

The surprising value of waste

February 14 2014, by Rob Matheson



Shown here is a Fresh Life Toilet, which comes with necessary equipment for Fresh Life Operators to run their businesses. Credit: Sanergy

In the "sanitation value chain," human waste, with the proper infrastructure, is turned into a valuable commodity. Collecting, storing, and recycling waste into valuable byproducts, such as fertilizer, can create work and renewable resources, the thinking goes.

Over the past three years, MIT spinout Sanergy has developed a model that impacts the entire sanitation value chain—from clean toilets to

waste management and conversion—in a 500,000-person Kenyan slum, Mukuru, that lacks a modern sanitation system, helping the community stay clean and earn a living.

This startup, its co-founders say, demonstrates that such value chains, if introduced in places like Mukuru, could be potential solutions to a sanitation crisis that affects 2.5 billion people worldwide.

Across Mukuru—where people defecate in pits or, sometimes, in the streets—Sanergy manufactures low-cost, concrete-housed bathrooms called Fresh Life Toilets (FLT). They franchise these toilets to local microentrepreneurs to run as Fresh Life Operators (FLOs). Sanergy collects and transports the waste to a processing facility, where it's converted into organic fertilizer and, soon, other useful byproducts.

"We're removing waste and creating value from that waste," says David Auerbach '11, one of Sanergy's co-founders. "As we do, we necessarily build out a market and that incentivizes everyone in the sanitation value chain to participate."

Sanergy's other co-founders are Nathan Cooke, a former instructor in MIT's D-Lab, Joel Veenstra '11, Lindsay Stradley MBA '11, and Ani Vallabhaneni MBA '11.

So far Sanergy, winner of the 2011 MIT \$100K Entrepreneurship Competition, has erected 330 FLT (with about new 25 toilets added monthly) and removed roughly 1,800 tons of waste. The waste is converted into fertilizer that's sold to local farmers, who had previously relied on (more expensive) imported fertilizer.

On top of that, the startup has created more than 350 jobs in Mukuru, a community with 40 percent unemployment. These jobs include roughly 170 FLOs, as well as jobs for those who construct and service the toilets

and provide business support to the operators.

Stories of successful FLOs have reached numerous media outlets. Auerbach recalls a recent story about a mother in Mukuru who had bought two FLT franchises, and had earned enough to buy land for her son to open two of his own. "When I see that kind of thing happening," he says, "I realize that we're doing something really, really good."

Sanergy has won numerous business and sanitation awards—from MassChallenge, MIT's Legatum Center for Development and Entrepreneurship, and the Lemelson Foundation, among others—totaling hundreds of thousands of dollars.

Ingredients for a business plan

The Sanergy model has its roots in 15.375J (Development Ventures), a class in MIT's D-Lab that focuses on building entrepreneurial ventures in developing countries.

Upon hearing that 8 million people in Kenyan slums lack access to proper sanitation, the Sanergy team conceived an idea to construct toilets as businesses in Kenya.

A trip to Nairobi for a feasibility study—funded by MIT's Public Service Center and the Legatum Center—confirmed the commercial viability of this model. Pay toilets were already in use, Auerbach says, but they were so poorly designed that regular waste-collection was impossible. And the locals running these toilets were struggling to turn a profit.

"We saw so much entrepreneur spirit from people looking to change their community and earn a living," Auerbach says. "That's the moment

when I started really thinking about turning Sanergy's model from a project into a massive opportunity."

Raising about \$25,000 from the Public Service Center, the team traveled back to Nairobi. They built two toilets—one in Kibera, one of the world's largest slums, and the other in Mukuru, a slum of nearly the same size—and established a rudimentary system for collecting the waste and turning it into fertilizer.

Equipped with these "ingredients to put together a business plan," Auerbach says—a proof-of-concept and a feasibility study—the team won the grand prize at MIT's \$100K. A few months later, Sanergy relocated to Mukuru (where it's now headquartered) and opened its first toilet for business in late 2011.

Today, each Sanergy FLT comes equipped with two removable, airtight waste cartridges—one each for liquid and solid waste—a trashcan, a sealed bin for sanitary pads, and a solar lantern, among other conveniences. People can use FLTs on an unlimited basis by purchasing a membership for roughly \$1 a month.

FLOs, collect the money and may derive extra income from selling hygiene-related products, such as toilet paper and soap. Each FLT costs about \$600 (or \$1,100 for two), which includes construction, waste collection, and business and other support from Sanergy. Partnerships with financial organizations such as Kiva, an online loan platform, allow Sanergy to provide zero-interest loans to vetted FLOs.

Waste not

Statistics point to 2.5 billion people worldwide affected by a lack of access to proper sanitation. But factor in where their waste ends up—dumped into rivers and waterways used for drinking, and leached

into soil—and that number reaches closer to 4 billion, Auerbach says.

"When it comes to sanitation it's no longer a question of, 'Can you bring someone a good toilet?' If that's the answer we would have already solved it," Auerbach says. "You need to address the entire sanitation value chain to solve the challenge."

That system involves clean toilets, and collecting and converting waste into valuable byproducts, such as fertilizer, biogas, biochar (a type of charcoal), and even some plastics.

Currently, Sanergy focuses on producing fertilizer, which it makes by composting the collected waste with sawdust and microorganisms. Funded primarily by venture capital and grants, Sanergy sells the fertilizer to Kenyan farmers, reinvesting the revenue into expanding its infrastructure.

The startup recently purchased new technology to expedite the waste-to-fertilizer process. A high-tech facility in Muruku, currently in the final stages of construction, will convert the biogas—primarily methane and carbon dioxide, created from the decomposing [waste](#)—into a renewable energy source.

Within a few years, Auerbach says, Sanergy hopes to install 1,000 FLT's across Mukuru and spread its operations across Kenya, the rest of Africa, and eventually South Asia and East Asia. But for now, he cautions, the company is staying put to ensure that its model is sustainable in Mukuru. "We need to get it right in the community we're serving first," he says.

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