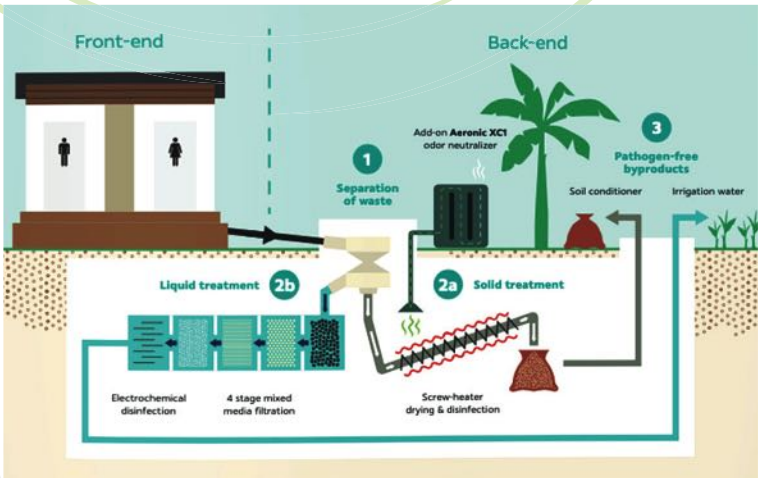
EXPERIENCE NOTES

Case Stories on Inclusive Sanitation

April 2021
Issue No. 4

The ADB Water Sector Group's Experience Notes are case stories on inclusive sanitation projects. The stories invite readers to learn about innovative approaches, technologies, and strategies used in initiatives supported by the Sanitation Financing Partnership Trust Fund (SFPTF) under the Water Financing Partnership Facility. Each case lists lessons and tips that can guide water supply and sanitation practitioners. These are critical as the world continues to wrestle with the coronavirus disease (COVID-19) pandemic, making water and sanitation essential to protecting and saving lives.



Waste to wealth. Piyapath Suksanguan, vice-chair of the Khlong Phlabphla community, said the Zyklon reinvented toilet at the pilot site in Rama IX has also provided for urban agriculture (photos by SCG Chemicals Co., Ltd).

Changing the Future of Sanitation through Reinvented Toilets

IN THIS ISSUE: ***The ADB Water Sector Group shows how cutting-edge, off-grid sanitation solutions are slowly becoming more accessible for booming cities and isolated areas. We share fresh insights gathered from the innovation process and the potential of these technologies to help countries reach universal safely managed sanitation.***

Piyapath Suksanguan, vice-chair of the Khlong Phlabphla community in Bangkok, Thailand, remembered the time when the canal in their neighborhood reeked of decaying human waste.

"Before the reinvented toilets were installed, people who came out here to exercise usually sneaked in the canal just behind me and relieved themselves. There were no efforts to maintain safe sanitation," she said.

In 2018, their community was chosen as the pilot site for the Zyklon, the first reinvented toilet in Thailand by SCG Chemicals Co., Ltd. and supported by the Bill & Melinda Gates Foundation. In collaboration with the Asian Institute of Technology, they built pilot units at the public park near the canal. The technology improved the residents' sanitation standard and opened up an opportunity for urban agriculture.

"After these toilets were installed, we have been happier. We can wash ourselves after we defecate. I can even show my neighbors how their waste is turned into odor-free fertilizers to grow vegetables. This has really improved life in our community," said Suksanguan.[1]

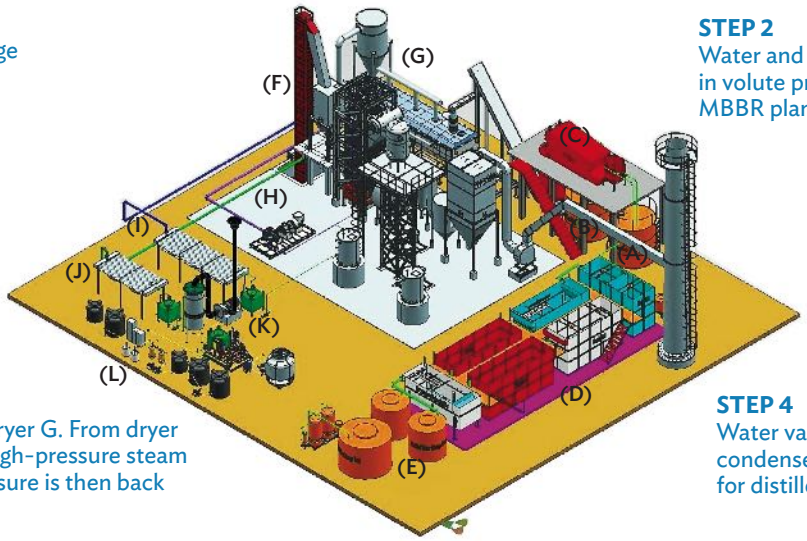
The self-contained toilet also helps ensure safe waste disposal. The Zyklon prevents harmful pathogens from being released

[1] Use of treated waste for vegetables is still not recommended in many areas. This particular reinvented toilet used biotreatment, which involves different filtration media, aeration, and water recirculation, as well as electrochemical disinfection, to produce sanitized water. The solid waste is sterilized at temperatures as high as 100–120 degrees Celsius so that it can be used as soil conditioner.

Girls benefit more from improved sanitation access than boys. Sanitation projects that support menstrual hygiene management means girls do not have to skip school and they can help uplift their communities (photo by ADB).

3D Process Flow Diagram of the Omni-Processor

STEP 1
Septage is emptied in sludge receiving tank A. After agitation, it is delivered to Volute screw press C.



STEP 2
Water and solid waste are separated in volute press C. Water enters the MBBR plant D and stored in Tank E.

STEP 3
Solid cake from C enters dryer G. From dryer G, it enters boiler Silo F. High-pressure steam drives turbine H. Low pressure is then back to dryer G.

STEP 4
Water vapor from the dryer enters condenser J. Liquid is treated in L for distilled water production.

Source: Ankur Scientific.

into rivers and reduces the spread of infectious diseases. Residents also use the by-product—the soil conditioner—to improve the growth of Phlabphla's community vegetable garden. They keep some of the produce, sell the surplus, and use the income to help maintain the reinvented toilets.

Suksanguan's testimony of how a reinvented toilet can change a community is proof that the market is eager for radical solutions. The "business as unusual" approach is fueling this sanitation revolution and it is pushing the limits of what toilets can do.

Out-of-the box sanitation solutions

For decades, governments and funders prioritized the building of expensive centralized sewerage systems in urban areas. This traditional approach ignored the harsh realities of 4.5 billion people who lived off the grid.

Life for these communities got even harder given the impact of climate change and booming populations. It became clear that there was no single solution that was good for all. Decision-makers needed diverse options to ensure that the most vulnerable groups got basic sanitation services.

The shift to the "business as unusual" approach sparked creativity and collaboration among engineers, researchers, and private companies. They designed technologies that were eco-friendly, low-cost, and gave countries a range of choices—on-site versus off-site and sewered versus non-sewered solutions.

In 2011, the Gates Foundation fast-tracked global innovation in sanitation through the Reinvent the Toilet Challenge. It gave grants to research teams from different parts of the world to develop self-contained toilets that killed pathogens.

The challenge was to come up with aspirational next-generation products for everyone that can operate off-the-grid without connections to water, sewer, or electrical lines. The toilet must cost less than $.05 per user per day. Finally, it must promote sustainable and financially profitable sanitation services and businesses that operate in poor, urban settings.

The funding from the Gates Foundation has paved the way for several research teams to move forward from concept, product development, pilot testing, to commercial launch. For instance, 18 smart cities in India have bought Eram Scientific Solutions' eToilet for public use since it was launched. Across the People's Republic of China, Clear Environmental Technology's Bio Toilet

Revolutionary concept of integrated toilets. School children in Nellore, India benefit from the solar-powered toilets with automatic self-cleaning and washing mechanisms (photo by Eram Scientific Solutions).

and Yixing Eco-Sanitary Manufacture Co.'s Eco-San toilet have set up units in parks, schools, temples, and toll plazas among others.

The grant also funded the development of the omni-processor technology to solve the problem of processing fecal sludge and biosolids from pit latrines and septic tanks. It is a self-powered, small-scale treatment plant that takes in fecal sludge, kills the pathogens, and converts the output into useful products such as clean water, electricity, and fertilizer.

The first prototypes were tested in Africa. One example is the Janiciki Omni-Processor, which has been pilot tested in Dakar, Senegal since 2015. Proponents learned during the pilot test the importance of understanding the relevant regulatory and institutional frameworks of their chosen market. Companies must be prepared to conduct expensive testing to get the needed permits.

Organizations also need to invest time in engaging universities, private companies, and public institutions. These groups will be keen to validate the claims of new products before endorsing them.

Three tips to help advance the use of reinvented toilets

So far, the research and development process to create new sanitation technologies has been promising. The next step is to build strong pathways to advance the adoption of these new products so they can serve the people who need them most.

"Establishing good institutional frameworks and financing mechanisms to support and build demand for innovative sanitation solutions, like the reinvented toilet, are critical now," said Roshan Shrestha, deputy director, Water, Sanitation, & Hygiene program, at the Gates Foundation.

"Multilateral development banks, in partnership with governments, can do a lot to accelerate the effective use and impact of these new products towards our shared SDG 6.2 goal, by committing to lending and planning mechanisms that prioritize equitable sanitation service delivery and accountability—and to taking advantage of every promising solution we can," said Shrestha.

Building on Shrestha's perspective, the Asian Development Bank shares three key insights here that may help reinvented toilets gain greater acceptance and support, in markets where they can provide safely managed sanitation solutions.

1. Highight the positive, long-term social impact of gender-sensitive reinvented toilets.

Engineers have developed units that are more responsive to the needs of different types of female users. This is a big leap because past sanitation projects have often ignored elements that mattered to school-aged girls, young women, mothers, etc. Features that help in menstrual hygiene are important to them aside from safety, accessibility, and cleanliness.

Research teams have also learned from field trials that it was not enough that they get women's feedback. They need women as part of their design teams to improve their prototypes especially when it comes to promoting menstrual hygiene.

Today, the Smart SHE model of eToilets offers a two-door unit—one serves as toilet while the other is a comfort station for women travelers. Aside from automatic lighting, self-cleaning, and washing mechanism, it also has a coin-operated napkin vending machine and a time-based napkin destroyer. Extras include seats, a diaper changing station, room freshener, wall-mounted fan, and a mobile charger.

Duke University Center for Water, Sanitation, Hygiene, and Infectious Disease (WaSH-AID) also designed a Safe Hygiene for Everyone (SHE) unit that can be added to public restrooms. It gives users an option to safely dispose of menstrual products and produces safe ash.

"We believe that improving access to menstrual waste disposal options is something that could have a true positive impact for women and girls to attend school and employment," said Mara Shurgot, associate director of communications. "There are also environmental benefits from not disposing menstrual waste in toilets, landfills, or bodies of water, " she added. The center will pilot test the SHE unit in India in 2021.

2. Reframe the conversation on waste to gain more broad-based support.

Public and private conversations on waste need to change to gain popular support for reinvented toilets. This is critical especially when these products become commercially available. Simple public relations campaigns would not be enough to break the taboo on the topic. A culturally sensitive,

multipronged communication strategy is needed to educate and engage different groups. People want to hear their peers share why sanitation matters to them and how these new technologies have transformed their lives.

Possible entry points may include highlighting the financial and environmental benefits or how it ushers community transformation. This was true in the pilot test of the Zyklon in Bangkok where the community became more food-secure by using the fertilizer for their vegetable garden. They also learned to be more self-reliant since they helped maintain the toilets.

The openness to adopt new sanitation solutions may also nurture individual and collective agency. This means that users begin to aspire for something better and pool resources to achieve them.

For instance, when field trials were held for the Pee Power toilet in the water-stressed province of Kisoro, Uganda, the participating female high school students became highly interested how it worked and how they can use the electricity produced by Pee Power. The students also planned to form a science club to discover more about sanitation technologies. Encouraging these kinds of conversations might make it easier for ordinary people to accept and eventually promote them.

3. **Engage the public and build knowledge partnerships to improve sanitation technologies.**

Effective communication and public participation are among the key factors to help high-tech solutions to scale up. To achieve this, some companies have harnessed technology to continuously improve their units. eToilet gives users several options to send their feedback. They can use the mobile app, scan the QR code that is linked to a portal, press the feedback switch, or call a 24/7 call hotline posted inside the unit.

Multilateral development banks, in partnership with governments, can do a lot to accelerate the effective use and impact of these new products towards our shared SDG 6.2 goal, by committing to lending and planning mechanisms that prioritize equitable sanitation service delivery and accountability—and to taking advantage of every promising solution we can.

—Roshan Shrestha, deputy director, Water, Sanitation, & Hygiene program, Bill & Melinda Gates Foundation

Aside from setting up robust feedback mechanisms, knowledge partnerships are vital to grow and spread the lessons. Universities need to work closely with the private sector to guide them in applying scientific principles. Researchers need to build strong ties with the community as they test prototypes. Funding institutions like the Asian Development Bank need to collaborate with the Gates Foundation to help develop markets and build local capacity.

Conclusion

The future of sanitation looks promising with the growth of cutting-edge and culturally appropriate solutions. The financial backing of the Gates Foundation and other multilateral organizations has breathed energy into research and development. It is evident that the world has entered an era where people are slowly accepting that different communities need different sanitation solutions.

As these technologies are scaled, the challenge is to put as much investment to projects that will promote equity, participation, and two-way communication. Science alone is not enough but with the world's 7.5 billion people working together, a different world is possible.

What's Next?

Watch out for case stories of inclusive sanitation from Indonesia, Papua New Guinea, and Nepal in succeeding issues.

The grant fund for this knowledge product was from the Federal Ministry of the Republic of Austria, the Bill & Melinda Gates Foundation, and the Urban Climate Change Resilience Trust Fund financed by the Rockefeller Foundation and the governments of Switzerland and the United Kingdom.

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Publication Stock No. ARM210126-2
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