

Reducing the health effects of geogenic contaminants in groundwater in India

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Bridging the gaps between academia, industry, and government to lower arsenic poisoning in South and Southeast Asia to achieve SDG 6

Millions of shallow tubewells/handpumps have been installed by villagers in unconsolidated sand deposited by rivers draining the Himalayas, in Indo-Gangetic floodplains. The handpumps are preferred choice over piped water supply or dug wells because the water is free of microbial contamination and therefore does not require any further treatment before being consumed for drinking and domestic needs. However, the households install these tubewells/handpumps without getting the water tested for arsenic.

The consumption of high arsenic groundwater not only causes multiple health problems such as cardiac arrest, still births, skin lesions, cancers of gallbladder, kidney, liver etc but also affects the mental ability of kids thus affecting their performance in schools and considerably limit adult earnings.

A large blanket testing campaign in the state of Punjab and scattered blanket testing in villages of Bihar, Uttar Pradesh revealed that the groundwater matrix is heterogenous and contains variable amount of arsenic within a single village (fig. 1). Testing of approximately 20000 handpumps/tubewells in almost 300 villages spread across Indo-Gangetic floodplains uncovered that almost 30% of these wells contained groundwater arsenic greater than $10\mu\text{g/L}$, a benchmark set by WHO. If the households are informed of their groundwater arsenic status and the health impacts of arsenic consumption through their handpumps the households are ready to switch to safe wells. We conducted a study in 26 villages with interventions such as testing of groundwater and sharing the information with households resulting we 37% of the arsenic exposed population switch to safer wells.

Punjab Govt. suggests installation of deep wells as an intervention of mitigate arsenic poisoning of population. The cost of testing handpump/tubewell water with a field test kit costs approximately 2.70 USD, whereas installing a deep well at about 300ft in India costs about 1750-2000 USD. By the best estimates that are available in Bangladesh, public and private investment in lowering arsenic exposure of that order of magnitude would eliminate over 100,000 annual deaths and raise annual rural income by US\$800 million.



Fig. 1. Blanket testing results from 2 villages in Punjab, India. Blue denotes wells that meet the WHO guideline for As in drinking water of $10\mu\text{g/L}$, in green $>10\mu\text{g/L}$ but up to $50\mu\text{g/L}$ As, and in red wells with $>50\mu\text{g/L}$ As.