Puerto Rico’s Waste Management Infrastructure

...an educated third-party perspective on 2017 Hurricane Season’s impact

Hanna K. Rodriguez-Morales, PE, SC
Our 100x35 Reality
Legal Framework

- 1978 - Creation of PRSWA
- 1992 - Recycling Act
- 2003 - Waste Characterization Study
- 2003 - Landfill Lifespan Study
- 2004 - Strategic Plan for Solid Waste Management (PERMS) & PREQB - Permitting
- 2008 - Infrastructure Dynamic Itinerary
Baseline Waste Management Issues

- Compliance
- Landfills are PR’s only means of disposal
- Tipping fees are low!
- Lack of funding streams for infrastructure improvements, closure, and post-closure costs
- Low diversion and recycling rates
Limited landfill space

Overfilling landfills choke Puerto Rico amid economic crisis
Published April 21, 2017

Associated Press
TOA BAJA, Puerto Rico – At first glance, it looks like people have abandoned this rural community tucked into Puerto Rico’s soft rolling hills: the windows are shut, the doors closed and the gates locked.

But everyone is still here, just sealed inside their homes to shield themselves from the stench, flies and dead dogs of the nearby landfill that has expanded so much it is now just steps away from their front doors in Villa Abitu near Puerto Rico’s north coast.

“You have no idea what it’s like to gulp in that smell 24 hours a day, 365 days a year,” said Yahnaha Porrata, whose house is roughly 10 steps from the landfill. “You have to shutter the house completely because you can’t breathe … If I had the money, I would have moved a long time ago.”

The majority of landfills across Puerto Rico are over capacity and growing under tons of liquefied garbage seeping into the tropical soil and posing threats to people and the environment, according to the U.S. Environmental Protection Agency. Nineteen of the island’s 20 landfills are violating federal laws, yet they still accept a large portion of the 8,500 tons of garbage that Puerto Ricans generate daily. The EPA has ordered local officials to close 13 of those landfills including the one in front of Porrata’s home because of the health risks they pose, but a decade-long economic crisis has prevented that from happening.

Ref.: ENDI, Fox News, Caribbean Business
Pre-2017 Hurricane Season
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Ref.: ENDI, El Vocero, SWANA Caribbean on Twitter

PR Waste Management News

Pay As You Throw (PAYT)

Atender la disposición de basura es asunto de País

La intención de municipios es cobrar a los ciudadanos por el recogido de los desechos sólidos, aunque esto no sea una buena idea.

Municipios quieren cobrar por recoger la basura

Hay municipios que quieren cobrar a los ciudadanos por el recogido de los desechos sólidos, pero esto puede ser un problema.

Ref.: SWANA Caribbean on Twitter
PR Waste Management News
Coal Combustion Residuals (CCRs)

EPA insists that ash is not dangerous
Carmen Guerrero validates claims of the neighbors of Pefuelas and calls for dialogue with the government

Puerto Rico had towering landfills and coal ash pollution. Then, Maria hit.
By Yessenia Funes on Sep 29, 2017

More than a week has passed since Hurricane Maria made landfall on Puerto Rico, and still little word has come from remote parts of the island — like the southeast, for example, where many residents of African descent, as well as industrial sites, are concentrated.

Puerto Ricans living outside the island are struggling to reach friends and family members. And from Grist and others’ reporting, the situation on the ground is looking grim. Conservative estimates by NASA show that Maria, which hit the U.S. territory as a Category 4 storm, dropped nearly two feet of water on Puerto Rico in a single day. That’s the amount of rainfall so-called dreary London gets in a year.
Pre-2017 Hurricane Maria Status

Landfills Situation – Environmental Crisis

- Operation
- Expansions
- Closure Orders
- AOC with EPA (expansion)
- New facilities, PPP

- 29 landfills (USEPA, Nov. 2016)
  - 19 continue using unlined cells
  - 12 under legal agreement with EPA

- PRSWA & PREQB, April 2014
  - 3 Compost Facilities
  - 115 Recyclable Materials Collection Facilities
  - 4 Recyclable Materials Facilities (MRFs)
PR Waste Generation

Waste Generation Rate:

- 5.56 pounds per person per day
- 70% disposed of in landfills

Ref.: PRSWA Interactive Map [http://www.ads.pr.gov/mapas/mapa-srs.html]
Pre-2017 Hurricane Maria Status
As per the Puerto Rico Solid Waste Management Authority (PRSWA)

Diversion Rates

Recycling Rates

IEMES, PSC
Integrated Environmental Management & Engineering Services

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PR Climate Change Council (PRCCC)

- Ensure a coordinated effort in assessing risks and impacts from coastal hazards and climate changes and in recommending adaptation strategies.
- Works towards the following objectives:
  - Use the best available scientific knowledge;
  - Identify, assess, prioritize, and develop effective adaptation strategies and policies;
  - Communicate findings, consensuses, and recommendations to government, civil society;
  - Cultivate a well-informed Puerto Rican society.
Assessment Methodology – ISO 31000

Waste Management
Industry infrastructure components, or service chain elements evaluated

- Collection, Transfer and Transport Systems,
- Segregation and Materials Recovery
- Treatment and Energy Recovery
- Disposal

significant Single Events

- 0.5 meter sea level rise
- 1 meter sea level rise
- Storm surge scenario based on Category 1 through 5 hurricane flood

ongoing/Cumulative Events

- Greenhouse Gas (GHG) emissions increase
- Temperature variability
- Precipitation Patterns

- Working Group 3: Society and Economy
- Focus: Critical Infrastructure
- Collaborating Organization: Natural Disaster Management Commission of PR’s Professional College of Engineers and Land Surveyors

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WM Infrastructure Risk Register Results

Risk Treatment or Adaptation Measures (existing or potential)

1. Train emergency response personnel in site-specific risks or vulnerabilities; improve operator-response agency communication.
2. Improve weather prediction technology and communications.
3. Promote Best Available Control Technology (BACT) and Best Management Practices (BMPs) when designing, constructing, and operating Landfill Gas (LFG) systems.
WM Infrastructure Risk Register Results

Risk Treatment or Adaptation Measures (existing or potential)

4. Improve **monitoring** technology to improve statistics and projections.

5. **Research and development opportunities** in the island's solid waste industry.

6. Promote waste diversion by implementing **Integrated Solid Waste Management (ISWM)** alternatives.

7. Ensure no landfill **expansions** towards potentially affected (or vulnerable) areas are approved or built.
2017 Hurricane Season

Several storms that developed “on each other's heels” from Aug. 17 to Sept. 16:
Harvey, Irma, Jose, Katia, Lee and Maria

Ref.: NASA/NOAA GOES Project
Waste Management

News shifted

After Maria, Puerto Rico Struggles Under The Weight Of Its Own Garbage

December 14, 2017 - 6:29 PM ET
Heard on All Things Considered

MERRIT KENNEDY | LAUREN MIGAKI

Listen: 5:39 | Queue | Download | Transcript

The active part of the landfill in Toa Baja is currently a hot, ranid, open dump. Federal regulations require trash piles to be covered daily with earth. But the state's supervisor says that's currently impossible.

Jose Jimenez-Tejada for NPR

Ref.: ENDI, Fox News, Caribbean Business

Post-2017 Hurricane Season

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US Army Corps of Engineers Chose Only One Company to Collect Majority of Puerto Rico’s Hurricane Debris

Ref.: ENDI, Fox News, Caribbean Business

Debris removal becomes a lucrative business

Municipalities grant millions in contracts to clear up their communities

Ref.: ENDI, Fox News, Caribbean Business

Street at Villa Carolina in Luquillo, Puerto Rico, three months after Hurricane Maria. (Edwards Melendez | Center for Investigative Journalism)

Ref.: ENDI, Fox News, Caribbean Business

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Legislative Updates

Proposals and New Legislation

- Task force created by PREQB for Emergency Solid Waste Management
- Public policy to fight climate change in Puerto Rico proposed
- Municipalities are allowed to create and manage temporary vegetative and construction debris collection centers, following certain guidelines
- PREQB approves thermal treatment of debris via waiver
- Microgrid development regulation
Post-Hurricane Maria Timeline

Sept 20, 2017
Hurricane María Ravages Puerto Rico

October 13, 2017
USACE Debris Cleanup Efforts begin

October 16, 2017
7,367 Cubic Yards Have been removed

Image Refs.: NASA, USACE, Cagle Cartoons
Post-Hurricane Maria Timeline (cont.)

October 23, 2017
Debris Cleanup Begins in Levittown

October 24, 2017
Fajardo Mayor signs Right-of Entry for USACE In effect authorizes thermal treatment

February 8, 2018
PREQB Approves Thermal Treatment of Debris (via waiver)

Image Refs.: CNN, Google Maps, FEMA

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February 23, 2018
Federal funding for Cleanup Extended

March 21, 2018
Six months after Hurricane Maria, many areas still lack power

March 31, 2018
EC Waste announces that in six months they received one year’s worth of waste, need for more airspace
Household Hazardous Waste (HHW)

January 5, 2018

- 130,000 containers of HHW and orphan containers, white goods and e-waste items, have been collected

Ref.: USEPA
Debris & Vegetative Waste

USACE: Recycling metal and wood chips;
November 21, 2017 estimates:

- Wood chipper converting 5,000-6,000 cubic yards per day into Mulch
  - 630,000 cubic yards will be reduced and used for compost, landfill cover and slope protection.
- Close to 9,000 appliances are part of the debris

Ref.: The Fort Campbell Courier
Sunken or Grounded Vessels

- 377 Vessels
- Over 300 miles
- 1000 Tons of solid vessel waste materials disposed

Ref.: Reuters, U.S. Coast Guard News, NYT
Flood Control Pumps

Aerial View Juana Matos Community in September 22, 2017
Ref.: The Guardian
Almost closing

• PRSWA estimates that the powerful hurricane created 6.2 million cubic yards of waste and debris.
• Estimates that at current recycling rates, all of the island's landfills will be full in 20 to 25 years.

Don't forget about the US Virgin Islands!
• As of March 3, 2018 736,000 cubic yards of debris had been collected.
New Challenge!

China Waste Import Restrictions

In 2017 and 2018, the Chinese government implemented a series of waste import restrictions limiting or banning a variety of recyclable materials that had previously been accepted for processing.

The restriction of the flow of materials has created new challenges throughout the supply chain of scrap.

The lack of efforts to achieve an ISWM in addition to lack of coordination between the different sectors has truly compromised the effectiveness of WM systems and the industry in the Caribbean.

ReImagina Puerto Rico publishes final reports

The Resilient Puerto Rico Advisory Commission published its final reports with actionable and timely recommendations for the responsible use of recovery funds. This focused on rebuilding Puerto Rico in a resilient and sustainable manner; physically, economically, and socially.

All six (6) reports are available in English and Spanish on their website: http://www.resilientpuertorico.org.

More info: https://www.iemespsc.com/news--information
References not otherwise noted on slides

- Rivera, Cynthia, and Antonio Ríos, interview by Hanna K. Rodríguez Morales and Fernando L. Rodríguez Ocasio. 2017. Meeting with PRSWA Executive Director and Head of the Operations Division San Juan, Puerto Rico, (March 3).