Towards a more effective operational response

Arsenic Contamination of Groundwater in South and East Asian Countries

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Presentation outline

- Objective and outline of the study
- Why is arsenic so special and where is it found?
- Putting development needs into perspective
- Operational responses: what has been done so far in Asian countries
- Study results: towards a more effective operational response
- Recommendations of the study
- Summary remarks
Objective of the study

• Take stock of current knowledge regarding the arsenic issue; and
• Provide options for specific and balanced operational responses to the occurrence of arsenic in excess of permissible drinking water limits in groundwater in Asian countries
Study outline

• Volume I – Policy Report
• Volume II – Technical Report
  – State-of-the-art overview of arsenic occurrence in Asia
  – Operational responses to the arsenic issue
  – Technological options for arsenic mitigation
  – The economics of arsenic mitigation
Why is Arsenic so dangerous?

- Long-term exposure can cause a variety of diseases, ranging from cough and diabetes to skin lesions and cancer
- Carcinogenic at very low concentrations
- Invisible, odorless and relatively expensive to detect
- WHO provisional guideline is 10 microgram/liter
Patients with hyperkeratosis
Where is naturally-occurring arsenic in groundwater found globally?
Where is arsenic in groundwater found in Asia?

About 60 million people in Asia live in arsenic affected areas.
In which sectors does one encounter arsenic issues?

- Water supply
- Health
- Education
- Irrigation
- Rural development
Putting development needs in perspective…….
Arsenic health impacts compared to waterborne diseases

Between 650,000 to 1.3 million children under the age of 5 die every year of diarrheal diseases in the arsenic affected countries.

Immediate vs. long-term needs
## Estimated annual deaths from diarrheal disease of children < 5

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual total mortality of children under the age of five</th>
<th>Low estimate (15% under 5 years due to diarrhea)</th>
<th>High estimate (30% under 5 years due to diarrhea)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>323,000</td>
<td>48,450</td>
<td>96,900</td>
</tr>
<tr>
<td>Cambodia</td>
<td>65,000</td>
<td>9,750</td>
<td>19,500</td>
</tr>
<tr>
<td>China</td>
<td>735,000</td>
<td>110,250</td>
<td>220,500</td>
</tr>
<tr>
<td>India</td>
<td>2,346,000</td>
<td>351,900</td>
<td>703,800</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>20,000</td>
<td>3,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Myanmar</td>
<td>129,000</td>
<td>19,350</td>
<td>38,700</td>
</tr>
<tr>
<td>Nepal</td>
<td>74,000</td>
<td>11,100</td>
<td>22,200</td>
</tr>
<tr>
<td>Pakistan</td>
<td>579,000</td>
<td>86,850</td>
<td>173,700</td>
</tr>
<tr>
<td>Vietnam</td>
<td>64,000</td>
<td>9,600</td>
<td>19,200</td>
</tr>
<tr>
<td>South Asia total</td>
<td>3,451,000</td>
<td>517,650</td>
<td>1,035,300</td>
</tr>
<tr>
<td>East Asia total</td>
<td>884,000</td>
<td>132,600</td>
<td>265,200</td>
</tr>
<tr>
<td>Total</td>
<td>4,335,000</td>
<td>650,250</td>
<td>1,300,500</td>
</tr>
</tbody>
</table>
## How many people show health symptoms?

<table>
<thead>
<tr>
<th>Region/country</th>
<th>People at risk (million)</th>
<th># Arsenicosis patients</th>
<th>Year of first discovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>0.3 (2.7%)</td>
<td>—</td>
<td>2000</td>
</tr>
<tr>
<td>China</td>
<td>3 (0.2%)</td>
<td>522,566</td>
<td>1980s</td>
</tr>
<tr>
<td>Myanmar</td>
<td>5 (10%)</td>
<td>—</td>
<td>1999</td>
</tr>
<tr>
<td>Taiwan</td>
<td>0.2</td>
<td>—</td>
<td>1960s</td>
</tr>
<tr>
<td>Vietnam</td>
<td>11 (13.7%)</td>
<td>—</td>
<td>1998</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>35 (28%)</td>
<td>10,000</td>
<td>1993</td>
</tr>
<tr>
<td>India (West Bengal)</td>
<td>5.0 (6.25%)</td>
<td>200,000</td>
<td>1978</td>
</tr>
<tr>
<td>Nepal</td>
<td>0.3 (3.4%)</td>
<td>8,600</td>
<td>1999</td>
</tr>
<tr>
<td>Pakistan</td>
<td>—</td>
<td>242 per 100,000</td>
<td>2000</td>
</tr>
</tbody>
</table>
### Arsenic in Bangladesh – health impact estimates

**Estimated cancer fatalities**
over 50 years: 326,000

**Estimated arsenicosis cases occurring each year:**

- Keratoses 352,233
- Hyperpigmentation 971,230
- Cough 90,712
- Chest sounds 211,858
- Breathlessness 270,122
- Weakness 373,104
- Glucosuria 131,439
- High blood pressure 182,762

Major health, productivity and social impacts, but trade-offs with other development and health interventions.
Operational responses: What has been done so far in Asian countries?
Actions range from assessment to mitigation and policy development

- Assessment of the arsenic situation
  - Screening (field test)
  - Screening (laboratory)
- Mitigation activities
  - Water sharing
  - Dug well
  - Rainwater harvesting
  - Pond sand filter
  - Deep tubewell
  - Household water treatment
  - Community water treatment
- Long-term collection and dissemination of information
  - Arsenic monitoring program
  - Database
- Dealing with arsenic at the national or state policy level
  - Arsenic policy
  - Arsenic committees/programs
Operational responses:
What has been done by whom?

Answer varies by country:
• Governments
• Donors
• NGOs
• International Finance Institutions
• UN organizations (esp. UNICEF and WHO)
• Academic research institutions
Study results: towards a more operational response
Arsenic is a “people issue”
A lot has been learned about arsenic occurrence and effects of exposure, but much more needs to be done:

- Epidemiological research
- Hydrogeological research
- Hydrochemical research
- Arsenic in the agriculture and in the food chain
- Socioeconomic research
The technology side:

- A plethora of technology options exist, from urban-sized arsenic removal plants to household filters.
- There is no silver bullet, especially not in rural areas!
- The key is: affordability and sustainability.
- Listening to communities and applying lessons learned in the water supply and sanitation sector over the past decades is KEY!
The financial and economic side:

- There are trade-offs in development investments, e.g. bacteriologically safe water supply and arsenic-safe water supply, roads, education, etc.
Mitigation measures may bring other hazards, such as microbial contamination of drinking water.
The financial and economic Side (cont.)

• Cost-benefit analysis for Bangladesh shows that arsenic mitigation measures are justified, BUT success rates of implementation and sustainability play a major role.

• The study shows that economic cost/benefit analysis can be undertaken with few data requirements and can inform the decision making process.
The political side:

• Lack of cohesion in responses up to date
• Need to address the issue in a more strategic manner, embedded in the water supply and health sectors and national policies
• Overcome political economy factors?
Recommendations of the Study

• Project – Level Action
• National – Level Action
• Global – Level Action
Project-level recommendations

Any project using groundwater as a source:

• Will arsenic occurrence affect outcome of project? If yes, make provisions accordingly
  – Holds for all water supply, education, health, and irrigation projects

• Currently no guidelines for irrigation water
  – Irrigation wells should be tested & documented for possible future use

• Sequencing and integration
Project-level recommendations

Problem Identification and Option Assessments

Assess scale of problem

Find out if problems are getting worse over time

Identify the potential strategies or alternatives that are most appropriate for supplying (arsenic) safe water*.

ACTION

Collect available information

Testing:
- Field testing
  - reconnaissance testing
  - blanket testing
- Laboratory testing

Monitoring/Surveillance

Analyze and develop appropriate mitigation responses (immediate, medium and long term):
- technological analysis
- economic analysis
- financial analysis
- social and cultural analysis

* Implies water safe from all public health risk
National-level recommendations

- Acknowledge arsenic as a risk factor
- Encourage research on affected areas
- Develop viable options and coping mechanisms for people
- More investment and assertive action on the arsenic issue
Global-level recommendations

While local and national activities are going on, the global community can support more cohesive and targeted research:

- Epidemiological
- Socio-economic
- Hydrogeological and hydrochemical
- Arsenic in agricultural production and in the foodchain
Summary remarks
Arsenic is a complex issue requiring collective and strategic action.
There is sufficient knowledge to act now.
• The arsenic issue is not going to go away.
• Don’t treat arsenic contamination as an emergency.
• Mainstream it into investments and sector operations.
Depoliticizing the arsenic topic would help develop and implement more effective responses.
Government support and leadership play a major role at local, national and global levels.