The Disaster of Arsenic Poisoning of Groundwater in South Asia

Dr. Zafar Adeel
Environment and Sustainable Development, United Nations University

Overview of the Arsenic Crisis
The pollution of groundwater – the primary source of drinking water – by arsenic in West Bengal (India), Nepal and Bangladesh has led to a crisis of unprecedented proportions. Some recent estimates show that more than 35 million people are potentially at risk from drinking arsenic-contaminated water (Smith et al., 2000) – this indeed brings the problem to a catastrophic scale. In comparison, the current estimate of people possibly infected by the HIV virus all over the world is around 34 million (UN AIDS, 2001). The sheer magnitude of this disaster means that we face new and unique challenges and tasks.

Awareness about the pollution of drinking water with arsenic and the significance of the crisis has risen significantly during the 1990’s. Naturally-occurring and human-induced arsenic pollution in drinking water has since been discovered in many parts of the world (please see Box 1). It is now recognized that dealing with arsenic contamination in groundwater is a problem of global dimensions.

Box 1 – Arsenic, the silent killer
Arsenic – a metalloid element – is a natural part of the earth's crust in some parts of the world and may be found in water that has flowed through arsenic-rich rocks. Arsenic is also emitted into the atmosphere by high-temperature processes such as coal-fired power generation plants, burning vegetation and volcanic action. High concentrations of arsenic in drinking-water are found in various parts of the world including Argentina, Bangladesh, Chile, Taiwan, Hungary, India (West Bengal), Mexico, and the USA. A variety of instrumental techniques available for the determination of arsenic in water and air.

Source: WHO Environmental Health Criteria, No. 224: Arsenic

The Public Health Dimension
It is important to understand the suffering of the large population impacted by arsenic poisoning through drinking contaminated water. Long-term exposure to arsenic in drinking-water causes increased risks of cancer in the skin, lungs, bladder and kidney. It also leads to other skin-related problems such as hyperkeratosis and changes in pigmentation. A large number of patients with visible or measurable health impacts are anticipated – although precise estimates for South Asia have not even been developed as yet. It is important to note that it takes several years of drinking arsenic-contaminated water to develop visible symptoms – although they may appear earlier in some patients. This makes estimation of the future number of arsenicosis patients quite difficult. At the moment, no reliable cure for these arsenicosis patients is available. At a minimum, ceasing the consumption of arsenic-contaminated water and improving nutritional health are shown to assist in recovering from early stages of arsenicosis. Therefore, provision of clean, safe water to all becomes an essential requirement.

Societal Problems and Lack of Knowledge
Several studies on the arsenic crisis indicate a general lack of knowledge about arsenicosis, its causes and possible remedies. This is particularly true because the vast majority of the population in South Asia lives in rural areas and is not well-educated. Pre-existing notions and superstitions about the diseases triggered by arsenic exposure further worsen the situation. There is a social stigma associated with the people affected by arsenicosis, in which the
disease is wrongly attributed to sins in the current or past lifetimes. This lack of awareness exists despite the concerted efforts made by many stakeholders to educate the general public.

The arsenic crisis has also triggered a number of societal problems that were not foreseen and are still not fully recognized or understood. Recent studies confirm that worst arsenic problems are encountered by the poorest fraction of the society (WHO, 2000) – particularly those who are already undernourished. Significant gains can be made through educating the people about improving the level of nutrition in their diet and providing them support for doing so. This, obviously, has to be coupled with provision of clean and safe water.

Safe Water Options
An urgently-needed measure is to provide arsenic-safe water to the people in the affected region. In view of the overwhelming dependence of the population on groundwater, point-of-use treatment of arsenic-contaminated groundwater appears to a promising short-term option for providing safe water to the rural population. However, the broader spectrum of safe water options has to be carefully evaluated and locally-viable options have to be adopted.

Numerous available options can be cited here. First, some deeper aquifers have been found to be arsenic-free and can be utilized for accessing to safe water; concerns about cross-contamination by arsenic seepage from shallow aquifers remain need to be addressed. Second, shallow hand-dug wells in some areas have also shown to be arsenic-free; however these are vulnerable to microbiological contamination from the surface sources. Third, rainwater harvesting coupled with disinfection can also be utilized in some areas where sufficient rainfall is available throughout the year. Fourth, surface water may be treated at the point-of-use or at community level. Fifth, piped water supplies – where the source is treated surface or ground water – are also an ideal, but expensive, long term solution.

It is important to point out that each of the safe water options has some challenges in their mass implementation in the region. The capital costs and the costs associated with effective operation and maintenance of each option has to be carefully weighed. Water supply experts recommend that piped water supply should be deemed as the eventual target, but any of the other options can be utilized locally in accordance with the persisting local conditions.

UNU’s Role in Research on the Arsenic Crisis
In order to fully understand the arsenic crisis and to adequately respond to it, a number of gaps in the scientific knowledge must be filled. Importantly, information from scientific research should be directly fed into the development of strategies to cope with the arsenic crisis. UNU has undertaken such research work focused on better understanding the scientific problems. UNU is also engaged in conducting policy-relevant research and facilitating the dialogue on the mitigation of the arsenic crisis (Adeel, 2001).

As a first phase of the research work, development of economical technologies/methods for treating arsenic contamination at household level was undertaken. Based on this work, a number of household treatment units were set up and are successfully operating in two villages in Bangladesh. Interestingly, a number of villagers adopted the technologies at their own expense and effort, which clearly shows their acceptability. An international workshop held by UNU in Dhaka evaluated different technologies that are currently available for arsenic treatment and identified critical directions for further research on these technologies. In a new joint research project, UNU is now focusing on answering some of the questions related to the fate of arsenic in the environment. The overall objectives of this research work
are: (a) to estimate overall mass of arsenic extracted with groundwater each year; (b) to estimate the quantity of arsenic deposited in agricultural soils; and (c) to estimate the arsenic concentration in soil and selected crop/vegetable, both in some arsenic-affected and unaffected areas.

References


