

Wasting Away: Can a Gates Foundation-Funded Toilet-Design Initiative End a Foul Practice in the Developing World?

A low-tech plumbing challenge searches for the "iPad of commodes"

By Jim Nash

Chances are that if you are reading this, you have a private flush toilet a few steps from your bed. Your commode is more reliable than your mobile connection, and likely will outlast all of your home appliances. Yet huge tracts of the developing world have yet to see so much as a latrine, a situation that facilitates the spread of debilitating or even deadly diarrheal diseases.

Advocates for universal access to and use of basic personal sanitation hope their efforts will get a big boost in August, when the Bill & Melinda Gates Foundation present several hygienic innovations developed through its Reinventing the Toilet Challenge. Technology alone might help with failing sewers in industrialized countries, but for poor nations, where changing social norms is more important, the Gates Foundation is a powerful ally. The foundation's involvement could do for sanitation what it has accomplished in the battle to eradicate malaria—raise the visibility of a fundamental health care crisis and encourage new efforts to end it.

Toilet tech

According to the United Nations Children's Fund (UNICEF), 2.6 billion people, almost entirely in the developing world, use bucket, public or open (uncovered) latrines—if they use latrines at all. Of that total, 1.1 billion people defecate in the open—a social norm in some societies, but one that results in typhoid, cholera, dysentery and other diseases.

One of the foundation's efforts in this fight was to spread \$3 million in grants last summer among engineering teams at eight research institutions in North America, Asia, Africa and Europe, including the California Institute of Technology, South Africa's University of KwaZulu–Natal and National University of Singapore. The foundation approached about 20 institutions, eight of which took up the challenge. These teams were charged with developing concepts that: do not use piped-in water; are not connected to a sewer system; do not use outside electricity; and will not cost more than 5 cents per visitor per day to operate, including initial investment and ongoing maintenance.

Several prototypes have been proposed: A team at the Delft University of Technology in the Netherlands proposes using microwaves to turn human waste into carbon monoxide and hydrogen, which would be stored in solid-oxide fuel stacks to generate electricity. Teams at Loughborough University in England and Stanford University are working separately on methods that involve turning waste into charcoal, or biochar.

At the University of Toronto, researchers are building a system that sanitizes feces (dehydrated after running it between two rollers) by smoldering it. The system decontaminates urine via membrane filtration and ultraviolet radiation. Meanwhile, Caltech researchers have proposed a solar-powered toilet that generates hydrogen for fuel cells from the waste.

Frank Rijsberman, director of the Gates Foundation's Water, Sanitation and Hygiene Initiative, says he is hoping for something that goes beyond the minimum

criteria to become the "iPad of sanitation." He says, "There must be an aspirational element" to toilets or even latrines if they are going to become the norm. People have to want to be seen owning one.

Sanitation marketing

This last point is more important than one might think. After all, what arguments for toilets could be more persuasive than hygiene and health? The numbers alone would seem capable of convincing any adult mind that open defecation is disastrous. For instance, the World Health Organization says 1.5 million children alone suffer miserable deaths each year from diarrhea, a common outcome of poor sanitation. It turns out, however, that getting people to climb the first rung of what is called the sanitation ladder to improved waste-disposal practices is a complex social endeavor.

For example, although some people, particularly women and girls who risk being assaulted while crouching alone at night in the open, might opt for latrines and toilets where available, others say they prefer the experience of open defecation. To them, it is a natural practice going back generations.

Nonprofits and government agencies trying to end open defecation historically have parachuted into villages armed with health statistics, subsidies and latrines. Those involved in the battle say such campaigns are viewed locally as, at best, irrelevant and, at worst, as condescending noblesse oblige. Return visits revealed that if the facilities were used at all, they became grain stores, animal pens or even kitchens.

Even the Gates Foundation, Rijsberman says, is putting more money into toilet technology than behavioral efforts, but it recognizes the limits of technology in changing social norms. He says the foundation has also issued grants for "sanitation marketing programs" in Indonesia, India and Tanzania, for example.

Sanitation marketing programs are part of Community-Led Total Sanitation (CLTS), a growing social science–based technique pioneered in Bangladesh in 2000. CLTS creates a demand for improved sanitation—one villager at a time, if necessary—and is successful only when 100 percent of the targeted population has abandoned open defecation.

It shares some tactics with previous efforts, such as creating an ally of a village's leader before approaching the group. But the differences are significant. CLTS teams, which can be outsiders, regional converts or both, use sanitation marketing to render the status quo disgusting. A team might ask residents to create a large map of the village in a clearing and then have everyone pour a bright powder where they relieve themselves. The resulting image shows how much land is despoiled. Another approach is to point out that another local village held in high esteem does not defecate in the open, playing again on feelings of shame as well as aspirational sentiment.

Owning up

Aspirational motives play in the next phase as well, when the team prompts villagers to design latrines that can be built with locally found or purchased materials. If latrines cannot be produced locally, replacements will not be built when the original toilets break down and are abandoned.

Perhaps most counterintuitive is the importance of ownership. "Toilets need owners," says Jack Sim, founder of the World Toilet Organization, an information and advocacy group based in Singapore. Sim, who has been involved in improving sanitation since 1998, is not talking just about conceptual ownership, as in who takes care of a latrine. He and others have found that people should purchase a toilet with their precious money to give it value. "People often revert to open defecation when there is no ownership."

David Winder, CEO of the nonprofit WaterAid America, says that whenever possible, the toilet must bestow status on those using it. Something as seemingly minor as a coat of paint on a latrine's concrete slab encourages its use and care.

The only objective measure of progress in the fight to give everyone on Earth a safe, sanitary and private toilet is the United Nation's Millennium Development Goals, which call for halving the proportion of people living in poverty by 2015. The sanitation goal seeks to halve the proportion of people living without basic toilets by the same year.

The hope is that efforts such as sanitation marketing and the Gates Foundation's challenge will have an impact on sanitation problems worldwide, but the reality of what they face is daunting. "Of the Millennium Goals, sanitation is the one that's most off track," according to Rose George, author of *The Big Necessity: The Unmentionable World of Human Waste and Why It Matters*, (Metropolitan Books, 2008) which makes the case for universal toilets. Indeed, WaterAid estimates that at the present rate of progress, sub-Saharan Africa will not hit the mark for centuries.*