



Puerto Rico Trash & Landfill Crisis



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Proposed Solution for Puerto Rico Trash Crisis

Packet One ***General Information***

Includes:

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Tackling the garbage crisis in Puerto Rico



Background:

With the Puerto Rico garbage problem recently becoming front and center in global news, many didn't know that it's a problem that has existed for a very long time. Puerto Rico is in the midst of a crisis. Being an island nation, there aren't too many options for disposing of their municipal solid waste (MSW). There are only a couple of means of getting rid of the trash, at least until now.

Typically, it shouldn't be a matter of cost, since there are numerous ways to use the process in a waste-to-energy (WtE) operation. But the problem with Puerto Rico is that it's an island. Similar to the issue in Hawaii, generating electricity can only be used on the island itself (obviously Hawaii has several islands, but there is no way to easily transmit the electricity to other islands). A process known as **micro-grid** is the idea that no energy comes in or goes out. It can be used in a variety of applications, such as small, remote towns, or globally for remote villages. Another name for micro-grid is **islanding**, which makes sense. Since there would be no way to sell the electricity generated, the value would be from the use of the electricity at a significantly lowered cost.

But there is a solution that can offset that. Recent figures show that there are more than 5 million tourists that visit Puerto Rico each year. The idea would be to charge tourists a fee upon arrival, or through the tickets for their flights into the Luis Muñoz Marín International Airport. If a simple \$2 fee was applied, they would collect more than enough to build a single WtE facility. In addition, local businesses could also pay a fee to build the facilities, as more would surely be needed. The PR government could still collect the tourist fees and give electricity at reduced rates to those businesses that cooperate. Another revenue generation could come in the form of tipping fees. The tipping fees vary anywhere from \$10 per ton to \$35 per ton, but will be set according to industry standards based on location and volume of waste intake.

Immediate strategy:

The immediate strategy is to contact the Authority for the Financing of Industrial, Tourism, Educational, Medical and Environmental Control Facilities (Government Bank) in PR. I have reached out to my contacts in Senate and House offices in Washington D.C., gathering information and contact details for the various federal agencies that handle Puerto Rico. I will also be contacting:

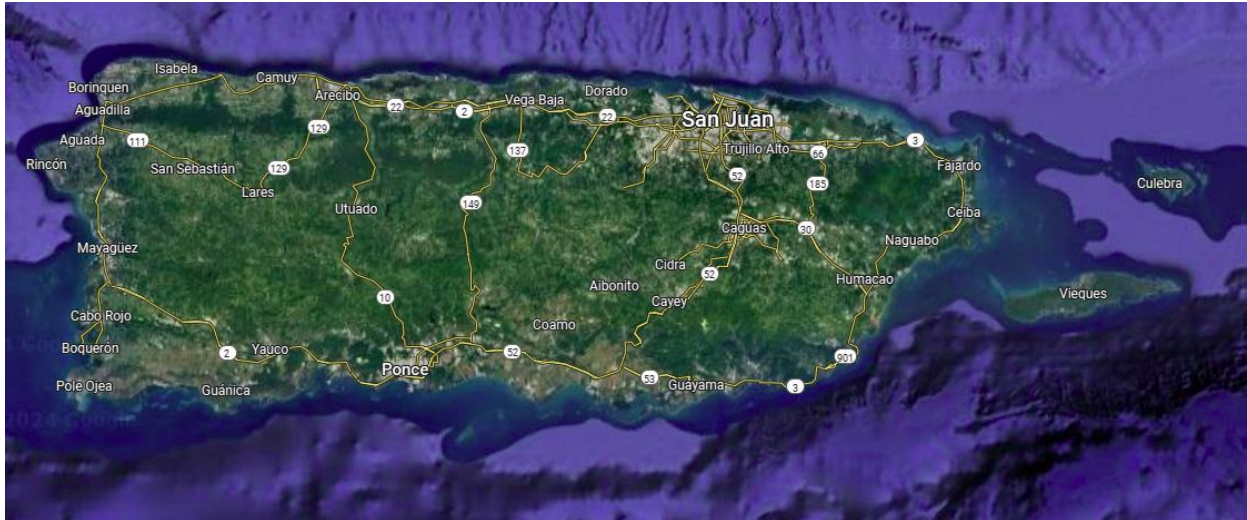
- ✓ FEMA Region 2,
- ✓ FEMA's Grace Lee – Director Interagency Coordination Division,
- ✓ COR3 also known as Central Office for Recovery, Reconstruction and Resiliency
- ✓ Current offices of Jenniffer González-Colón, member of the U.S. Congress, and recently elected as Governor of Puerto Rico, assuming the office in January 2025
- ✓ Contacting the two primary waste haulers: CONWASTE and EC Waste to introduce this resource

Our recommendation is to select a smaller landfill, preferably one that is still active. At that site, we would install a thermal vortex unit only, without energy recovery. This will allow us to collect specific data on the operations, and then offer a scaled up process for larger landfills. With this WtE technology being modular, any location can start off with only the Thermal Vortex Technology or TVT, and later add the energy recovery components, namely the waste heat boiler and the steam turbine generator. The value comes with this technology because of the various applications that can be deployed. This can be used as:

- ✓ Processing MSW in the form of typical curb side and industrial waste
- ✓ Processing landfill waste for reclamation purposes
- ✓ Disaster cleanup and waste elimination
- ✓ Construction and demolition (C&D)

The focus will be on the landfills

Puerto Rico has 29 active landfills; most are at or over capacity. In the most recent information, the United States EPA got directly involved and ordered 12 of those landfills to close, which can take many years to be able to do so properly.





Simple description of our process

Our two basic scientific principles deal with combustion in general, and stoichiometric combustion, also known as **“complete and perfect combustion.”** (*See Thermal Vortex for Dummies to learn more about complete and perfect combustion.*)

In addition, we can also explain why we are able to achieve such an extensive level of efficiency, and why our performance will easily exceed current standards, including the strictest standards in the world with AQMD, the Air Quality Management District in Southern California.

Simply put, we don't follow all of the typical methods for processing waste materials. Our technology is actually closer to being a fumes burner than an incinerator, in that the **waste material is shredded** and fed into the chamber, where it **burns in full suspension inside the vortex**, and never rests. When waste material rests on a grate, and has a constant flame from a fuel source underneath, that material smolders, and results in an **“incomplete combustion.”**

Through our patented design (Pat # 11835,231), we are able to enhance typical parameters of combustion, and offer much higher levels of performance. Essentially, we shred the waste material (1½ inch chip size and smaller), blow it into the chamber with our primary air feed (enhanced with heated air), where it is blended tangentially (meaning that it moves in the same direction as the vortex to avoid any “friction”) into the 2,000°F, 90 mph vortex (tornado on its side). The waste material undergoes the first phase in our process, which is the thermal destruction. As any of the material is moved to the back wall, whatever has mass to it, even microscopic dust particles, it travels along that back wall, then moves forward on the flue pipe that extends inward, where it then reaches a low pressure point along with a baffle that forces it to be deflected and reintroduced to the vortex slightly upstream. *(That's a lot of technical jargon that simply means that the combustible waste material burns up, becomes ash, and gets redirected back upstream in the vortex where the combustible material repeats this operation until completely converted to gases and is able to exit the exhaust portal.)*

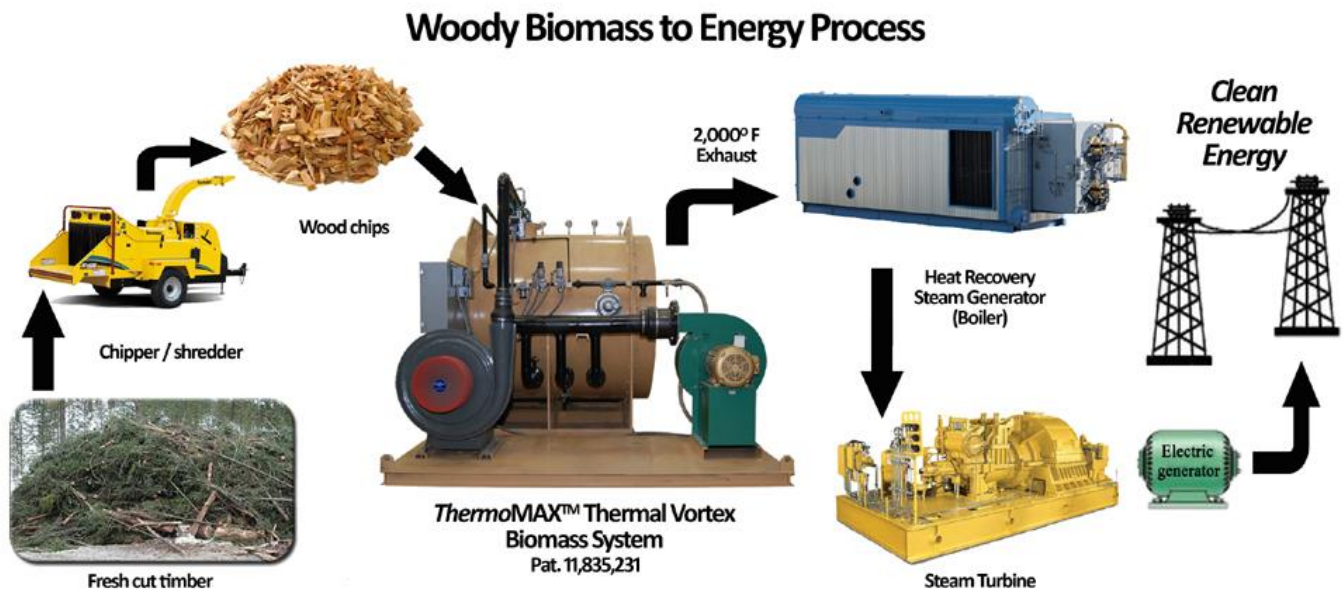
In addition to the efficient combustion process, and again through proprietary methods, we introduce additional air flows in a manner that increases the performance level significantly. In fact, during a demonstration using a unit we built for a company from Poland, we achieved our primary performance levels (minimum 1,800°F and 90 mph vortex) using only 40% of our air intake! Because of our extensive efficiency level, and the fact that since we don't require exhaust scrubbers, our temperatures are never reduced, we are able to produce higher flow rates. ***We are able to more than double the typical performance,*** and produce sufficient exhaust flow to boil the required volume of steam that will be used with the steam turbine to produce electricity. ***Because of our fire bricks and refractory materials, with 2,000°F inside the chamber, the external steel material will be whatever the ambient temperature is. That means you can touch the outer steel shell while in full operation, and you will feel the temperature of the surrounding area. Because of this, we create a 98% thermal efficiency inside the chamber.***

To summarize, we shred the waste material, introduce it into the thermal vortex chamber with a pneumatic (air forced) conveyor, and with enhanced designs, we are able to achieve **complete and perfect combustion**. We easily produce significantly higher performance levels than conventional methods, with a byproduct of super-heated, clean exhaust that can then either be expressed into the atmosphere, or used in a waste-to-energy (WtE) system with a *waste heat boiler* to generate steam that will in turn be used in a *steam turbine* and produce clean energy.

Technology Brief

Our Technology (nothing is on the market that even comes close to this)

This newly patented technology is an upgraded version of a 150+ year old process for generating electricity, that consists of a heat source, waste heat boiler, and a steam turbine. What we have done is to replace the heat source such as a coal-fired furnace or gas turbine, with a smaller sized, more efficient, and more productive system. We can destroy a variety of waste materials (and the only technology that can mix waste materials) that burn in full suspension inside the vortex at 2,000°F in a 90mph tornado, or vortex. This now becomes an extremely efficient and powerful waste-to-energy (WtE) system.



Our smaller unit can process up to 4 tons per hour of municipal solid waste (MSW), or 96 tons per day. (Our larger unit processes up to 8 tons per hour of MSW, or 192 tons per day!) That's enough to handle all of Shelby County Indiana's MSW (excluding industrial, commercial, and institutional waste collection), and with the boiler and steam turbine added, can generate enough clean, sustainable electricity to power roughly 6,000 average sized homes, or 12,000 for the larger system.

Benefits

- 🌀 Long life cycle on the vortex chamber that requires virtually no ongoing maintenance
- 🌀 Small physical footprint (Full WtE facility can fit easily into a 15,000 square foot building)
- 🌀 Extremely small carbon footprint. After 15 to 20 minutes, the external fuel source, whether natural gas, methane, or propane, can be shut off since the waste materials become their own fuel.
- 🌀 Because of its relatively low up-front cost and very low maintenance or upkeep costs, using the revenues from the sale of the clean energy, a full WtE facility can reach a return on investment in as little as 12-18 months. This can be accomplished even without subsidies and some tax credits that virtually all other forms of energy production require.
- 🌀 In terms of waste destruction, this system offers additional benefits not found in typical one-dimensional waste technologies with the addition of being able to integrate with energy production components.

Available Markets (Applications or fuel sources)

The following market amounts are based on using our most efficient system as part of a WtE facility, which is the lowest cost solution that will also generate significant revenues.

Municipal Solid Waste (MSW)

With a current population of 341,953,640 in the United States, and considering industry figures showing each American produces a whopping 1,700 pounds of waste each year on average, that means that there is approximately 291 million tons of waste. That means a potential annual market revenue of more than \$46 billion.

Landfill reclamation

Although nearly 50% of MSW is deposited into the nearly 2,000 active landfills, this section will focus on reclamation efforts, to include the more than 10,000 closed landfills in the U.S. Based on the number of WtE systems in each landfill, it the potential market revenue can be between \$134 billion and over \$1.3 trillion.

Woody biomass (forest thinning) / Agricultural waste (corn, sugar cane, rice hulls, sargassum...)

According to a joint report by the USDA and the US Dept. of Energy regarding biomass materials available each year in the U.S., there is a total of 1.366 billion tons. That gives a potential annual market revenue of nearly \$290 billion.

Medical / Hospital / Infectious waste

The latest information states that there is an estimated 5.9 million tons of medical waste produced annually. That gives a potential annual market revenue of \$1.5 billion.

Scrap tires

In the U.S. alone, we dispose of over 300 million tires each year. With an extremely high thermal value, or BTU value, it requires a smaller amount of shredded tires to produce the same amount of super-heated exhaust as 4 times that of MSW! The potential annual market value is just about \$3 billion, plus currently stockpiled tires for an extra of \$569 million.

Information for volume of MSW based on different populations per week

The amount of municipal solid waste generated per week can vary significantly based on a number of factors including location, local recycling practices, waste management policies, and the standard of living. However, a general estimate can be made using average waste generation rates. In the United States, the average person generates about 4.9 pounds of solid waste per day, according to the Environmental Protection Agency (EPA). That's far higher than the global average of 1.6 pounds per day.

The total weekly estimated calculation of waste for municipalities of different populations:

1. For a population of 10,000:

Daily waste=10,000×4.9 lbs=49,000 lbs/day

Weekly waste=49,000 lbs/day×7 days=343,000 lbs=**171.5 tons**

2. For a population of 15,000:

Daily waste=15,000×4.9 lbs=73,500 lbs/day

Weekly waste=73,500 lbs/day×7 days=514,500 lbs=**257.25 tons**

3. For a population of 20,000:

Daily waste=20,000×4.9 lbs=98,000 lbs/day

Weekly waste=98,000 lbs/day×7 days=686,000 lbs=**343 tons**

4. For a population of 25,000:

Daily waste=25,000×4.9 lbs=122,500 lbs/day

Weekly waste=122,500 lbs/day×7 days=857,500 lbs=**428.75 tons**

The **ThermoMAX3™** can accept up to 4 tons per hour for MSW (based on typical waste composition models and factoring for the amount of non-combustibles) = 96 tons per day / 672 tons per week. The calculation can be made for cities based on their size, but keep in mind that this would be to destroy all MSW for the entire population. For larger populations, and to reduce carbon emissions from additional transportation of the waste materials, multiple systems could be installed in different areas of the municipalities. Also, the **ThermoMAX6™** can accept up to 8 tons per hour for MSW, which is 192 tons per day / 1,344 tons per week. Using the information above, 3 **ThermoMAX6™** systems could be used for a population of 75,000.





Puerto Rico is grappling with a pressing trash problem that's not just a visual blight, but a serious threat to its stunning landscapes, marine life, and the environment. The urgency of this crisis is underscored by its far-reaching impacts on health, tourism, and the economy. Let's delve into the reasons behind this crisis, its profound effects on Puerto Rico, and the ongoing efforts to restore the island to its former glory.

Trash Problem Overview

The Puerto Rico trash problem has been growing for decades. With a population of around 3.2 million, the island generates about 3.7 million tons of waste yearly. Despite being small, the island's landfills are full and there's no proper recycling infrastructure. This trash crisis affects everything from health to the economy so solutions are crucial for Puerto Rico's future.

Why So Much Trash in Puerto Rico?

Here are the main reasons:

1. **Limited Landfill Space:** Puerto Rico's landfills have been full for years and many are already at capacity.
2. **No Recycling Programs:** Recycling is scarce and only 10% of waste is recycled on the island.
3. **High Consumption:** Like everywhere else, Puerto Rico has a high consumption of goods, plastic, and single-use items.
4. **Tourism:** Tourism brings millions of visitors to the island every year and more trash.
5. **Weak Waste Management Infrastructure:** [Hurricanes](#) and other natural disasters have weakened the waste infrastructure making cleanup efforts harder.

These two factors create a cycle of waste accumulation and put a lot of pressure on the environment and the people of Puerto Rico.

How Waste Affects Puerto Rico’s Environment

Trash on the streets and beaches is just the surface. The waste problem affects the air, water and soil. Here’s a quick rundown:

Environmental Impact	Description
Water Pollution	Waste contaminates local water sources, affecting drinking water and harming ecosystems.
Soil Contamination	Hazardous waste seeps into the ground, polluting soil and affecting agriculture.
Air Quality Issues	Open burning of waste releases harmful chemicals, reducing air quality.
Ecosystem Disruption	Wildlife habitats are damaged by trash in natural areas and the ocean.



Effects on Marine Life and Ecosystems

Since Puerto Rico is surrounded by water, its trash problem heavily impacts [marine ecosystems](#). Waste, especially plastic, ends up in the ocean, where it poses a serious threat to sea life:

- **Plastic Pollution:** Thousands of tons of plastic waste end up in the ocean each year, harming fish, turtles, and seabirds.
- **Coral Reef Destruction:** Trash covering coral reefs blocks sunlight and introduces toxins, harming these fragile ecosystems.
- **Marine Animal Injuries:** Animals mistake plastic for food or get entangled, leading to injuries or even death.

Health Risks from Waste

Puerto Rico Trash Problem aren’t just environmental; they can also impact human health. Here are a few of the main health risks associated with waste in Puerto Rico:

- **Disease Spread:** Improperly managed waste attracts pests like rats, which can carry diseases.
- **Waterborne Illnesses:** Trash in water sources contaminates drinking water, causing illnesses.
- **Respiratory Issues:** Burning waste releases harmful chemicals, affecting respiratory health.

Many communities in Puerto Rico face direct health risks due to the improper disposal and management of waste.

Economic Impact of Puerto Rico's Trash Problem

The **Puerto Rico trash problem** also has a significant economic impact. Trash-filled beaches and polluted streets discourage tourism, one of Puerto Rico's largest economic sectors. Additionally, it raises costs for cleanup and reduces the value of properties in trash-affected areas.

Real-time Data Example: Puerto Rico spends millions of dollars each year on waste management and cleanup efforts. An increase in tourism-driven waste after the COVID-19 pandemic has further raised these expenses, putting more pressure on local budgets.

Efforts to Manage Waste

What's Being Done Managing the **Puerto Rico trash problem** is a collective endeavor that involves government programs, community initiatives, and individual action. Here's a glimpse of the inspiring efforts, programs, and real examples of how Puerto Rico is taking proactive steps to address its waste crisis:

Waste Reduction Programs

The Puerto Rican government and local organizations have launched several waste reduction initiatives to address the Puerto Rico trash problem:

- **3Rs Program (Reduce, Reuse, Recycle):** In San Juan, this program encourages residents to reduce waste, recycle, and reuse whenever possible. With workshops in schools and community centers the program is working to increase recycling rates from the current 10% to 20% by 2030.
- **Zero Waste Puerto Rico:** An initiative led by local environmental groups like Basura Cero Puerto Rico, this program promotes sustainable lifestyles and zero-waste practices. They offer free resources on composting, teach communities how to reduce single-use plastics and partner with businesses to reduce waste. Several restaurants in San Juan like Café Común and Bebé Café have joined the initiative by replacing plastic packaging with compostable ones. The initiative has seen significant success, with a 15% reduction in plastic waste in participating businesses and over 2,000 residents attending workshops annually.

Example of Impact: Since its launch Zero Waste Puerto Rico has reported a 15% reduction in plastic waste in participating businesses, over 2,000 residents have attended workshops annually.

Community Cleanups: A Growing Movement

Community cleanups are a key part of Puerto Rico's fight against litter, especially on beaches and urban areas. Volunteers of all ages come together to clean their neighborhoods.

- **[Limpiemos Nuestra Isla \(Let's Clean Our Island\)](#):** This community-based program initiated by local non-profit Scuba Dogs Society organizes monthly cleanups across the island.



- In 2023 over 5,000 volunteers removed approximately 45,000 pounds of trash from beaches, parks and rivers. Popular cleanup sites are Isla Verde Beach in Carolina and Escambrón Beach in San Juan where plastic bottles, fishing gear and other debris accumulates.
- **Playas Limpias (Clean Beaches) Campaign:** Focused on tourist areas, this program encourages local businesses to sponsor cleanups. With the support of eco-friendly organizations it has cleaned up areas like Condado Beach and Playa Flamenco in Culebra. This campaign also includes educational sessions to educate tourists on proper waste disposal resulting in cleaner beaches and more waste in recycling bins.

Example of Impact: According to Playas Limpias reports [plastic waste at Condado Beach](#) has decreased 18% since 2022, over 200 businesses are supporting the campaign through funding and participation.

Puerto Rican Government Policies

To improve waste management in the island, the government of Puerto Rico has been working on policies to support sustainable waste practices and increase recycling:

- **Landfill Regulations:** In 2022 the Environmental Quality Board (EQB) tightened up the rules for landfills. They require better waste segregation and penalize landfills that exceed capacity. The Toa Baja Landfill for example has received funding to implement better waste sorting and on-site recycling facilities.
- **Act 247 – Recycling Promotion Law:** To promote recycling, Act 247 requires all municipalities to have recycling programs and drop off points for recyclable materials like glass, paper and electronics. Bayamón and Ponce have set up collection centers and recycling rates have increased 12% since 2021.
- **Single-Use Plastics Ban:** To [reduce plastic waste](#), Puerto Rico phased out single-use plastics in 2021. This includes plastic bags, straws and utensils, so businesses have to switch to biodegradable options. Businesses are incentivized to transition and there are tax breaks for those using compostable packaging.

Example of Impact: Thanks to the single-use plastics ban, restaurants and stores in Old San Juan have seen a 25% reduction in plastic waste, over 150,000 plastic bags replaced with biodegradable or reusable ones.

Results and Outcomes of Waste Management Efforts

It's starting to add up:

- **Recycling Increase:** Since Act 247 was passed, island wide recycling has gone from 8% to 10%. Still low but a positive trend and more recycling facilities are being planned for Arecibo and Caguas.
- **Beach Cleanliness:** Thanks to programs like Limpiemos Nuestra Isla, beaches are cleaner. According to Scuba Dogs Society's 2023 report, beaches that participate in the cleanups have 30% less trash than last year.
- **Community Involvement:** More Puerto Ricans are participating in cleanups, 20% more since 2022. This growing volunteer base shows a growing awareness of environmental issues and a shift towards sustainable practices among residents.

Individual Actions and Local Support

While government policies and organized programs are important, individual actions are key. Through educational programs and social media campaigns Puerto Rican residents are encouraged to:

- **Compost at Home:** Composting reduces household waste by turning organic matter into natural fertilizer. The Municipio Verde program offers free composting bins and instructions, over 1,500 households already participating.
- **Use Less Plastic:** Puerto Ricans are choosing reusable bags, bottles and containers. Stores like El Mercado Verde in Mayagüez offer discounts to customers who bring their own bags, reducing single-use plastic.

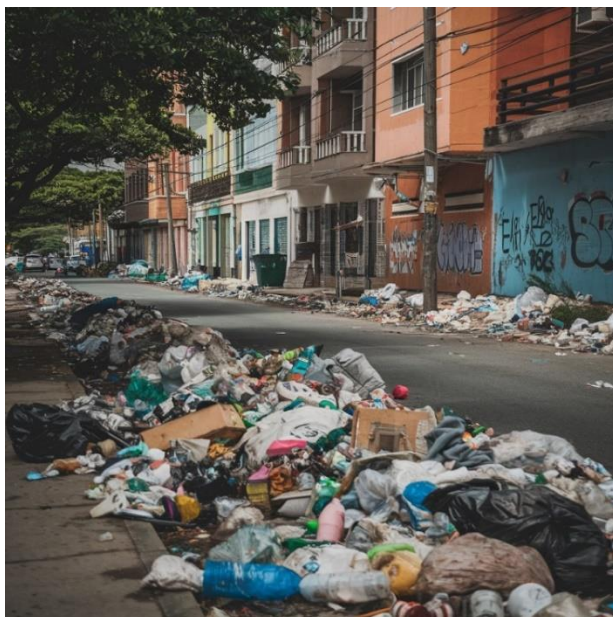
These combined efforts are gradually reshaping Puerto Rico's approach to waste, leading the way toward a cleaner and more sustainable future. Although challenges remain, these initiatives show that effective waste management is possible with a collaborative approach among government, organizations, and individuals.

What Individuals Can Do to Help

While the government and organizations work on large-scale solutions, individuals can also make a difference:

1. **Reduce, Reuse, Recycle:** Cut down on waste by [recycling and reusing](#) items whenever possible.
2. **Support Eco-friendly Businesses:** Buy from companies that prioritize sustainability and reduce waste.
3. **Participate in Cleanups:** Join local cleanup events to help keep communities and beaches clean.
4. **Educate Others:** Spread awareness about the trash problem in Puerto Rico and encourage sustainable habits.

Every small effort adds up, and individuals play a vital role in managing the trash problem.



Challenges in Solving the Trash Problem

Several challenges make it difficult to resolve Puerto Rico's waste issues:

- **Limited Funding:** Budget constraints make it hard for the government to invest in large-scale waste solutions.
- **Natural Disasters:** Hurricanes and storms disrupt waste management infrastructure, setting back progress.
- **Lack of Awareness:** Some residents are unaware of the severity of the trash problem or how they can help.

- **Inefficient Waste Systems:** Outdated waste systems make it hard to implement modern, sustainable practices.

Overcoming these challenges will require collaboration among communities, government, and international partners.

Future of Waste Management in Puerto Rico

Puerto Rico's future waste management plans are looking to address the current challenges with new approaches and sustainable solutions. As the island is facing overflowing landfills and low recycling rates, the government, environmental groups and the community are pushing for a transformation to reduce waste and increase recycling.

Increasing Recycling Rates and Infrastructure

- **Current Recycling Rate:** Puerto Rico's recycling rate is around 9-12% vs the US average of 32%. To achieve this, the government has set a target of 35% recycling rate by 2030. This will require a lot of investment in new recycling facilities and community engagement.
- **Expansion of Facilities:** Plans are to increase the number of materials recovery facilities (MRFs) across the island. In 2022 Puerto Rico allocated almost \$40 million to expand recycling infrastructure, with two new MRFs to be built in the San Juan metropolitan area by 2025. These facilities will increase local capacity to sort and process recyclable materials that are currently being exported off-island.

Zero-Waste Initiatives

- **Basura Cero Puerto Rico:** Basura Cero, or "Zero Waste Puerto Rico," is a growing movement to reduce waste generation. This initiative focuses on educating communities about composting, recycling and reducing single-use plastics. In 2023 Basura Cero reported that over 100,000 people participated in educational programs and several neighborhoods in San Juan reduced their waste by 25% in one year through community-led composting and recycling efforts.
- **Plastic Reduction Goals:** By 2035 Puerto Rico will eliminate single-use plastics. The implementation of a 2021 law that banned single-use plastic bags in large stores has already reduced plastic waste by 15% in the first two years. As more single-use bans are phased in, plastic waste will decline even more.

Waste-to-Energy (WTE) Initiatives

- **Potential WTE Facilities:** With limited landfill capacity Puerto Rico is exploring waste-to-energy (WTE) plants as a way to divert waste and generate electricity. A WTE facility in Arecibo has been proposed and could process 500,000 tons of waste per year and generate electricity for up to 150,000 households. If approved and built, this facility will reduce landfill waste by 15% and address both waste management and energy needs.

Biofuel Pilot Programs: Besides WTE plants, smaller pilot programs are converting organic waste into biofuel. One in Ponce will process 2,000 tons of organic waste per year and produce biofuel to power municipal vehicles, reducing emissions and waste.

Landfill Closures and Alternatives

- **Current Landfill Capacity:** Puerto Rico's landfills are at a critical tipping point, with over half of the island's 29 landfills either at or near capacity. The U.S. Environmental Protection Agency (EPA) has mandated the closure of at least 10 landfills that no longer meet safety regulations, putting further strain on the remaining sites.
- **New Landfill and Alternatives:** As an alternative, Puerto Rico's Department of Natural and Environmental Resources (DRNA) is studying potential sites for a modernized landfill facility with advanced waste sorting and recycling capabilities. The government is investing approximately \$20 million in landfill technology upgrades to prolong the life of existing sites and minimize their environmental impact.

Government Policies and Community Involvement

- **Policy Enforcement and Incentives:** The government is tightening enforcement on illegal dumping and waste violations, with fines up to \$5,000 for individuals caught dumping. Additionally, incentives such as tax breaks and grants are being offered to businesses that adopt zero-waste practices or invest in recycling infrastructure.
- **Community Engagement Programs:** To raise awareness, government-sponsored programs like *Puerto Rico Limpio* organize monthly clean-up drives in major cities. In 2024, over 200 community groups participated in island-wide cleanup initiatives, collecting approximately 500 tons of waste from public spaces and beaches. Public participation in such programs is increasing by 10% annually, showing a growing commitment to cleaner surroundings.

Looking Ahead

With these strategies in place, Puerto Rico is on a path to significantly [reduce waste](#), conserve resources, and protect the environment. If the island can achieve its targets, including the ambitious 35% recycling rate by 2030, it will serve as a model for other regions facing similar challenges. Transformative solutions, combined with policy enforcement and community action, indicate a promising future for waste management in Puerto Rico.

FAQs About Puerto Rico Trash Problem

1. What causes Puerto Rico's trash problem?

The trash problem is caused by limited landfill space, lack of recycling, weak waste management systems, and high consumption levels.

2. How does waste affect Puerto Rico's environment?

Waste affects water, air, and soil, leading to pollution that harms wildlife and disrupts ecosystems.

3. Are there recycling programs in Puerto Rico?

Yes, there are some recycling efforts, but they're limited and cover only about 10% of the island's waste.

4. What can residents do to reduce waste?

Residents can recycle, reduce single-use plastics, support eco-friendly products, and join cleanup efforts.

5. How does tourism impact the trash problem?

Tourism increases waste from disposable items and plastics, putting extra pressure on the island's waste systems.



Puerto Rico Landfill Problems: All You Need to Know

Published May 09, 2022

According to a study commissioned by the Federal Emergency Management Agency (FEMA) and conducted by the United States Environmental Protection Agency (EPA), Puerto Rico could run out of landfill space in 2-4 years. This long-identified capacity issue has been exacerbated by tonnes of debris left behind by two back-to-back hurricanes that devastated the region in 2017.



However, at least two big Puerto Rican waste companies believe that insufficient capacity is not the underlying issue. The largest sites claim that they can probably take in the trash for more than 30 years. They claim that the problems are primarily related to compliance and poor management, which seem to be the result of limited resources. Continue reading to learn more about the landfill issues in Puerto Rico.

Puerto Rico Landfill Situation

Randy Jensen, president, and CEO of EC Waste says, “There is an absolute landfill crisis in Puerto Rico, but it’s not air space. It is that we still allow 22 unlined dumps to accept waste. While we do have regulations, enforcement on the island is not consistent. I believe more consistent enforcement needs to occur across all waste receiving sites.”

[Municipalities own the majority of landfills.](#) And, for the most part, they are allowed to operate as they please, according to Carlos Contreras, CEO, and president of Consolidated Waste Services, which manages five landfills serving 19 jurisdictions. Some of the landfills he manages are lined, but not all.

Operators of pre-Subtitle D sites are permitted by law to add lined cells if the remaining unlined portion of the site is closed. Because it has already been determined that this space complies with a permitted use, expansion must take place within the landfill's original footprint. According to Ivelisse Estrada, president of Ecosystems, Inc., many Puerto Rican operators who are adding lined cells are not closing the unlined portions, and sometimes those cells remain active.

Another issue appears to be the slow pace of administrative progress. Contreras claims he has two landfills that need to be expanded for Subtitle D lined portions and has been waiting for permit approval for four years.

The time lag and issues that allow non-compliant landfills to operate are mainly due to the lack of funding and technical expertise.

According to some of the region's operators, another issue is the uneven distribution of facilities, which has resulted in an uneven playing field. Most landfills in the northeastern part of the island have reached capacity and closed, and this is where the majority of the waste is produced. There are a lot of sites in the southwest, but there isn't a lot of waste. Competition is fierce in the southwest, with operators lowering their tip fees so low that they are forced to invest in resources to meet Subtitle D regulations.

Meanwhile, according to the CEO of EC waste, Puerto Rico has nearly 100 million cubic yards of compliant air space and nearly 40 million cubic yards available for expansion (equating to more than 140 million tonnes total).



The Solution to Puerto Rico Landfill Problem

The EPA's Caribbean Environmental Protection Division is assisting with recovery funding and is collaborating with local and federal partners to identify recycling mechanisms for demolition materials.

The US EPA is assisting the Puerto Rican government as well in reviewing and permitting new compliant landfill cells. The EPA had also issued consent orders to some non-compliant landfills, for example, informing them that they must install interim covers and/or EPA-approved groundwater monitoring systems by specific dates or face penalties.

Smaller landfills that are not in compliance will be forced to close in five to seven years due to overflowing of waste. Contreras believes that there will be more fair competition as a result. Nonetheless, some non-compliant large sites may continue to accept waste in the future.

EPA Files Complaint against Puerto Rico Municipality over Landfill

The United States Department of Justice [lodged a complaint](#) in the District of Puerto Rico on February 25, 2021, on behalf of the United States Environmental Protection Agency (EPA) demanding that the municipality of Toa Alta stop disposing of solid waste at its landfill and take action to address public health and environmental threats posed by hazardous conditions at the landfill, which is being operated in violation of federal and commonwealth solid waste laws.

The complaint also requests that the court order the municipality of Toa Alta to pay civil penalties for violating an EPA order issued in 2017 that addressed issues at the landfill.

According to the complaint, the landfill poses three major threats:

- Toa Alta's municipality is taking insufficient measures to prevent large amounts of leachate – water mixed with harmful pollutants that seep from the landfill – from escaping into nearby neighborhoods, surface waters, and the underlying groundwater aquifer.
- The slopes of the landfill in certain areas are unstable and may collapse, potentially endangering people that work at the landfill and residents whose homes are near the landfill's foot.
- The Municipality has not consistently placed required soil on top of waste disposed of at the landfill at the end of each day's disposal activities. The use of this soil cover, also known as daily cover, prevents insects, vermin, birds, and trespassers from accessing landfill waste and aids in the prevention of disease spread, such as the dengue and Zika viruses.

Concerning the problems at this landfill, the EPA is in contact with the Puerto Rico Department of Natural and Environmental Resources. The EPA is collaborating with the department to improve solid waste management in Puerto Rico.

Puerto Rico Landfills: Is the Problem Around Capacity or Noncompliance?

Some waste companies in Puerto Rico claim landfill problems are around compliance and mismanagement rather than inadequate capacity.

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Puerto Rico could [run out of landfill space](#) in two to four years, reports a study the Federal Emergency Management Agency (FEMA) commissioned to the U.S. Environmental Protection Agency (EPA). This long-anticipated capacity problem has been heightened by tons of debris left in the [aftermath of two back-to-back hurricanes](#) that hit the region hard in 2017.

But at least two large Puerto Rican waste companies believe inadequate capacity is not the underlying problem; the largest sites can potentially take in trash for more than 30 years, they claim. They assert the issues are really around compliance and mismanagement, resulting mainly from limited resources.

“There is an absolute landfill crisis in Puerto Rico, but it’s not air space. It is that we still allow 22 unlined dumps to accept waste. While we do have regulations, enforcement on the island is not consistent. I believe more consistent enforcement needs to occur across all waste receiving sites,” says Randy Jensen, president and CEO of EC Waste.

Most of the landfills are owned by municipalities. And, for the most part, they are left to operate as they see fit, says Carlos Contreras, CEO and president of Consolidated Waste Services, which manages five landfills serving 19 jurisdictions. Some, not all, of the landfills he operates are lined.



By law, operators of pre-Subtitle D sites can add lined cells if the remaining unlined portion of the site is closed. Expansion has to be within the landfill's original footprint since it already has been determined that this space conforms with permitted use.

But many Puerto Rican operators that are adding lined cells are not closing the unlined portions, and sometimes those cells remain active, according to Ivelisse Estrada, president of Ecosystems, Inc.

Meanwhile, Estrada says she has to compete with these operators who can offer cheaper tip fees, which has put roadblocks in front of her and other operators who meet Subtitle D regulations.

"It took me 10 years to get permitted for my landfill. And it took nearly another 10 years to start construction because I could not find investors willing to pay what it would cost to run a compliant landfill. The numbers did not work out for them," she says.

Estrada eventually ended up securing her first contract with one customer through prearranged, upfronted pricing so she could build her first cell.



Another issue seems to be that movement is slow going on the administrative front. Contreras says he has two landfills requiring expansion for Subtitle D lined portions and has been waiting four years for permit approval.

The lag time and problems whereby noncompliant landfills are able to operate are largely due to insufficient funding and technical expertise.

Another problem, according to some of the region's operators, is related to the distribution of facilities, which has resulted in an unlevel playing field. In the northeastern part of the island, most landfills have reached capacity and closed, and that's where most of the waste is generated. In the southwest, there are plenty of sites but relatively little waste. Competition in the southwest is fierce, with operators there dropping their tip fees so low that they are pressed to invest in resources to meet Subtitle D regulations.

Meanwhile, Puerto Rico has nearly 100 million cubic yards of compliant air space and nearly 40 million cubic yards available for expansion by Jensen's calculations (equating to more than 140 million tons total).

Jensen himself has 40,480,000 tons of permitted airspace remaining. Estrada has capacity for about 32 million tons. Republic Services operates Puerto Rican landfills, too, but did not respond to *Waste30's* request for capacity figures.

But to put the confirmed figures in perspective—almost 73 million tons of permitted space between two companies—in one year, the island usually fills about 2.5 million tons of air space, says Jensen. Though the past few years have been exceptions, due to massive volumes of construction debris from two hurricanes. And the material is not being recycled, adds Jensen, who sees this situation as an opportunity.

“We [EC Waste] are establishing construction and demolition recycling facilities on the island because we believe if we can get policy change for reuse of material, it would be in the best interest

of Puerto Rico. We would reuse aggregates from demolished buildings for new buildings or reconstruction,” says Jensen.



EPA’s Caribbean Environmental Protection Division is stepping in to help with recovery funding and is beginning to work with local and federal partners to identify mechanisms to recycle demolition materials.

Carmen Guerrero, director of the U.S. EPA Caribbean Environmental Protection Division, told *Waste360* of other agency plans, which include assistance with developing an integrated solid waste management plan and waste characterization study. EPA is also helping the Puerto Rican government with its capacity to review and permit new compliant landfill cells, says Guerrero.

Recently, EPA has issued consent orders to some noncompliant landfills, informing them, for instance, they must install interim covers and/or EPA-approved groundwater monitoring systems by specific dates or be penalized.

The smaller landfills that aren’t in compliance will close in about five to seven years because they will be full. Then, there may be more fair competition, projects Contreras. Though there are still some noncompliant large sites that could potentially accept waste into the future, says Estrada.

“I have the hope that the regulatory agencies will make them close and/or become compliant so there will be a level playing field amongst all of us. But I’m not sure because I have been waiting for this to happen for 20 years,” explains Estrada.