



# 2020 ECOS FALL MEETING

September 22 - September 23

## **Plastics Circular Economy**

*Strategies For Optimizing Guam's Plastics Use*

# OVERVIEW

## 1. THE PLASTIC PROBLEM

## 2. CURRENT COSTS

## 3. GUAM'S STRATEGY

- a. **AVOID**
- b. **RECYCLE**
- c. **RECOVER**

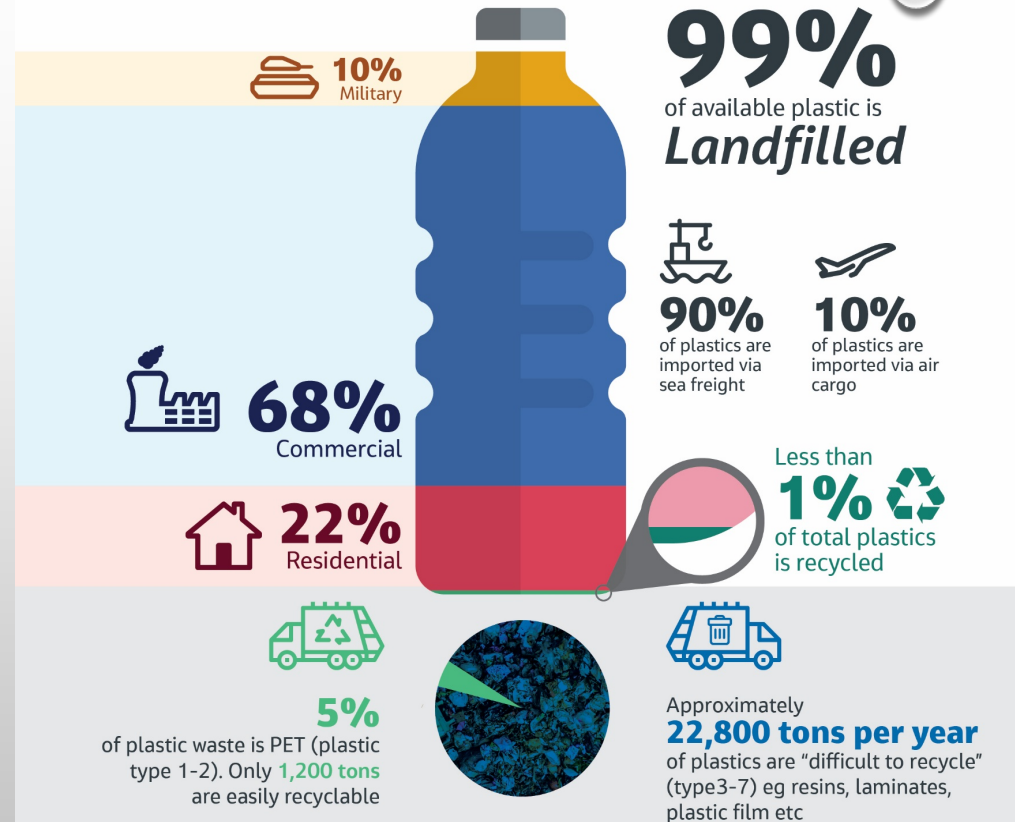


# THE PROBLEM

- **12%** = GLOBAL PLASTIC PRODUCED IS RECYCLED
- **95%** = MATERIAL VALUE OF PLASTIC PACKAGING IS LOST TO THE GLOBAL ECONOMY AFTER ONLY A SINGLE USE
- **RECYCLING (BINS) → SINGLE FAMILY RESIDENTIAL**
- **0** = ON-ISLAND PLASTIC RECOVERY PLANTS

Up to 24,000 tons of plastic waste is generated in Guam each year.

**Only 200 tons are successfully recycled**



**Strategy 1: Avoid**  
Leverage data and education



**Strategy 2: Recycle**  
Acquire partnerships for investment



**Strategy 3: Recover**  
Consider chemical recycling to convert plastic to an alternative fuel

# COSTS TO RECYCLE



GSWA is  
Currently  
Subsidizing  
Recycling:

\$500/Ton  $\approx$  Recycling  
\$100/Ton  $\approx$  Collection  
\$100/Ton  $\approx$  Sorting  
**\$700/Ton  $\approx$  Total** (Baled  
PET/HDPE)



Landfilling

$\approx$  \$170/Ton  
 $\approx$  \$100/Ton (Collection)  
**\$270/Ton = Total**



Residential Recycling  
Program

**\$410/Ton  $\approx$**



## Define

- Plastic's role
- List useful plastic vs. plastic waste

## Capture

- Engage recycling responsibility to include military, commercial, and multi-residential
- Metric / Standard creation

## Target

- GovGuam leadership (legislative or regulatory mechanism)
- Replacement strategies for plastic waste

# STRATEGY ONE: AVOID

*Leverage Data & Education*



# Solid Waste Management in Small Island Destinations: A Case Study of Gili Trawangan, Indonesia



- Capacity in Gili Trawangan was improved through stakeholder engagement, access to resources, knowledge and networks, financial support, and transparency and accountability
- The Coordinating Ministry of Maritime Affairs and the Ministry of Environment and Forestry teamed up with the Global Plastic Action Partnership, with a focus on **consolidating local waste management data**.
- The data aims to: **reduce overpackaging**; use innovative recyclable plastic material; substitute material; increase recycling rates; improve waste collection rates

- Non-governmental organization called the Gili Eco Trust (GET) found extensive stakeholder consultation critical for the successful development *of a sustainable tourism strategy*.
- The new waste system was implemented under a **multi-stakeholder partnership** with a community-based organization FMPL (Forum Masyarakat Peduli Lingkungan).
- FMPL is responsible for operational management (collection and disposal), whilst GET is largely involved with planning and enhancing public awareness and education.
- **Partnership improved waste management services** on the island through improving the practical aspects of collection, disposal and diversion; working to address waste-related behavior; promoting reduction; enhancing education and awareness of waste related issues





# The Roadmap Towards a Clean and Safe Palau: 2017 to 2026



- The Bureau of Public Works Solid Waste Management Division is responsible for regular data collection and analysis that will aid the **development of a national database** and guidelines for standard operating procedures
- Strategic goals for the government include developing and enforcing national policies and legislation to promote best practice waste management such as creating a **Plastic Bag Ban Act** and for Palau to become a signatory to the Waigani Convention

- **National Solid Waste Management Strategy** emphasises prevention and reduction of waste – reduce, reuse, recycle, return – and recommends selection of appropriate and affordable technology to enable waste management
- **Public-private partnership, multi-sectoral** and transparency approaches became guiding principles, along with a focus on product stewardship, polluter pays, public participation and precautionary approach.
- Stakeholders believe waste strategy can be achieved through data management and analysis, institutional development and using best practice along with cost-effective approaches



# Caribbean National Rally Pollution-Free Future (August 2019)



- The 5-year ISLANDS programme targets the unique challenges of Small Island States, including remoteness, land scarcity, accessibility to technology, low economic growth and environmental vulnerabilities, dependency on tourism sector
- ISLANDS programme will implement both regional and national solutions by bringing together government and stakeholders to implement legislation on waste, aiming to eliminate 9,000 metric tons of contaminated material, 150,000 metric tons of marine litter from the Caribbean region
- The regional programme is further supported by UN Environment Programme, the United Nations Development Program, the Food and Agriculture Organization of the United Nations and the Inter-American Development Bank
- Crucial to enable sustainable technologies that are appropriate for Small Island States and to protect fragile ecosystems

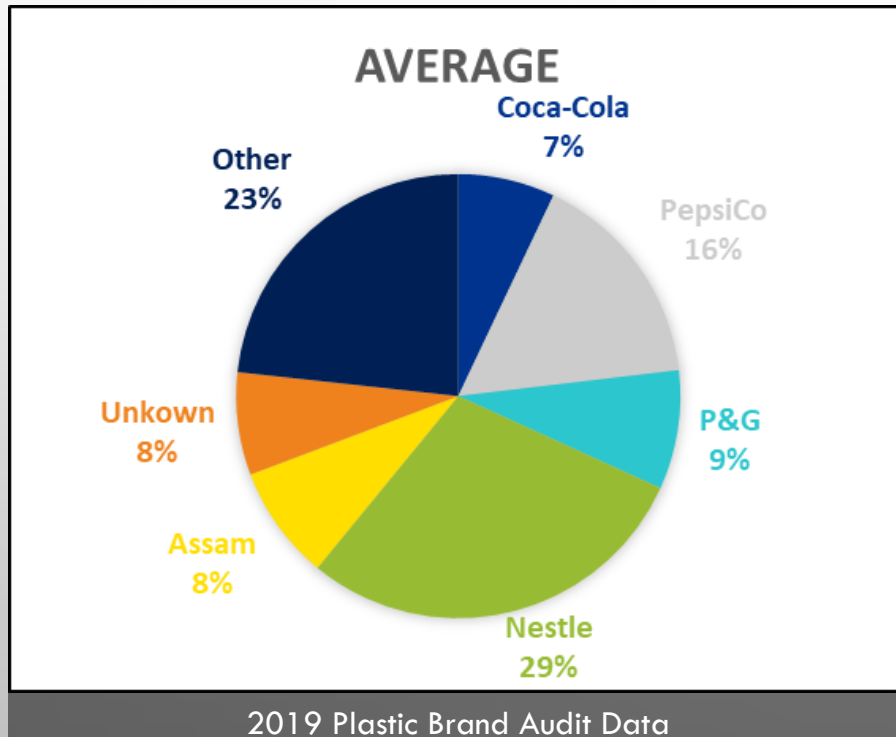
- 9 small Caribbean Island States launched the **ISLANDS (Implementing Sustainable Low and Non-Chemical Development in Small Island Developing States)** programme in Port of Spain in 2019
- Initiative is part of a larger program backed by \$450 million in funding from public and private partnerships, including the Global Environment Facility (GEF), all funds go towards eliminating toxic chemicals and waste globally
- GEF is an international partnership of 183 countries, institutions, civil society organisations and private sectors – provided over \$18 billion in grants and mobilised \$94 billion in co-financing over 4,500 projects since 1992





# STRATEGY TWO: RECYCLE

*Develop Partnerships For  
Investments*



- Leverage Investments From 'New Plastics Economy Global Commitment Signatories'
  - PepsiCo, Nestle, Coca-Cola
  - Committed to Increasing Recycled Content in Their Packaging to an Average of 25% By 2025
- Leverage American Beverage Association \$100 Million PET Recycling Fund (Every Bottle Back Initiative)
- Engage With Military

# PARTNERSHIP & INVESTMENT OPPORTUNITIES



## Recycle and Reuse Micro factories

- **University of New South Wales (UNSW)** houses the Centre for Sustainable Materials Research and Technology (SMaRT) which has developed a **micro factory** that recycles materials and **transforms waste into useful products**
- SMaRT works with local councils, and global research partners and the government to innovate environmental waste solutions, one of which is developing an efficient way to turn plastic waste into a material that can be used to make steel
- Each micro factory is used to create a single product, and SMaRT's next micro factory will help turn discarded plastic into high-quality 3D printing filaments
- Micro factory can be built in modules and can scale up as demand grows, enabling customisation as required and can lower overall costs when the produced materials are cost-efficient and sustainable

## Circular Economy Joint Venture

- **Asahi Beverages**, Pact Group and Cleanaway Waste Management joined together to develop a local plastic pelletising facility to contribute to a circular economy
- New facility will process up to 28,000 metric tons of plastic bottles and other recyclables into flake and food grade pellets that can be used for producing new packaging
- Waste facility to provide available feedstock after collecting and sorting plastic waste. Pact to provide technical and packaging expertise. Asahi Beverages and Pact will buy the recycled pellets to be used in packaging products
- New facility will service markets on the Australian East Coast and create 30 local jobs – industry collaboration across different components of the plastics value chain



## **STRATEGY THREE: RECOVER**

*Consider Chemical  
Recycling to Convert  
Plastics to an  
Alternative Fuel*

- Fuels & Liquid Feedstock -  
Production of New Plastics, or  
Chemicals to be Used as Raw  
Materials
- \$300 Million/Year of Energy  
Imports

# AVAILABLE TECHNOLOGY



## Bin2barrel Turns Non-recyclable Plastics Into Fuel

- Bin2Barrel (now IGE Solutions Amsterdam) uses pyrolysis to turn non-recyclable plastics into clean fuel for the transport sector, producing road ready diesel and resources for new plastics
- The plastic-to-oil plant under construction in the port of Amsterdam will turn 35,000 metric tons of plastic into 30 million litres of clean fuel annually, reducing carbon-intensive waste incineration and landfill
- Effectively extend life and product cycle of plastics and further reduce dependency on fossil fuel resources to establish a circular and sustainable new market for plastic waste

## ChemCycling Turns Mixed Plastics Into Chemical Feedstock

- ChemCycling project is the result of global chemical giant BASF investing in and partnering with Quantafuel pyrolysis specialist to optimise chemical recycling of plastic waste
- Integrated pyrolysis and purification processes will ensure mixed or contaminated plastic is repurposed using chemical reactions at 850 degrees Celsius to break down plastics into oil or gaseous products, which can then be used as raw material feedstock in the chemistry industry
- Pilot project has developed new products such as refrigerator components, insulation panels and cheese packaging, showing that high quality and hygiene standards can be maintained and a diversity of products can be made
- BASF working to develop the market for chemically recycled plastics which can partially replace fossil fuel resources, and add to a circular economy for plastics





# AVAILABLE TECHNOLOGY



## Licella – Cat-HTR Technology

- Australian company Licella developed the Cat-HTR (Catalytic Hydrothermal Reactor) which recycles end-of-life plastics, biomass and industry residues into oil, which can be further refined into biofuels and chemicals
- The hydrothermal chemical recycling process takes 20-30 minutes and produces 45% less carbon dioxide than waste to energy processes
- Currently building the first commercial scale Cat-HTR technology in the world's only large-scale hydrothermal upgrading plant located in NSW Central Coast, which will transform organic based material into a stable synthetic oil
- Licella has a joint venture with Canfor and integrated the Cat-HTR to reduce biomass residue waste from pulp and paper mills

## Plastic Energy – TAC Technology

- Plastic Energy uses patented Thermal Anaerobic Conversion (TAC) technology to convert end-of-life plastic waste into a new feedstock, which can be used to develop clean recycled plastics or alternative low-carbon fuels
- The TAC process involves receiving plastic waste, heating the waste plastic in the absence of oxygen until melting and in the end a hydrocarbon vapour is produced, which can be condensed into diesel, light oil or combusted as an energy source
- Every ton of plastic waste can produce 850 litres of chemical feedstock and the company has committed to converting at least 300,000 tons of low-value plastic waste into feedstock for new plastic manufacturing by 2025





## RECOMMENDATIONS

Applying Circular Economy Paradigms to Address Plastic Waste On Guam Requires an Interrelated Suite of Strategies Designed to:

- **AVOID** and Reduce Guam's Use of Plastic, Capture More of What is Being Used,
- **RECYCLE** Through Conventional Means High Value Materials,
- **RECOVER** Through Novel Technology to The Remaining Residual



Development and Implementation of a  
Sustainable Materials Management Program

## Plastics Circular Economy

Strategies for optimizing Guam's plastic use



ASTSWMO, Providing Pathways to Our  
Nation's Environmental Stewardship Since 1974

[http://astswmo.org/files/Policies and Publications/Position Papers/ASTSWMO-Recycling-Position-Paper-July-2020.pdf](http://astswmo.org/files/Policies_and_Publications/Position_Papers/ASTSWMO-Recycling-Position-Paper-July-2020.pdf)