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Position paper on Arsenic Mitigation on Water
Resources by Thematic Group on Arsenic

Prepared by

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Position paper on Arsenic Mitigation on Water Resources **From Water Resources Planning Organization (WARPO)**

1.0 Introduction

The rural areas of Bangladesh generally suffer from lack of quality drinking water, but country achieved a remarkable success by providing 97% of the rural population with tubewell water supply, which was believed to be safe until 1993. In 1993 arsenic was discovered in the groundwater water supply tubewell in many parts of the country. Arsenic has reduced the safe water supply coverage from 97% to 76% due to arsenic. It is estimated that 27% of the tubewells in the country, spread over **268 upazilas** (Sub-districts), are contaminated with arsenic above Bangladesh drinking water quality standard of 0.05mg/L. Arsenic in drinking water supply has exposed 35 million people to health hazard. Several alternative technologies are being tested and implemented for safe water supply in the affected area.

2. Present Status

National Water Management Plan (NWMP) in 2001 has proposed priority program for arsenic mitigation in the Urban and rural areas. The programs are consistent with National Water Policy (NWPo) and National Policy for Safe Water Supply and Sanitation (NPSWSS). NWMP anticipated that by the Year 2010 nearly 100% of population would be bought under arsenic safe drinking water if sufficient investment were arranged in the sector. Unfortunately the progress in the arsenic mitigation has not achieved the target set in the NWMP.

Government has declared National Policy for Arsenic Mitigation (NPAM) and Implementation Plan in 2004. The Policy clearly states that while surface water options to be given priority there is no single appropriate technological option, which may be feasible in a particular affected area. An Implementation plan for Arsenic Mitigation has also been prepared which suggests 100% subsidy in those villages where more than 80 percent of wells are contaminated. The implementation for the Arsenic Mitigation Plan was started under the leadership of the Ministry of Local Government, Rural Development and Cooperatives. A good number of institutions are involved in the effort concerning health, hydro-geology, water resources etc. WARPO under the Ministry of Water Resources has been also involved in the process.

In the mitigation initiatives several technologies are being tested and several guidelines were prepared to suggest different option depending on constraints in the affected areas. *Dug well* a traditional technology has been found to be free from dissolved arsenic & iron even in locations where tubewells are contaminated.

Given the presence of a large number of ponds in rural Bangladesh and the surface water being free from arsenic, construction of community type *slow sand filters* commonly known as PSF has been proved to be a prospective alternative water supply option in arsenic affected areas especially in the coastal region. It is a low cost technology with high efficiency in turbidity and bacterial removal. It may however require chlorination to meet drinking water standards. Regular maintenance is crucial for the effectiveness of PSF;

Rainwater harvesting is basically a household-based technology. It has good potential for water supply in arsenic and salinity affected areas. Several pilot programs have been undertaken to promote rainwater harvesting in the country.

Many technologies have been developed that remove arsenic from groundwater. There are several issues relating to the safety of the technology, in terms of chemical and biological water quality, and to the disposal of the liquid and solid waste from the arsenic removal processes; Four arsenic removal technologies (Sono, Read-F, Alcan and Sidko) have been issued provisional licenses, but the technology verification process has been far too slow.

It is also the opinion that deep drilling for *Deep hand Tubewell* (DHTW) can be an option in the short term where in the affected areas the shallow contaminated aquifer is separated from a deeper aquifer by an impervious layer. Manually operated deep tubewells are already a source of safe and reliable water supply in many parts of the coastal area. In other areas, safe deep aquifers may be available to produce water of acceptable quality for water supply;

There are no reliable statistics on the proportion of the exposed population now served by different arsenic-safe water supply alternatives. A significant, but unknown, proportion of people living in arsenic affected areas have switched to nearby safe wells. A 2007 Policy Advisory Note from World Bank estimated that about 14% of the exposed population had access to some kind of arsenic safe technology.

Rural piped water systems have had mixed success. In most cases water has dawn been from tubewells, but surface water and dug wells have been used. Greatest success came from schemes pumping groundwater for both drinking and irrigation, an approach that cannot be recommended for deep aquifers until proper yield assessments have been carried out.

Major shortcomings if arsenic mitigation is the lack of quantitative time-bound targets, and weak monitoring and evaluation framework for projects.

Although important research has been conducted, very little action on agricultural mitigation has taken place. The draft National Water Act has been revised by WARPO which took the needs of arsenic mitigation. The draft National Water Act is under consideration by Ministry of Water Resources.

3. Theme Specific issues

Institution

Department of Public Health Engineering (DPHE) under the Ministry of Local Government, Rural Development & Cooperatives (MoLGRD&C) is mandated government organization for implementing rural water supply. It has a countrywide network of personnel and is presently responsible for coordinating the overall mitigation activities including emergency response program. DPHE monitor the progress of implementation of the Arsenic mitigation initiatives. It is focal agency for providing necessary technical information and advice for implementation of the emergency program. Bangladesh Arsenic Mitigation and Water Supply Project (BAMWAS), the principle agency is working in close cooperation with the R & D Division of DPHE.

The Union Parishad, as local government institute (LGI's) through the Union Arsenic Mitigation Committee and Ward Arsenic Mitigation committee is responsible to oversee and coordinate the emergency water supply program in the rural areas and paurashavas. There is a National Arsenic Committee, supported by an Arsenic Implementation Monitoring Unit (AIMU) to collate, analyse and report information on arsenic mitigation.

Arsenic committees exist at various administrative levels: national, district, upazila, union and ward.

- There is a lack of proper coordination in the arsenic mitigation. A framework for coordination may be established for the implementation of mitigation plan by different Ministry;
- An institutional arrangement may be reviewed to bring changes and reform in the local government institutions;
- There is clear need for empowerment of the local Government institutions for arsenic mitigation;
- The roles and responsibilities of the other institutions including the government institution may be revisited a fresh;
- Development funds should be channeled to the local government for arsenic mitigation projects;
- A detailed review of the functioning of the arsenic committees should be undertaken to clarify their roles, membership and functions as discreet entities..

Capacity Development

- It is required to review and amend the ordinances/act that governs WASAs, City Corporation and pourashavas;
- Capacity development of the local Government is required to handle development funds;
- Requirement of Human resources development at different level of institution may be reviewed and Plan for its development may be implemented;
- Provision of training should be integral part of every arsenic mitigation projects.

Technical

- A review of effectiveness of different technical alternatives for arsenic mitigation may be taken up linking with the type of aquifers, aquifer properties, availability of groundwater and surface water in all the arsenic affected areas;
- An assessment on the current status of exposure, contamination of the current stock of wells, and the provision of safe-water in arsenic affected areas are core issues that are required to be ascertained;
- The existing implementation plan has made some progress on mapping wells in the deep aquifers, but little has been achieved in monitoring or determining the sustainability of this resource;
- The performance of arsenic test kits has improved, and their utilization by LGIs is encouraging;
- There has been progress in expanding the network of laboratories, but they have yet to become operationally effective;

- Methods for the safe disposal of arsenic-rich sludges from treatment plants are yet to be agreed.
- Research in the last five years has shown that arsenic is accumulating in the food chain and is, in some areas at least, affecting rice yields. This will require a major programme of action.

Social

- Inequity of access to water supply currently arises as a result of discrimination against low-income and low status users;
- In urban areas, 47% of households derive drinking water from sources other than piped supply or tubewells;
- Women are constrained from participating in design, siting and decision-making on water supply and sanitation, and so from improving their own access as managers of household water to the facilities.

The primary, high-level recommendation is that the NPAM should remain unchanged, but that each of the key ministries – Agriculture, Health, Local Government (for water supply) and Water Resources – should develop separate implementation plans for arsenic mitigation in each sector.

4. Strategies to address the issues

To address future water supply and sanitation needs the National Water Policy (§4.06a) seeks to facilitate availability of safe and affordable **drinking water supplies** through various means, including rainwater harvesting and conservation.

The National Policy for Safe Water Supply and Sanitation (NPSWSS), published in 1998, states the aim of facilitating access of all citizens to a basic level of services in water supply and sanitation. It also recognises the importance of providing arsenic-free water in areas of high contamination.

Arsenic Policy

- (1) The role of government is to ensure that no-one, is excluded from a basic right to safe water for reasons of poverty or lack of awareness.
- (2) Arsenic mitigation will be delivered through the combined efforts of government, NGOs, the private sector and individual citizens.
- (3) Local Government Institutions (LGIs) are accountable to **ensure** safe water for all through determining needs, mobilising demand and registration of providers. DPHE will support to LGIs through programming and budgeting of mitigation measures;
- (4) The Government of Bangladesh is accountable to **regulate** LGIs to eliminate exposure to unsafe water.

- (5) DPHE will play a greater role in strategic planning, monitoring and impact assessment, and quality assurance in testing and technology development.
- (6) Research agencies, donors and partners **offer** technical and capacity support to ensure the sustainability of mitigation;
- (7) It is required to improve in data management, and a commitment to share information across ministerial and government and non-governmental boundaries.
- (8) Legislation and regulation, including licensing of abstraction, will be required to protect critical water resources, especially the deep aquifers of southern Bangladesh;
- (9) There is a requirement for testing new and existing wells to be carried out principally by LGIs, NGOs or the private sector;
- (10) R&D is required for safe and practical disposal of treatment wastes;
- (11) *in-situ* (subsurface) treatment to remove not only arsenic but also iron and manganese.

5. Implementation of Plan

Implementation plans for arsenic mitigation may be classed one for agriculture, one for health, one for water resources and one for water supply. Each implementation plan should be elaborated by the respective ministry, but coordinated and monitored through the office of the Principal Secretary (PS), who will be advised by the National Arsenic Committee, and supported by an Arsenic Implementation Monitoring Unit (AIMU) to collate, analyse and report information.

5.1 Water Supply

This plan will be carried out under the guidance of MLGRD&C through a combination of government departments, NGOs, the private sector and individual citizens.

5.2 Health

The Plan for Health will have to be built on the substantial progress made to date in the identification, diagnosis and management of patients.

5.3 Agriculture

The Plan for Arsenic Mitigation in Agriculture should scale-up the knowledge gained from research in the last six years. The first objective would be to map the extent and severity of arsenic contaminated irrigation water. Water surveys would be supplemented by focused sampling of soils and crops. Thereafter, mitigation measures to reduce the accumulation of arsenic in soils; reduce the uptake arsenic into the edible parts of plants; and to resist the toxicity of arsenic in the soil-water complex may be approached

5.4 Water Resources

The objective of the Arsenic Mitigation in Water Resources would be to create the environment in which the plans for water supply and agriculture may be managed and, where necessary, controlled. With this in view implementation plan for water resources should include:

- (i) Monitoring of water levels and water quality in deep wells and nested piezometers throughout the exploited deep aquifers; Progressive trends in water levels or quality should be shared with DPHE and BADC on at least an annual basis.
- (ii) Based on the above determine the long-term and/or yields of the various deep aquifers, and predict the evolution of piezometric levels for a range of credible pumping scenarios. To this end, information on deep aquifers should be freely exchanged between MLGRD&C and MoWR through the National Water Resources Database (NWRD) of WARPO and databases held by DPHE.
- (iii) Create the legal and regulatory environment to define Water Stressed Areas, as per the NWP, within which the quality of groundwater can be protected.
- (iv) Create a system of abstraction licensing that can be used to prevent over-exploitation of groundwater within Water Stressed Areas without unnecessarily constraining economic development.
- (v) Create a system of abstraction licensing that can be used to prevent wasteful use or loss of safe groundwater within Water Stressed Areas.
- (vi) Identify sources of surface water or low arsenic groundwater that can be economically exploited for irrigation where current practices are harming agriculture.

6. Progress monitoring indicators

The progress monitoring may involve the regular comparison of activities and impacts against pre-determined criteria represented by indicators which themselves usually require verification.

The objective of the water resources implementation plan and its related indicators may be shown as below:

Objectives of and Indicators for Water Resources Plan Implementation

Actions	Indicators/Means of Verification	Due
<ul style="list-style-type: none"> • Water level and quality monitoring capacity strengthened technically and geographically 	<ul style="list-style-type: none"> • Institutional strength of GWC of BWDB , DPHE and BADC enhanced 	2012
<ul style="list-style-type: none"> • Ground water modeling for deeper aquifer 	<ul style="list-style-type: none"> • Research project implemented 	2013
<ul style="list-style-type: none"> • Protocol signed between BWDB, BADC and DPHE 	<ul style="list-style-type: none"> • Protocol signed 	2010
<ul style="list-style-type: none"> • Quality assured water quality data available to all stakeholder 	<ul style="list-style-type: none"> • Number of stakeholders requesting data 	
<ul style="list-style-type: none"> • National Water Act prepared for groundwater regulation in water stressed area 	<ul style="list-style-type: none"> • National Water Act approved 	2012
<ul style="list-style-type: none"> • A system of licensing established 	<ul style="list-style-type: none"> • Licensing for stressed area established 	2011
<ul style="list-style-type: none"> • Identification of low arsenic aquifers for agriculture 	<ul style="list-style-type: none"> • Study project completed 	2015

7. Risks and mitigation measures

7.1 Political

- Lack of political willingness
- Prevailing institutional culture
- The vested interests of the line agencies in maintaining the status quo.
- Delays in the establishment of the Local Government Institutions that will have a crucial role to play in decentralised water management;
- Lack of coordination, cooperation and accountability (especially downwards accountability which is so necessary for successful decentralisation).

7.2 Social

- unwillingness to acknowledge the valuable role that the grass roots can play in the mitigation of arsenic;
- Sensitisation campaigns that are meaningless and badly focussed.
- Low political will, may dilute messages for wise and regulated use of water resources and maximised community responsibility for operation and maintenance of their projects.

7.3 Financial

- Adequate development fund release is not achieved for Local government institutions;
- Adequate fund is not available for groundwater modeling and research on arsenic on food chain.
- Adequate fund is not available for monitoring and database management