Affordable Sanitation
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Background:

The issue of open defecation has become a universal problem in sanitation. Although pit latrines provide a low-cost remedy in rural areas, such as the Upper East Region of Ghana, they have a tendency to collapse when unlined.

Project Objective:

The objective of the Affordable Sanitation team is **to develop a pit latrine liner that will resist the pressure of the soil and superstructure to prevent pit latrine collapse.** The team also has an affordability objective, a cost less than 150 Cedis or 34 USD, for the local Ghanaian people.

Definition of the Problem:

- Sandy soil collapses when saturated if the pit is not lined.
- People are deterred from using pit latrines because they are afraid the holes will collapse.
- Because people are afraid of the latrines, they resort to open defecation which leads to health hazards.

Partner & Funding

World Vision is a Christian humanitarian organization dedicated to helping children, families, and their communities worldwide reach their full potential by tackling the causes of poverty and injustice. The team's primary contact with World Vision is Bismark Norgbe.

Future Work

This project is ending after this semester. The project objective has been met.

2018 Site Visit:

In January of 2018, the Affordable Sanitation team traveled to the Upper East Region of Ghana to implement a Ferrocement and a Rebar-reinforced (RRF) liner.

The team also went to evaluate the status of the RRF liner created during the 2016 site visit. In these two years since implementation, the fabric around the liner deteriorated and the chicken wire started to rust. The failure of this RRF liner neccessitated modifications to the design while in Ghana. Even with these setbacks the trip was a success. The team helped build 2 ½ latrine liners and scheduled for 18 more to be built by a local artisan. 20 ferrocement liners are scheduled to be built and followed up with a survey.

The rebar reinforced fabric liner from 2016

The completed rebar reinforced facric liner 2018

Rebar-Reinforced Fabric Liner:

- A small scale model of the RRF liner was built on campus to ensure that the team had experience making the liner.
- The model was put in the ground on campus and withstood initial soil pressures without failing.
- When the team was in Ghana, after seeing the failed 2016 RRF liner, the team decided to modify the design of the liner.

The rebar reinforced fabric liner is one that the team has been working on and refining over the past several years. It includes a cylindrical cage made of rebar rings tied to a number of vertical stakes. This cage is then covered in chicken wire, followed by a layer of plastic-like material.

One of the modifications of the design was painting the rebar and chicken wire, as seen in the photo above.

Ferrocement Liner:

The team used a mold to create the ferrocement liner. Ferrocement is similar to cement but has a higher sand content and can be poured into the mold.

On Campus Testing

On campus, a version of the mold was tested. The mold produces a half circle, which is a two foot tall ferrocement section. Six of these sections can be stacked to create a full ferrocement liner. The mold was tested by creating the ferrocement sections using different release agents.

Final Design

The mold was modified on the 2018 Site Visit to be four sections that join together to create a full circle with a one-inch gap between the inner and outer mold pieces. Three ferrocement rings stacked on top of each other create the full liner. The cost of the liner is 62.5 Cedis.

The completed ferrocement liner

The modified ferrocement mold

Acknowledgements: