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## **Arsenic contamination of groundwater: quest for solutions**

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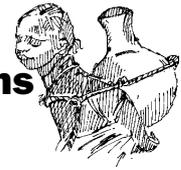
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## Arsenic contamination of groundwater: quest for solutions

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SURFACE WATER FROM ponds, lakes and rivers and, to a lesser degree groundwater from dug wells, was the traditional source of drinking water in Bangladesh. As a result, endemic water borne diseases exacted a heavy toll on human lives. With a view to save people from such diseases, the Department of Public Health Engineering (DPHE) embarked on a massive program in the early 70s to install tubewells with assistance from UNICEF (MIA, 1999). Basically a supply driven strategy and top-down planning were followed in the implementation of the program. A simultaneous communication campaign was mounted by government and non-government agencies to wean people from using surface water. The success of this program was remarkable. Over four million tubewells, majority of them privately installed, now dot the landscape. Over 97% of the population is reported to have access to "safe" water from tubewells (BBS, 1997). This enviable success could be attributed to the government agencies, NGOs, international agencies such as UNICEF, and bilateral donor agencies. However, in the early 90s a new menace shattered the notion of tubewell water as "safe." Arsenic was discovered in groundwater; first in West Bengal, India and then in Bangladesh. The problem of high levels of arsenic in tubewell water was first detected in 1993 in Bangladesh, and was subsequently confirmed after 1996. Initial investigations were of limited scope and area-specific. Follow-up national scale studies revealed the problem to be of an enormous magnitude engulfing almost the entire country. Over 4,600 cases of chronic arsenicosis have been identified in Bangladesh. It is estimated that at least 18 million people are confirmed to be currently exposed to arsenic poisoning, and perhaps two-thirds of the country's population of more than 120 million is potentially at risk. It is clearly one of the worst case of mass poisoning of water in history.

### Challenges

Mitigation of arsenic contamination in Bangladesh is extremely challenging. Some of the constraints are described here:

- *Lack of information.* Although presence of contaminated tubewells has been confirmed in 59 of the country's 64 districts (Bridge and Husain, 1999), the actual extent of the problem still remains unknown. Except for an exhaustive survey in 200 villages, data collected so far are based on random sampling only. It is difficult to draw realistic conclusions from a small sample size compared to the vast number of tubewells located in

various hydrological conditions. Only about 80,000 tubewells out of a possible five million have been tested for arsenic so far. Even the number of existing tubewells is unknown. Most tubewells are privately owned and there is no mechanism to record their installation. Data from the UNDP funded Emergency program in 200 villages study reveals some startling facts: only about 10% of the tubewells are government owned and the user size per tubewell is only around 15 persons. Therefore, the actual number of tubewells may be much larger than the estimate. However, this is based on the 200 village effort and is only indicative.

- *Mitigation options and awareness.* A number of options are available for mitigation. These range from treatment of arsenic contaminated tubewell water (with oxidizing agent and coagulants, filters, ion exchangers, etc.), treatment of surface water (slow sand filters, solar disinfection), to alternative sources of drinking water (rain water harvesting, sanitized dug wells, etc.). However, only limited attempts have been made so far to ascertain whether these options are practical for field conditions and acceptable to the people. Moreover, it is unlikely that a single solution could be applicable for the whole country. Awareness about arsenic remains low despite coverage by media.
- *Sustainability: vision for the future.* It is clear that arsenic in groundwater is going to remain a problem for the foreseeable future. Time has come to re-examine the whole water supply sector in view of this impending crisis. The relevant questions are: is the supply driven, top-down approach still valid; or should people have a choice in selecting, managing and financing their water supply; and how can continuous water quality monitoring be assured for the future?

### Facing the challenge: Bangladesh arsenic mitigation water supply project

Realizing the scale and magnitude of the arsenic crisis in Bangladesh, the World Bank came forward with a US\$44.4 million project entitled 'Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP)'. This includes a US\$32.4 million interest-free credit from the International Development Association (IDA), the World Bank's concessionary lending window. The Government of Bangladesh and local communities are contributing US\$9 million and the Swiss Agency for Development and Cooperation (SDC) is contributing a US\$3 million grant.

Launched in September 1998, this project has many innovative and exceptional features. The project takes a three-pronged approach: (i) emergency mitigation in hard hit areas, (ii) understanding the causality and finding appropriate solution through scientific studies, and (iii) strengthening national capacity (PAD, 1998).

The project will implement a countrywide tubewell screening program to identify contaminated and safe tubewells. This will be the largest ever water quality monitoring endeavor in Bangladesh. Maintaining a high standard of quality while testing millions of tubewell is a daunting task. The Project will provide emergency relief, which involves information dissemination and provision of arsenic-free water and medical help on a temporary basis to communities awaiting the setup of a sustainable water supply. Project activities will be coordinated with local communities, in partnership with government entities and non-governmental organizations. It will be the first attempt of enabling villagers to choose options, award contracts, supervise implementation and pay for works.

A National Arsenic Mitigation Information Center (NAMIC) has been set up under this Project to collect, process, interpret, manage and disseminate relevant information. The project staff are building a GIS database and Internet web site. NAMIC, in time, will become a one-stop information clearinghouse for easy access to arsenic related data.

The Project has provision to fund investigative studies in arsenic related fields to further enrich our knowledge base. Call for proposals will announced internationally and funding will be awarded after review and selection. A technology advisory group (TAG) consisting of eminent scientists has already been formed for this purpose.

The Project envisages a demand driven, community participatory, and sustainable water supply system for the future. Capacity building activities will be carried out at community and agency level to achieve this goal. Successful implementation of this Project will not only provide solutions to the arsenic problem, but also guide the whole water supply sector towards a demand driven and sustainable direction.

Training and capacity building efforts play an important role in the Project. As part of the on-site mitigation efforts, the Project will also help strengthen the ability of communities to carry out an maintain field interventions and manage funds allocated or collected for that purpose. For the health sector, training for medical universities and colleges on arsenic diagnosis will be included.

The arsenic problem is multidimensional encompassing engineering, scientific and social issues. It warrants national and international effort. BAMWSP has been designed with flexibility to call upon and draw support from donor agencies, educational institutions, government agencies and NGOs. It is hoped that the arsenic crisis could be turned into an opportunity for identifying sustainable, safe drinking water supply systems. This is especially challenging when considering the colossal scale of intervention – 120 million people, 85,000 villages and over 250 urban centers.

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