

# Transforming the arsenic crisis into an opportunity

● High levels of arsenic in drinking water in south-east Asian countries is having a serious impact on communities' health, but a community-based treatment system offers the potential for delivering safe water through a sustainable business model. **SUDIPTA SARKAR, HUL SEINGHENG, DAVIN UY** and **ARUP SENGUPTA** outline the approach and its ongoing application to countries in the region.

**A**lthough unknown 25 years ago, natural arsenic contamination of groundwater has now emerged as a major global crisis, affecting over 50 countries around the world. The adverse health effects are, however, most prevalent in south and south-east Asia where over 200 million people, according to World Health Organization (WHO), are threatened with arsenic-inflicted health impairment (i.e., arsenicosis) caused by drinking contaminated groundwater<sup>1</sup>. The use of groundwater in these regions is favoured because of its easy availability due to natural recharging of the aquifers by significant rainfall, low salinity and absence of microbial contamination.

The arsenic crisis in countries in south-east Asia, namely Cambodia, Laos and Vietnam, surfaced a decade ago in the wake of widespread reports in Bangladesh and eastern India. Although rainwater harvesting offers some relief to relatively affluent villagers during the monsoon period, arsenic-contaminated groundwater remains the only viable source for safe drinking water in hundreds of villages in the Mekong delta. The level of arsenic contamination in Kandal province in Cambodia and neighbouring regions is by far the highest, often exceeding 500 µg/L, while the permissible level according to WHO is only 10 µg/L. Arsenic does not affect the colour, taste or odour of water. Also, the health impact of arsenic poisoning from drinking water is slow and takes several years before becoming fatal. It is

initially seen mostly by changes in the skin through the formation of hard, dark scales, accompanied by lesions (hyperkeratosis) and followed by malignancy in many cases.

## Removing arsenic

Following an active collaboration between the Institute of Technology in Cambodia (ITC) and Lehigh University in Pennsylvania in the US, the first SARSAC (Sustainable Arsenic Removal System in Affected Communities) unit was installed in Preak Eng commune in Kandal province, Cambodia, two years ago, and several others quickly followed. The community-based plants are simple to operate and a reusable hybrid arsenic-selective adsorbent is used<sup>2</sup>. Figure 1 shows how the SARSAC unit is consistently removing arsenic from the severely contaminated groundwater.

Water vending is currently being introduced in the affected villages using local transport so that each community-based system can provide safe water to villagers within three kilometres. For economic sustainability, a business model was created where every participating household is required to pay a small amount of tariff (40 US cents per month per family for 20 litres of safe water a day) and all labour is fully or partially compensated using the tariff paid by villagers. Similar community-based systems have shown both economic sustainability and proactive villager participation in eastern India. Figure 2 shows the revenue collected from participating families, which has been increasing over time.



**Implementation of a system in Po Ta Pang site in Kandal province in Cambodia, October 2011.**

## Conclusion

In the Mekong delta and other regions in south-east Asia, arsenic-contaminated groundwater is the only reliable water resource during the dry season. Household arsenic removal units, although easy to deploy, are economically unsustainable for prolonged use and they pose environmental hazards. In essence, through intervention of appropriate technology and a community-based business model, the arsenic crisis has the potential to be transformed into a business enterprise in remote communities, while also providing safe water. ●

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## References

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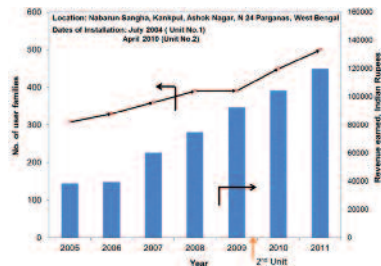
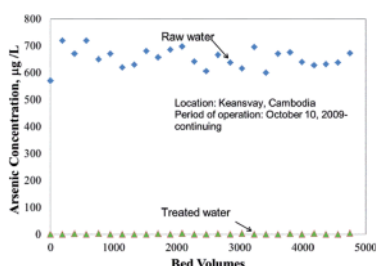
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**Figure 1 (FAR LEFT):** Arsenic levels in raw and treated water in Keansvay, Cambodia.

**Figure 2:** Revenue earned from collection of water tariff at the installation of an arsenic removal unit in Ashoknagar, West Bengal, India.