RECYCLED GLASS AS BEACH NOURISHMENT MATERIAL:
Preliminary Feasibility Study

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PROJECT AIMS

This interdisciplinary project aims at **designing, producing, and testing the optimal recycled glass beach grain** to mitigate Puerto Rico's erosion problems, while reducing the amount of solid waste reaching the landfill. Our findings will provide a solid groundwork for the development of engineering infrastructure to provide the island with a **sustainable erosion mitigation alternative** resulting from glass recycling.

MOTIVATION:

Puerto Rico experiences **severe erosion** problems. This picture was taken near the Villa Cofresí Beach area in **Rincón, PR**. Current efforts are in place to evaluate the feasibility of a beach nourishment program in the area, yet sand sources to replenish the beach are scarce.

Recycled Glass as Beach Nourishment Material

Source: Gabriela Salgado

1 Meter of erosion per year

1 700 lbs. Of glass reaching the landfill every day

7% Of waste in landfill is glass

1 Million years for glass degradation

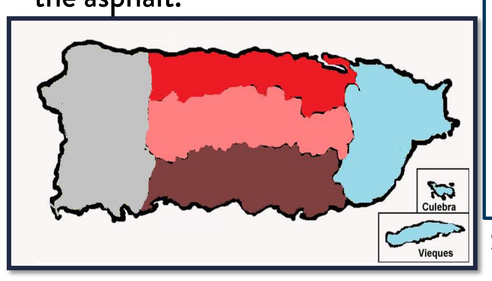
1 Ton of glass saves 1.4 cubic yards in dump space

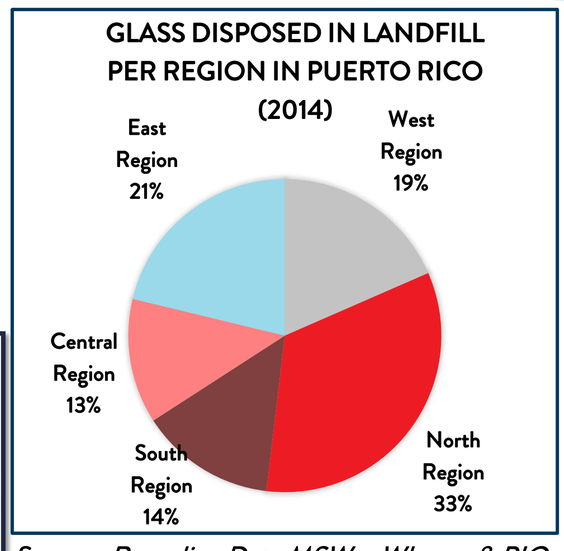
5 Types of recyclable glass

WHY GLASS?

GLASS IN PUERTO RICO:

Since 2008, glass on the island is not 100 percent recycled; although, there are a few companies that are dedicated to the production of ornamental blocks or used as aggregate in the asphalt.





Source: *Recycling Data MSW – Wheran & PIO Disposition Rev. 18-11-15*

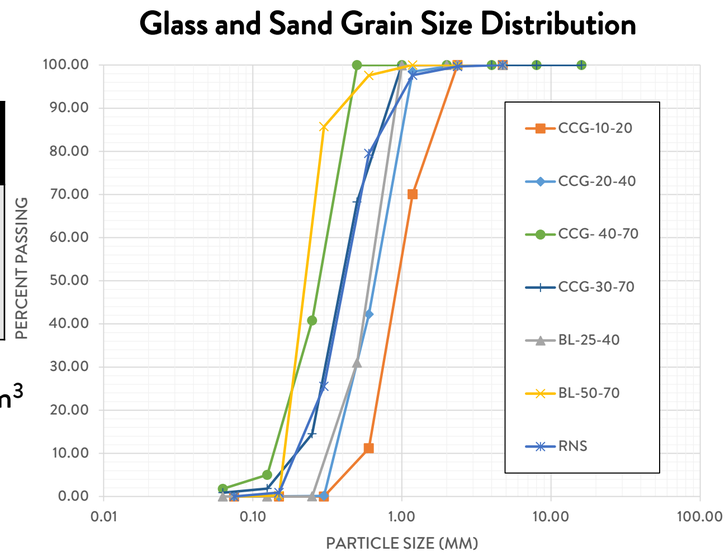
Material ID	CCG 10-20	CCG 20-40	CCG 30-70	CCG 40-70	BL 25-40	BL 50-70	RNS
D50 (mm)	.98	.68	0.41	0.29	.64	.24	.44

Compatible with properties of Rincon sand → 1 bottle of glass = 147 cm^3 of crushed glass

Sand

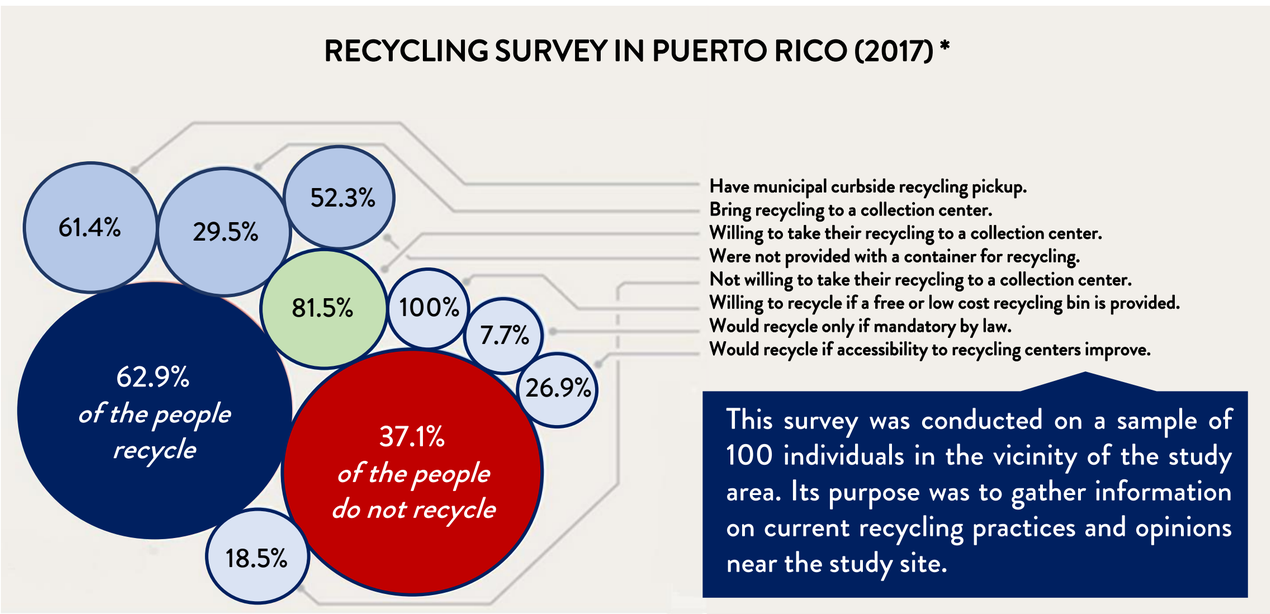
Same nature

Recycled Glass Cullet



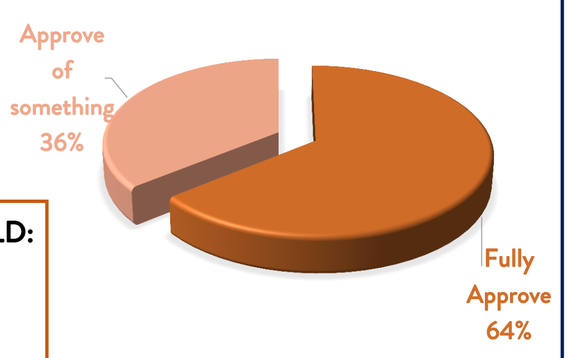
ONGOING WORK

SOCIAL FEASIBILITY



This survey was conducted on a sample of 100 individuals in the vicinity of the study area. Its purpose was to gather information on current recycling practices and opinions near the study site.

In order to analyze the feasibility of this project the social opinion about this implementation is important, surveys about recycling were conducted to evaluate the recycling potential in the area. However, surveys about the community's approval of using glass as beach nourishment material was conducted; the pie chart shows the results obtained.



GLASS BEACHES AROUND THE WORLD:

- Caribbean island of Curaçao
  - Hilton Hotel on Piscadera Bay
  - Zanzibar Park
- Town of Lake Hood, New Zealand.

EDUCATION & OUTREACH

GlaRE

What is it?

Glass Recycling for Erosion. Initiative that evaluates the **feasibility** of using recycled glass as a **beach nourishment material** to mitigate erosion problems in Rincon, Puerto Rico. As part of the project, activities will be carried out to **integrate the community** using **outreach presentations,** school visits, **local activities** and **community meetings**, while raising community awareness about glass waste management practices.

Glass Beach Prototype

ECONOMIC FEASIBILITY

FUTURE RESEARCH WORK: An economic analysis will be conducted to compare the cost of using recycled glass, sand or a mixture of both, as nourishment material in the Rincón area. Some facts about this process include:

- To replenish a 36 m berm, **675,736 m^3** of **sand** is needed
- **4.6 billion** of **bottles** are needed to reach the previous volume
- **$70 – 80 per ton** to complete the process of crushing the glass.

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