Andrew Larsen/Fontes Foundation: Update on GCE Phase I Work

Work in Cité Soleil, Haiti

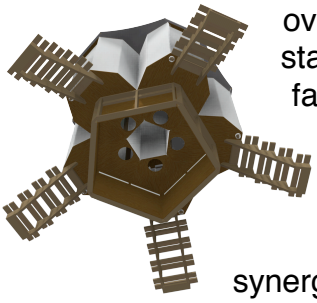
We currently have four toilet blocks of five toilets each, operating in Vodrey, a peri-urban community within Cité Soleil--a large slum in Port-au-Prince, Haiti. The toilet blocks have been in operation since August, 2012. Three of us (two Americans and one Canadian) lived in Vodrey through the summer of 2012. We worked together with the community and established a shop for workers, brought in tools, and trained and employed 12 workers to build the toilet blocks.

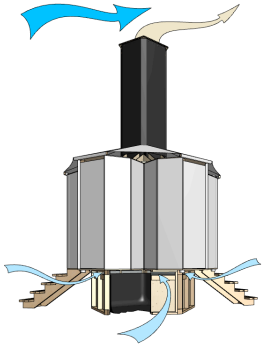
Sanitation Awareness-Raising

Along with the construction side of the work, we met with community leaders and members and organized sanitation awareness campaigns. These were comprised of various activities including group discussions and performances by a local theater troupe to spread the message of sanitation through the community. We actively sought community involvement and participation. Upon completion, each of the individual toilets were opened to either one or more families who agreed to maintain the inside space of the toilet. These decisions were made by community leaders.

Technical Design

On the technical side, the toilets are built from local lumber using reused vinyl billboard fabric. The fabric is stretched around lumber frames to make an inexpensive, robust and weatherproof toilet cubicle. Then, five cubicles are placed together over a common collection bin, which allows the toilet block to be very stable, even in high winds and torrential downpours. The billboard fabric is also used in the collection bin to form a bag (not shown in the drawing), that keeps all excreta from touching the ground. The stairs of each toilet extend to the ground forming wide support for the overall structure. The toilet block is synergistic, both in its ability to resist overturning, as well as in the use of a common collection system for feces, urine, toilet paper and sugarcane bagasse--a carbon material used to facilitate thermophilic composting of the excreta. This is not currently a urine-diverting (UD) design but could be in the future.





Enhanced Passive Ventilation

The entire toilet block is passively ventilated both for odor control and for supplying ample air to the pile for aerobic composting. This is accomplished by having a large, central ventilation plenum which extends upward from the tops of the five cubicles. In this way, the lower part of the plenum is formed by the backs of the five cubicles, and the top part simply continues on

up. The result is that there is smooth air flow without obstruction, thereby enhancing wind-driven ventilation. The upper part of the ventilation plenum is made from black billboard fabric to facilitate solar gain and subsequent thermally-driven passive air flow.

Other Design Issues

The use of this vinyl billboard fabric makes the design relatively inexpensive--allowing for things such as the large ventilation system, waterproof collection bin and bag, and cleanable surfaces throughout to be achieved where it may be cost-prohibitive if traditional materials were used. These toilet blocks can also be taken apart and moved if necessary--something not practical for brick and mortar designs, or ones involving permanent pits. Finally, the toilet blocks are located right in the living areas between the houses and the users report that they like the toilets and that there are no odor issues at all. Due to the high water table in the area and the problem of flooding, this design is important because all excreta are contained in a waterproof container.

Challenges

Some of the challenges were typical for environments such as this: difficulty at times getting materials, intermittent power supplies, exploding generators and the like. The living conditions were difficult but we wanted to be in the community rather than come and go each day. From the design side, we learned that our method of compost extraction was going to be harder than we thought. We are working on that currently and plan to build a prototype of a new design in the community over the next few months.

Successes

The awareness-raising campaign went very well and people began to realize the connections between sanitation and health. The young people in the community prepared their own poster for the community education night which was done in conjunction with a dance concert.

The sanitation messages were performed as entertaining skits throughout the night with the MC reiterating the themes. There was a very good turnout for the event.

Attention!!! Shit is the source of a lot of sickness
Protect your health, don't defecate in the open
Shit in a toilet, respect hygiene rules

On the technical side, we noticed that the toilet blocks did not fill up "arithmetically" so to speak, meaning that there was considerable shrinkage of the compost pile within the collection bin as time went on. We knew some of this would happen but we believe that the much enhanced ventilation greatly helped in this regard--partly because liquids spread through the matrix more fully, thus allowing for greater evaporation potential due to increased surface area. Also, the heavy rains did not fill up the collection bin at all--we think because the processes were active enough and the continuous air flow kept evaporation at a high level.

The toilet blocks withstood both Tropical Storm Isaac (which blew down nearly all of the banana and plantain trees in the community), as well as the flooding from Hurricane Sandy which, though less directly an issue in Vodrey, caused the nearby river to swell to the extent that several houses were completely destroyed by the rising waters.

Major Findings

Using the re-used billboard fabric proved to be a good building material from an engineering standpoint. The “embodied engineering” already present in the material make it a good barrier against UV radiation and weather in general, but also allowed it to be pulled very tightly around the frames making up the cubicle, such that the resulting walls were taut and didn’t blow around at all in the wind.

We established a team of four of the workers to do the ongoing maintenance of the toilet system--things beyond the basic cleaning of the inside of the cubicles. This group is energetic but we feel they need further direction.

The local community learned the building techniques very quickly and became quite adept at working with the wood and fabric. Part of what we are working toward in this design is the ability for the training to be done once the very initial stages of a disaster are over, thereby enabling people to begin working immediately to bring sanitation to affected areas and have income while doing it.

The composting processes can work very fast and can approach those documented by Howard and others. Aeration is key.

Way Forward

We need to go back to the community and address the compost removal technique which, although it has not been necessary yet, needs to be changed. It’s important that we do this soon since we need to maintain the confidence of the community. We need to revisit the design, discuss the new ideas with the community and then build some more units.

Recommendations

We don’t have any specific recommendations at the moment.

Bio for Andrew Larsen

I am an American student at the Norwegian University of Life Sciences working with Andreas Koestler Ph.D at Fontes Foundation in Oslo, Norway. Last year, we received a Grand Challenges Exploration (GCE) grant from the Bill & Melinda Gates Foundation for continued work on a dry sanitation approach for refugee camps in Haiti. I have volunteered with three different organizations since the earthquake two years ago. These experiences, along with what I am studying help to shape the sanitation design we are promoting. I am currently residing in Salt Lake CIty, Utah, USA.

Bio for Dr. Andreas G. Koestler, Managing Director of A-Aqua AS, Norway

www.a-aqua.no (Swiss, born 1953, living in Norway since 1981)

As originally Swiss, after having studied geology at University and ETH of Zurich in Switzerland, he did his PhD geological research about an area in the Norwegian mountains. He was lecturer at University of Oslo for under- and postgraduate levels in geology for more than five years. Later he was teaching emergency management and supervised postgraduate scientific research in different areas. He has trained numerous expatriate and local staff in disaster management, hydrogeology and emergency water & sanitation assessments and related project implementation. He has managed his own consulting company Fontes AS since 1985. As the response on the obvious need for professionalism in water supply for developing countries and disaster response, he started the Yme Foundation in 1989, a Norwegian Humanitarian NGO. From 2004 to 2008, he was an advisor at the Norwegian Red Cross in Oslo on International Disaster Preparedness and Water&Sanitation. He extended the focus on climate change adaptation and disaster risk reduction. Since 2002, he is also a member of the United Nations Disaster Response Team UNDAC. He has gained a lot of relevant field experience from disaster areas such as Rwanda crisis 1994 to 1997, Turkey earthquake in 1999, Kosovo crisis 1999, Angola since 1996, Mozambique floods 2000, Goma volcanic eruption 2002, Tsunami 2004-05, Haiti 2010, Afghanistan 2011, as well as from many development aid projects in mainly African countries. Recently, he became a guest lecturer at the Management University of St. Gallen, Switzerland, with focus on leadership in disaster management and development aid projects. Since June 2012 Koestler is Managing Director for a company providing services and equipment for disaster response in the WASH-sector.

Title: Urban Sanitation Solutions for High-Use, Flooded, and Difficult to Serve Areas
Lead Organization: Andrew Larsen/Fontes Foundation
Primary Contact: Andrew Larsen nesralwerdna@gmail.com
Grantee Location: Salt Lake City, UT USA, Oslo, Norway
Developing country where the research is being done: Haiti

Short description of the project: Our design is an urban sanitation solution which is low-cost, robust, aesthetic, deployable, and erectable in kit form for areas which have been previously very difficult to serve: high-density urban areas, refugee camps, and flooded areas--situations which are common in the aftermath of disaster.

Objectives: To implement sanitation in Cite Soleil (village of Vodrey), a slum area within Port-au-Prince, Haiti; to address the social and technical issues together with the community served; to use the lessons learned for the development of an erectable sanitation solution for use in disaster affected areas.

Goals: To complete several toilets and a compost system within the village of Vodrey; to demonstrate user acceptability of the sanitation approach; to work with the community through the complete cycle from toilets to a finished, usable product.

Start and end date: Research and preparation--May 2011-March 2012; implementation--June 2012 to present.

Research or implementation partners: Hana Nelson MSc. (Halifax, NS, Canada), Dr. Andreas G. Koestler (Oslo, Norway).

Contacts, links, further readings: (none at present).

Keywords: Low-cost sanitation structures, community-driven approaches, thermophilic composting of human excreta, reuse potential of properly sanitized compost.

Funding for this research courtesy of the Bill & Melinda Gates Foundation.