

LBNL Tech Removes Arsenic And Excess Fluoride, Providing Safe Drinking Water In India

Lawrence Berkeley National Laboratory



With 600 million people relying on groundwater in rural India, safe drinking water is a priority. Two inventions from LBNL are helping address this vital issue.

Arsenic, a known carcinogen, and fluoride, which in large doses can cause deformities and crippling illness, are both present in high levels in groundwater across India, making safe drinking water a major challenge. Since the early 2000s, there have been so many reports of arsenic contamination that the World Health Organization has referred to India's problems as "the largest mass poisoning in recorded history." Meanwhile, of the 85 million tons of natural fluoride deposits on the earth's crust, almost 12 million are in India.

“ Although there are numerous potential solutions for arsenic and fluoride removal on the market, many are expensive and/or ineffective, and few are sustainable in the long-term.

Scientists at the Lawrence Berkeley National Laboratory (LBNL) in Berkeley, California, led by Ashok Gadgil, developed

two technologies to combat the threats: ECAR and SAFR. **Electro-Chemical Arsenic Remediation (ECAR)** uses a small amount of electricity to create rust in contaminated water. The rust binds to the highly toxic arsenic, which is then extracted from the water.

The **Safe & Affordable Fluoride Removal Technology (SAFR)** uses minimally processed bauxite ore as an inexpensive adsorbent to battle the fluoride contamination that exists in 22 states and 200 districts, putting 60 million people at risk of fluorosis. Lab tests have shown that the best-performing bauxite from Guinea, an amorphous clay rock used in fluoride remediation, was about 23-33 times less expensive than with the widely used activated alumina.

Both technologies were designed using locally sourced materials. Both are affordable, highly effective, technically feasible, and robust in rural settings where approximately 595 million people live and rely on groundwater for drinking. They require minimal manpower to operate and maintain. Both meet World Health Organization guidelines.

In 2018, both ECAR and SAFR were licensed by LBNL to Bangalore-based SATTVA Consulting, known as a leader in clean water solutions. To develop and scale these technologies, Sattva invited a small group of corporate and non-profit national experts, including Piramal Sarvajal and the INREM Foundation, to develop a collective action consortium to tackle the clean water crisis, called SAFEbillion.

These licenses accelerate the deployment of the technologies by leveraging the SAFEbillion network and its ties to local entrepreneurs, delivering clean drinking water in India and Bangladesh by setting up water dispensing stations (“water ATMs”) owned and operated by local entrepreneurs. Its goal is to identify areas of acute problem of Arsenic and Fluoride contamination, develop a localized solution and task force, create behavior change materials, and implement the technology.

The LBNL licenses are non-exclusive and require low royalties, providing the opportunity for further deployment by other organizations to maximize deployment around the world.

The government of India’s Department of Drinking Water and Sanitation includes ECAR on its list of recommended technologies for arsenic removal. ECAR is mentioned as one of five technologies that work in a 2018 report by the United Nations University Institute for Water, Environment and Health.

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