

A HYBRID SANITATION SOLUTION, EARTHAUGER

- **Background**

Over 2.5 billion people – roughly 37% of the world’s population – lack access to basic sanitation, with over 1 billion people practicing open defecation. The lack of basic sanitation perpetuates the cycle of poverty and disease in multiple and insidious ways. Poor sanitation practices existing in the world include: open defecation, improperly operated and maintained public/community systems, direct defecation in water bodies, and discharge of untreated wastewater and wastewater residuals into water bodies. Each of these directly affects human health and the environment.

The EarthAuger is designed as a home sanitation unit to serve 4-6 people. They are also demonstrating a community system with 4-6 EarthAugers for schools or emergency response situations.

- **Location, Date**

12 countries, 2001 onwards

- **Areas**

Rural as well as semi urban

- **Stage/Scale**

Pilot

- **Objective of the assignment**

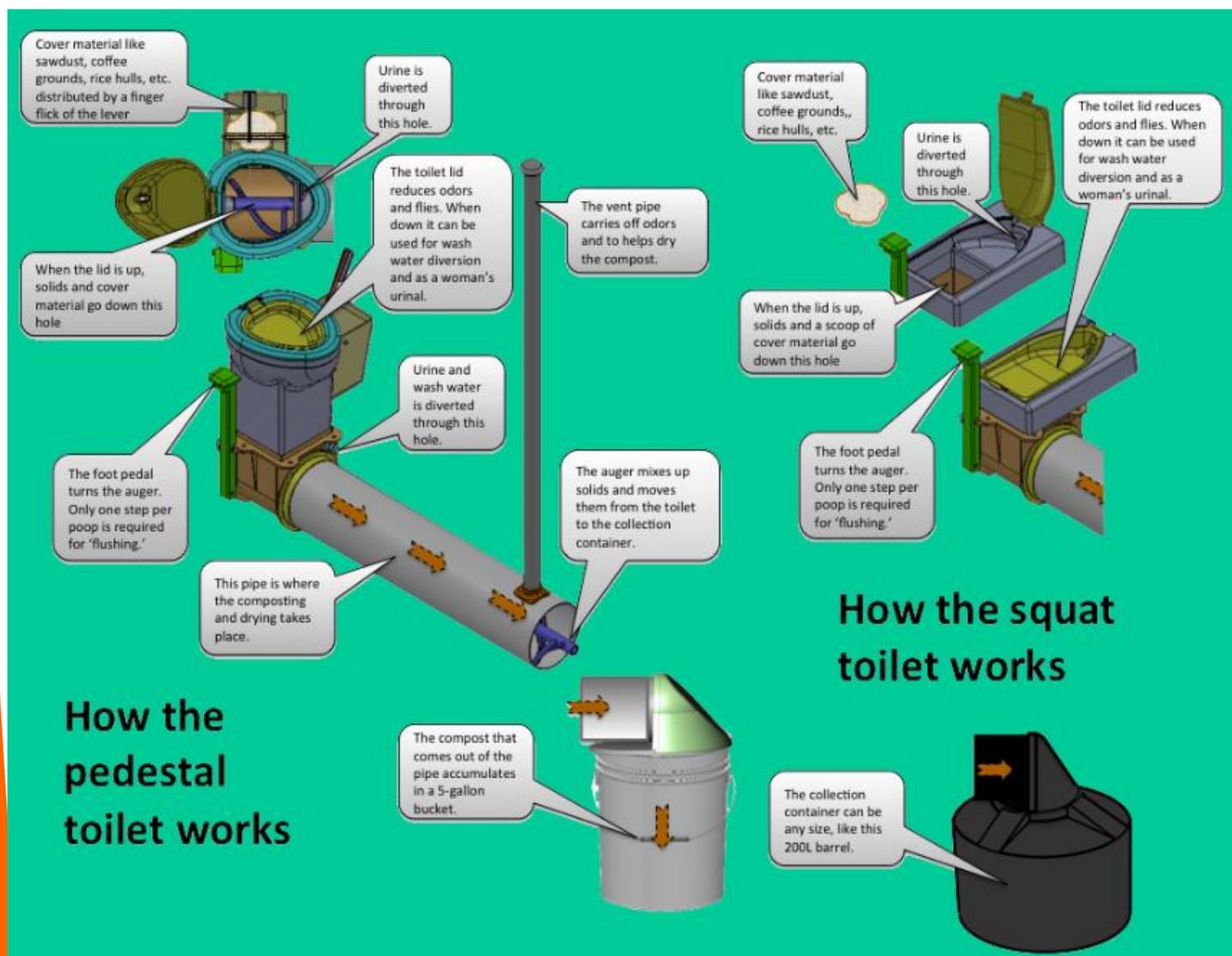
The goal is to alleviate the global sanitation crisis by developing safe, affordable, and environmentally sustainable sanitation technologies for marginalized communities worldwide.

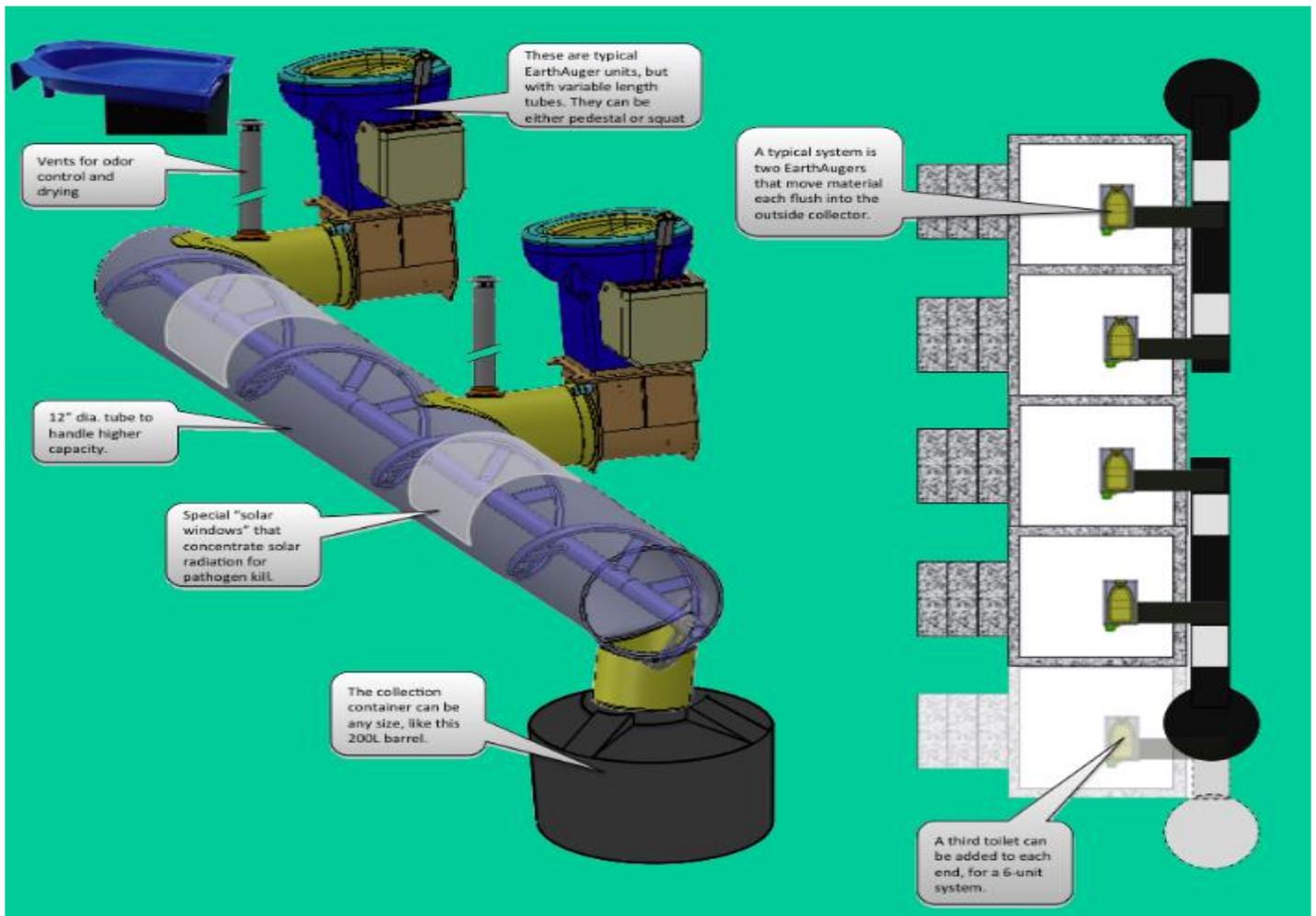
- **What was done**

- The goal of EarthAuger was to have a toilet that could:
 - Be installed inside the house and get treated solids and liquids out of the house, while avoiding smells and flies
 - Create usable end products
 - Operate effectively without power or water
- The multi-partner team is testing and iterating on toilet design models that meet the needs of low-income urban consumers in terms of affordability, hygiene, adequacy and desirability.
- The EarthAuger is a hybrid sanitation system: a urine diverting dry toilet (UDDT) and a composting toilet. A composting toilet makes use of naturally occurring bacteria that use the solids as an energy source – as food – and in the process, convert the solids to a more stable form. Composting happens faster and with greatly reduced odors if done aerobically (with oxygen); a UDDT helps with this in that the urine (and any other water) is separated from the solids by the way that the toilet seat/vertical chamber is made. The odors from poop dissipate relatively quickly, whereas as urine sits around, it really stinks over time. If both urine and poop sit together – that’s the worst conditions

for odors, as the mess becomes anaerobic (without oxygen), causing ideal conditions for odor generation.

- There are a number of ways that the EarthAuger enhances composting, drying and odor reduction. First, a cover material is added (like sawdust, coffee grounds, rice hulls, ash, etc.). These materials absorb odors as well as absorb moisture. Ideal composting happens between 40 and 60% moisture, so it's best to reduce the moisture in poop as soon as possible in the system. Secondly, each 'flush' turns an auger that mixes the poop with the cover material. This action makes the composting happen faster by maintaining aerobic conditions, breaking up chunks of materials and continually moving the materials. Eventually, composting slows because the bacteria have used the solids that are easily broken-down. It's easy to tell the solids have changed form, as the material that comes out the end has a typical musty odor of rich earth rather than a fecal smell.
- The black vent tube outside the toilet building also helps drying. As the sun hits this black tube, the air inside heats up, rises and pulls air down through the toilet seat and through the horizontal chamber. Any odors that are produced are carried away.
- Both pedestal and squat interfaces are available. Both have seals on hinges that, when lifted, allows solids and liquids to be deposited; when down, they allow urination and washing.





- **Impact**

The team now have EarthAuger projects in 11 countries and four continents. The EarthAuger Community Systems have been installed in 3 countries.

- **Challenges and Issues**

Their goal is to keep the EarthAuger as inexpensive as possible, and they have achieved that goal. Traditional collection and treatment is expensive, potentially the highest costs for large sewage systems followed by a wastewater treatment plant. Traditional wastewater treatment also presents technical obstacles. Since a mechanized treatment plant is designed to run within a narrow tuning of parameters, failure in a developing country is often just a broken part, power outage, or funding shortfall away!

- **Innovation**

- It requires no water to operate.
- It doesn't use energy.
- It has little odour or flies.
- It produces two usable end products: compost (great for the soil) or for making energy pellets, and urine (a great liquid fertilizer).
- It's easy to use and maintain.
- It can be used in difficult situations like areas prone to flooding, shallow groundwater, or unstable ground.

- **Lessons learnt**

- Of course, as with any good human-centred design intervention, there have been suggestions for improvement. For one, the seat size was not optimal: it may be too big for children, while too small for large-sized users. Dr. Henry quickly solved this problem by developing a larger seat.
- Other challenges seem to be occurring because of misuse or poor motivation to adhere to operational instructions. For instance, although the Earth Auger toilet was originally designed for four to six users, up to fifteen users were found to be using monitored toilets. Overuse can adversely affect the stability of the compost created by the toilet. In another case, an error in the construction of the floor of the superstructure meant that the superstructure did not completely surround the toilet, which caused the pedal to malfunction.

- **Financials**

Not available

- **Economic sustainability/Revenue Model**

In many countries, this project is funded by organizations like the Gates foundation.

- **Implementer Contact Persons**

- **Dr. Chuck Henry**
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- **Sources and References**

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- <http://psiimpact.com/2016/06/the-earth-auger-toilet-a-solution-for-the-masses/>
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