15 Years of Clean Water in South Rampur
Success of Arsenic Removal Programs in West Bengal
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In a secluded village outside of Kolkata, India, in the shadows of coconut palms, stands a one-and-a-half-meter tall steel cylinder painted a futuristic teal-blue. The cylinder houses lifesaving technology. It filters out dangerous levels of arsenic in the drinking water that would otherwise go unnoticed by the families of this village.

Arsenic contamination in the ground water of West Bengal was first identified in the early 1980s[1]. Since then, the extent and impacts have been widely studied by the World Health Organization, Indian and international academic institutions, foreign governmental investigative teams, and non-governmental organizations (NGOs). These studies show that millions of people in several densely populated districts of West Bengal were experiencing prolonged arsenic exposure at dangerous levels[2].

Proven Technology

Following these findings, several mitigation strategies have been implemented throughout the region with varying levels of success[3]. The Amal filter performed best based on surveys of consumers[4]. This arsenic removal technology, developed by the (recently renamed) Indian Institute of Engineering and Science Technology (IIEST) and Dr. Arup Sengupta of Lehigh University (USA), has been recognized as an Outstanding Civil Engineering Achievement Project (2008) by the American Society of Civil Engineers[5]. With support from Water for People (a NGO based in Denver, USA) and SATHEE (Shibpur Association for Technological, Humanitarian and Environmental Endeavors, based in West Bengal) Amal filters have now been installed in around 150 villages.

The Amal filter in South Rampur has consistently and effectively removed dangerous levels of arsenic since 2001. While the Amal filter has proven to be a highly effective technology, the sustainability of this technology depends also on the institutional, social, and financial frameworks managed by the community.

Empowered Management Team

In South Rampur, an all-volunteer village water committee is responsible for overseeing the maintenance, finances, and management of the filter and pump system. A new water committee is selected every year, and in 2016 this 7-person committee is entirely female. Day-to-day monitoring is the task of a local care-taker who lives just a short walk from the system. Other local caretakers in other villages are often paid by their water committees, but in South Rampur, the caretaker volunteers his time without charge.

Unfiltered piped water is often provided free of charge by the municipal government, but the community members of South Rampur are eager to get clean, safe drinking water and willing to pay for it. Families are charged a small fee of 20 Indian Rupees ($0.35 USD) for a months-worth of arsenic-free drinking water, enough to cover O&M costs while accumulating a surplus for the community's water fund. While this fee may seem small, it happens to be out of reach for a few families. Hence, upon request, South Rampur's water committee allows two

families to collect water free of charge, and thus ensuring equitable access to safe water for everyone in the community.

At the start of the project in 2001, SATHEE conducted an awareness camp in South Rampur to educate the community about the risks of prolonged arsenic exposure and the importance of clean, safe water. The camp included a theater performance and magic show, and news about the camp was so widespread that people from other villages came to South Rampur to participate. Many more families now understand the value of clean and safe water and want to participate in the Amal filter project, but South Rampur's system can't supply enough water for the growing demand. Confronted with this increase in demand, the water committee conducted a survey and concluded that families are willing to pay as much as 30 Indian Rupees per month. This Willingness to Pay makes the committee interested in seeking capital to increase the capacity of the current Amal filter and pump.

The village caretaker keeps a close eye on the filter's performance and is vigilant at the first sign of damage. The filter and pump only require a few periodic maintenance actions each year, and he wants to make sure that the community is never without service. He has a stockpile of spare parts on hand and he can always rely on turn-around technical assistance from SATHEE. His tasks include monitoring the condition of the media inside the unit; the media become exhausted every year or two and need to be replaced. The water committee can choose from new media or less expensive regenerated media. Previously, communities would have to halt water collection for several days to get the exhausted media replaced. A central media regeneration facility, started by SATHEE and now operated as a private enterprise, delivers fresh regenerated media to the filter at a reduced cost, and also dropping filter downtime from days to hours.

Progress since the first filters were Installed

The South Rampur program may sound like a rare success story, but the 13 other programs I visited in November 2016 displayed similar, if not greater results. One program that was started in 1996 recently upgraded its system to increase its capacity, and now provides clean water to 300 families. Another program supplies 630 families, many of which live a considerable distance from the filter system. To meet this growing need, several students bring filtered water to these distant consumers on bicycles and charge a delivery fee, providing these students substantial funding towards their education. Another water committee is managing its program so effectively that it provides a local student a scholarship out of its water fund.

The most recently upgraded and installed Amal filters incorporate improved technology that increase system efficiency and capacity. Electric pumps have been introduced to withdraw water rather than the labor-intensive hand-pumps as the one used in South Rampur. Large tanks store the water, so now a tap simply needs to be opened during collection, reducing the wait times for consumers. Newer and upgraded Amal filters are often enclosed in spacious permanent structures to protect the systems from damage and by their sheer presence underscore the importance of clean water.

Moreover, some upgraded systems now include a separate/second filter to remove high levels of iron from drinking water. Iron can give water a brownish tint, influencing consumer

perception of the cleanliness of the water. Some water committees have found that as iron concentrations were reduced and water looked really clear, the number of families eager to pay for clean safe water jumps dramatically.

Keys to Sustainability

Other researchers have concluded that important issues to participants of arsenic removal programs in West Bengal are the cost of water, trust in the program, distance from the filter, and understanding the health impacts of arsenic[4]. These very important issues have been effectively addressed by Amal filter program promotors.

While many arsenic removal technologies aren't designed to last more than 10 years[4], the South Rampur program has sustained already for over 15 years because community members are empowered, collectively, to control the system, its usage, its financial regimen, and its division of labor. When they implement some of the strategies of neighboring water committees, the program of South Rampur may actually increase the number of families it can incorporate and support. The program is a most feasible community project, with a high impact of improved health (only anecdotal data) and improved quality of life. It will sustain the village until an alternate source of arsenic free water becomes available for the whole of West Bengal.

The caretaker proudly shows off the Amal filter that was installed in 2001

Collecting water. This Amal filter that was started in 1996 and upgraded in 2010

References

[1]First reported by K. C. Saha in 1983, as cited in Chakraborti, D., Mukherjee, S., Pati, S., Sengupta, M., Rahman, M., Chowdhurry, U., Lodh, D., Chanda, C., Chakraborti, A., and Basu, G. (2003). Arsenic Ground Water Contamination in Middle Ganga Plain, Bihar, India: A Future Danger? *Environmental Health Perspectives*, 111(9), pages 1194-1201.

[2]Groundwater Arsenic Contamination in West Bengal – India (20 years Study), (2006). The School of Environmental Studies (SOES), Jadavpur University. http://www.soesju.org/arsenic/wb.htm

[3]Public Health Engineering Department, 2012, as cited in Etmannski, T., & Darton R. (2014). A methodology for the sustainability of arsenic mitigation technology for drinking water. *Science of the Total Environment*, 488-489, 505-511.

[4]Etmannski, T., & Darton R. (2014). A methodology for the sustainability of arsenic mitigation technology for drinking water. *Science of the Total Environment*, 488-489, 505-511.

[5]Outstanding Civil Engineering Achievement (OCEA) Award Past Award Winners. http://www.asce.org/oceakit/?all_recipients=1

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Mark Lotto completed his Master of Science in Applied Geosciences degree at the University of Pennsylvania. His final project consisted of developing and administering a sustainability assessment of arsenic removal and school WASH programs in West Bengal, India. The sustainability assessment, conducted in November 2016, would not have been possible without

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