The Bottle House

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"A society is defined not only by what it creates, but what it refuses to destroy."

John Sawhil

History

Access to safe, sanitary, affordable housing and basic infrastructure is a basic human right. In Colonial Africa, Africans were limited to living in segregated, poorly planed areas. There is no exception in Kenya, increased urban populace has caused a major challenge to keep up with low cost affordable housing. Today over 50% of the population live in dense unsanitary and insecure neighborhoods also known as slums. As a result of mass evictions and demolitions that have occurred over many years, people have been moved to public and unused private lands.

The people who live in the slums need to be seen as equal citizens with rights and basic amenities such as; clean water, garbage collection, working sewers, light and all children deserve to have quality education and healthcare.

Nairobi, Kenya generates over 3,000 tons of waste per day and only about half of it gets collected. Most of the collected waste if dumped at Dandora Landfill which is filled beyond capacity but is still in use. Other parts of the city are now being used as a dumping site such as a dumping site in Kayole.

ECO-TEC

ECO-TEC environmental solutions was born as the inspiration and invention of ECO-TEC's founder, Andreas Froese, in an effort to discover an deliver innovative solutions to the problem of "junk". ECO-TEC has developed and tested construction techniques utilizing soft drink bottles made from polyethylene terephthalate (PET). ECO-TEC has developed a learn by doing philosophy and achieving over 50 projects in Honduras, Bolivia, Colombia, and India.

ECO-TEC Method

"a system where individuals and families learn by working together to form a structure that will be of benefit to the community, utilizes non returnable PET bottles as bricks, filling them with soil, gravel, plastic trash, or other materials from the site. The PET bottle bricks are links together to form a coherent structure."

Building System Objectives

1. Generate Community Benefits

Strengthen social networks: Communities actively engaging in a collective learning atmosphere during training and construction. This enhances community ties, social solidarity, and pride of accomplishment.

Improves the quality of life of the community: Building a better environment develops dignity and improves the quality of life for residents and future generations without a huge economic invention or debt just by re-purposing existing waste.

Generates employment opportunities for vulnerable populations: This project allows the involvement of untrained people; men, women, and children to participate on this project and it helps create an educational environment to help train people to train others.

Improving self worth: Participation and completion of this project promotes a personal satisfaction and fulfillment.

2. Generate Environmental Benefits

Save high-embodied carbon materials: Using PET bottles reduces the need for cement, iron, wood. Re-purposing trash into building materials.

3. Generates Intellectual Benefits

Promote productive environmental education: This project will help to create environmental awareness about the idea of recycling garbage and the mismanagement of existing garbage. People shouldn't be afraid of garbage yet embrace its possibilities.

Advance innovation: In the competitive search for alternative environmental architecture systems, this method raises the bar by engaging people of underserves communities in all aspects of innovation, sustainability, and environmentally sensitive design and construction.

Current Methodology

This building system utilizes PET bottles filled with rubble, soil, and plastic debris from the site. In addition, the system uses rope and wire that is most commonly used in agriculture. This system is assembled with active participation of individuals from the community

Basic Procedure

1. Soda and water bottles are collected which participants will fill with material.
2. The community or local institutions assist in the collection of material to fill bottles. Collected materials are strongly compacted during filling of the bottle; sand and soil is a good compact-able material.
3. Once enough material has been collected, a simple foundation is made for the base of the building.

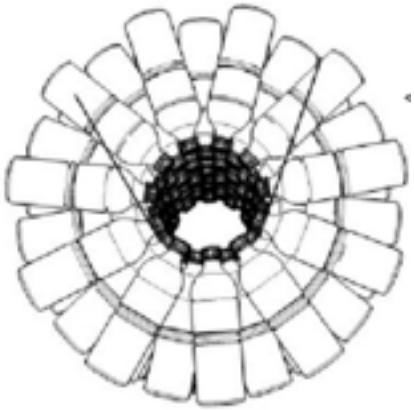
Preparation of Debris

1. Manual screening separates collected material into usable grades. Participants will use screens to sift through the materials to get various sizes. One person can screen six to eight cubic meters of debris in one day.

2. Participants screen the materials in preparation for the mortar mixture for the construction. up to one kilogram of debris fills a 0.6 ml bottle while a 2.5 litter bottle recycles up to four kilograms of debris material.

3. Participants place the second screening thickness (less than 5cm) diameter in the spaces between the bottles to stabilize the walls, allowing for the reduced use of cement. Participants reserve the largest thickness of material (larger than 5cm) for the use in the casting of concrete.

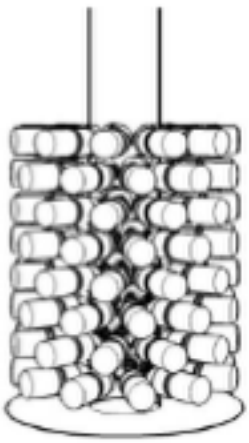
Construction of Walls



1. The mortar mixtures are usually 1:15 to 1:20, cement to clay or foundry sand, depending on the size of the house or structure.

2. After placing the first 1 inch (2.5cm) layer of mortal, work proceeds to fit the bottle, utilizing a level o assure correct placement. Bottles, from 0.3 liters to 3.3 liters, might vary in size from one wall to another but are not mixed in the same wall.

Column in mid-construction. This column was the first that utilized barbed wire for reinforcement.



Column model showing bottles without the soil or concrete mortar.

3.Participants tie each bottle at its base, check for the level then complete the row. Synthetic rope or wire is used to secure the bottles.

4.Participants places the mortar over the row of bottles and proceeds to start on the second row of

bottles carefully tying each bottle at the base and making sure the bottles are leveled.

Construction of Columns

1. Columns serve as lateral support for the walls, an in cases where the roof or upper levels rest directly on the system, columns function as load bearers. The concept of construction is similar as as normal bottle wall but instead you are making a circular format. The neck of the bottle is facing the inside of the column to create a hollow center of 4-8 inches (10-20cm) to hold reinforced concrete.

Finishes

Plaster finishes work well on interiors and exterior surfaces of the PET bottle structure. Due to the participants use of the larger materials to fill in the spaces between the bottles, a lower amount of plaster is used, this minimizes the cost as plaster is a high-embodied carbon material. The final step is using plaster, clay or lime to smoothen the outside. A completed house can last up to 300 years due to its materials.

Budget

Normal House:

Bottle House: