

# Arsenic Contamination in Asia

A WORLD BANK and WATER AND SANITATION PROGRAM REPORT

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*The public health effects of arsenic are a reality and they need to be taken seriously. As the effects of arsenic are long term, it is likely that arsenic-related disease, with and without fatal outcomes, is going to increase over the coming decades.*

*—Arsenic Contamination of Groundwater in South and East Asian Countries*

## Delivering a strategic response

Groundwater is an important resource, especially for rural populations, yet there is now evidence that unsafe levels of arsenic are present in many Asian countries, ranging from Bangladesh to China and Vietnam, with health risks for an estimated 65 million people. The impacts cut across many sectors - from water supply, to irrigation, health, and education.

The World Bank and the Water and Sanitation Program have completed the first comprehensive international study examining responses to the issue of naturally-occurring arsenic in the groundwater of Asian countries. It presents state-of-the-art knowledge on arsenic in Asia, and was developed based on extensive literature reviews, stakeholder and development partner meetings, and a questionnaire survey in the countries.

The study, *Arsenic Contamination of Groundwater in South and East Asian Countries*, shows that governments and donors have been seeking to address arsenic contamination for over a decade and a considerable amount of research has been carried out into the causes and effects of this contamination and possible mitigation measures. Yet, there are still significant uncertainties which have to be factored in when attempting to define a balanced policy response.

## The Challenge

Beginning in the mid-1970s, provision of tube wells—underground wells from which water is pumped through tubes—was a saving grace for rural communities across Asia which, until then, had depended mainly on surface water for drinking. The region's ponds and rivers were a source of bacteriological contaminants, which caused the death of millions of people, particularly children, each year.

However, many of those same wells were subsequently found to be a source of unsafe levels of naturally-occurring arsenic, a colorless, odorless, tasteless element which, over time can cause skin discolora-

tion, sickness, cancer, and sometimes death.

## The Response

Bangladesh and West Bengal in India were the first countries where the discovery of arsenic triggered mitigation and research responses. In the meantime, due to increased testing, arsenic has also been found in Cambodia, Lao, Myanmar, Nepal, Pakistan, Vietnam, several provinces in China and additional states in India. An estimated 65 million people in Asian countries are at risk of ingesting unsafe levels of arsenic through drinking water.

While most of the affected countries have made attempts to address this issue, significant gaps remain in the knowledge of the hydrogeological and chemical scope of the problem and the specific health effects of arsenic in Asia.

A number of responses have been implemented, ranging from large-scale testing of tubewells to community awareness raising campaigns, training of health workers and provision of alternative water supplies. As the country most severely affected by arsenic, Bangladesh has undertaken the most comprehensive response.

While a number of approaches have been effective on a small scale (for example, village-by-village interventions financed by NGOs and donors), and many people have already been provided with alternative, arsenic-safe water, there is an enormous need to scale up activities.

## Looking Ahead

The water supply sector has a specific role to play in arsenic mitigation. An important lesson learned over recent years has been that arsenic cannot be treated as an isolated issue, with distinct programs and approaches, but it has to be integrated into broader water supply sector policies and approaches.

In practice, this would imply:

- Routine arsenic testing in planned water supply interventions in those areas where arsenic is likely to occur (there is sufficient information now about geohydrology in the region to roughly predict which areas are at risk),
- Application of well-known demand-based techniques to solicit from communities what type of arsenic mitigation measures they would prefer (the water supply sector has moved away from the “top-down approach” to development and, for the sake of effectiveness and sustainability, the same move is needed in dealing with the arsenic challenge).

The solutions will take into account country and locality-specific

### Population at risk: Selected Countries in South and East Asia<sup>1</sup>

Bangladesh	35,000,000
China (Inner Mongolia, Xinjiang, Shanxi)	5,600,000
India (West Bengal)	5,000,000
Nepal	550,000
Taiwan	10,000 <sup>2</sup>
Vietnam	10,000,000 <sup>3</sup>
Myanmar	3,400,000
Cambodia	320,000 <sup>4</sup>

1. Estimated to be drinking water  $>50\mu\text{gL}^{-1}$

2. Before mitigation

3. United Nations Children's Fund (UNICEF) estimate

4. Maximum. Source: Regional Operational Response to ARsenic Workshop in Nepal, 26-27 April, 2004.



Signs of Arsenicosis: spots on the hands

#### Symptoms of Arsenicosis Include:

- High blood pressure
- Glucosuria
- Weakness
- Breathlessness
- Chest sounds
- Cough
- Hyperpigmentation
- Keratosis
- Cancer

characteristics and thus the approaches will vary. A range of tested options exist, from simple well-sharing in early phases, to provision of piped village water supply and to treatment of affected wells. The study outlines these options, and also analyzes them in economic, financial and social terms.

In summary, the study, which has drawn on information provided by a range of organizations - from governments to NGOs, donors, and academia to the World Bank's own operations - shows that there is now enough information to act, and that actors should not be deterred by the complexity of the arsenic issue which is inevitably marked by a certain degree of uncertainty.

Much still remains to be done, however. The responses to arsenic contamination have so far lacked cohesion, both at national and global levels, and the problem needs to be addressed in a much more integrated and strategic manner. March 22<sup>nd</sup> marked the beginning of the UN Water for Life Decade and a more strategic approach to scaling up arsenic mitigation efforts would naturally be part of the Decade's goals.

At **national and local levels**, there is a clear need to go beyond data collection and to actively integrate the available knowledge into development activities for the water supply sector. The same is true for the health sector (such as teaching health professionals about arsenic in an integrated way), for education (ensuring that when schools are built in arsenic-prone areas, wells are tested for arsenic), and for irrigation (many irrigation wells are also used as drinking water wells, and people need to be informed about their safety).

At the **global level**, there remains a need for more cohesion in scientific and medical research, and for the development and funding of a strategic research agenda, which would provide a more concrete understanding of the epidemiology of arsenic in the Asian context. Current estimates of the health impacts of arsenic ingestion are mostly based on data for the United States of America and Taiwan / China, and their validity on a wider, international scale is therefore frequently questioned.

Another remaining knowledge gap relates to the issue of arsenic in the food chain. In spite of scattered research efforts, there is still no conclusive evidence if and how food production will be affected by arsenic-contaminated irrigation water. A coherent research program to better study this vital question could be undertaken with a minimal amount of funding.

Politicians, donors and nongovernmental organizations must be the advocates for the scattered rural communities most affected by arsenic contamination since such communities often have limited political presence or ability to affect the direction of their own development. Poverty is a related issue since wealthier households



have greater means to look for alternative water sources.

Within these communities, people suffering from arsenicosis require assistance and advocacy as they often face stigmatization and discrimination, impeding their access to economic and social opportunities. To date, little research has been carried out on the social aspects of arsenic poisoning and only a few scientific papers provide sufficient rigor and depth to prepare any guidance on the matter.

Arsenic contamination is a long-term issue and, with extended screening, more affected areas are likely to be found in the future. There are also other toxic trace elements - such as fluoride, manganese and boron - which are found in groundwater and require similar approaches. Interventions and actions by governments and their development partners will therefore be required at the local / project, national and global levels simultaneously.

The World Bank is engaged in work with client countries, and can ensure that projects adequately address arsenic issues. Leadership by the respective governments and a response by the wider global community are required however to work towards developing more strategic responses to the arsenic challenge.

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*To view the entire report visit one of the following websites:*

The World Bank in South Asia: <http://www.worldbank.org/sar>

The World Bank in East Asia and the Pacific: <http://www.worldbank.org/eap>