volume II
DOWNSTREAM		
Illegal Dumping & Litter Control Enforcement 	Expand existing regulations, regulatory programs and volunteer programs to enforce/add to litter control and illegal dumping regulations.	White Paper H
Composting/Organics Processing Facility 	Establish a composting/organics processing facility (i.e., a new commercial composting operation) that accepts yard waste and soiled cardboard.	White Paper I
Construction & Demolition Debris Processing Facility 	Develop a small C&D debris processing/transfer facility equipped with mobile processing capacity for clean wood, aggregate and metals that can either be deployed to project sites or used at a stationary processing/transfer site to increase on-island capacity for processing source-separated C&D materials on a batch basis.	White Paper J
Construction & Demolition (C&D) Diversion Policy 	Create a mandatory C&D debris diversion policy that establishes minimum standards for the diversion of materials in the waste stream that have economically-sustainable markets, and contains enforcement provisions if the standards are not met.	White Paper K
GLOBAL		
Zero Waste Association of Guam 	Create a professional association of public, non-profit, and private sector stakeholders by building on existing organizations whose mission is to promote and support waste diversion infrastructure, programs, and policies in pursuit of zero waste goals on Guam.	White Paper L
Zero Waste Grant Program 	Create a Zero Waste Grant Program to provide financial resources to public, private and non-profit organizations for research, development and/or operation of new waste diversion pilot projects, programs or infrastructure.	White Paper M
Education & Outreach Program 	Initiate an island-wide Zero Waste Education and Outreach Program to explain, promote, and incentivize participation in Guam's Zero Waste Program.	White Paper N
Evaluation of Funding Sources 	Evaluate sustainable funding sources that can be used to cover the net costs associated with implementing a Zero Waste Program on Guam.	White Paper O

The key to economic growth through zero waste is through the recovery of discarded materials and by creating value to them through the development of enterprises and markets that view those materials as a valuable commodity. Source reduction, reuse, repair, recycling, and organics diversion offer direct and substantial opportunities for communities.

White papers which detail the results of the analysis conducted on each zero waste initiative are located in Volume II. It should be noted that these papers focused on each independent initiative without considering overlap with other potential zero waste initiatives. Assessment of overlapping initiatives is considered in Section 5 where a phased and integrated approach to implementing the initiatives is presented. As a result, the ultimate achievement of economic and environmental benefits and impacts may be staggered at different intervals than presented in the White Papers.

Please see the next page.



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



4. EXISTING CONDITIONS AND FUTURE PROJECTIONS



GUAM ZERO WASTE PLAN

4. EXISTING
CONDITIONS AND
FUTURE PROJECTIONS

Please see the next page.

4. EXISTING CONDITIONS AND FUTURE PROJECTIONS

Guam, a U.S. territory nearly 6,000 miles away from the U.S. mainland west coast and almost 3,700 miles away from the shores of Hawaii, is near Asia, which is currently one of the most populous and dynamic regions in the world. It is this proximity to major Asian countries of economic and political importance that provides Guam with two major economic drivers: military and tourism (Guam Visitors Bureau, 2013).

This section describes existing conditions that are relevant to developing and implementing a Zero Waste Program on Guam over the next 20 years. Past and current development has taken a toll on Guam's delicate environmental balance, and there is concern about impacts of future growth. Existing and future projected conditions described include a summary profile of Guam's existing solid waste management infrastructure; waste disposal quantity estimates; future solid waste generation projections, diversion potential and recovered material market conditions.

Overview of Solid Waste Management Programs and Infrastructure

The disposal of municipal solid waste (MSW) presents challenges for most communities, and is an especially difficult challenge on Guam. The majority of nonhazardous solid waste on Guam is currently disposed of in the Layon Landfill, which is a Subtitle D landfill permitted under the Resource Conservation and Recovery Act (RCRA). Construction and demolition (C&D) debris, cardboard, green wastes (i.e., biodegradable yard waste such as tree branches and vegetation), tires, electronic wastes (e-wastes), appliances and other materials are banned from disposal at the Layon Landfill. C&D debris and green wastes, when disposed of legally, can be taken to one of two GEPA-permitted hardfills (e.g., Primos Northern and Eddie Cruz) that were open to the general public and operating on the island when the Guam Zero Waste Plan was developed. The military also currently operates hardfills on Guam for their exclusive use.

Recycling is not mandated for commercial entities or residents on Guam. When it occurs, the recycling of cardboard, paper, metal cans, plastics, tires, appliances, e-waste and other scrap is accomplished by various secondary material handlers in private industry. There are multiple, decentralized recycling programs on Guam that supported the 2011 municipal solid waste diversion rate of 17.85%. These range from private recyclers (e.g., Pyramid and PayLess Supermarkets) to public/private partnerships and non-profit programs (e.g., i*Recycle and the Habitat for Humanity of Guam). These programs include direct source reduction, reuse, recycling and wood mulching. Other programs, such as those offered by the Recycling Association for Guam (RAG) and the University of Guam (UOG) Center for Island Sustainability provide education and outreach that raises waste diversion awareness for specific audiences.

The GSWA, a public agency autonomous from the Government of Guam, provides trash collection for single-family residential customers, maintains three convenience stations where residents can drop off trash for disposal and cardboard and glass for recycling; collects bulky items and white goods (i.e., discarded major appliances) from customers; and manages the contracts for the operations of a commercial hauler transfer station and the Layon Landfill (GSWA, 2013). Private hauling companies are contracted with to haul trash from commercial, institutional and multi-family homes. Commercial tipping fees at the Layon Landfill are currently \$174.57/ton. Residential collection fees are \$30.38/month for per single-family address. Residential customers

may also take household waste to one of three transfer stations on the island and pay \$7.50 for disposal of up to 3 cubic yards of waste or \$15.00 for disposal of from 3 to 6 cubic yards of waste.

Although not currently a solid waste management disposal option on Guam, an application to build and operate a Waste to Energy facility is reportedly under review by GEPA. Waste to Energy facilities are operated in many locations worldwide, are particularly attractive in island settings, and may be a viable disposal option on Guam in the future.

Projected Population Growth

In 2006, the DOD announced a military project, referred to on Guam as the "Buildup." The goals of this project are two-fold: one is to boost military capability in Asia and focus U.S. diplomatic and military attention on the region and the other is to shift thousands of U.S. Marines from the Japanese island of Okinawa. With the imminent relocation of thousands of DOD military and civilian personnel to the island from Japan and the limited amount of space available for disposal of solid wastes on land, the development and implementation of a Zero Waste Program on Guam has become even more critical.

According to the 2010 U.S. Census, Guam had a population of 159,358, representing a relatively small increase of 2.9 percent from the population of 154,805 reported in the 2000 Census (U.S. Census Bureau, 2012). For the purposes of this Zero Waste Plan, population growth estimates were developed for the baseline year 2012 and milestone planning years 2015, 2020, 2025 and 2030 using the following information:

- An induced population growth due to the relocation of 5,000 U.S. Marines from Okinawa to Guam;
- A predicted stable growth rate of 0.29% annually plus the Military Buildup Induced population increase years 2014 through 2024; and
- A stabilized growth rate of 0.29% annually using the projected 2024 population base for years 2025 through 2030.

Detailed information regarding the information used and development of the projected population growth is included in Volume II, Technical Memorandum 2.

Solid Waste Quantity Estimates

The tracking of disposal volumes began in earnest on Guam only recently. In 2012, Guam disposed of approximately 90,000 tons of solid waste at the Layon Landfill. Approximately 70% of that waste disposed of at the Layon Landfill came from non-residential sources, and the remaining 30% was from residential sources (Anderson, 2013). Measurement reporting of the volume of construction & demolition waste and green waste hauled to hardfills available to the public on Guam is less well-defined.

For the purposes of this Zero Waste Plan, in August 2012 solid waste quantity estimates were developed for the baseline year 2012 and milestone planning years 2015, 2020, 2025 and 2030 based on national and military waste generation and composition data, as well as population projections.

Table 4.1 summarizes the range of waste generation estimates for municipal solid waste (MSW) and non-MSW during the baseline and milestone years.

TABLE 4-1. PROJECTED SOLID WASTE GENERATION (TONS/YEAR)

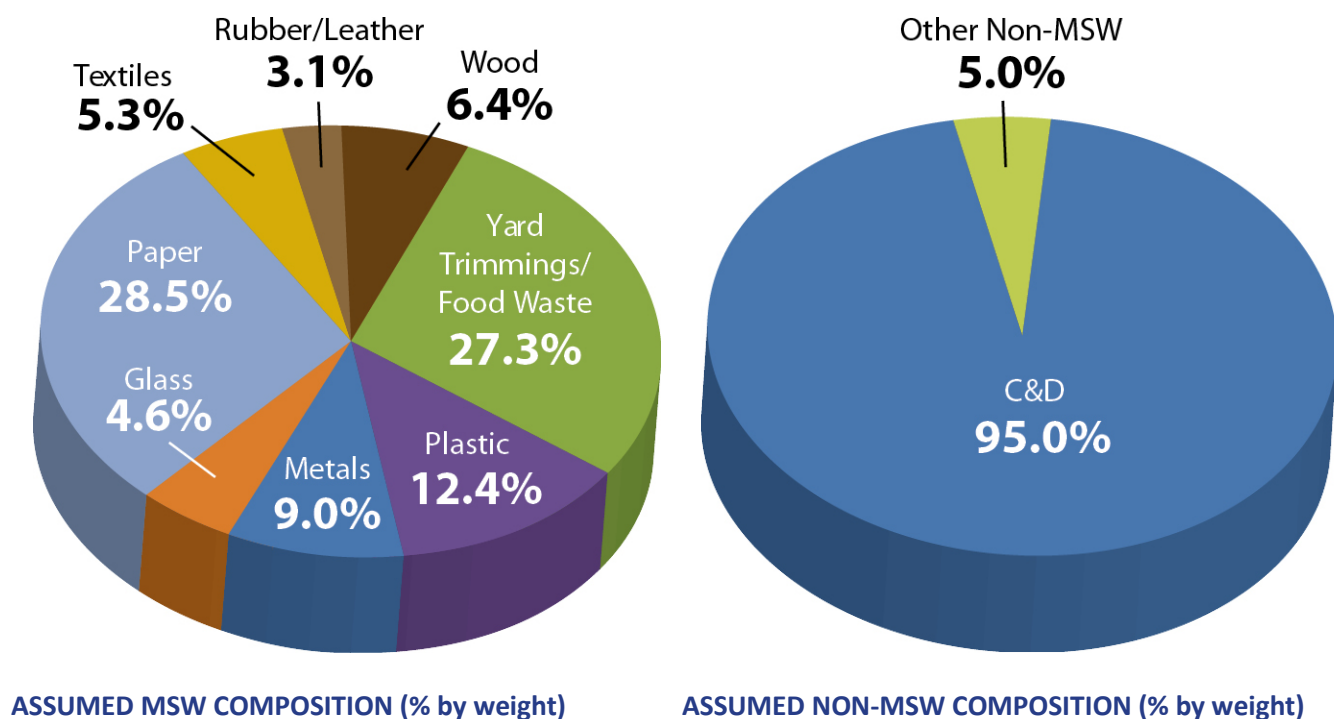
Year	MSW ⁽¹⁾		NON-MSW ⁽²⁾		TOTAL SOLID WASTE	
	Low	High	Low	High	Low	High
2012						
(Baseline)	129,000	154,000	82,000	86,000	211,000	240,000
2015	144,000	171,000	91,000	97,000	235,000	268,000
2020	169,000	200,000	105,000	112,000	274,000	312,000
2025	144,000	171,000	91,000	96,000	235,000	267,000
2030	146,000	172,000	92,000	97,000	238,000	269,000

¹. A low to high range of pounds per capita/day (ppcd) rates for MSW generation developed using findings from the USEPA (4.43 ppcd) and GEPA (5.28 ppcd).

². A similar range developed for non-MSW generation projections using USEPA and Naval Facilities Engineering Command measurements for C&D (2.80 and 7.4 ppcd, respectively).

As noted, the total solid waste quantities are expected to peak in 2020, and then fall off in 2025 and 2030. This estimate is tied to the population projections (discussed previously), which show a peak in the island's growth at the mid-point of the planning period due to the military build-up. These findings are represented in projected diversion quantities presented in subsequent sections of this Plan.

The figures below illustrate the assumed, relative composition of MSW and non-MSW streams on Guam in 2012.



Detailed information regarding the information used and development of solid waste generation quantities is included in Volume II, Technical Memorandum 2. While the information used and estimates developed are a reasonable guide for initially evaluating Zero Waste initiatives, material quantities on Guam may vary over time. It should be noted that in November 2012, an intensive effort was undertaken by GEPA and USEPA to measure solid waste generation and recycling efforts on Guam. Because the detailed analysis of initiatives for the Zero Waste Plan was well underway, the solid waste and recycling information collected during this effort was not used to develop the solid waste quantity and composition estimates included in this Section of the Plan. However, the November 2012 information collected and methodology used to collect the data was reviewed, and is discussed further in Section 7. Recommendations for expanding on-going data collection and measurement efforts to the full solid waste stream and improving the completeness and accuracy of data by collecting critical waste characterization data are provided in Volume II, Technical Memorandum 3.

Secondary Material Market Conditions

As materials are recovered from the waste stream, markets are needed to put these materials to productive use. There are two recovered material markets available for diverted materials: on-island markets and off-island markets.

On-Island Markets

On-island materials markets typically present the best opportunities in terms of regulating how recycling business is conducted, and offering diversion incentives and disposal disincentives. With an on-island market, there are no overseas shipping costs and the sale of material is not vulnerable to the wide price fluctuations experienced on the worldwide secondary material markets. On-island recovery provides more local jobs than shipping off the island along with potentially more tax revenues. On-Island markets at the current time include:

- **Untreated wood:** chipped/mulched for use as landscaping, soil erosion stabilization material and composting.
- **Green waste, wet cardboard, limited amounts of mixed paper:** used as a source for limited (mostly passive) composting.
- **Food waste:** diverted to pig farms as feed.
- **Glass:** crushed and used for landfill roads, alternative landfill cover, and as utility backfill.

Off-Island Markets

Materials sent off-island for recycling include metals from Guam's successful metal recovery program (including aluminum beverage cans from i*Recycle), old cardboard containers, limited quantities of other recovered paper, polyethylene terephthalate (PET) and high-density polyethylene (HDPE) plastic containers, car and truck batteries, tires and electronics. Shipping materials to markets off island introduces added complexities including:

- Baling to increase transportation efficiencies;
- Limited processing to minimize hazards;

- Transport requirements/costs including Port Authority of Guam charges, shipping costs and port charges at the receiving port; and
- Secondary processors and manufacturing end-markets whose pricing is subject to global influences and are very dynamic.

Opportunities and Constraints

A materials market conditions analysis (included in Volume II, Technical Memorandum 4) completed for this Plan indicates that as of December 2012, the following market conditions exist.

- Revenue-positive off-island markets exist for metals, aluminum beverage containers, cardboard and computer components (excluding monitors).
- Revenue-negative off-island markets exist for mixed paper and plastics #1/#2 that could potentially improve with greater quantities from an island-wide curbside recycling program.
- Glass crushing is provided on-island for use/give-away with no revenue generation.
- Limited to no revenues are available mulched/chipped wood.
- No markets have really been developed for compost and no active systems are in place.
- Guam's natural limestone provides a ready source of inexpensive, virgin aggregate making the revenue potential for aggregate products low.
- Many Guam recyclables are being marketed in Asia.
- Shipping lines bid transportation costs for containers on a case by case basis; these rates vary by current conditions, commodities, destinations and costs for fuel - most materials are shipped in 40-foot containers unless weight is an issue.
- In general, Chinese shipping lines transporting to ports in China have much lower costs than other shipping lines transporting to the west coast of the U.S.
- Port charges ranging from \$700 to \$800 per load are applied at both export and import points.

Additionally, it is important to note that the Port Authority of Guam may waive export port charges on non-containerized metal loads. The statutory authority for this waiver presented in Title 12, Guam Code Annotated, Section 58147 (12 GCA 58147) technically applies to all recyclables materials. It also exempts shipping and recycling businesses from the Guam Use Tax Law on revenues earned from recycling. The waiver does not appear to be applied for all materials, however, and represents an economic incentive (between \$700 and \$800 per load) for greater recycling on Guam.

Finally, it is important to remember that even with revenue negative recovered materials, a key benefit associated with waste diversion is the avoided landfill disposal costs. When these savings are considered in terms of real dollars, the economics of recycling many materials improves to a sustainable or near-sustainable level.

Please see the next page.

5. THE BLUEPRINT

GUAM ZERO WASTE PLAN

Please see the next page.

5. THE BLUEPRINT

While numerous initiatives and improvements to Guam's current solid waste system have been evaluated to assess the best strategy for a long-term Zero Waste Program over a 20-year planning period, all of the legislation, regulations, policies, programs and infrastructure described in this document cannot be practically implemented at once. The development of a Zero Waste Program will be an evolving process, and there will be political, technical, marketing, financial and educational issues to address at each step. The following approach focuses on a recommended initial phase for implementing those initiatives that will allow GovGuam and industry stakeholders to build a strong Zero Waste foundation, followed by subsequent phases that provide additional time to foster public/private partnerships, raise funds and allocate staff in support of additional initiatives.

Recommended Implementation Strategy

The blueprint is guided largely by the goals established for, and Zero Waste options developed during the February 2012 Zero Waste Visioning Session. This session emphasized the need to provide Zero Waste leadership on Guam, incentives, infrastructure, education and enforcement. The criteria used to establish the recommended phasing of initiatives include:

- Ability to build a strong foundation of GovGuam agency staffing, organized industry stakeholders, funding and public education;
- Relative ease of implementation;
- Ability to increase the quantity of waste diverted away from landfill disposal; and
- Synergies with stakeholders from the private and non-profit sectors and the military to leverage resources, increase efficiencies, and improve market influence.

Based on these criteria, the implementation strategy summarized in the graphic below and described in more detail in this section of the Guam Zero Waste Plan and the documents provided in Volume II is recommended.



Phase I (Present through 2015)



The activities recommended for Phase I implementation should be undertaken immediately, with the intention of full implementation within the first two years of the planning period. Especially time-sensitive will be the conversion to a pay-as-you-throw (PAYT) trash pricing system and initiation of territorial legislation that will form the primary foundation of Guam's Zero Waste Program. Specifically, Phase I activities should include:

- Implement PAYT for Guam's single-family residents;
- Expand/formalize the Zero Waste Association of Guam (ZWAG);
- Expand on-going data measurement activities;
- Pass legislation for the Guam Zero Waste Law;
- Establish a Guam Zero Waste grant program
- Ban single-use plastic bags
- Implement a Green/EPP Program for GovGuam Agencies;
- Initiate an island-wide Zero Waste Education and Outreach Program; and
- Improve enforcement of existing litter control and illegal dumping laws.

Details on the recommended Phase I activities follow.

- 1) Implement PAYT Trash Pricing for Guam's single-family residents (implemented by GSWA) – GSWA is currently evaluating the addition of curbside recyclables collection to its current single-family service area (and, if it proceeds, will roll-out this service in late 2013/early 2014). Significant advantages will occur if these programs are implemented simultaneously:
 - Savings will be achieved by purchasing fewer recycling carts (the 96-gallon trash carts made available by homes that choose to down-size with PAYT could instead be used for recycling).
 - GSWA can plan for, purchase, and implement both PAYT and curbside recycling programs at once (saving staff resources).
 - Residents can adapt to both new programs at the same time (rather than having major changes occur at two separate times).
 - See Volume II, White Paper C for more detailed information.
- 2) Expand/Formalize the Zero Waste Association of Guam (implemented by volunteer, industry stakeholders, MCOG and GovGuam agency membership). This may be a new or expanded association formed from the existing RAG, i*Recycle and UOG Center for Island Sustainability organizations and other waste diversion stakeholders. The ZWAG will ideally bolster (and occasionally push) GovGuam's overall Zero Waste leadership and is expected to play key roles in both the Phase I and III legislation, which they will likely champion, and implementation of the Guam Zero Waste Grant initiative. Other activities that the ZWAG will provide key support with includes:

- Implementing a Zero Waste Education and Outreach program;
 - Planning of new Used Building Material, C&D Debris, and Compost facilities (especially in identifying and supporting other organizations that might develop and operate);
 - Annual data measurement and litter control/illegal dumping enforcement efforts;
 - On-going review and updates/revisions to the Guam Zero Waste Plan; and
 - See Volume II, White Paper L for more detailed information.
- 3) Expand Data Measurement (on-going implementation by GEPA with support from USEPA) – Accurate information on what kinds of materials are generated and where is of critical importance. In 2013, GEPA will complete its second annual measurement process for the preceding year. By its very nature, data collection, analysis and reporting is an evolving process that takes multiple years to develop to the point where a strong majority of data is captured and captured accurately. During Phase I it is recommended that GEPA:
- Refine its methodology to capture missing programs/facilities, collect data from additional sources to "check" reported quantities, and minimize any potential double-counting.
 - Analyze collected data to interpret waste generation as well as diversion, calculate per-person/day generation and disposal rates and track historical trends.
 - Add new material streams to more fully measure diversion within the overall solid waste stream – including food waste, C&D, military waste, litter clean-up and marine debris.
 - Further details and recommendations regarding data measurement are provided in Volume II, Technical Memorandum 3.
- 4) Initiate Legislation for the Guam Zero Waste Law (policy developed by ZWAG with significant support from the MCOG and regulatory implementation by GEPA with support from ZWAG and the MCOG) – Successfully introducing and shepherding a new bill through the Guam Legislature and subsequently developing sound implementing regulations will be a relatively major effort that will most likely be led by members of ZWAG with assistance from the MCOG and other industry stakeholders. While the backbone of the legislation should be to establish a sustainable Zero Waste funding source (discussed in more detail later in this section), given the effort involved in introducing and passing legislation, the bill will ideally:
- Adopt solid waste diversion goals that will be used as the criteria to measure the Zero Waste Program. While establishing an end goal for the year 2030 is very important, it will also be helpful to set intermediate targets for the years 2015, 2020 and 2025.
 - Establish a funding source for the initial phase of Zero Waste Program development. A combination of a small surcharge to both the landfill tipping fee and the Guam Gross Receipts Tax is one potential way to initially fund the development of Guam's Zero Waste Program (the specifics of this recommendation is discussed at the end of Section 5).
 - Establish the Guam Zero Waste Grant program. The grant program will include:
 - Funding source (generated from the sources described above)
 - Grant parameters – it is recommended that approximately \$250,000/year will be available which is equivalent to ten \$25,000 grant awards each year)

- Grant staffing – it is expected that GEPA staff would have oversight but that ZWAG members would volunteer time to establish grant requirements, review application, track and report project outcomes
 - Legislation should allow modifications of the grant program exclusive of funding sources or amounts with GEPA approval only (i.e., further legislation not required)
 - See Volume II, White Paper M for more detailed information.
 - Establish GovGuam staffing – described later in the “Job Creation Potential” subsection.
 - Implement a Single-Use Plastic Bag Ban – this effort will be based on Pay-Less Supermarkets' current program and is expected to be implemented with minimal political obstacles or resource requirements. The effective date may vary over time for single-use bags used by an increasing number of retailers and other businesses. More details on this program can be found in Volume II, White Paper D.
- 5) Implement Green/EPP Procedures for GovGuam Agencies (implemented by GEPA and GDOA) – The development of new EPP procedures for office paper and electronics will be an important early step to demonstrate GovGuam's Zero Waste leadership and raise awareness about all aspects of diversion, including buying recycled-content/low waste/low toxicity products and services. This program can be implemented without legislation and will ultimately be a model for schools, other institutions and businesses to emulate. See Volume II, White Paper A for more detailed information.
- 6) Initiate an Island-Wide Zero Waste Education and Outreach Program (implemented by GEPA with support from the MCOG, ZWAG and other industry stakeholders) – As public education and outreach are critical to all aspects of Guam's Zero Waste Program, implementation should start immediately and be as broad as possible, ideally including the military. Initial activities should include development of a program brand, website and social media campaign; a public survey; and development of an island-wide strategy that addresses new residents and businesses as well as tourists. Subsequent activities will be determined by GovGuam's progress in implementing the Phase I and II recommendations. See Volume II, White Paper N for more detailed information.
- 7) Improve Enforcement of Existing Litter Control Laws (implemented by GEPA and GDPW with significant support from the MCOG, ZWAG, and other volunteer groups) – Tied closely with public education efforts, this program will strengthen the incentive for diversion by making illegal dumping less available. It will also demonstrate GovGuam's Zero Waste leadership and better maintain the beauty of Guam's environment. See Volume II, White Paper H for more detailed information.

Phase II (2016 through 2020)

The activities recommended for Phase II include those initiatives that will require time to build support among industry stakeholders and potential non-profit and private sector organizations that may ultimately develop and operate future waste diversion facilities. These initiatives need to be preceded by the establishment of credible

GovGuam and ZWAG leadership and an effective public education program. Also included in Phase II are recommended review and update of initiatives implemented in Phase I. Specifically, Phase II activities should include:



- Support Development of Multi-Stakeholder Reuse and Processing Facilities
 - Used Building Material Facility
 - C&D Debris Processing Facility
 - Compost Facility
- Expand Existing Programs
 - PAYT to Small Multi-Family Homes
 - ZWAG services (possibly including staff)
 - Green/EPP (add additional materials)
- Review/Update Guam Zero Waste Plan (five-year review cycle)

Details on the recommended Phase II activities follow.

- 1) Support Development of Multi-Stakeholder Reuse and Processing Facilities (*implemented by GEPA with support from the MCOG and ZWAG*) – It is unlikely that GovGuam or the villages will capitalize and/or operate these facilities. Both GovGuam and the MCOG can play an important role in creating incentives for private-sector development, feasibility studies, clarifying regulatory requirements, land ownership/use partnerships, materials marketing assistance and educating the public about opportunities provided at each facility. It is recommended that GovGuam and the MCOG encourage development of multi-sector partnerships and focus on fostering the development of:

- Used Building Material Facility – to accept for reuse/resale household items, used building materials and miscellaneous materials generated by contractors involved in the construction and demolition/deconstruction of both civilian and military projects (this may be a new facility or an expansion of an existing program such as Habitat for Humanity of Guam). See Volume II, White Paper E for more detailed information.
- C&D Debris Processing Facility – to serve all or a portion of the island's C&D waste stream, this facility is expected to initially accept source-separated clean wood, lead-free aggregate and metals for diversion. This may be a new, mobile facility or an expansion of existing hardfill operations. See Volume II, White Paper J for more detailed information.
- Compost Facility – to initially process yard waste and soiled cardboard generated by residents, businesses and institutions, this facility may be developed to eventually accept food waste, manures, biosolids, etc. This may be a new facility or an expansion of existing hardfill operations. See Volume II, White Paper I for more detailed information.

- 2) Expand Existing Programs – By the mid-point of Phase II, several Phase II initiatives (noted below) will be ready for expansion. While the specific impacts of these programmatic expansion efforts were not specifically analyzed in the Plan, the value of continuous improvement (i.e., on-going review, refinement and growth) is important in all goals worth pursuing, including Guam’s Zero Waste goals.
 - PAYT – variable trash pricing should be explored for small multi-family homes (such as duplexes, triplexes and quadplexes). See Volume II, White Paper C for more detailed information.
 - ZWAG – this organization should be firmly established and ready to expand its services (as well as dues and membership base) such as an annual conference, workshops and advocacy of Phase III legislation (this may also require the addition of part-time staff). See Volume II, White Paper L for more detailed information.
 - Green/EPP Program – at this time any pilot programs should be taken full-scale, cooperative purchasing with other governmental agencies should be in place and additional materials may be added. See Volume II, White Paper A for more detailed information.
- 3) Review/Update the Guam Zero Waste Plan (implemented by GEPA collaborating with GSWA, GDPW and ZWAG) – On at least a five-year cycle, the Guam Zero Waste Plan should be thoroughly reviewed for consistency and applicability to conditions, constraints and opportunities that have evolved on Guam during the previous five year period and to re-evaluate diversion potentials, revenues/avoided landfill costs and other costs. An update should be developed to confirm or revise the Plan, program and infrastructure policies for the next five years.

Phase III (2021 through 2025)



The activities recommended for Phase III include those initiatives that will likely be implemented through new legislation as well as those that will require more extensive research and planning. Specifically, Phase III activities should include:

- Pass legislation to revise the Guam Zero Waste Law (or develop new statute)
- Implement Extended Producer Responsibility (EPR) Policy
- Develop C&D Diversion Policy
- Implement “3R” Waste Minimization Standards for Building Construction and Renovation;
- Implement Greening Roadway Pavement System recommendations;
- Expand PAYT to large multi-family units; and
- Review/Update Guam Zero Waste Plan (five-year review cycle)

Details on the recommended Phase III activities follow.

- 1) Initiate Legislation for a Revised Guam Zero Waste Law (*policy developed by ZWAG, MCOG and industry stakeholders with technical support if needed from GEPA, GSWA, GDPW – regulatory implementation by*

GEPA with support from ZWAG) – As noted for the original statute in Phase I, successfully introducing and shepherding a new bill through the Guam Legislature and subsequently developing sound implementing regulation will be a relatively major effort that will most likely be led by the MCOG, members of ZWAG and other industry stakeholders. The key components of this law are expected to include:

- Implement EPR policy for e-waste and packaging (possibly pallets) – this effort should build-upon the existing EPP program and involve a comprehensive coalition-building effort with material/product-specific stakeholders from the manufacturing, recycling and collection sectors. See Volume II, White Paper B for more detailed information.
 - C&D Diversion Policy – once the Used Building Material and C&D Debris Processing Facilities are established, Guam should implement an island-wide policy requiring minimum levels of diversion on C&D projects (the effective date may vary over time for increasingly smaller projects and more materials. See Volume II, White Paper K for more detailed information.
- 2) Implement “3R” Waste Minimization Standards for Building Construction & Renovation (implemented by GEPA and GDPW). Ideally, these standards may be developed without legislation and will likely involve the operation of pilot projects to test which materials and which purchasing, reuse and recycling/composting strategies are most effective on Guam. If legislation is required, green building standards should be incorporated in the Revised Guam Zero Waste Law legislation also addressed during Phase III. See Volume II, White Paper F for more detailed information.
 - 3) Implement Greening Roadway Pavement System recommendations (implemented by GDPW and GEPA). Implementation of these specifications will further drive diversion by strengthening local markets (may initially target tires, glass, wood mulch and compost). Their implementation during Phase III will be more feasible as equipment capacities for processing these materials has been developed and GovGuam agencies have time to research other highway department specifications and build partnerships with local material processors See Volume II, White Paper G for more detailed information.
 - 4) Expand PAYT – Variable trash pricing should be explored for large multi-family homes (those not yet addressed through previous programming).
 - 5) Review/Update the Guam Zero Waste Plan (implemented by GEPA with support from GSWA, GDPW and ZWAG) – As noted under Phase II and applicable to next five-year window.

Long-Term (Beyond 2025)

Long-term activities are expected to include the expansion of existing policy and programs to continually expand the scope of Zero Waste practices and move towards Guam's Zero Waste goals. As for all previous phases, it is possible that periodic review of the Guam Zero Waste Plan will identify additional and varied plan priorities as

new conditions develop on Guam; recommended actions should be adjusted accordingly. At this time, the most likely long-term next steps are expected to include:

Blueprint for Zero Waste

PHASE I PRESENT - 2015

PHASE II 2015 - 2020

PHASE III 2021 - 2025

LONG TERM 2025 AND BEYOND

- Expand Green/EPP Program, EPR and C&D Diversion Policies (add additional materials);
- Expand “3R” Waste Minimization Standards for Building Construction and Renovation to include additional sustainable design, construction and operation requirements (see Section 7 for additional information) and Greening Roadway Pavement System recommendations by prioritizing the use of additional recycled materials; and
- Review/Update the Guam Zero Waste Plan (five-year review cycle).

Suggested Implementation Timeline

Following is a suggested timeline for implementation of the Zero Waste Blueprint described herein.

	PHASE I			PHASE II						PHASE III					LONG-TERM				
ZERO WASTE INITIATIVES	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
PHASE I																			
Pay As You Throw (PAYT)	▶				✓					✓									
Zero Waste Association of Guam	▶					✓													
Data Measurement	▶		✓																
Enact New Guam Zero Waste Law		▶																	
Funding		▶																	
Zero Waste Grant Program		▶																	
GovGuam Staffing		▶																	
Plastic Bag Ban		▶																	
Green Purchasing Program		▶				✓					✓					✓			
Education & Outreach		▶	▶																
Illegal Dumping & Litter Control		▶																	
PHASE II																			
Used Building Material Facility				▶															
C&D Processing Facility				▶	▶	▶													
Organics Recovery/Compost Facility				▶	▶	▶													
Review/Update Zero Waste Plan						✓					✓					✓			
PHASE III																			
Revise/Update Guam Zero Waste Law									▶	▶	▶								
Environmental Producer Responsibility									▶	▶	▶					✓			
C&D Diversion Policy									▶	▶	▶					✓			
“3R” Requirements for Buildings										▶						✓			
Greening Roadway Pavement Systems										▶						✓			
Review/Update Zero Waste Plan						✓					✓					✓			
NEXT STEPS																			
Review/Update Zero Waste Plan						✓					✓					✓			
Preliminary Stakeholder Organization and Research				Implementation				Follow-Through & Reporting											
Initiate Action ▶				Program Updates (not applicable to all alternatives)								✓							

Benefit 1. Landfill Waste Diversion Potential

Diversion of landfill waste is the over-arching goal of Guam's Zero Waste Plan, and can be achieved with the initiatives described herein. In the United States, the national landfill diversion rate is 34%. Many communities

have achieved over 50% landfill diversion and San Francisco, a leading Zero Waste community, has achieved 80% landfill diversion.

Typically, diversion success increases as new or expanded programs mature due to increased operational efficiencies, greater public participation and established markets. When multiple programs are operated at the same time, there may be some overlap of diversion activities. Table 5.1 summarizes the diversion potential estimated for the Zero Waste initiatives evaluated in this Plan, based on the timing of implementation and synergy with one another. The detailed basis for the information contained in Table 5.1 (following) is provided in the Volume II White Papers.

TABLE 5.1. ESTIMATED WASTE DIVERSION POTENTIAL FOR ZERO WASTE INITIATIVE IMPLEMENTATION^{1, 2}
TONS/YEAR UNLESS OTHERWISE NOTED, ROUNDED TO NEAREST 100 TONS)

	BASELINE	2015	2020	2025	2030
PHASE I (Present through 2015)					
<i>Build a Strong Foundation</i>					
Add Residential PAYT	-0-	1,500	6,000	6,000	6,900
Build ZWAG ⁹	---	---	---	---	---
Pass Guam Zero Waste Law					
✓ Grant program ²	-0-	6,300	7,300	18,800	19,000
✓ Plastic bag ban		100	1,300	1,200	1,400
Implement Green/EPP ⁹	---	---	---	---	---
Initiate Education & Outreach ⁹	---	---	---	---	---
Improve Litter Control & Illegal Dumping Enforcement ⁴	-0-	800	2,000	2,600	3,600
PHASE II (2016 through 2020)					
<i>Develop New Infrastructure⁵</i>					
Used Building Materials Facility	-0-	-0-	1,400	2,700	3,300
C&D Debris Processing Facility ⁴	-0-	-0-	800	1,400	1,700
Compost Facility	-0-	-0-	1,700	4,800	4,300
PHASE III (2021 through 2025)					
<i>Growing the Zero Waste Program</i>					
Pass New Zero Waste Law					
✓ EPR ^{6, 7}	-0-	-0-	-0-	400	1,100
✓ C&D Diversion Policy ^{6,7}		-0-	-0-	2,400	3,000
Implement 3R Requirements for Buildings	-0-	-0-	-0-	400	1,600
Greening Roadway Pavement Systems	-0-	-0-	-0-	1,100	2,500
Estimated Tons Diverted with New Initiatives (in addition to existing diversion)	-0-	8,700	20,500	41,800	48,400
ESTIMATE OF DIVERSION POTENTIAL ⁸ (% by weight)	18%	21%	25%	35%	37%

¹ These estimates summarize detailed analysis completed for individual Zero Waste Initiatives provided in the Volume II White Papers. See Volume II for further information regarding specific White Papers.

² Due to the recommended implementation schedule, tonnages may be diverted later than shown in Volume II White Papers. While tonnages do vary over time, the differential has less to do with increasing population/waste generation than with program maturation.

³ Diverted tons associated with Guam Zero Waste Grant Program may duplicate some tons estimated for other programs in this table, but this overlap is unknown and has not been accounted for at this time.

⁴ Not all tons collected through Litter & Illegal Dumping Enforcement efforts will be diverted.

⁵ Facilities most likely owned and operated by the private or non-profit sectors.

⁶ Tons associated with the C&D processing facility assumes a small facility accepting only 25% of the building waste generated on Guam a larger facility would divert greater quantities.

⁷ Adjustments were made to account for duplication with other programs (EPR – plastic bags were banned in Phase I, C&D Diversion Policy – Used Building Material and C&D Processing Facility tons were diverted in those line items)

⁸ Based on reported recycling rate of 17.85% in 2011 (GEPA's 2012 Recycling in Focus Fact Sheet) and projected solid waste generation levels on Guam (Volume II, Technical Memorandum 2). Beyond the baseline year of 2012, the percentages shown are in addition to 2012 diversion rates.

⁹ Not all Zero Waste Initiatives (i.e., Education & Outreach, etc.) generate direct landfill diversion quantities. However, implementation of these Initiatives is critical to achieving a strong Zero Waste Foundation. These Initiatives have significant, but indirect influence over the increased diversion quantities shown for other Zero Waste Initiatives and are essential to the ultimate success of Guam's Zero Waste Plan.

Table 5.1 illustrates expected progress towards Guam's Zero Waste goals through the implementation of the initiatives evaluated. Relatively conservative estimates were made throughout the analyses conducted for each initiative in terms of both levels of implementation and diversion successes such that the Plan is both practical in its recommendations and reasonable to put in place. It is possible that higher diversion levels can be achieved by:

- Applying Guam-specific data to verify the most effective strategies (e.g., waste composition data to target the "best bang for your buck" materials in each program);
- Implementing initiatives earlier than recommended in the Blueprint (e.g., bringing an active compost facility on-line by 2015);
- Expanding programs as soon as possible (especially growing the PAYT program to include multi-family homes);
- More aggressively leveraging of stakeholder resources (e.g., working with the military and helping ZWAG to take an even more active role in implementing initiatives); and
- Robustly enforcing policy (e.g., littering, bans and diversion mandates) and reporting results of all programs (to better catalyze public support).

Increased diversion will extend the life of Guam's new Layon Landfill, thereby delaying the schedule for closure and post-closure activities, which will allow for additional time to develop a financial reserve to address closure and post-closure activities. As discussed in more detailed in this Section of the Plan and also in the Volume II White Papers and Technical Memoranda, additional benefits of increased waste diversion include, but are not limited to the:

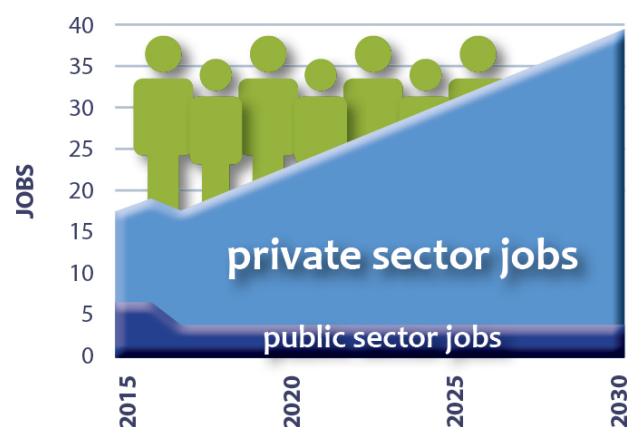
- Generation of jobs which tend to be higher-paying positions than those traditionally associated with waste disposal;
- Creation of small business and public-private partnership opportunities;
- Generation of revenues through materials sales/resale;
- Significant and usually permanent diversion of waste and materials away from disposal;
- Saving natural resources and virgin materials through reuse and recycling;

- A reduction in greenhouse gas emissions, water and air pollution; and
- Preservation of local ecosystems, especially marine ecosystems.

Regular updates to the Guam Zero Waste Plan will be essential to evaluating progress and adjusting short-term strategies, such as modifying program targets or accelerating Zero Waste Programming. While long-term planning is essential to establish goals, priorities and strategies, many variables (population, the market place, on- and off-island economics, etc.) are so dynamic that quantity, revenues/landfill savings and cost projections need to be re-evaluated every few years to have real value.

Benefit 2. Job Creation Potential and Small Business Opportunities

Zero waste is an economic development tool as well as an environmental tool. Reuse, recycling, composting and source reduction offer direct and substantial development opportunities. Discarded materials are a resource



that can create jobs and lead to the formation of new businesses (Institute for Local Self-Reliance [ISLR], 2002). Some sources have documented that employment per ton of recycled material can be ten times greater than disposed waste, and employment per ton of mulched/composted material can be two times greater (ISLR, 2002 and 2013; Cascadia, 2009). Job growth has been shown to have dramatic potential in the future, showing that if our national waste diversion rate increases to 75%, as many as 1.5 million new jobs would be created in the United States (Tellus, 2008; Recycling Works!, 2011).

Most of the Zero Waste initiatives evaluated in this Plan will require GovGuam staffing increases for program planning, implementation, enforcement and/or oversight. Many of the waste diversion activities will also create a significant number of materials processing jobs in the private sector. These jobs represent an additional economic benefit, and are discussed in more detail in the White Papers presented in Volume II for each Zero Waste initiative. A summary of the overall job creation potential and business opportunities follows.

Job Creation Potential

Both public and private sector jobs will be created with the implementation of a Zero Waste Program for Guam. The GovGuam job requirements needed to implement the Zero Waste initiatives range from periodic ZWAG meeting attendance and on-going program monitoring to a full-scale re-structuring of residential collection fees and island-wide litter control/illegal dumping enforcement and a Zero Waste education and outreach program. When combined across the board, the stand-alone analyses described in Volume II, White Papers identifies the need for 4 to 6 Full-time equivalents (FTEs) across GEPA, GSWA, GDPW and Guam Department of Administration (GDOA). These staff requirements vary over the planning period but will likely be reduced if multiple initiatives are implemented in an integrated manner that creates greater efficiencies and opportunities for resource

sharing than each individual initiative would alone. It is likely that the GovGuam staffing needs to implement an integrated Zero Waste Program to include:

- GEPA: staffing of 3 to 4 FTEs for programs implemented in tandem or sequentially to build off one another;
- GSWA: staffing of less than 1 FTE for the first year or two of PAYT program development only;
- GDPW: staffing of less than 1 FTE for enforcing plastic bag ban, waste minimization standards for building construction and renovation and greening roadway pavement. Staffing is expected to be reduced once the programs mature and stakeholders become more educated and acceptance for the Zero Waste Program grows);
- GDOA: staffing of less than 1 FTE for initial development of the Green/EPP Program and EPR Policy only; GDOA may also be able to accommodate with existing staff; and
- GovGuam staffing requirements are summarized in the estimated economic costs included later in this Section and are described in more detail for each initiative in the White Papers provided in Volume II.

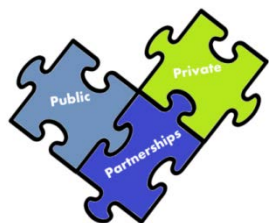
The potential for creating private and non-profit sector jobs is notably greater than those estimated for GovGuam agencies. These jobs will most likely be created downstream of specific diversion programs and as such, are not included in the Zero Waste initiative cost estimates. Volume II, Technical Memorandum 5 provides summary of these jobs based on the probable timing of their implementation and overlap with one another. The job creation potential for new processing jobs in the private and non-profit sectors over the projected implementation period could range from as many as 7 new FTEs in 2015 up to 37 FTEs by 2030 for reuse activities, primary recyclables processing, local composting and local C&D processing on Guam. Additional off-island jobs would be created for secondary processing and manufacturing (especially for e-waste).



Job creation estimates were based on a limited number of available regional and national studies for new jobs required to meet material collection and processing needs. The estimates provide a general approximation of jobs potential, but should not be construed as a definitive projection. Cultural, geographic and economic conditions on Guam may well alter the actual number of new jobs ultimately generated by the various waste diversion initiatives evaluated. Volume II, Technical Memorandum 5 includes a description of the resources utilized in the analysis.

Public-Private Partnership Opportunities

As GovGuam and local village governments are not expected to become directly involved with materials management, local processing jobs will be created primarily in the private sector and to a lesser extent in the non-profit sector. The most obvious opportunities for public-private partnerships exist with the following initiatives evaluated in the Zero Waste Plan:



- Used Building Material Facility
- C&D Debris Processing Facility
- Compost/Organics Recovery Facility
- Greening Roadway Pavement Systems

In each of these initiatives, a GovGuam agency can partner with private/non-profit owners to facilitate various aspects of new program development or facility operation. GovGuam agencies are well-suited at providing pre-development planning services, clarifying regulatory requirements, and facilitating land ownership/use partnerships, materials marketing assistance and educating the public about program and facility services. Advantages of public-private partnerships are numerous and include, but are not limited to, fully leveraging equipment and facilities; increasing quantities managed/reducing operating costs; and allocating risks to the private sector that is better equipped to manage it.

Small Business Opportunities

Many material diversion operations (i.e., recycling, reuse and remanufacturing) tend to be small or medium-sized businesses. The recycling, reuse and remanufacturing industries as a whole are very diverse and include a wide variety of service and product businesses, from those that collect and process all sorts of materials to those that reuse materials or manufacture with recycled content. The industry also supports businesses in public education, consulting, transportation, brokering, and retailing of recycled products. Recycling businesses are structured in every form imaginable, from sole proprietorships and corporations to joint ventures and non-profit enterprises. In the world of Zero Waste, small business opportunities are almost unlimited. However, some types of businesses are easier to start than others. Only a very small percentage of products on the market today are truly new inventions (USEPA, 2013).

Benefit 3. Revenue Generation from Material Recovery Sales

As has already been noted, Zero Waste is an economic development tool as well as an environmental tool. Reuse, recycling, composting and source reduction offer direct and substantial development opportunities for communities. In addition to its job creation potential, many waste diversion activities will generate direct revenues from materials sold to those reusing salvaged materials, secondary processors or manufacturers both on Guam and off-island.

Estimating revenues for both local and off-island materials sales was especially challenging as pricing fluctuates dramatically in some markets, overseas shipping costs are unavailable for most non-traditional materials and private sector recyclers consider pricing data to be proprietary. The market analysis described in Volume II, Technical Memorandum 4 includes an indication of relative pricing and shipping costs for traditional materials in late 2012. These values will fluctuate/change over time. Additional information detailed



information regarding estimated revenue generation from material sales made for each initiative are described in the White Papers presented in Volume II.

General revenue estimates are summarized in Table 5.2 and are based on the implementation schedule recommended in the Blueprint. These revenues will be earned by whichever party accomplishes diversion (e.g., GSWA for PAYT, grantees for the grant program, Guam Bureau of Statistics and Plans for coastal clean-up, GEPA for litter control and illegal dumping enforcement, private/non-profit contractors for C&D, etc.). While these estimates are intended to provide an approximation of revenue potential, additional data will be needed to confirm actual earnings (especially for the Phase II facilities) during a particular period. Costs are presented in 2013 dollars (\$).

TABLE 5.2. ESTIMATED REVENUE GENERATION FROM MATERIAL RECOVERY SALES FOR ZERO WASTE INITIATIVE IMPLEMENTATION ^{1,2} (IN 2013 \$, ROUNDED TO THE NEAREST 100 TONS)

	BASELINE	2015	2020	2025	2030
PHASE I (Present to 2015)					
Build a Strong Foundation					
Add Residential PAYT ³	\$-0-	\$(143,600)	\$(548,400)	\$(574,500)	\$(652,400)
Build ZWAG ⁴	---	---	---	---	---
Pass Initial Zero Waste Law					
✓ Zero Waste Grant Program	\$-0-	\$254,500	\$297,600	\$763,000	\$770,300
✓ Plastic Bag Ban	\$-0-	\$-0-	\$-0-	\$-0-	\$-0-
Implement Green/EPP ⁴	---	---	---	---	---
Initiate Education & Outreach ^{3,4}	---	---	---	---	---
Improve Litter Control and Illegal Dumping Enforcement	\$-0-	\$23,700	\$71,000	\$85,200	\$108,800
PHASE II (2016 to 2020)					
Develop New Infrastructure					
Used Building Material Facility ⁵	\$-0-	\$-0-	\$73,600	\$182,500	\$268,300
C&D Debris Processing Facility ⁵	\$-0-	\$-0-	\$11,700	\$21,000	\$24,800
Compost Facility ⁵	\$-0-	\$-0-	\$21,400	\$60,200	\$54,000
PHASE III (2021 to 2025)					
Growing the Zero Waste Program					
Pass Revised Zero Waste Law					
✓ EPR ³	\$-0-	\$-0-	\$-0-	\$(90,800)	\$(250,300)
✓ C&D Diversion Policy	\$-0-	\$-0-	\$-0-	\$19,000	\$39,000
Implement 3R Requirements for Buildings	\$-0-	\$-0-	\$-0-	\$6,800	\$24,000
Greening Roadway Pavement	\$-0-	\$-0-	\$-0-	\$-0-	\$-0-

¹ Feasibility-level costs for planning purposes only. These estimates summarize detailed analysis completed for individual Zero Waste Initiatives provided in the Volume II White Papers. See the Volume II, White Papers for detailed technical and cost-related information for the fifteen Zero Waste Initiatives.

² Due to the recommended implementation schedule, tonnages may be diverted later than shown in Volume II White Papers. While tonnages (and therefore revenues) do vary over time, the differential has less to do with increasing population/waste generation than with program maturation and an erratic market place.

³ Not all material sales generate positive revenues. For example, traditional materials (PAYT program), e-waste, etc., currently have no local markets and have to be shipped overseas at a net cost, but avoided landfill costs more than off-set this factor for most programs.

⁴ Not all Zero Waste Initiatives (i.e., ZWAG, Education & Outreach, etc.) generate direct material sales and corresponding revenue. However, implementation of these Initiatives is critical to achieving a strong Zero Waste Foundation. These Initiatives have significant, but indirect influence over increased diversion and corresponding positive material sales/revenues of the other Zero Waste Initiatives and the ultimate success of Guam's Zero Waste Plan.

⁵ Facilities most likely owned and operated by the private or non-profit sectors.

Key observations from Table 5.2 include:

- Only material sales revenues are included. Other revenues streams are not included (such as facility tipping fees likely charged by private sector operators at the C&D processing and compost facilities).
- Not all material sales generate positive revenues. For example, traditional materials (PAYT program), e-waste, etc., currently have no local markets and have to be shipped overseas at a net cost, but avoided landfill costs more than off-set this factor for most programs.
- Future development of local markets for these materials would significantly improve earnings potential.

Benefit 4. Avoided Landfill Disposal Costs (Savings)

The primary benefit of implementing a Zero Waste Program on Guam is the diversion of significant quantities of materials from landfill and hardfill disposal. While the avoidance of landfill disposal does not represent a tangible revenue stream, these savings go directly to the bottom line of any solid waste management program. Additionally, avoided landfill disposal cost savings are often responsible for providing a Zero Waste Program with an overall net zero (or even revenue-generating) operation and should always be considered when evaluating the potential for, and success of, any program that includes diversion.



Estimating avoided landfill costs has the same challenges as those identified for estimating quantities, and requires the same collection of Guam-specific data to ultimately verify the accuracy of the numbers estimated. As this estimate is also tied to landfill and hardfill disposal (also referred to in this Plan as tip fees), changes in those fees will directly impact avoided disposal costs (i.e., if disposal costs increase, the savings from avoiding landfill disposal also increases. The costs summarized in Table 5.3 provide a reasonable projection of savings generated by each of the Guam Zero Waste Plan initiatives.

TABLE 5.3. ESTIMATED AVOIDED LANDFILL DISPOSAL COSTS (SAVINGS) FOR ZERO WASTE INITIATIVE IMPLEMENTATION ^{1, 2, 3} (IN 2013 \$, ROUNDED TO NEAREST 100 TONS)

	BASELINE	2015	2020	2025	2030
PHASE I (Present to 2015)					
Build a Strong Foundation					
Add Residential PAYT	\$-0-	\$263,200	\$1,034,300	\$1,052,700	\$1,209,800
Build ZWAG ⁴	---	---	---	---	---
Pass Initial Zero Waste Law					
✓ Zero Waste Grant Program	\$-0-	\$769,500	\$900,000	\$2,307,000	\$2,329,200
✓ Plastic Bag Ban	\$-0-	\$22,900	\$220,000	\$213,800	\$244,400
Implement GovGuam Green/EPP ⁴	---	---	---	---	---
Initiate Education & Outreach ⁴	---	---	---	---	---
Improve Litter Control & Illegal Dumping Enforcement	\$-0-	\$148,400	\$357,900	\$453,900	\$628,500
PHASE II (2016 to 2020)					
Develop New Infrastructure					
Used Building Material Facility ⁵	\$-0-	\$-0-	\$49,100	\$94,600	\$113,800
C&D Debris Processing Facility ⁵	\$-0-	\$-0-	\$27,300	\$49,000	\$57,800
Compost Facility ⁵	\$-0-	\$-0-	\$79,200	\$241,300	\$241,300
PHASE III (2021 to 2025)					
Growing the Zero Waste Program					
Pass Revised Zero Waste Law					
✓ EPR	\$-0-	\$-0-	\$-0-	\$94,900	\$262,700
✓ C&D Diversion Policy	\$-0-	\$-0-	\$-0-	\$85,600	\$106,400
Implement 3R Requirements for Buildings	\$-0-	\$-0-	\$-0-	\$15,800	\$56,000
Greening Roadway Pavement	\$-0-	\$-0-	\$-0-	\$112,200	\$177,600
ESTIMATED TOTAL AVOIDED LANDFILL SAVINGS	\$-0-	↑\$1,204,000	↑\$2,667,800	↑\$4,720,800	↑\$5,427,500

¹ Feasibility-level costs for planning purposes only. These estimates summarize detailed analysis completed for individual Zero Waste Initiatives provided in the Volume II White Papers. See Volume II for further information technical and cost details for each Zero Waste Initiative.

² Due to the recommended implementation schedule, tonnages may be diverted later than shown in Volume II White Papers. While avoided costs do vary over time, the differential has less to do with increasing population/waste generation than program maturity and rising disposal tip fees.

³ Based on 2013 Layon Landfill tip fees of \$174.57/ton and estimated average hardfill tip fees of \$35/ton (held constant for all time periods).

⁴ Not all Zero Waste Initiatives (i.e., EPP, Education & Outreach, etc.) lead to direct landfill cost savings. However, implementation of these Initiatives is critical to achieving a strong Zero Waste Foundation. These Initiatives have significant, but indirect influence over increased diversion and the correlate to the landfill cost savings that are predicted for the other Zero Waste Initiatives and are essential to the ultimate success of Guam's Zero Waste Plan.

⁵ Facilities most likely owned and operated by the private or non-profit sectors.

Key observations from Table 5.3 include:

- The tip fees were held constant to be consistent with providing cost/revenue values at a flat 2013 \$ level. While costs are expected to rise, it is likely that the Layon Landfill tip fee will rise significantly (GSWA has proposed a \$225/ton commercial disposal rate for 2015) – this will generate much higher landfill savings than is described above.
- Landfill savings associated with the EPR program was measured at the Layon Landfill rate. If disposal rates for hazardous wastes at a RCRA Subtitle C facility had been used, the avoided costs would have been significantly higher.
- Avoided landfill costs will increase notably as programs grow and are expanded over time (especially PAYT).
- Any potential increase in facility tip fees associated with funding the Zero Waste Program (a proposed funding strategy is presented at the end of this Section) will also increase avoided landfill costs for all initiatives whose diverted materials would otherwise be managed at the Layon Landfill.

Benefit 5. Human Health and Environmental Impacts

The purpose of Zero Waste is to eliminate waste at the source through product design and producer responsibility, and implement waste reduction strategies further down the chain such as source reduction, reuse, recycling and composting. Governments and communities that implement Zero Waste plans, programs and strategies aim to switch from waste disposal to value-added resource recovery systems that will help build sustainable local economies.



The human health and environmental impacts realized by implementing a Zero Waste Program on Guam will be positive and measurable. Some of the most important benefits include:

- Significant and usually permanent diversion of waste and materials away from disposal;
- Saving natural resources and virgin materials through reuse and recycling;
- A reduction in greenhouse gas emissions, water and air pollution; and
- Preservation of local ecosystems, especially marine ecosystems.

A detailed list of the beneficial impacts created by implementing each initiative evaluated in the Guam Zero Waste Plan is presented in the white papers contained in the White Papers presented in Volume II.

Impact 1. Estimated Economic Costs

One of the scope requirements for the Guam Zero Waste Plan was to estimate programmatic-level costs to implement the initiatives evaluated in the Plan. Table 5.4 summarizes the estimated total costs to implement each initiative evaluated for this Guam Zero Waste Plan over a 20-year planning period. Detailed cost estimate information for each Zero Waste initiative can be found in the Volume II White Papers and in Technical Memorandum 6. Costs estimated include labor for program development and on-going implementation, as well

as some operational costs. Additionally, estimated private/non-profit sector costs for the Phase II facilities (not all of which will be operated by GovGuam) is also included.

Estimating the cost of initiatives presented in the Guam Zero Waste Plan was challenging as design and operating parameters are only generally defined, quantities are approximated, and opportunities for partnerships to increase efficiencies and reduce costs are unknown. The costs estimates provided in Table 5.4 (following) provide a feasibility-level estimate of the relative investment required for each initiative. It is noted that refinements to these estimates – to consider actual design capacities, equipment shipment to Guam, operating expenses and other costs – will be needed before actual implementation. The actual costs incurred will depend upon the sequencing of initiatives. Cost estimate assumptions made for each initiative are described in the White Papers provided in Volume II. Costs are presented in 2013 dollars.

TABLE 5.4. ESTIMATED COSTS FOR ZERO WASTE INITIATIVE IMPLEMENTATION^{1,2}
(IN 2013 \$, ROUNDED TO NEAREST \$100)

	BASELINE	2015	2020	2025	2030
PHASE I (Present to 2015)					
<i>Build a Strong Foundation</i>					
Residential PAYT ³	\$1,034,000	\$-0-	\$-0-	\$-0-	\$-0-
Build ZWAG	\$-0-	\$6,700	\$6,700	\$6,700	\$6,700
Pass Initial Zero Waste Law					
✓ Grant Program	\$18,700	\$268,700	\$287,500	\$287,500	\$287,500
✓ Plastic Bag Ban	\$18,700	\$18,700	\$13,300	\$13,300	\$13,300
Implement Green/EPP	\$35,600	\$143,700	\$143,700	\$151,200	\$151,200
Initiate Education & Outreach	\$72,500	\$46,500	\$46,500	\$46,500	\$46,500
Improve Litter Control & Illegal Dumping Enforcement	\$297,200	\$241,500	\$241,500	\$241,500	\$241,500
PHASE II (2016 to 2020)					
<i>Develop New Infrastructure⁴</i>					
Used Building Material Facility	\$-0-	\$-0-	\$713,400	\$175,600	\$351,400
C&D Debris Processing Facility	\$-0-	\$-0-	\$494,100	\$274,000	\$356,400
Compost Facility	\$-0-	\$-0-	\$2,177,900	\$227,800	\$302,800
PHASE III (2021 to 2025)					
<i>Growing the Zero Waste Program</i>					
Pass Revised Zero Waste Law					
✓ EPR	-0-	\$-0-	\$-0-	\$18,700	\$18,700
✓ C&D Diversion Policy	\$-0-	\$-0-	\$-0-	\$18,700	\$18,700
Implement 3R Requirements for Buildings	\$-0-	\$-0-	\$-0-	\$81,700	\$50,000
Greening Roadway Pavement	\$-0-	\$-0-	\$-0-	\$32,000	\$-0-
ESTIMATED TOTAL COSTS	\$1,476,700	\$725,800	\$4,124,600	\$1,575,200	\$1,844,700

¹ Feasibility-level costs for planning purposes only. These estimates summarize detailed analysis completed for individual Zero Waste Initiatives provided in the Volume II White Papers. See Volume II for further information regarding specific White Papers.

² Due to the recommended implementation schedule, costs may be incurred earlier than shown in Volume II White Papers. While costs do vary over time, the differential has less to do with increasing population/waste generation than with the stages of program development (i.e., initial development and capitalization versus on-going implementation of a mature program).

³ When PAYT is initially introduced, it is likely that 96-gallon trash carts currently in use by many current customers will be taken out of service. These carts will have many years of use left, however, and can be used for expanding PAYT to new multi-family customers later in the planning period (especially small multi-family units). It is expected that this cart exchange would be coupled with other methods (such as maintaining other existing multi-family containers but decreasing the collection frequency) to implement PAYT at no significant cost increase in the future.

⁴ Facilities most likely owned and operated by the private or non-profit sectors.

Key observations from Table 5.4 include:

- Costs are limited to GovGuam costs with the exception of the Phase II facilities (Used Building Material, C&D Debris Processing and Compost Facilities).
- Most program costs are higher initially and in part reflect elevated staffing needs for pre-implementation planning, legislation and research. Typically labor costs are reduced once the program is operational.
- GovGuam agency staffing is a key component of most initiatives and is the primary cost estimated for the ZWAG, Plastic Bag Ban, EPR Policy, C&D Diversion Policy, Waste Minimization Standards for Building Construction and Renovation and Greening Roadway Pavement System initiatives.

Individual program costs include:

- PAYT: GSWA efforts to set/approve new rates, purchase and deliver new 32- and 64-gallon trash carts.
- Zero Waste Grant Program: an assumed \$250,000 grant amount each year.
- Green/EPP Program: a price premium on green purchases of \$125,000/year (may be reduced if the premium is lower or lower quantities of targeted office paper and electronics are purchased).
- Education and Outreach Program: planning, graphic design, a public survey and miscellaneous supplies.
- Litter Control and Illegal Dumping Enforcement costs: staffing, equipment lease, materials and supplies; disposal fees for non-diverted materials are waived.
- Phase II facilities: assumes private ownership/operations and the co-location and expansion of existing facilities and labor based on GEPA rates (it is likely that these rates over-estimate this cost item and require adjustment). Additional property and building space needs include (assumes utility and road infrastructure to these properties is existing):
 - Used Building Material Facility: 1-acre facility site and a 3,500 square foot (SF) building;
 - C&D Debris Processing Facility: 1-acre facility site and 500 SF building; and
 - Compost Facility: 4-acre facility site and 2,500 SF building.

The financial model developed to estimate the costs included in this Zero Waste Plan are included in Volume II, Technical Memorandum 6.

Impact 2. New Legislation, Regulations & Policies Needed

A comprehensive legislative and regulatory framework is needed to support some of the Phase I and III Zero Waste initiatives. GEPA will be instrumental in developing and implementing many new policies and programs that support Guam's future Zero Waste Program efforts. While it is possible that the Governor's Office requests the input of GEPA on certain legislative efforts and that GEPA strongly supports these bills, GEPA staff will, in general, not be able to actively pursue legislation. The same will be true of other Guam governmental department staff such as GDPW, GSWA and GDOA. As a result, it will be critical for other public, private, non-profit and individual stakeholders to both introduce bills and take the lobbying lead. These efforts would ideally be coordinated by the new/expanded Zero Waste Association of Guam.



Some of the most important legal and regulatory needs include:

- An (initial) Guam Zero Waste Law that establishes the following:
 - A Zero Waste goal and a directive to the territorial government to implement an island-wide Zero Waste Program;
 - Funding for Guam's Zero Waste Program including the Zero Waste Grant Program;
 - A provision to hire additional GovGuam staff resources; and
 - A directive to implement a single-use Plastic Bag Ban.
- Comprehensive Green/EPP Legislation: to use GovGuam's purchasing power to create markets for recycled, reused and waste preventing products. The federal government has made significant strides in this area and has produced purchasing guides for use by state and local governments.
- Strengthen Guam's Litter Control Laws to provide for consistent and meaningful enforcement, and the Solid Waste Management Act to establish mandatory performance targets and to be consistent with a Zero Waste goal.
- Other legislation/implementing regulations for:
 - A bigger and better bottle bill for Guam to reduce the amount of waste that must be managed;
 - Shipping waiver for recyclers; and
 - Quarantine regulations for the Coconut Rhinoceros Beetle.

More details regarding the legislation needed to accomplish the recommended implementation strategy summarized above and a summary of the activities that will be required to pass a bill in the legislature and subsequently develop new implementing regulations for the new statute(s) is provided in Volume II, Technical Memorandum 7. Examples of Zero Waste legislation language can be found throughout electronic documentation referenced in Volume II, Technical Memorandum 8.

Impact 3. Impact of Increased Diversion on Annual Tip Fee Revenues



As Guam plans for a Zero Waste future and increases its focus on achieving higher diversion and recycling rates, the impact on the current solid waste management program, which is supported in large part by the tipping fees collected at the Layon Landfill (through the commercial transfer station under contract to GSWA) and three permitted hardfills, will create financial implications that must be evaluated. With declining annual tip fee revenues due to a projected decrease in disposal, side effects of a phenomenon referred to by some in the solid waste management industry as the “death spiral” will occur and must be managed.

If the Zero Waste Program is successful and the landfill diversion rates projected in Table 5-1 are met, the avoided disposal costs shown in Table 5-3 will result in a directly proportional amount of funding that will no longer be available to fund existing solid waste management obligations. This presents a dilemma for GovGuam, because future projected tip fee revenues, in part, were intended to help cover the amortization payment structure/schedule for the bonds issued to fund the construction of the Layon Landfill.

Alternatives that may have to be considered to potentially mitigate the negative impacts from the decreased availability of funding for the Layon Landfill may include a combination of any of the following:

- Increase landfill tipping fees to cover the shortfall;
- Scale back the size of the new landfill, thereby reducing future construction and long-term O&M costs;
- After the existing Consent Decree is complete and the Layon Landfill is transferred back to GovGuam to manage, GovGuam should conduct a cost-benefit analysis on the feasibility of permanently privatizing landfill operation and maintenance activities to lower operating costs; and
- Refinance existing bond structure to accommodate a longer term and lower payment schedule.

This is a significant potential issue for the Government of Guam and the GSWA. According to GSWA’s spring 2012 Rate Setting Model, debt service payments for the Layon Landfill will increase to \$15.7 million in September 2013, of which \$3.7 million annually is expected to be paid by “other sources”, principally a portion of Guam’s Section 30 revenues. Total revenues for GSWA are projected at \$21.4 million for 2013, increasing to \$24.9 million by 2015. These revenue levels assume a commercial tipping fee of \$225 per ton, and residential collection costs increasing from \$30 per month in 2012 to \$45 per month in 2015. The financial summary of the Rate Setting Model is shown in Table 5-5. As shown in the Table, it is anticipated that the proposed rate structure could result in a deficit of almost \$5.5 million for the year. Additionally, the residential collection service currently operates at a substantial deficit of almost \$3 million annually.

TABLE 5-5. SUMMARY OF GSWA'S SPRING 2012 RATE SETTING MODEL RESULTS¹

2013 ESTIMATES ²	
REVENUES	
Disposal Tipping Fees	\$14,167,234
Residential Collection Fees	\$7,345,200
Self-Haul Fees	\$309,000
Other Revenues	\$32,651
Uncollectable Accounts	\$(430,429)
TOTAL REVENUES	↑ \$21,423,656
EXPENSES	
Administration ¹	\$1,743,140
Landfill Ops/Related Activities	\$2,872,880
Residential Collection	\$10,323,743
Net Debt Service	\$11,980,494
Total Expenses	↓ \$26,920,257
SURPLUS (DEFICIT)¹	↓ \$(5,496,601)

¹ Restated from the Guam Solid Waste Authority Receiver's Quarterly Report to the Federal Court, dated July 18, 2012, Rate Setting Model Spring 2012, Tab 11d, Full Government Reimbursement Rate Option (Gershman, Brickner & Bratton, Inc., 2012).

² The Rate Setting Model projects a deficit of \$3.7 million for 2013 under the Full Government Reimbursement Model. However, the model appears to calculate the deficit based solely upon revenues and direct operating costs, which does not account for GSWA's cost of administration of \$1.7 million.

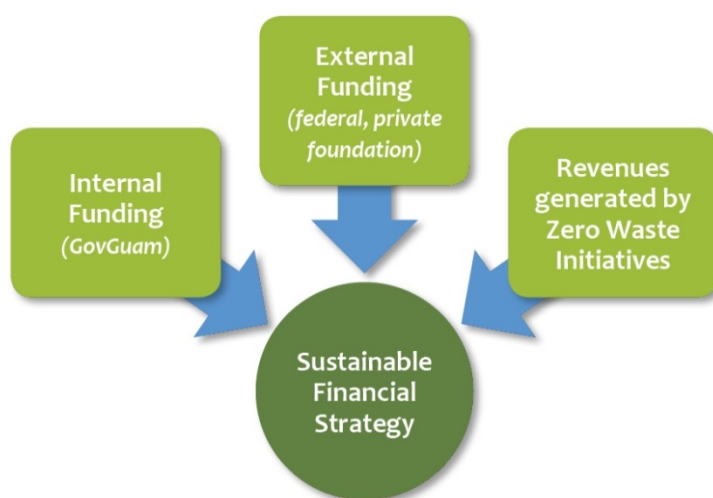
In the simplest terms, the successful implementation of a Zero Waste Program could result in diversion of 8,700 tons of waste from the Layon Landfill in 2015, more than 9% of the total tonnage projected by GSWA in their Rate Setting Model. As discussed in Table 5.5, this equates to \$1.2 million in avoided tipping fees at the current rate of \$174.57 per ton, and \$1.55 million at GSWA's projected 2013 tipping fee assumed in the spring 2012 Rate Setting Model of \$225 per ton. As the Zero Waste program becomes more successful, diverted tonnage could approach 50,000 tons by 2030, though some of this tonnage would be from building materials, which are not accepted at the Layon Landfill.

In order to offset this reduction in revenue, a profit-motivated owner would typically reduce expenses or raise service costs (revenues). Reducing expenses could take the form of reduced hours of operation, termination of some staff positions, a reduction in benefits or a renegotiation of the operator's contract. Some of these strategies may not be politically acceptable, while others may be affected by outside influence such as the Federal Court system.

Funding Strategy

No Zero Waste Plan would be complete without a discussion regarding funding. The long-term savings and economic benefits from implementing a Zero Waste Program will eventually dwarf the initial investment. However, while the long-term savings of Zero Waste Programs may be significant, many of the program initiatives require multiple years of investment before savings are seen.

The use of a combination of internal and external funding sources to build a sustainable financial strategy is recommended. Although external grant funds may be available in some cases to assist with initial capital costs for facilities and equipment, ongoing operational expenses for the Zero Waste Program will most likely need to be funded through internal funding sources. Additionally, because external grant funds can take a considerable amount of lead time to obtain, this funding source may also not be available during funding of the early phases of the Guam Zero Waste Program.



A summary of various funding strategies that GovGuam could utilize, in whole or in part, to fund the Zero Waste Program is summarized herein and presented in more detail in Volume II, White Paper O. Over time, the use of a more diversified funding strategy, which potentially includes the addition of revenues generated by the various Zero Waste initiatives implemented and grant awards, should be evaluated.

Landfill Tipping Fee Surcharge

All landfills charge a tipping fee or “gate” fee. A small increase in the fee paid per ton by commercial customers (who pay tipping fees for Layon Landfill-bound waste at GSWA’s contracted commercial transfer station) and in the service fees paid by residents who receive curbside trash collection can generate significant fees. For example, during 2012 approximately 89,500 tons of solid waste was disposed of at the Layon Landfill, including MSW from 17,000 homes, waste collected through GSWA’s convenience centers and commercial waste (Anderson, 2013). The potential funding impacts of a 1% to 5% increase over current tipping fees/collection rates are summarized in Table 5-6 below. As shown, a 1% increase in commercial tipping fees would generate more than \$106,000, while a 5% increase would generate more than \$530,000 in funding. Similarly, an increase of 1% in residential collection costs would generate more than \$61,000 in annual funding, while a 5% increase would generate more than \$300,000 in annual funding.

TABLE 5-6. POTENTIAL ZERO WASTE PROGRAM FUNDING FROM LANDFILL TIPPING FEE SURCHARGE

SERVICE TYPE	BASIS	UNITS	FEE	PER	FUNDS GENERATED
Commercial ¹	61,000	Tons	1%	Ton	↑ \$106,488
Commercial ¹	61,000	Tons	2%	Ton	↑ \$212,975
Commercial ¹	61,000	Tons	3%	Ton	↑ \$319,463
Commercial ¹	61,000	Tons	4%	Ton	↑ \$425,951
Commercial ¹	61,000	Tons	5%	Ton	↑ \$532,439
Residential ²	17,000	Homes	1%	Year	↑ \$61,200
Residential ²	17,000	Homes	2%	Year	↑ \$122,400
Residential ²	17,000	Homes	3%	Year	↑ \$183,600
Residential ²	17,000	Homes	4%	Year	↑ \$244,800
Residential ²	17,000	Homes	5%	Year	↑ \$306,000

¹: Transfer Station Tip Fees, commercial collections shown in tons

²: Curbside Collection Fees, residential collections show by number of houses/accounts serviced.

A combination of residential and commercial fees dedicated to Zero Waste is one approach available to GovGuam to fund a program which can have a positive effect on Guam's solid waste management practices. For example, a 3% fee for both commercial and residential customers would generate just over \$500,000 annually. Additional revenue could be generated if transfer station fees are also increased. the 2012 GSWA Rate Setting Model identifies \$14.2 million in tipping fees and \$7.3 million from residential collections. Increasing the tipping fee by 5% would generate additional revenue of more than \$700,000.

Gross Receipts Tax Surcharge

According to the Governor's FY 2013 budget request (GovGuam 2013), revenues are expected to exceed \$693.7 million. Expected revenue sources include:

- Income Tax – \$412,892,666;
- Business Privilege – \$218,282,984;
- Federal Sources – \$50,669,528;
- Other Taxes – \$3,619,372;
- Other Sources – \$ 8,274,204.

Among these sources, the Business Privilege Tax also referred to as the Gross Receipts Tax or (GRT) offers the next highest potential as an internal source of funds to support the Zero Waste Program. The use of privilege taxes (also known as occupational taxes) to generate public program income is common throughout the United States. Some local communities (such as Boulder, Colorado) leverage an occupational tax on trash haulers specifically to fund its Zero Waste Program.

As stated in the Governor's FY 2013 budget, the GRT is projected to generate \$218.3 M in 2013 at the present tax rate of 4.0%. As shown in Table 5-7, every 0.1% incremental increase in the GRT rate would produce an incremental increase in revenues from the GRT of just over \$218,000. Incremental changes to the GRT could generate significant funding for the implementation of the Zero Waste Program. Every incremental increase in the GRT rate would produce an estimated \$218,000 for Zero Waste Programs.

TABLE 5-7. POTENTIAL ZERO WASTE PROGRAM FUNDING FROM GRT RATE INCREASE

GRT RATE	INCREMENTAL REVENUE
4.0%	\$-0-
4.1%	\$218,283
4.2%	\$436,566
4.3%	\$654,849
4.4%	\$873,132
4.5%	\$1,091,415

From a practical perspective, a combination of a landfill tipping fee surcharge and a GRT Rate surcharge dedicated to funding a Zero Waste Program is another reasonable approach to funding this program. A more detailed discussion regarding creating a sustainable funding strategy is presented in Volume II, White Paper O.



Please see the next page.



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



6. EDUCATION, OUTREACH AND PUBLIC AWARENESS

6. EDUCATION,
OUTREACH & PUBLIC
AWARENESS

GUAM ZERO WASTE PLAN

Please see the next page.

6. EDUCATION, OUTREACH AND PUBLIC AWARENESS

Most of the Zero Waste initiatives identified in the Zero Waste Plan have a public education and outreach component. Many different marketing and communication strategies can be implemented to get the word out about Guam's Blueprint for Zero Waste. There are numerous volunteer and business programs currently in place to promote recycling and Zero Waste awareness on the island of Guam. Non-profit organizations and volunteers have accomplished much of the public education and outreach efforts on Guam to date. To reach higher levels of diversion and the goals of Zero Waste, a formal public education program needs to be established, which requires staff, budget, supplies, outside expertise, and political and institutional support.



very important to work closely with the Village mayors.

Establishing an education program will need permanency of funding and staffing. Fortunately for the Zero Waste Program, there is an existing network of education and outreach providers to draw from including the MCOG, RAG, i*Recycle, GEPA and its public relations program, USEPA, the local recycling community and GSWA as well as committed academic resources from the UOG faculty, students and its Center for Island Sustainability. While all of the potential providers in the network are important, the MCOG is likely the most influential in ensuring a successful education and outreach program, and it will be



An education, outreach and public awareness program which gives careful consideration given to the unique characteristics specific to Guam, including distinct language and cultural considerations, the influence of the MCOG, large military presence, large influx of people moving to Guam, tourism and hospitality industries, local media, and existing businesses must be developed. A summary of the immediate actions which need to be implemented with respect to implementing an education, outreach and public awareness campaign include:

- Form a Public Education and Outreach Advisory Committee consisting of members of stakeholder groups
- Hire part-time staff dedicated the Outreach program
- Conduct community relations surveys

- Develop a strategy
- Develop program logo, brand and graphics
- Develop program identity and branding
- Continue and build-upon current education and outreach efforts
- Consider developing incentives with monetary rewards and public recognition awards for the villages to participate
- Develop information for Guam newcomers
- Develop information systems to support tourists' understanding of Guam's Blueprint for Zero Waste
- Integrate existing tourism and hospitality and military education and outreach efforts into the campaign
- Launch a website and social media campaign to link with supporters

An implementation strategy which discusses each of the actions identified above is presented in more detail in Volume II, White Paper N.



7. MEASURING SUCCESS AND NEXT STEPS



GUAM ZERO WASTE PLAN



Please see the next page.

7. MEASURING SUCCESS AND NEXT STEPS

You can't manage what you don't measure. This old management saying is as true today as when the thought was first developed. Unless you measure something you don't know if it is getting better or worse. With a clearly established metric for success, you can monitor and review progress. Implementing a philosophy of continuous improvement and having a strong “can do!” attitude will go a long way in helping the government and people of Guam realize their goal of Zero Waste and preserve the environment for Guam's children and the future.

Measuring Success

To ensure that Guam's Zero Waste Program is optimally effective, the following activities should be implemented to measure its success.

Data Collection and Measurement

The collection of accurate data is an essential starting point for any source diversion program, including a Zero Waste Program, because of its role in identifying obstacles, opportunities, efficiencies and progress. The collection of accurate data is also very important with respect to justifying future grant fund requests for the Zero Waste Program. Data collection and measurement is an on-going process that begins with establishing a baseline data set that is subsequently used as a basis of comparison for future program measurement. In 2012, Guam's MSW diversion rate (primarily recycling) was measured for the first time, and a rate of 17.85% by weight was calculated for calendar year 2011 (GEPA, 2012). This work was completed by GEPA with support from USEPA. Current measurement efforts do not include C&D materials, and these materials need to be added to support comprehensive measurement and evaluation of

the Zero Waste Plan over time. Detailed recommendations for expanding on-going data collection and measurement efforts in the future include:

- Adding organics data, construction & demolition debris and reuse materials;
- Using export data to improve accuracy; and
- Reporting by recyclers to promote successful diversion efforts.

Capture of material currently not measured is critical to the tracking of overall zero waste efforts on Guam. Also critical to the success of the on-going data collection and measurement activities, as well as the overall zero waste efforts on Guam will be the completion of a comprehensive waste characterization study as soon as

possible. See Volume II, Technical Memorandum 3 for a detailed evaluation of Guam's current measurement program and recommended improvements/future actions related to the measurement program.

Monitoring and Review

Regular updates to the Guam Zero Waste Plan will be essential to evaluating progress and adjusting short-term strategies, such as modifying program targets or accelerating Zero Waste Programming. While long-term planning is essential to establish goals, priorities and strategies, many variables are so dynamic that quantity, revenues/landfill savings and cost projections need to be re-evaluated every few years to have real value.

Continuous Improvement

Simply put, continuous improvement is an ongoing effort to improve. Continuous improvement efforts include incremental improvement over time and breakthrough improvement all at once. It will be essential for GovGuam to continuously improve the Zero Waste Program, share the information that is collected with stakeholders and the public, publicize successes, and keep enthusiasm for Zero Waste efforts high.

Next Steps

Section 5 of this Plan identifies key steps recommended to create a successful Zero Waste Program on Guam, there are also a number of important ancillary activities that GovGuam and its stakeholders should consider undertaking to improve the efficiency and success of Guam's Zero Waste Program. These include:

- Make an early commitment to the Guam Zero Waste Plan, beginning with the establishment of Zero Waste goals, adopting this Plan and collaborating with Zero Waste stakeholders from the public, private and non-profit sectors.
- Obtain appropriate legal counsel review of all policy and funding strategies suggested in this Plan.
- Complete a comprehensive, Guam-specific waste characterization study as soon as possible to obtain a defensible, robust set of baseline data. Among other benefits, this will allow GovGuam to ensure that the appropriate materials are being targeted for diversion, and will allow for a more accurate determination of where the most significant payoff for investment (i.e., "bang for the buck") is likely to occur.
- Consider additional policies and programs to support organics diversion (e.g., curbside collection, regulatory clarifications for processing, and ban disposal in all facilities).
- Consider additional policies to incentivize diversion of hardfill materials – address any unenforced permitting regulations, increased hardfill disposal fees.
- Pursue partnership opportunities with all sectors to share equipment, property, staffing, including the military (especially for C&D diversion).
- Conduct feasibility studies for processing facilities to more definitively identify costs.
- Develop local markets, especially for compost and recycled C&D materials.
- A separate study to determine how GovGuam could go about requiring that public buildings on Guam meet the U.S. Building Council's Leadership in Energy and Environmental Design (LEED) requirements or a similar program.
- Begin working with the Micronesian Chief Executives (MCEs) to export Guam's Zero Waste success and support other regional Zero Waste goals and initiatives.



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



8. REFERENCES



GUAM ZERO WASTE PLAN

Please see the next page.

8. REFERENCES

Additional references located in each White Paper and Technical Memo included in Volume II of the Plan.

Anderson, 2013. Email from Chace Anderson, GB&B to Julie Carver, Matrix. March 25.

Cascadia, 2009. Recycling and Economic Development – A Review of Existing Literature on Job Creation, Capital Investment, and Tax Revenues. Prepared for King County Linkup. April.

GEPA, 2012. Recycling In Focus Fact Sheet, November.

Gershman, Brickner & Bratton, Inc. 2012. Civil Case No 02-00033. Quarterly Report of the Receiver to the Federal Court. July 18.

GovGuam, 2013. Office of the Governor. 2013 Budget, Governor of Guam, Maga'lāhen Guahan EXECUTIVE BUDGET, Page 3. <http://bbmr.guam.gov/FY2013%20EXECUTIVE%20BUDGET%20REQUEST.pdf>

Guam Visitors Bureau, 2013. Five Year Strategic Plan. www.visitguam.org. February 15.

ISLR, 2002. Salvaging the Future: Waste Based Production/Recycling Means Business: <http://www.ilsr.org/recycling-means-business>. February.

ISLR, 2013. Pay Dirt – Composting in Maryland to Reduce Waste, Create Jobs & Protect the Bay. May.

New York State, 2008. Zero Waste.

Recycling Works!, 2011. <http://www.recyclingworkscampaign.org/2011>.

Tellus Institute with Sound Resource Management, 2008. More Jobs, Less Pollution: Growing the Recycling Economy in the U.S.

U.S. Census Bureau, 2012. www.uscensus.org

U.S. Environmental Protection Agency, 2013. <http://www.epa.gov/waste/conserve/rrr/rmd/dpcs>. April 3.

Please see the next page.



ONE GUAM
ONE ISLAND. ONE VISION. ONE FUTURE.



ACRONYMS

GUAM ZERO WASTE PLAN

Please see the next page.

ACRONYMS

C

C&D construction and demolition

D

DOD United States Department of Defense

E

EPP Green/Environmentally Preferable Purchasing

EPR Extended Producer Responsibility
e-wastes Electronic wastes

F

FTE full-time equivalent

G

GCA Guam Code Annotated
GDPW Guam Department of Public Works
GDOA Guam Department of Administration

GEPA Guam Environmental Protection Agency

GRT Government of Guam
Gross Receipts Tax

GSWA Guam Solid Waste Authority

H

HDPE High density polyethylene

L

LEED Leadership through Energy and Environmental Design

M

MCOG Mayors' Council of Guam
MSW municipal solid waste
MCEs Micronesian Chief Executives

N

NAVFAC Naval Facilities Engineering Command

NGOs Non-governmental organizations

O

OEA Office of Economic Adjustment

P

PAYT pay-as-you-throw
PET polyethylene terephthalate plastic
Plan Zero Waste Plan
ppcd pounds per capita per day

R

RAG Recycling Association for Guam
RCRA Resource Conservation and Recovery Act

S

SF square foot

U

U.S. United States
UOG University of Guam

Z

ZWAG Zero Waste Association of Guam

