

Document of
The World Bank

Report No: ICR000028

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IDA-31240 SWTZ-21082)

ON A

CREDIT IN THE AMOUNT OF SDR 24.2 MILLION
(US\$ 44.4 MILLION EQUIVALENT)

TO

BANGLADESH

FOR

ARSENIC MITIGATION WATER SUPPLY

June 10, 2007

Sustainable Development Department
Environment and Water Resources Unit
SOUTH ASIA REGION

CURRENCY EQUIVALENTS

Exchange rate effective: Average during project duration

Currency unit = Taka (Tk)

Tk 1.00 = US\$ 0.016

US\$ 1.00 = Tk 59.1

FISCAL YEAR January 1 – December 31

ABBREVIATIONS AND ACRONYMS

APL	adaptable program loan
BAEC	Bangladesh Atomic Energy Commission
BAMWSP	Bangladesh Arsenic Mitigation Water Supply Project
BWSPP	Bangladesh Water Supply Program Project
DANIDA	Danish International Development Agency
DFID	Department for International Development (UK)
DPHE	Department of Public Health Engineering
GPS	global positioning system
IAEA	International Atomic Energy Agency
ICR	Implementation Completion and Results Report
ISR	Implementation Status and Results Report
MoU	memorandum of understanding
NAMIC	National Arsenic Mitigation Information Center
NWSSIC	National Water Supply and Sanitation Information Center
PDO	project development objective
PMU	Project Management Unit
SDC	Swiss Agency for Development and Cooperation
SIL	specific investment loan
UNICEF	United Nations Children's Fund
WAMWUG	ward arsenic mitigation water user group
WSP	Water and Sanitation Program

Vice President: Praful Patel

Country Director: Xian Zhu

Sector Director: Constance Bernard

Project Team Leader: Karin Erika Kemper

ICR Team Leader: Karin Erika Kemper

People’s Republic of Bangladesh
Arsenic Mitigation Water Supply Project

CONTENTS

Data Sheet

A. Basic Information.....	i
B. Key Dates.....	i
C. Ratings Summary.....	i
D. Sector and Theme Codes.....	ii
E. Bank Staff.....	ii
F. Results Framework Analysis.....	iii
G. Ratings of Project Performance in ISRs.....	vi
H. Restructuring (if any)	vi
I. Disbursement Graph.....	vii

1. Project Context, Development Objectives, and Design.....	1
2. Key Factors Affecting Implementation and Outcomes	5
3. Assessment of Outcomes	12
4. Assessment of Risk to Development Outcome.....	20
5. Assessment of Bank and Borrower Performance	21
6. Lessons Learned	25
7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners	27
Annex 1. Project Costs and Financing.....	28
Annex 2. Outputs by Component	29
Annex 3. Economic and Financial Analysis	33
Annex 4. Bank Lending and Implementation Support/Supervision Processes.....	34
Annex 5. Beneficiary Assessment Results	38
Annex 6. Stakeholder Workshop Report and Results.....	43
Annex 7. Borrower’s ICR and/or Comments on Draft ICR	46
Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders	60
Annex 9. List of Supporting Documents	61
Maps.....	62
Arsenic Contamination in Bangladesh	
Upazila Production Wells Screened by Different Stakeholders Since 1998	
Upazila Production Wells Screened by BAMWSP	
BAMSWP Mitigation Activities by Project Phase	

A. Basic Information			
Country:	Bangladesh	Project Name:	Arsenic Mitigation Water Supply
Project ID:	P050745	L/C/TF Number(s):	IDA-31240,SWTZ-21082
ICR Date:	06/06/2007	ICR Type:	Intensive Learning ICR
Lending Instrument:	SIL	Borrower:	GOB
Original Total Commitment:	XDR 24.2M	Disbursed Amount:	XDR 16.2M
Environmental Category: B			
Implementing Agencies: Department of Public Health Engineering			
Cofinanciers and Other External Partners: Swiss Agency for Development and Cooperation			

B. Key Dates				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	08/20/1997	Effectiveness:	02/20/1999	02/20/1999
Appraisal:	12/05/1997	Restructuring(s):		
Approval:	08/27/1998	Mid-term Review:		03/27/2001
		Closing:	09/30/2002	06/30/2006

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Moderately Satisfactory
Risk to Development Outcome:	Moderate
Bank Performance:	Satisfactory
Borrower Performance:	Moderately Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)			
Bank	Ratings	Borrower	Ratings
Quality at Entry:	Satisfactory	Government:	Moderately Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Moderately Satisfactory
Overall Bank Performance:	Satisfactory	Overall Borrower Performance:	Moderately Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	Yes	Quality at Entry (QEA):	Satisfactory
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA):	Moderately Unsatisfactory
DO rating before Closing/Inactive status:	Satisfactory		

D. Sector and Theme Codes		
	Original	Actual
Sector Code (as % of total Bank financing)		
Central government administration	28	15
Health	20	15
Other social services	20	
Sanitation	8	5
Sub-national government administration		25
Water supply	24	40
Theme Code (Primary/Secondary)		
Access to urban services and housing	Primary	Secondary
Environmental policies and institutions	Primary	Secondary
Participation and civic engagement	Primary	Primary
Pollution management and environmental health	Primary	Primary
Rural services and infrastructure	Primary	Primary

E. Bank Staff		
Positions	At ICR	At Approval
Vice President:	Praful C. Patel	Mieko Nishimizu
Country Director:	Xian Zhu	Pierre M. Landell-Mills
Sector Director:	Constance Bernard	Ridwan Ali
Project Team Leader:	Karin Erika Kemper	Nadim Khouri
ICR Team Leader:	Karin Erika Kemper	
ICR Primary Author:	A. D. C. Godavitarne	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

The Development Objective of the BAMWSP is to reduce mortality and morbidity in rural and urban populations caused by arsenic contamination of groundwater using sustainable water supply, health, and water management strategies.

Revised Project Development Objectives (as approved by original approving authority)

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Coverage of sustainable safe water supply increased			
Value quantitative or Qualitative)	Absence of ready-made, straightforward solutions. Extent of problem not known; hence no solution was foreseen at appraisal	Appropriate on-site mitigation strategies developed and implemented for hotspot areas (both rural and urban). Not defined		(a) Screening done in about 3.04 m wells in 190 Upazilas and 390 pdctn. wells in 100 Pourashavas. (b) Mitigation programs in 6 Upazilas (Phase 1), 35 Upazilas (Phase 2) and 17 Upazilas (Phase 3); 1 urban Pourashava; and one rural piped water supply
Date achieved	02/20/1999	06/30/2006		06/30/2006
Comments (incl. % achievement)	Appropriate mitigation strategies developed and implemented			
Indicator 2 :	Quantity of arsenic ingested by most of the population at risk is significantly reduced			
Value quantitative or Qualitative)	35 million people exposed to unsafe levels, 85 million at risk.	Quantity of arsenic ingested by population is reduced		(a) Water sources of about 50 m. people screened and marked as (un)safe to incentivize switch to different options; (b) about 95% of screened popn. aware of unsafe

				sources/health problems(c) mitigation options covering 2 - 2.5 m. people
Date achieved	02/20/1999	06/30/2006		01/31/2003
Comments (incl. % achievement)	With acquired knowledge, unsafe wells painted, and availability of arsenic-safe water sources, most people in project areas use arsenic-safe sources for drinking. All achieved during 2002/2003			
Indicator 3 :	Increased percentage of arsenicosis patients treated in project areas			
Value quantitative or Qualitative)	Number of arsenicosis patients unknown and number of treated arsenicosis patients unknown	Key treatment is less intake of arsenic. Therefore provision of arsenic-safe sources is essential. - No specific target value defined.		(a) About 29,500 people affected by arsenic-related disease identified; (b) 2,300 doctors & 12,599 health workers trained; (c) arsenic-safe water provided to an estimated 2 - 2.5 million people
Date achieved	02/20/1999	06/30/2006		06/30/2006
Comments (incl. % achievement)	Identification of patients & training of doctors /health workers achieved by 2003. All others by project closure.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Improved knowledge of extent and origin of arsenic contamination			
Value (quantitative or Qualitative)	Extent of problem and causes initially unclear. Results by 2001 showed worse situation than initially expected with 54 out of 64 districts with confirmed arsenic contamination (270 Upazilas affected)			(a) Data from 190 Upazilas screened, including household data in NAMIC database; (b) water quality samples from 2,265 deep tubewells constructed and GPS location of ~ half of all new deep tubewells; (c) isotope analysis conducted in selected locations.
Date achieved	02/20/1999			06/30/2006

Comments (incl. % achievement)	Results from screening in 2001 indicated a situation worse than originally thought w/ 54 out of 64 districts (covering 270 Upazilas) with confirmed arsenic contamination; 29% of shallow TWs contaminated; 14 out of 100 Pourashavas contaminated			
Indicator 2 :	Arsenic-safe drinking water in 4,000 villages covered by the project			
Value (quantitative or Qualitative)	Not measured. High levels of arsenic in drinking water in hotspot villages	Preliminary target of 4,000 villages w/ new arsenic-safe drinking water sources		(a) Covered: 122 villages in Phase 1; 1,026 villages in Phase 2; and 660 villages in Phase 3 (b) 9,272 deep tubewells, 300 rain water harvesting systems & 393 dug wells; 1 piped water supply system
Date achieved	02/20/1999	06/30/2006		06/30/2006
Comments (incl. % achievement)	Coverage of 4,000 villages was set as a target when a programmatic intervention was being considered. However, the coverage achieved was about 50% of the target villages with arsenic-safe water with a better distribution density of wells			
Indicator 3 :	Implementation capacity strengthened			
Value (quantitative or Qualitative)	Low capacity of communities, local and central government in participatory planning and design and in O&M of water supply systems	Increased capacity of communities, local and central government NGOs and private sector in participatory planning and in O&M of water supply systems		(a) Local stakeholder capcty. increased through 4,331 community actn. plans and 894 ward actn. plans; (b) capcty. of Union Parishads strengthened; (c) DPHE implmntn. capcty. enhanced; (d) doctors/health workers trained in 229 Upazilas; S.Comments for more
Date achieved	02/20/1999	06/30/2006		06/30/2006
Comments (incl. % achievement)	Continued...: e) tariff reform in 1 urban water supply & a new type of water supply system; (f) public-private partnership for rural piped water supply formed. Final outputs were possible only thru strengthened capcty. of communities & local govmnt.			

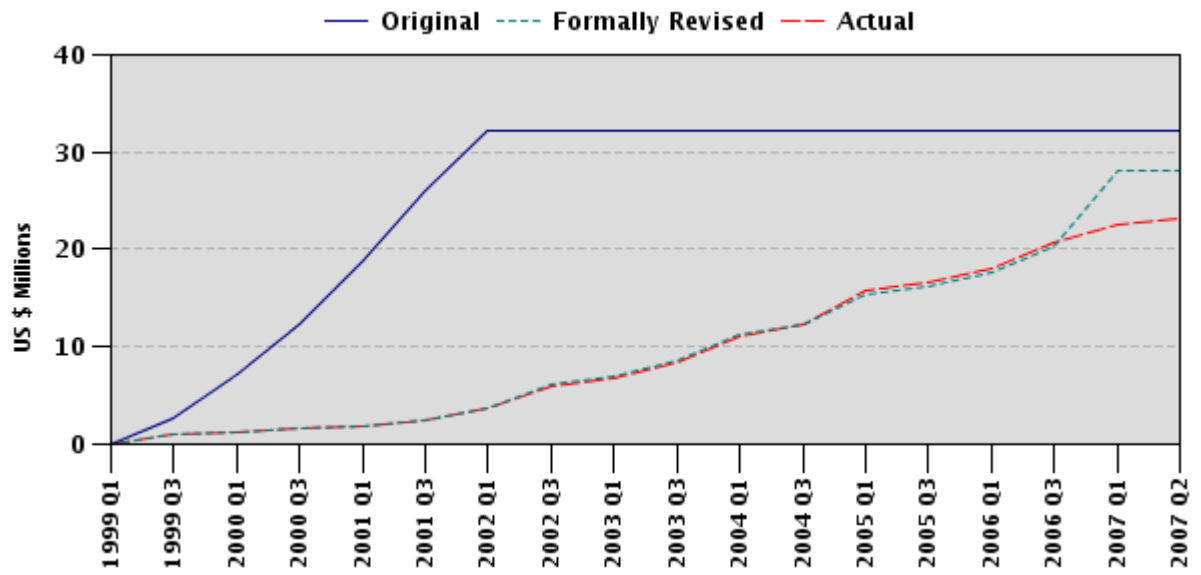
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	11/20/1998	Satisfactory	Satisfactory	0.00
2	04/12/1999	Satisfactory	Satisfactory	0.97
3	05/07/1999	Satisfactory	Satisfactory	0.99
4	12/02/1999	Satisfactory	Unsatisfactory	1.38
5	06/14/2000	Satisfactory	Unsatisfactory	1.81
6	12/14/2000	Satisfactory	Unsatisfactory	2.11
7	06/14/2001	Satisfactory	Satisfactory	3.00
8	12/12/2001	Satisfactory	Satisfactory	5.44
9	06/28/2002	Satisfactory	Unsatisfactory	6.38
10	12/30/2002	Unsatisfactory	Unsatisfactory	7.13
11	06/30/2003	Unsatisfactory	Unsatisfactory	9.45
12	12/21/2003	Unsatisfactory	Unsatisfactory	11.29
13	05/06/2004	Satisfactory	Satisfactory	13.80
14	10/20/2004	Satisfactory	Satisfactory	15.97
15	12/24/2004	Satisfactory	Satisfactory	15.97
16	05/24/2005	Satisfactory	Satisfactory	17.68
17	10/22/2005	Satisfactory	Satisfactory	18.29
18	05/05/2006	Satisfactory	Satisfactory	21.69
19	06/30/2006	Satisfactory	Satisfactory	22.84

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Development Objectives, and Design

(this section is descriptive, taken from other documents, e.g. PAD/ISR, not evaluative)

1.1 Context at Appraisal

(brief summary of country and sector background, rationale for Bank assistance)

In 1993, the Government of Bangladesh became aware that there was a problem of high concentrations of arsenic in thousands of wells used for drinking water across more than half of the country's 64 districts.¹ The extent of the problem and its potential impact on health were not known, but it was estimated that millions of people depending on shallow tubewells were threatened by death and illness resulting from ingestion of arsenic.² A series of localized and isolated field tests carried out with donor assistance during 1995–1999 revealed the possible extent of the problem, and a nationwide study by the British Geological Survey of around 3,500 water sources indicated that nearly 27 percent of shallow tubewells and about 35 million people were likely to be affected by arsenic, which occurs naturally in groundwater in certain geological strata.

At that time, there was little scientific knowledge about how, why, or where arsenic occurred in drinking water sources. Doctors and health workers did not have much knowledge of the epidemiology, symptoms, or treatment methods, nor were there any records of the number of patients suffering from arsenic-related illnesses. This new development also risked rolling back the significant progress made over two decades in both the provision of safe drinking water under the shallow tubewell program and the complementary improved sanitation in the country, which had contributed to a reduction in mortality and morbidity, especially among children. Arsenic contamination of the main source of drinking water emerged as a national crisis, and action was urgently required. The Government of Bangladesh sought international assistance to address this emerging crisis. These conditions provided the rationale for the World Bank and other donors to assist Bangladesh in its efforts to tackle the arsenic problem in a coordinated manner.

1.2 Original Project Development Objectives (PDO) and Key Indicators

(as approved)

The project development objective (PDO) was to reduce morbidity and mortality in both the rural and urban population caused by arsenic contamination of Bangladesh's groundwater within sustainable water supply, health, and water management strategies.

Quantitative key performance indicators were not specified in the project appraisal document (PAD). The requirement of a results framework did not exist at the time the project was processed. However, the project design summary specified the following indicators: (a) quantity of arsenic ingested by most of the population at risk significantly

¹ The Bangladesh national standard for maximum permissible concentration of arsenic in drinking water is 50 micrograms per liter.

² Chronic arsenic poisoning from drinking water is termed “arsenicosis”.

reduced; (b) coverage of sustainable safe water supply increased; and (c) percentage of treated arsenicosis patients in project areas increased.

1.3 Revised PDO (As Approved by Original Approving Authority) and Key Indicators, and Reasons/Justification

Not applicable.

1.4 Main Beneficiaries

(original and revised, briefly describe the “primary target group” identified in the PAD and as captured in the PDO, as well as any other individuals and organizations expected to benefit from the project)

Original Beneficiaries

Project beneficiaries were (a) communities, in 4,000 affected villages, and urban and peri-urban poor affected by arsenic poisoning who would receive arsenic-safe water; (b) arsenicosis patients who would receive advice and treatment from medical authorities; (c) rural and urban dwellers who would be informed on arsenic-related issues, and receive support for capacity building efforts directed at the formal and non-formal sectors, and from increased participation of the private sector in water supply service provision; (d) communities and local governments, which would be empowered with responsibilities for planning, construction, and maintenance of rural water supplies through a participatory, demand-driven, and cost-sharing approach; (e) the Government of Bangladesh and the Department of Public Health Engineering (DPHE), which would benefit from a comprehensive database acquired through the project, providing a framework for future policy decisions; and (f) scientists and researchers, who would have access to the comprehensive national database containing information on the spatial distribution of arsenic occurrence, wells with arsenic contamination, new arsenic-safe tubewells installed under the project, including their water quality and global positioning system (GPS) coordinates, household data, and hydrogeological information.

Revised Beneficiaries

Following adjustment of the 4,000 village target, project benefits accrued to between 2 and 2.5 million people through implementation of 9,977 mitigation options in 1,800 villages, and in one pourashava, which would not have been possible if the 4,000 village target had been pursued. Other beneficiaries remained unchanged.

Co contributors to the achievement of some of the above benefits were a number of donors, who undertook numerous field tests; the British Geological Survey, which carried out a nationwide well screening program before the start of the project; and the Swiss Agency for Development and Cooperation (SDC), which provided co-financing for technical assistance support. These inputs contributed to formulation of the strategy to address the problem.

1.5 Original Components

(as approved)

Project components are summarized below. The PAD provides a detailed component description.

On-site mitigation (US\$26.1 million): (a) Emergency mitigation relief to villages affected by high concentrations of arsenic in drinking water; (b) rural water supply using the community-based participatory approach with cost sharing and responsibility for maintenance of assets; (c) capacity building of communities, assisted by support organizations, to plan and implement water supply and sanitation schemes in about 4,000 villages; (d) appropriate intervention strategies for the 14 priority pourashavas following analysis of 100 pourashavas; and (e) health interventions comprising limited training of doctors and health workers.

Improved understanding of the arsenic problem (US\$3.8 million): (a) Development of baseline data on arsenic contamination and water quality monitoring; (b) establishment of the National Arsenic Mitigation Information Center (NAMIC) with a comprehensive database; (c) establishment of the Technology Assistance Group; (d) Setting up a laboratory calibration and verification system to ensure analytical quality control; and (e) studies and research on the arsenic problem, and coordination with leading research organizations.

Strengthening of implementation capacity (US\$14.50 million): (a) Operating costs and strengthening of zonal laboratories; (b) technical assistance for NAMIC and zonal laboratories; and (c) capacity building of all partners, monitoring and health sector development.

1.6 Revised Components

Not applicable.

1.7 Other Significant Changes

(in design, scope and scale, implementation arrangements and schedule, and funding allocations)

The design of the project permitted flexibility to make changes in accordance with new knowledge emerging with regard to arsenic, both generated by the project and by the many other stakeholders. Changes were made during implementation to refine the components, improve efficiency of implementation, and facilitate achievement of outcomes. Changes were approved by sector or regional management, as needed, and by the Government of Bangladesh through requisite changes in the project proforma. The significant changes were:

(a) The original Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP) allocation for health activities was shifted, in 2001, to a proposed Arsenic Public Health Project, which was already included in the IDA pipeline. Thus, health activities under BAMWSP were not further developed. In the end, however, the proposed new project did not materialize.

(b) As surface water was recommended as the sole arsenic-safe source in the National Arsenic Mitigation Policy, implementation of the deep tubewell option was permitted, as

an exception, only in coastal areas; project interventions in other areas included dug wells, pond sand filters, and rainwater harvesting systems.

(c) Project intervention criteria were revised as follows: (i) emergency response for villages where more than 80 percent of wells were above the Bangladesh arsenic standard of 50 micrograms per liter (31 upazilas); (ii) phase 1: villages with more than 40 percent of wells contaminated above the Bangladesh standard (6 upazilas); (iii) phase 2: unions with more than 40 percent of wells contaminated (35 upazilas); and (iv) phase 3: unions with more than 60 percent of wells contaminated (17 upazilas).

(d) The spatial distribution of deep tubewells was changed from one deep tubewell for 100 families, to one deep tubewell for 50 families, and finally, to one deep tubewell for 10 to 15 families, responding to demands from communities rather than pursuing the original supply-driven goal to cover 4,000 villages. Cost sharing was also reduced from the original 20–40 percent to 10 percent for consistency with other Government of Bangladesh-financed and donor programs.

(e) The approach of preparing a community-based action plan per option was changed to the setting up of ward arsenic mitigation water user groups (WAMWUGs) covering many options, to expand the coverage and to reduce the administrative burden on both the Project Management Unit (PMU) and communities. In creating the WAMWUGs, the project also followed the guidance of the new National Arsenic Mitigation Policy of 2004.

(f) In order to increase focus on linkage between groundwater resources and arsenic mitigation options, the project introduced a deep well drilling program (up to 600 meters in depth) to study hydrogeology and water quality in aquifers, including isotope analysis, development of a water quality monitoring protocol, and building a database on wells drilled under the project to provide a basis for aquifer mapping. Introduction of isotope analysis in deep aquifers was a result of collaboration between the project, the Bangladesh Atomic Energy Commission, and the International Atomic Energy Authority.

(g) The PMU was incorporated into the DPHE, in 2003, in order to accelerate project implementation and enhance DPHE ownership of the project.

(h) The grant closing date was extended four times, initially in 2002, and three more times, after management changes and improved implementation progress.

(i) Grant cancellation occurred twice: in 2002, an amount of SDR 3.31 million (US\$4.967 million³) was cancelled due to the slow progress of mitigation activities; and an amount of US\$6.48 million of the unutilized credit balance was canceled at project closure. Additionally, the SDC trust fund closed in 2005 due to extremely low disbursement (see section 7(b)).

³ Using current exchange rate of SDR 1.5/US\$. Source: Client Connection.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design, and Quality at Entry

(including whether lessons of earlier operations were taken into account, risks and their mitigations identified, and adequacy of participatory processes, as applicable)

Lessons learned from past projects in Bangladesh included the need to reduce the lengthy approval and funds release procedures for emergency projects; devolve implementation responsibility to the field to expedite implementation; and link institutional support needs to institutional objectives, including specific components, to have any significant impact.

Project Preparation

After considering various lending instruments, including an emergency investment loan, the specific investment loan (SIL) was adopted. The Bank made a conscious decision to embark on the project without the traditional full preparation, but using a flexible approach because of the need for a quick response; the many uncertainties and the limited knowledge of the problem; the lack of prior experience of a similar project; the unavailability of proven test kits and technologies; and the lack of knowledge and strategy for scaling up well screening and mitigation. It incorporated a learning-by-doing approach based on existing technologies, evolving approaches, changing the mindset and building the capacity of centralized agencies, and using a participatory delivery mechanism with cost sharing, in close collaboration with other donors. The project preparation went from concept to appraisal in a mere three and a half months, comparable to the processing of emergency operations. *It might have been more appropriate for this intervention to follow emergency investment procedures.*

Design

The project target was to provide arsenic-safe water in 4,000 villages out of an estimated 43,000 villages affected. This was the same target set when the adaptable program loan (APL) instrument was being considered, but was not revised when the SIL was adopted. The design and delivery modality were to be reviewed and revised on an annual basis, learning from the previous year's experience, incorporating a community-based participatory approach with the local government union parishad chairperson as the key motivator. The project intervention criterion was the percentage of wells in a village that were contaminated by more than the Bangladesh standard of 50 micrograms per liter. This was adopted because arsenic test kits only show if water is above or below the threshold. There was not sufficient capacity in the country to test the millions of tubewells with more sophisticated laboratory procedures. The beneficiary assessment observed that intervention on this basis had little relation to arsenic concentration levels, population density, or the number of arsenicosis patients. *The Implementation Completion and Results Report (ICR) review believes that given the reality of millions of contaminated wells and the need to work with communities and their leaders in order to ensure a demand-based approach for future sustainability, the criteria adopted in the project contributed to enhancing the outcome.*

The key elements of project design included (a) screening of about 3.04 million shallow tubewells and pourashava production wells to concretely establish spatial arsenic

contamination and level of arsenic concentration, and to identify unsafe wells; (b) conducting a mass awareness raising campaign to inform the population about the effects of arsenic ingestion, introducing mitigation options, a delivery approach, and criteria and procedures for participation; (c) development of affordable and appropriate mitigation options for non-piped water supply, and testing, validation, and certification; (d) a decentralized and fully participatory implementation modality involving communities and local governments, with communities sharing 20–40 percent of costs and being responsible for construction; (e) use of support organizations (mostly NGOs) contracted and trained under the project, to form community-based organizations, inform them about arsenic issues and mitigation options, train them to screen and field-test water sources, help prepare community action plans, and conclude memoranda of understanding (MoUs) with the PMU ; and (f) setting up a comprehensive database under NAMIC, comprising information on spatial distribution of arsenic contamination, including level of arsenic concentration; patient information; household data; details of mitigation options implemented; water quality; and hydrogeological data from groundwater investigations.

An important design feature was the new project management model of a semi-independent PMU parallel to the DPHE, with a direct link and reporting to the Ministry of Local Government, Rural Development and Cooperatives. Justifiably, the project management model intended to overcome many of the problems encountered in previous Bank-financed operations with the DPHE. However, the arrangement did not provide the PMU with the needed independence because it was still subject to all DPHE administrative procedures and approvals, and relied on management and field staff to perform its functions. *This decision had a significant adverse impact on project implementation.*

There was no project intervention for the treatment of arsenicosis patients even though the specific intent was stated as a performance indicator of the project development objective. Though originally included in the project, healthcare activities were taken out to be addressed under an arsenic health project, which was to be prepared concurrently with BAMWSP. In the end, that project did not materialize. While other project interventions were designed to have a health impact, for instance the provision of arsenic-safe water and the massive training of health workers, the specific linkage to treatment was thus not made. *Under the circumstances, it would have been more proper to revise the performance indicator for the project development objective.*

Risks and Mitigation Identified

The project risks that were analyzed, and mitigation actions taken on the main risks, were as follows:

- (a) The risk of people continuing to drink water from arsenic-contaminated wells was mitigated by the plan to identify unsafe wells and paint the handpump spouts red.
- (b) The risk of the use of unsafe surface water was to be mitigated through development of alternative treatment and mitigation solutions.
- (c) The expected weak organizational capacity of communities was to be enhanced through the use of project-contracted support organizations.

(d) The risk of slow implementation due to the need to deal with a large number of entities was mitigated through adoption of a decentralized participatory approach involving local governments and complemented by support organizations and community-based organizations and, in the last phase, ward-level user groups.

The identified risks were adequately addressed. The risk inherent in setting up a semi-independent PMU under the administrative control of the DPHE was not recognized by the Bank. This risk should have been obvious, and appropriate mitigation actions in the form of clear operating procedures should have been formulated if this model was to succeed.

Adequacy of Participatory Processes

The participatory process adopted under the implementation modality was highly satisfactory, as it fully involved communities and local governments. Decisions on mitigation options, site location of facilities, and construction organization were made entirely by community-based organizations with the union parishad chairperson playing a key role, thus empowering local government institutions. This was achieved with the assistance from support organizations (usually NGOs) contracted by the project, and regional PMU and DPHE field engineers. Communities provided valuable inputs and contributed to capital costs (except in the emergency phase), procured material, organized contractors to construct the facilities, supervised the work, and undertook maintenance of completed assets. Following well screening, women were informed of the unsafe wells so that they may be avoided. The beneficiary survey indicates, however, that even though participation of women was built into the project design, they did not adequately participate in decisions on well locations; and people used arsenic-safe water for drinking, while some continued to use surface water for cooking.

The uneven distribution of wells in some communities may be due to participation not being equally comprehensive in all locations, or because some people were able to influence decisions regarding the siting of wells. Though not perfect, the participatory process has worked satisfactorily. Community contributions have not always been uniform; more affluent people have contributed more to compensate for the smaller contributions from poor households. Thus frequent location of facilities close to homes of affluent families has occurred. The factors that contributed to this situation included the difficulties of mobilizing timely contributions from all community members; the ability of larger contributors to influence location of facilities; the accelerated implementation that occurred in the last phase immediately prior to project closure; and the difficulty of closely monitoring the participatory process in a project of this scale. In spite of this, every family in project areas had access to arsenic-safe water. The beneficiary survey states that the project provided more safe options to higher-income households. *It is entirely possible that those contributing more than their share were able to influence the location of wells; however, there is no evidence to support the position that the project promoted this outcome.*

2.2 Implementation

(including any project changes/restructuring, midterm review, project at risk status, and actions taken, as applicable)

The required project start-up and initial activities, especially establishment and staffing of the PMU, well screening, procurement of consultant services and water quality test kits, progressed extremely slowly over the first 2½ years. Recruitment of the international consultant, who had a significant role to support the PMU in detailed design, implementation, and monitoring, was started, but was finally abandoned prior to negotiating a contract. *This decision of the Government of Bangladesh not to provide this key international input caused a major setback at the outset.*

The selected project management model had a significant impact on the operation of the PMU, contributed to delays in project implementation, and turned out to be a major bottleneck. The project had six project directors, all from the DPHE, and the PMU was subject to all approval procedures of the DPHE. A number of directors did not share the project concept, were unable to break away from the working practices of the DPHE, or were not sufficiently motivated to move the project forward. Over a 2½-year period (December 1999 to December 2000; June 2002 to December 2003), the project was rated “unsatisfactory” for implementation. In 2003, the Bank supported the reconstitution of the PMU as part of the DPHE. Following that change, and coinciding with the commencement of new proactive management that took decisive actions, improved communications with field operations, and, at times, bypassed bureaucratic procedures, there was significant acceleration of the pace of implementation. The Bank responded with four extensions of the grant closing date as the prospects for successful completion of the project improved significantly. *Despite the initial poor performance, Bank management waited over four years to take action. With hindsight, it may be too hasty to conclude which model stood the better chance of success or whether proactive project management would have assured success, based on the implementation progress of the follow-on project, the Bangladesh Water Supply Program Project (BWSPP), which has been under full DPHE management from the outset. This project is in the same position in which BAMWSP was in its early years, with extremely slow progress made thus far, and only US\$1 million of the credit disbursed after nearly three years.*

The approach of using community-based organizations gained the trust and confidence of communities, as they were able to make decisions, make their contributions, and have services delivered in about five months. It also resulted in a flurry of activity during the last six months of the project as communities tried desperately to participate in the program. However, monitoring results indicated that the approach using community-based organizations to cover the 4,000 villages resulted in an installation ratio of one safe source for 50 to 100 households, which was deemed inadequate to prevent many people from reverting to contaminated sources due to the convenience factor associated with travel distance. It also became apparent that, in the remaining project time, it was unrealistic to cover 4,000 villages using the community-based organization modality. The high demand for one deep tubewell for 10 to 15 households therefore led to the formation of ward arsenic mitigation water users groups (WAMWUGs). This modified approach was more effective, reduced the burden of dealing with a large number of community-

based organizations, and also accelerated implementation significantly, resulting in the completion of nearly 10,000 options by the end of the project.

A water quality testing and monitoring protocol, including arsenic, iron, chloride, and other parameters, was developed in the last two years of the project to ensure that safe water was available in project areas. In addition, guidelines were developed for site selection, drilling, and testing of arsenic-safe wells in the deep aquifer. The project also supported the use of isotopes for characterizing and mapping the origin and quality of the arsenic-safe deep groundwater. This took place in collaboration with the International Atomic Energy Agency (IAEA) and the Bangladesh Atomic Energy Commission (BAEC). Furthermore, a pilot project to test the feasibility of surface water infiltration schemes as a potential source of arsenic-free river water was implemented in one pourashava.

The screening of shallow household tubewells in urban pourashavas was abandoned because there was little support from the then project management, for several reasons: the scope of the task was much larger than estimated; the PMU lacked the capacity to undertake nationwide urban water source screening within the original credit closing date; counterpart funds were limited; and the urban unit of the PMU was less organized and resourced. *Consequently, an undetermined number of people using shallow tubewells in pourashavas continue to be at risk.* The follow-up BWSPP addresses 5 of the 14 pourashavas found to be arsenic-contaminated and other donors are in discussions with the Government of Bangladesh for support to additional pourashava water supply systems.

The main findings of the Quality of Supervision Assessment carried out in 2000 are described in Annex 4. This assessment was critical of the Bank's supervision strategy, the project management model adopted, and the lack of Bank management response for several years, despite all the indications that the project was progressing extremely poorly.

2.3 Monitoring and Evaluation Design, Implementation, and Utilization

Although planned, formal independent monitoring and evaluation of project implementation was not done because the then project management was not convinced of its utility. Instead, the PMU and task team conducted their own monitoring and evaluation on an ongoing basis. Based on the number of changes in design and implementation modality and the project's outcomes, this effort proved to be valuable. In addition, the key activity of water quality monitoring in deep tubewells was carried out under the auspices of NAMIC. The beneficiary survey also notes that monitoring and evaluation of project achievements did not receive much attention from the PMU, and that records were not maintained in a consistent manner.

The deep tubewells constructed are in operation, and are being used. In accordance with the MoUs prepared under the community or ward action plans, the operation and maintenance responsibility lies with the communities. Given the long experience with shallow tubewells in the country, capacity exists within communities to manage this task satisfactorily. The beneficiary survey observed that over 90 percent of the wells constructed are in working order.

2.4 Safeguard and Fiduciary Compliance

(focusing on issues and their resolution, as applicable)

Safeguard Compliance

The project triggered the Bank's safeguard policies, primarily on environmental assessment, and the project was classified as Category B. Since communities themselves arranged the necessary land for the facilities, involuntary resettlement policies were not triggered.

Disposal of arsenic-rich water treatment sludge was not an issue because the project did not include water treatment plants with arsenic removal. The impact of the arsenic-rich media waste from the four prototype household chemical treatment options that were under validation is considered insignificant due to the small number of prototypes and quantities of residue involved.

Evidence from the field had indicated that routine end-of-the tap (spout) water quality monitoring was insufficient to provide assurance that people were ingesting arsenic-safe and bacteriologically safe water. This concern prompted the development of a water quality testing and monitoring protocol during the last two years of the project, to ensure that arsenic-safe water was available in a sustainable manner in the mitigation options constructed. At project closure, due to the acceleration of the project in its final years, there was a backlog of 7,710 deep tubewells (of a total of 9,272 deep tubewells) for which water quality had not been tested or GPS coordinates recorded. Completion of testing and recording of GPS coordinates for the remaining deep tubewells has been formally included under the follow-on BWSPP.

Based on information from the well-screening database, arsenic-safe locations were determined and made known to communities. For deep household tubewells and dug wells, there was no formal requirement to include an environmental screening data sheet along with the community action plans and ward action plans submitted to the PMU for appraisal. In the case of the larger piped water supply projects, a full environmental screening procedure was developed and applied. Additionally, health messages were confined to water issues only.

The project provided only arsenic-safe water supply; no sanitation was provided although the intent was stated in the PAD. There was no requirement to include a statement on sanitation in the community action plans and ward action plans submitted for appraisal by the PMU.

Fiduciary Compliance

Financial management. For a substantial period of the project, financial management inputs in the PMU were insufficient due to frequent turnover of the financial management specialist and accounts manager. The computerized accounting system envisaged in the project was not in place. Quarterly project monitoring reports were prepared irregularly in the initial years, but later improved in accuracy and timely submission. Project monitoring reports frequently used information that was not derived from the general accounting system, thus making them not entirely reliable. Some component expenditures

were estimates rather than actuals, rendering the comparison with original component allocation relatively weak.

The Financial Management Unit developed procedures for accounting and financial reporting at community level, but monitoring of compliance was inadequate. Throughout the project, the Financial Management Unit had an experienced and knowledgeable staff to deal with the disbursements, yet submission of replenishment claims was rarely done at monthly intervals.

At credit closure, there were 43 outstanding audit observations. They related largely to form, rather than substantive irregularities. Despite the preparation of a dated action plan and agreement to assign a dedicated staff to pursue settlement of the audit observations, target dates were missed for many actions, which could have been easily resolved.

Procurement. Findings on procurement administration by the PMU, based on post reviews conducted on a number of contracts, were: (a) in general, the procurement capacity of the project staff for the types of contracts processed was weak; (b) the frequent turnover of procurement staff was reflected in variations in the quality of procurement processing; (c) documentation was found to be in a poor state, with files not being maintained satisfactorily in some cases; (d) the project generally complied with agreed provisions; and (e) processing time was generally satisfactory. The ICR review notes that the simplified procurement procedures adopted for community contracting worked well. However, delays in procurement actions and decisions occurred regularly when DPHE or ministry approvals were required.

2.5 Post-completion Operation/Next Phase

(including transition arrangement to post-completion operation of investments financed by present operation, operation and maintenance arrangements, sustaining reforms and institutional capacity, and next phase/follow-up operation, if applicable)

In accordance with the MoUs between the communities and the project, operation and maintenance of the rural mitigation options are the responsibility of communities. The technologies introduced are well within the capacity of the communities to maintain. The country has a well-established tradition of individuals and communities maintaining nearly 9 million shallow tubewells on their own.

The follow-on operation – the BWSPP – incorporated all the lessons learned from BAMWSP. The PMU, now part of the formal structure of the DPHE, continues to mainstream BAMWSP experiences. The delivery modalities and cost sharing arrangements have also been incorporated into the BWSPP. The works of BAMWSP not completed by project closure – about 600 ward action plans for which MoUs had been signed, water quality testing of new deep tubewells, measurement of GPS coordinates of the tubewells, building a GPS-based deep groundwater quality database, further testing of surface water infiltration schemes, implementation of the 10 pilot rural piped water supply projects, and follow-up to the completed pilot rural piped water supply project – have all been transferred to the BWSPP. Until the proposed National Water Supply and Sanitation Information Center (NWSSIC) is established at the DPHE, the BWSPP has agreed to support updating of NAMIC as an interim measure. *The Government of Bangladesh needs to fully operationalize the NWSSIC as soon as possible to sustain this valuable resource.*

Four regional DPHE laboratories were upgraded and five new laboratories built with modern equipment providing them with the capability to analyze up to 34 chemical parameters. Due to inadequate provision of operating budget, equipment, spares, and chemical supplies, the water quality testing facilities at the new and upgraded regional laboratories were frequently interrupted. This was happening despite payments made from project funds for all water quality tests, and repeated reminders from the task team. *Assurances should be sought from the Government of Bangladesh that adequate funding will be provided for the continued operation of the upgraded laboratories, which will play a key role in the prevention of arsenic ingestion by the vulnerable population. It is recommended that the government continue with the program started under BAMWSP by expanding the program to address the large number of villages that were not covered under BAMWSP using the demand-driven participatory modality, and addressing the pourashavas where incidence of high levels of arsenic contamination has been reported.*

3. Assessment of Outcomes⁴

3.1 Relevance of Objectives, Design, and Implementation

(to current country and global priorities, and Bank assistance strategy)

Relevance of Objectives

Rating: Satisfactory

More than 95 percent of the rural population depends on the widely used shallow tubewells with handpumps constructed during the last four decades. The discovery of arsenic in drinking water threatened to derail and diminish this significant achievement. The project development objective (PDO) responded to the emerging crisis, which had put a significant portion of the Bangladesh population at risk from arsenic-related illnesses, resulting in increased morbidity and mortality. The PDO was also closely linked to the National Water Supply and Sanitation Policy adopted in 1998, which, among other things, aims to provide basic levels of (safe) water supply and sanitation throughout the country. The project development objective was also consistent with the Country Assistance Strategy approved by the Bank's Board in March 1998. It had five strategic priorities, four of which were supported either directly or indirectly through the project, namely: (a) promoting faster and more equitable human development with respect to education, health, nutrition, and population; (b) promoting a competitive private sector as the engine of growth, and providing essential physical infrastructure; (c) promoting better public sector management and improved public services for the private sector and civil society; and (d) accelerating agricultural growth and rural development.

⁴ The ICR assessments make use of the full spectrum of ratings now available. ISRs were constrained to use only "satisfactory" or "unsatisfactory" ratings.

Relevance of Design and Implementation

Rating: Satisfactory

Project design using the adaptive approach was highly appropriate to respond to the crisis in an environment of little knowledge of the spatial distribution of arsenic contamination, and limited knowledge on feasible mitigation solutions.

The community-based, demand-driven participatory approach with community cost sharing, and a substantive role for local governments (union parishads) in the planning, implementation, and management of water supply schemes, was successful. By continuing to provide the union parishads with an important decisionmaking role, the project supported the governance and decentralization objectives of the Government of Bangladesh.

The use of support organizations to mobilize and build capacity in communities was an important contribution to successful delivery of outputs. Moving from the community-based organizations to the ward-level water user groups facilitated the scaling up of the program to reach the 2 million to 2.5 million people that benefited from arsenic-safe options. The delivery modality was singularly successful in the project's ability to reach the large number of people that benefited from arsenic-safe water at costs affordable by communities. This would not have been possible through a supply-driven approach. Communities gained confidence in and came to trust the delivery modality, which assured delivery of outputs within a short time, and led to the unsatisfied demands at project closure. The beneficiary assessment notes the need for longer involvement of support organizations beyond arsenic mitigation, to support community development. *Had support organizations spent more time in the communities, they could have provided inputs to improve maintenance arrangements through contributions to bank accounts for operation and maintenance and a sinking fund for asset replacement, as described in the PAD.*

The criterion for intervention based on the percentage of wells contaminated in a village was a sound basis to address the problem in villages with a large population at risk. The widely used deep tubewell option (80 percent of all options), implemented through communities, was able to deliver affordable arsenic-safe water options at the community level, and was the most popular option. This option was permitted only as an exception in coastal areas under a rigorous protocol to protect deep aquifers from infiltration and contamination by arsenic, under the National Arsenic Mitigation Policy, reformulated in 2004, which recommended surface water as the primary source for arsenic mitigation. This effectively foreclosed use of the less costly option of tubewells as a safe source for small communities, leaving the less popular dug wells, rainwater harvesting, and pond sand filters as options for other areas. Many dug wells were abandoned, and some communities installed new shallow wells (with uncertain arsenic levels) or reverted to surface water from ponds (where water quality is suspect). The few pond sand filters were not popular due to the high maintenance required. Implementation experience confirms that user preference is influenced significantly by the convenience factor (walking distance), the most favored being handpumps (mostly shallow with low maintenance needs) serving on average two to three households. Failure to achieve a

similar service level when offering mitigation options may cause households to return to unsafe yet convenient water sources.

Project design included an important initiative to advance knowledge of arsenic in drinking water. In addition to support for research activities, the project included the creation of the National Arsenic Mitigation Information Center (NAMIC), and development of a comprehensive database. The database contains data on the national well screening, water quality in shallow wells and new deep tubewells installed under the project (including their GPS coordinates), household data, and hydrogeological data from the deep well drilling and aquifer studies (including isotope analysis and water quality test results, which would provide a scientific basis for aquifer mapping). This is a valuable resource for research, and for the Government of Bangladesh to review its national arsenic mitigation policy and strategy.

In summary, the objectives, design, and implementation were consistent with the Government of Bangladesh's key policies on water supply and sanitation and arsenic mitigation, the later-issued Poverty Reduction Strategy Paper of 2005, and also with the Bank's new Country Assistance Strategy for 2006 to 2009, which is built on three pillars: improving the investment climate, empowering the poor, and core governance.

3.2 Achievement of Project Development Objectives

(including brief discussion of causal linkages between outputs and outcomes, with details on outputs in Annex 2)

Rating: Moderately Satisfactory

The achievement of the project development objectives against indicators defined at project appraisal is illustrated below. Detailed outputs by component are described in Annex 2.

Quantity of arsenic ingested by most of the population at risk is significantly reduced. The following proxies illustrate that the population at risk reduced significantly the ingestion of arsenic, although it was not possible to determine the actual reduction in quantity of arsenic ingested by the population at risk: (a) identification of wells with arsenic levels exceeding safe levels (with spouts painted red), signaling to people to avoid water from those wells, following screening of over 3 million tubewells in 190 upazilas⁵ and production wells in 100 pourashavas; (b) construction of nearly 10,000 arsenic-safe water options, including simple alternative surface water or rainwater mitigation options, identification of groundwater aquifers with arsenic-safe water, piloting surface water infiltration as an arsenic-safe water resource option for urban water supply systems, and piloting a private sector-community partnership for piped water supply in a high-density village; (c) wide dissemination of information about the health impacts of drinking

⁵ Originally, the total number of upazilas screened by BAMWSP was 189. However, one of the upazilas – Meherpur – was later divided into two upazilas by the Government of Bangladesh: Meherpur and Mujibnagar. Thus the number of screened upazilas is 190.

arsenic-contaminated water; and (d) upgrading of laboratories for water quality testing, as well as developing a water quality testing and monitoring protocol, and the GPS-based water quality testing of over 2,200 deep tubewells to evaluate the overall quality of the deep groundwater.

Coverage of sustainable safe water supply increased. Between 2 and 2.5 million people in project areas now have access to sustainable water supply through (a) construction of about 10,000 technologically appropriate and affordable arsenic-safe water points in rural areas, and surface water infiltration wells in one pourashava covering a population of about 44,000; (b) construction of a much larger number of safe water supply options and a significantly higher density of coverage than was originally planned, though about half of the planned coverage of 4,000 villages was achieved; (c) provision of rural mitigation options that owe their sustainability to several factors, including use of a decentralized participatory approach with a key role for local government and communities that have planned, organized, and supervised construction; use of technologies that were not complex, were capable of construction by small contractors, and were easily maintained by community artisans; and community contribution of at least 10 percent of capital costs and assumption of responsibility for operation and maintenance, consistent with the track record of communities and individuals maintaining over 9 million shallow tubewells throughout the country.

Increased percentages of arsenicosis patients were treated in project areas. There is a disconnect between this performance indicator of the PDO and project components. The project included training for 2,300 doctors and 12,599 health workers on the identification of symptoms and treatment options for arsenic-induced illnesses. The provision of safe water supply itself is also part of treatment of arsenicosis. The health messages provided through a mass information dissemination campaign advised the population that drinking water with no arsenic and use of vitamin supplements to strengthen the immune system are effective means to reverse early symptoms of arsenic-related illnesses. Thus the health aspect of the overall PDO was addressed by the project. However, the project had no specific intervention for the treatment of arsenicosis patients. There are no data available to confirm that hospitals treated more arsenicosis patients, or that hospitals were equipped with necessary medical supplies, or that any special treatment camps were conducted based on the extensive training provided. This was also shown in the beneficiary survey, which states that patients did not know where to go to receive treatment.

Achievement of Intermediate Outcome Indicators

Achievement of intermediate outcome indicators, as tracked in the implementation status and results reports (ISRs), is summarized below.

Improved knowledge of extent of arsenic contamination. The spatial distribution of arsenic occurrence in the country has been established. The deep tubewell drilling program, borehole lithographs, and water quality tests have established the existence of arsenic-safe water in the aquifer below the clay layer at varying depths, which can be tapped by community contractors experienced in drilling tubewells in alluvial soils.

Mitigation options were studied and tested and the appropriate options were available for selection by communities. Some chemical treatment options were under monitoring through project closure. National and international specialist organizations and donors⁶ provided technical assistance for testing, monitoring, and validation of the mitigation options.

The initiative to carry out a pilot project to test the feasibility of surface water infiltration schemes as a potential source of arsenic-safe river water in one pourashava also enabled the project to provide safe water to an urban population and to develop an alternative for safe water supply to be applied in other settings in Bangladesh.

The project introduced the use of isotopes for characterizing and mapping the origin and quality of the arsenic-safe deep groundwater, in collaboration with the IAEA and the BAEC, which provided vital data for future water supply in the pourashava and demonstrated the opportunities for this technology to inform the identification of arsenic-safe water.

The publicly accessible database developed by NAMIC is a useful research and study resource comprising information on the spatial distribution of arsenic, water quality test results, GPS coordinates of deep tubewells constructed under the project, and socioeconomic data of households. Hydrogeological information from the very deep drilling (600 meters) carried out by the Geological Survey of Bangladesh, the Bangladesh Water Development Board, and the isotope analysis have established the existence of another arsenic-free deep aquifer that could be used as a future safe water resource.

The above activities have significantly helped to improve the understanding of the occurrence and the spatial distribution of arsenic in groundwater. Uncertainties remain on the source, mobilization, and transport of arsenic in groundwater. The monitoring carried out so far is insufficient to understand the variations in arsenic levels in groundwater over time. Further monitoring will continue under the BWSPP and by donors, who have expressed interest in supporting detailed countrywide groundwater mapping.

Implementation capacity strengthened. The modality for implementation of mitigation options was a decentralized, demand-driven, community-based approach closely linked to the local governments (union parishads). Support organizations (mostly NGOs) were contracted, trained, and deployed to communities to mobilize and form community-based organizations, convey information on arsenic-related matters and mitigation options, and assist communities to enter into contracts with the PMU to undertake the work themselves.

A highly effective and successful model, trusted by communities, for delivery of safe water to a large number of villages, with explicit cost sharing criteria, has evolved. Union parishads and communities have been empowered to plan and construct facilities for safe water through an approach that includes capital cost sharing and responsibility for

⁶ The Bangladesh Council for Scientific and Industrial Research, the Ontario Center for Environmental Technology Assessment, the United Nations Children's Fund (UNICEF), the Danish International Development Agency (DANIDA), the Swiss Agency for Development and Cooperation (SDC), and the Arsenic Policy Support Unit of DFID.

operation and maintenance. Through this modality, it has been possible to provide arsenic-safe water to a large population. A community-level contracting industry capable of drilling deep tubewells (in coastal areas) has also developed. A model for private sector participation in rural piped water supply has been developed, and implemented in one scheme. Through their involvement in the project, support organizations (mainly NGOs) have been recognized as partners and facilitators for development work.

The capacity of the DPHE has been strengthened. A number of the key staff of the PMU, including project directors, came from the DPHE. Despite the earlier setbacks, the performance of the PMU showed significant improvement during the last three years when it was formally incorporated into the DPHE structure. Thus the DPHE will be able to replicate the BAMWSP approach in its future activities.

The ICR review concludes that project development objectives were substantially achieved, except for treatment of arsenicosis patients, thus leading to a “Moderately Satisfactory” rating.

3.3 Efficiency

(Net present value/economic rate of return, cost-effectiveness, e.g. unit rate norms, least cost, and comparisons; and financial rate of return)

The project benefited between 2 million and 2.5 million people who received arsenic-safe water. Potentially, another 40 million to 50 million people benefited from health messages on the ingestion of arsenic, and the countrywide screening of wells, and clear identification of unsafe wells.

A cost-benefit analysis was not done at appraisal. The primary aim of the project was to provide safe water to people, focusing on minimum needs and health. During implementation, project-established criteria and procedures ensured that least-cost acceptable solutions were selected to meet the drinking and cooking requirements of the population.

3.4 Justification of Overall Outcome Rating

(Combining relevance, achievement of PDOs, and efficiency)

Rating: Moderately Satisfactory

The PDO was highly relevant to the crisis at hand, except that there were no health interventions for treatment of arsenicosis patients. Although the first step was taken and training was provided to doctors and health workers, there is no evidence to conclude that there was a sustained attempt to treat arsenicosis patients, notably because this responsibility had been shifted to the planned project that would specifically address arsenic and health issues under the Ministry of Health and Family Welfare.

(a) Through provision of nearly 10,000 safe water points, including 1,800 (of the planned 4,000) villages in 58 upazilas, and a water system in one pourashava, the number of people ingesting arsenic-contaminated water has been substantially reduced.

(b) Project activities provided nearly 10,000 arsenic-safe water points serving between 2 million and 2.5 million people at risk in project areas.

- (c) Sustainable safe water supply was provided through the community-based approach adopted, whereby communities shared costs and assumed responsibility for maintenance.
- (d) Through the wide information campaign conducted by the project, between 40 million and 50 million people were informed about the health impacts of arsenic ingestion.
- (e) Through the comprehensive well screening and water quality testing program, the extent of arsenic contamination in Bangladesh has been established and the understanding of the arsenic problem has improved.
- (f) The capacity of communities, local governments, and the private sector was strengthened to screen, plan, implement, and maintain community-level infrastructure with capital cost sharing.

Since neither BAMWSP nor other Government of Bangladesh or donor-financed projects have as yet covered all arsenic-affected areas of Bangladesh, the task is not complete, as a section of the population at risk continues to drink arsenic-contaminated water. The follow-on project (BWSPP) addresses some of this population and aims at providing an approach that will permit scaling up.

3.5 Overarching Themes, Other Outcomes and Impacts

(if any, where not previously covered or to amplify discussion above)

Poverty Impacts, Gender Aspects, and Social Development

Cost sharing by communities made allowances for the poor, who contributed at least 1 percent of capital cost in cash or physical labor. In some communities, affluent families contributed more than the 10 percent required. As a consequence, the poor were also less able to fully participate in the decisionmaking process for locating the new tubewells. The beneficiary survey also states that the poor had fewer opportunities to influence the location of mitigation options. However, indications are that reduction of the well-to-household ratio has increased the potential for the poor to have access to a safe source of water, though they may have to walk longer distances for their water supply compared to other income groups.

Equal participation of women in ward arsenic committees is specified in the National Arsenic Mitigation Policy. Participation of women in the community-based organizations occurred, as one of the two joint signatories for the community bank account was a woman. However, their actual participation in decisionmaking was limited. The first health messages on arsenic impacts were given to women as part of the well screening process, establishing knowledge about not using water from wells painted red. In keeping with past practices, women were frequently assigned the role of caretakers of wells.

With regard to social development, the project has contributed to bringing decisionmaking power to the village, ward, and union levels. This has led to significant empowerment of local-level government institutions.

Institutional Change and Strengthening

(particularly with reference to impacts on longer-term capacity and institutional development)

The project has successfully demonstrated the feasibility of the decentralized, demand-driven, participatory approach to providing community infrastructure. The modality is trusted by communities for its transparency and efficiency to deliver services, and the union parishad chairpersons are expected to be the principal advocates for the continued use of this decentralized planning and construction of services. The approach is also consistent with the National Water Supply and Sanitation Policy.

The project intended to restructure the DPHE, linking it to an independent PMU, and changing it to a planning and regulatory agency that would adopt a demand-driven approach with communities planning and implementing community-level water supply. However, specific project-supported initiatives were not included to achieve this goal, and the new institutional arrangement was perceived by the DPHE as an attempt to undermine the established administrative structure. The arrangement was abandoned in 2003, when the PMU was formally incorporated into the DPHE structure.

The “independent” PMU was closely linked to the DPHE hierarchy and adopted the same administrative procedures. A number of key staff, including the project directors, were drawn from the DPHE, supplemented by specialist consultant support. The implementation modality enabled the PMU staff to gain hands-on experience in implementing the demand-driven approach, working with support organizations and communities, appraising community proposals, and providing general oversight of implementation. Noteworthy was the interest and motivation demonstrated by DPHE superintending and assistant engineers at the upazila level in participating in the project activities in close collaboration with the regional PMU staff. *Overall, this arrangement served to strengthen the DPHE, and it could be inferred that this level of interest and collaboration even at the field level, and the success of the project, may have some lasting impact on the DPHE. Whether the DPHE’s senior managers are ready to change established practices is not certain at this time.*

The incorporation of NAMIC as part of the DPHE will provide an in-house resource that will enhance its long-term capacity for integrating arsenic mitigation planning into water sector planning, and developing policies and strategies.

Other unintended outcomes and impacts (positive and negative)

Other supplementary unintended outcomes are (a) the development role of NGOs as consultant partners to support public sector programs; (b) the strengthening of informal contractors to enter into simple contracts with community-based organizations for community infrastructure; (c) the development and use of a water quality testing and monitoring protocol, which will have a significant influence on the national water quality protocol under preparation; and (d) the operational linkage between (ground)water resource and water supply interventions.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

The detailed findings of a beneficiary survey, carried out by an independent consultant, based on a sampling approach, are provided in Annex 5, and the lessons learned are

summarized below. The complete report is available in the project files. The findings were discussed at a stakeholder workshop held on 21 June 2006.

- (a) Overall, the report finds that the project was successful in providing sustainable arsenic-safe water supply options, with better design than other approaches; and significantly strengthening local government institutions by giving power (and funding) to union parishad chairpersons.
- (b) The report states that while the demand-based approach had significant other benefits, project interventions did not relate to arsenic concentration levels, population density, or number of arsenicosis patients, and did not result in a uniform distribution of mitigation options, because of the demand-based approach adopted (see commentary on this statement in Section 2.1).
- (c) The stature of union parishad chairpersons was significantly enhanced as they played a key role in the community and ward-level decisionmaking and implementation.
- (d) Support organizations need to spend more time in communities to raise awareness to support community development.
- (e) The project provided more safe water options to the higher-income population as the poor took part less in the decisionmaking process to obtain safe water.
- (f) The quality of work was satisfactory due the local control of quality of material and implementation.
- (g) Over 90 percent of deep tubewells constructed were in good working order, but people had concerns about the presence of high concentrations of iron and salinity.
- (h) Despite a project design that formally included women, they generally had a limited role in the decisionmaking process, though they were often involved in caretaking of constructed facilities.
- (i) Over 90 percent of the sample population used arsenic-safe water for drinking, but used surface water for cooking.
- (j) Since 2003, BAMWSP became closely identified with the DPHE, and the PMU's regional management units had a strong and decisive presence.
- (k) On health aspects, there was no coordination between BAMWSP and government health services; a few villages having a high concentration of arsenicosis patients did not receive arsenic-safe water; trained doctors were not always posted in upazilas with arsenicosis patients; and neither the patients nor the community knew where to go for treatment of arsenic-related illnesses.
- (l) Monitoring and evaluation of project achievements was not given enough attention by the PMU, nor was it carried out in a thorough or consistent way.

4. Assessment of Risk to Development Outcome

Rating: Moderate

The assessment is based on the following:

(a) The current National Arsenic Mitigation Policy is restrictive and does not provide affordable options to provide arsenic-safe options to a large population still at risk. The mitigation options adopted in non-coastal areas (dug wells, pond sand filters, and rainwater harvesting) were not popular. The wealth of data and experience that accrued from BAMWSP provides a unique opportunity for the Government of Bangladesh to review this policy. Not to do so would risk achieving development outcome.

(b) Since distribution of the new deep tubewells is not as dense as the widely used shallow tubewells, requiring longer walking distances, people may revert to using arsenic-contaminated water from shallow tubewells or unhygienic surface water. Some people use the safe option for drinking, and continue to use surface water for cooking. This risk is minimal because, similar to the proliferation of shallow tubewells in the last two decades, it is highly likely that individuals and communities will construct more deep tubewells with their own resources.

(c) Due to possible change or deterioration in water quality in new deep tubewells, specifically the increase in the level of arsenic contamination, communities need to be made aware of the need for periodic testing of the new tubewells to monitor changes in arsenic concentrations. The continuation of the awareness raising campaign would reduce this risk.

(d) People will avoid using water from tubewells painted red, but will drill new shallow tubewells for use without testing water quality. This risk could be reduced by a continuing education campaign, and an arrangement for community-level water quality testing in tubewells installed in the future.

(e) The DPHE may not be committed to using the demand-driven community-based approach to provide arsenic-safe options to all vulnerable people in the country, which could put achieving the development outcome at risk. The risk is not considered high, for several reasons: the demand-driven approach achieved overwhelming success under BAMWSP; the United Nations Children's Fund (UNICEF) and the Danish International Development Agency (DANIDA) used the same model except that funding was passed through the DPHE, unlike in BAMWSP where funding was passed through the communities; and the national water supply and sanitation policy recommends decentralized implementation.

(f) It is possible that the new deep tubewells will fall into disuse because communities will fail to maintain them. This risk is minimal because maintenance of the tubewells is within the capability of communities; communities have made firm commitments to maintain the assets; and because of the established track record of communities that have maintained millions of shallow tubewells in the country.

5. Assessment of Bank and Borrower Performance

(Relating to design, implementation and outcome issues)

5.1 Bank Performance

Bank Performance in Ensuring Quality of Entry

(i.e., performance through lending phase)

Rating: Satisfactory

The Bank responded quickly and confidently to a crisis, the magnitude of which was not known, and with limited available knowledge of arsenic occurrence in drinking water. Based on preliminary, but sound, assessment of the problem and available limited knowledge, the project was formulated incorporating a flexible approach explicitly providing for adjustments based on experience gained during implementation. The design included countrywide well screening; an intensive awareness-raising campaign; development of arsenic-safe mitigation options, implementation strategies, and eligibility criteria; 20–40 percent cost sharing by communities; arsenic-safe affordable and sustainable community-friendly mitigation options appropriate for community-level construction; empowerment of local governments, particularly the union parishad chairpersons; a scalable demand-driven delivery modality, with appropriate fiduciary controls, capable of reaching many communities, emphasizing community participation in planning and construction, cost sharing and maintenance of assets; use of support organizations (including NGOs) as partners to form community-based organizations and help them to prepare action plans based on community preferences; piloting private sector participation in the provision of piped water supply to large rural communities; and activities to improve understanding and expand knowledge of the arsenic problem. Donor collaboration was accorded priority to coordinate assistance to the Government of Bangladesh and to harmonize implementation. *The project design and implementation modality were entirely appropriate to the prevailing emergency, and are judged “highly satisfactory”.*

The project recognized the primary need to improve understanding of the extent and occurrence of arsenic contamination. The project provided for two key start-up activities, which were well screening and an information campaign on health issues. Another important activity planned was the development of the comprehensive database through NAMIC. *These activities were correctly recognized as having significant impacts on improving the understanding about arsenic, and reducing the quantity of arsenic ingested by the population at risk.*

A cornerstone of project design was a strong and “independent” Project Management Unit (PMU), which would depart from traditional practice and procedures to successfully manage the program using a demand-driven approach with extensive community participation. *It should have been obvious to the Bank that the arrangement would meet considerable opposition from the DPHE. The risk was compounded because no systems and procedures were put in place to enable the PMU to operate without being subject to administrative controls of the DPHE.*

The overall rating of quality at entry is therefore “satisfactory”.

Quality of Supervision

(Including of fiduciary and safeguards policies)

Rating: Satisfactory

Supervision teams faced a number of challenges: timely establishment and staffing of the PMU, project directors who were unable to advance implementation, and delay in start-

up procurement of test kits and consultants. The supervision mission's aide memoires provided detailed accounts of the problems in the project. Unsatisfactory ratings started within the first six months of the project, and it was designated a problem project for over 1½ years. Many staff were involved in supervision – 30, according to the QAS assessment. The large supervision input appears to have had little impact on, or response from, the PMU, which was closely controlled by the DPHE. In the face of mounting problems in the project, Bank management did not react decisively until four years into project implementation. *Quality of supervision by the Bank during this four-year period is assessed as “moderately satisfactory”.*

The Quality of Supervision Assessment in 2000 (Annex 4 provides details) rated Bank supervision as “marginal”. Their main findings were: (a) supervision effort lacked a strategy, and did not use the Bank's leverage to achieve project objectives; (b) the Bank miscalculated the practicality of the project management arrangement independent of the DPHE; (c) regional country management did not take action despite “unsatisfactory” ratings, and differences within the supervision team; (d) supervision was not well planned, having 30 staff at one time and exceeding the supervision budget, and receiving little cooperation from the DPHE management; (e) after four years, the Bank actively supported incorporation of the PMU into the DPHE, and granted extensions to the credit closing date four times in response to improved progress; and (f) supervision improved in later years with a new team and greater cooperation with the Water and Sanitation Program (WSP).

In 2003, the Bank supported the incorporation of the PMU formally into the DPHE. This action also coincided with the appointment of new management for the PMU and a change in the Bank's supervision team. The combination of the new proactive PMU management and the new Bank team, reinforced by the Dhaka-based WSP inputs, was the turning point for improved cooperation between the PMU and the Bank team. The implementation modality was changed from community-based organization to the ward level and the pace of implementation improved significantly. Both disbursements and project performance improved significantly enabling the project to substantially achieve its objectives. *Bank supervision during the latter period from 2003 onwards is rated “satisfactory”.*

The overall rating of supervision during the project's lifetime is “satisfactory”.

Justification of Rating for Overall Bank Performance

Rating: Satisfactory

The project demonstrated successfully a model for decentralized implementation, and it also improved the understanding of the arsenic problem. Project design, incorporating a flexible approach and a decentralized participatory approach empowering communities and local governments, was highly satisfactory considering that the project started out with little knowledge of the problem. The flexible approach enabled changes to suit new situations. In the search for an alternative to the DPHE, the Bank settled on a model that had little chance of success. Bank supervision was poor during the first four years, but improved significantly in the last three years. The project management model created many difficulties in the early years, reflected in the critical appraisal by the Quality of

Supervision Assessment. Having made the necessary adjustments in 2003, the Bank resolutely pursued the primary objective of providing arsenic-safe water to the target population; between 2 and 2.5 million people benefited from safe options and about 50 million people were educated on the impacts of arsenic in drinking water. *Based on the Bank's overall performance over the entire period, performance is assessed as "satisfactory".*

5.2 Borrower Performance

Government Performance

Rating: Moderately Satisfactory

The Government of Bangladesh was highly committed to the project, recognizing the need to address the arsenic issue urgently. Consistent with the National Water Supply and Sanitation Policy, the government was very supportive of the decentralized participatory approach to deliver mitigation options. The government also supported the establishment of the PMU independent of the DPHE, and it was keen to restructure the DPHE. However, it was not able to influence the DPHE to actively support the PMU during the first four years. The government constituted a National Expert Committee to draft the National Arsenic Mitigation Policy, which many experts believe needed review. The government was not able to provide adequate counterpart funds to meet the high demand for mitigation works during the last six months of the project. It did not encourage and support the PMU to use the SDC grant funds for technical assistance activities. There were also significant delays in decisionmaking or approvals sought.

Implementing Agency or Agencies Performance

Rating: Moderately Satisfactory

During the first four years, when the PMU was the formal implementing agency, it did not operate proactively, or with any degree of independence, as the senior management comprised staff deputed from the DPHE. The project directors were not effective because they were not motivated, did not support project concepts, or were too entrenched in the DPHE practices. *During that period, the performance of the PMU is assessed "unsatisfactory".* The performance improved significantly in 2003 after the PMU was incorporated into the DPHE, and new management was installed in the PMU, and the project outputs were fully achieved. *The performance during the post-2003 period is judged "satisfactory".*

For all intents and purposes, the DPHE remained the de facto implementing agency throughout the project. Even though managers of the DPHE may not have fully supported the project management model, it appears that senior managers supported the involvement of the field engineers to work in close cooperation with the PMU's regional staff to provide implementation support. *The overall performance of the DPHE is assessed "moderately satisfactory".*

<p>Department of Public Health Engineering. Indirectly, the DPHE influenced the performance of the PMU as it had certain administrative and financial powers. The DPHE opposed this independent arrangement, and cooperation from the DPHE was not forthcoming. Matters that were within its powers were referred to the Local Government Division for decision or approval. Since the incorporation of the PMU into the DPHE in 2003, the DPHE probably facilitated the PMU to operate more efficiently without interference.</p>	<p>Project Management Unit. Project start-up was delayed for about 1½ years due to delays in establishment and staffing of the PMU, procurement of test kits for well screening, and engagement of key consultants. The PMU was not able to operate independently of the DPHE. Performance during the last 2½ years of the project improved significantly, primarily due to improved management, and incorporation of the PMU formally into the DPHE.</p>
---	--

Justification of Rating for Overall Borrower Performance

Rating: Moderately Satisfactory

Despite the initial and continuing difficulties, the Government of Bangladesh remained committed to the project and to achieving the primary goal of providing arsenic-safe water in the project areas. The government continued its support for the decentralized participatory approach that empowered communities and local governments. Following delays at project start, the PMU complied with most agreements with the Bank, and it has made significant progress since 2003, following several years of poor performance. Thus, despite the protracted initial difficulties, given that outputs exceeded the original targets set, and project outcomes were substantially achieved, the borrower’s overall performance is rated as “moderately satisfactory”.

6. Lessons Learned

(Both project specific and of wide general application)

6.1 General

Arsenic mitigation needs to be mainstreamed into the water supply sector in order to be sustainable, focusing on innovative ways to deliver safe water supply in both nonpiped and piped water supply. The BWSPP incorporates this key lesson learned from the BAMWSP experience. Mitigation options should be based on a sound National Arsenic Mitigation Policy that takes account of the understanding and scientific knowledge acquired through the implementation of BAMWSP and by other donor interventions. A significant population of the country continues to ingest arsenic-contaminated water, including in pourashavas, as BAMWSP interventions covered only a small portion of the affected population. Continuing public and private sector interventions will be required to address the problem.

Decentralized community-based planning and management of rural water supply and sanitation with a central role for local governments has been demonstrated as a model for future interventions by the Government of Bangladesh. Communities came to trust the implementation modality of BAMWSP: it empowered them to plan, share costs, and

implement the options, and results could be delivered in a relatively short time compared to the traditional supply-driven approach. Views expressed at the stakeholder workshop indicated that union parishad chairpersons would have played a greater role in the delivery of mitigation options once they gained confidence and understood the process. While encouraging the key role of the union parishad chairpersons, the participatory process needs to be made more transparent and include women and the poor in decisionmaking. The conclusion is that there are good prospects for implementing rural community infrastructure, adopting the same or similar approaches with appropriate fiduciary controls and transparency.

Supply of bacteriologically safe water should be the priority, not just arsenic-safe water. Though alarm was raised over arsenic, available information indicates that there are about 30,000 arsenicosis patients and an estimated 6,500 annual deaths from arsenic-induced cancers, compared to the reported average of about 110,000 deaths of children per year due to water-related illnesses (2002 UNICEF statistics). Consumers concerns about iron, taste, odor, and safe levels of barium and manganese should be addressed.

The rolling out of pilot village piped water supply with significant private financing and management through carefully controlled and guided assistance from both the PMU and the Bank is a good example of field-testing and development of large-scale investments. Further development of this model will require that issues relating to hygiene and sanitation, disposal of wastewater, non-revenue water, and regulation of service providers are addressed.

6.2 Project Specific

Practical and workable project management models need to be designed taking account of administrative and political sensitivities. The model of a PMU independent of the DPHE, but still under its administrative and financial procedures, had little chance of success unless systems and procedures were clearly specified to provide it with the necessary powers. Alternatively, a program to restructure the DPHE through the vehicle of BAMWSP should have been considered, including activities or incentives to support the institutional change.

The treatment of arsenicosis patients could have been addressed with more vigor, through the new health project that had been planned. Continued monitoring of patients and outreach activities by the health services are necessary, as symptoms of arsenicosis may appear many years after ingestion.

It is important to continue the awareness campaign regarding arsenic in drinking water, reinforcing messages on drinking arsenic-safe water, testing of new shallow tubewells, periodic testing of new deep tubewells, and the safe storage and use of water. Since many more wells are being constructed outside the public sector, consumer awareness should be enhanced to include testing water quality at construction, and periodically thereafter. A system to make available water testing kits through union parishads or leading NGOs would complement the private sector efforts to provide drinking water, and provide a check on water quality.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

7.1 Borrower/Implementing Agencies

The output figures mentioned in the Borrower's Comments and Report, which had been based on the earlier draft submitted by the Borrower, have been revised in this final ICR document, as applicable.

7.2 Cofinanciers

We agree with the observations conveyed by SDC (see Annex 8).

7.3 Other Partners and Stakeholders

DFID was a close partner during project implementation and provided the comments shown in Annex 8.

ICR Team Comments: (a) BAMWSP has demonstrated that the less costly mitigation options than that of the surface water proposed in the National Arsenic Mitigation Policy are available through the program of deep tubewells and scientific knowledge and data to support exploitation of a deep aquifer. Accumulated evidence makes a strong case for the government to revisit the policy; (b) Coordination between BAMWSP and the health sector did not occur because a planned project that was supposed to take place in parallel to address health issues in a more comprehensive manner did not materialize; (c) It is likely that the integration of the PMU into the formal structure of DPHE in 2002 did influence the DPHE to adopt a demand-driven approach, which now has a proven track record of success; (d) though more research studies could have been carried out, valuable work was done on the use of isotopes for characterizing and mapping arsenic-safe water in the deep groundwater aquifer, development of a water quality testing and monitoring protocol, and testing of household-level chemical treatment options for arsenic removal; (e) the NAMIC database is now fully accessible to all interested parties, after technical problems and data validation issues have been addressed.

Annex 1. Project Costs and Financing

Project Cost by Component (in USD Million Equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
On-Site Mitigation	26.10	11.731	44.95
Improved Understanding of the Arsenic Problem	3.80	11.712	308.21
Strengthening of Implementation Capacity	14.50	4.959	34.20
Total Baseline Cost	44.40		
Physical Contingencies	0.00	0.00	0.00
Price Contingencies	0.00	0.00	0.00
Total Project Costs	44.40	28.40	
Project Preparation Fund	0.00	0.00	0.00
Front-End Fee IBRD	0.00	0.00	0.00
Total Financing Required	44.40	28.40	63.96

Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions) ⁷	Percentage of Appraisal
Government of Bangladesh	Counterpart	4.90	3.66	74.69
Other (Community)	Cofinancing	4.10	1.51	36.82
International Development Association (IDA)	Credit	32.40	23.16	66.66
Switzerland: Swiss Agency for Development and Cooperation (SDC)	Cofinancing	3.00	0.207	6.90

⁷ GoB and Community contributions are those reported by the Borrower. The difference between the total estimate reported here and the estimate reported in the project cost table is attributed to a difference in the exchange rate used to calculate these contributions. IDA and SDC contributions are from Client Connection.

Annex 2. Outputs by Component

On-site mitigation

Four alternative arsenic mitigation options were identified, tested, and validated: dug wells, deep tubewells, pond sand filters, and rainwater harvesting. Four arsenic removal technologies (chemical options), approved by the Bangladesh Council for Scientific and Industrial Research and the Ontario Center for Environmental Technology Assessment, were deployed by the proponents; they were under testing and validation until the end of the project. The deep tubewell option, which was the most popular, reliable, and considered to provide arsenic-safe water, costs about Taka 45,000 (about US\$650). The deep tubewell option was also the lowest-cost option on a per capita basis. Where deep tubewells were not permitted by government policy, dug wells, pond sand filters, or rainwater harvesting were adopted, which together accounted for only about 7 percent of the options chosen.

In total, 9,977 mitigation options for nonpiped water supply have been constructed. These include 9,272 deep tubewells, 393 dug wells, 12 pond sand filters, and 300 rainwater harvesting systems. The mitigation options benefited households in about 1,800 villages. A further 600 ward action plans had already been approved by the PMU, and those additional mitigation options have been carried over for implementation under the BWSPP. A population of between 2 million and 2.5 million were provided with arsenic-safe water.

The density of distribution of deep tubewells increased as the project progressed, as follows: one per 200 households in the 6 upazila program; one per 50 households in the 35 upazila program; and one per 10–15 households in the 17 upazila program. The decision to increase the well density per village, thus reducing the project target to less than 4,000 villages, was made for two reasons: the increased demand and evidence from other projects indicating that increasing the number of families using one tubewell results in longer walking distances, and the tendency of people to use nearby sources irrespective of water quality, resorting to contaminated water sources nearby.

390 production wells in 100 pourashavas (urban areas) were screened, establishing data on the status of arsenic contamination. The project financed two new production wells, rehabilitation of existing production wells, and the distribution network in one pourashava (Chapai Nawabganj), which had registered the highest level of arsenic contamination. The urban screening as originally planned was not carried out towards the end of the project because of limited PMU capacity, resources, and time for an analysis of all the household shallow tubewells in 100 pourashavas.

One scheme for rural piped water supply for 1,100 households was completed based on a new model that includes construction, management, and operation for 15 years by a sponsor (an investor, most often an NGO) on a cost sharing basis of 10 percent, 40 percent, and 50 percent by community, sponsor, and project, respectively. Under this scheme, consumers have individual connections that will facilitate internal plumbing, including water closets. There is an explicit emphasis on provision of safe affordable water to the poor. This new option permits the convenience factor to be addressed in household water supply choices. It would also permit, on a large scale, the focusing of

water quality monitoring on one point source per scheme, rather than dozens of deep tubewells or hundreds of shallow tubewells per village.

Mitigation options were affordable, and could be constructed by communities or community contractors. A participatory delivery mechanism with cost sharing (10 percent minimum) developed under the project was able to reach a large number of beneficiaries. The union parishad chairperson played a lead role in the planning and implementation of the options for which funds were passed on to the bank accounts of the community organizations. The communities own the assets created, and will maintain them.

Improved understanding of the arsenic problem

Overall, a reasonably good understanding of the arsenic problem has emerged through project activities carried out jointly with other actors. Continuous monitoring and more research and studies are required to improve this understanding.

Project activities that helped improve the understanding of the arsenic problem include the countrywide well screening program, the deep tubewell drilling program, and the water quality database developed by NAMIC. Collaboration with other partners participating in the arsenic mitigation program has led to the NAMIC database being essentially converted to a national database. Analysis of the NAMIC database indicates that the extent of arsenic contamination is worse than was originally estimated. About 54 of the 64 districts, amounting to 270 upazilas, have been confirmed to have arsenic contamination. About 29 percent of all shallow tubewells in the country have arsenic contamination above Bangladesh's standard.

The project supported the development of a comprehensive database that provides a picture of spatial distribution of arsenic in the country, level of arsenic contamination in all screened wells, water quality in new deep tubewells constructed, hydrogeological information results from the deep tubewell drilling program, GPS coordinates of new wells, and household socioeconomic data. NAMIC has helped advance knowledge of the arsenic problem. The database will facilitate policymaking and integration of arsenic mitigation into water sector investment planning in Bangladesh. This freely accessible database can also serve as a baseline reference, and provide information to researchers and the general public. Data from the NAMIC database are available on the BAMWSP website and have been transferred to the BWSPP website for continued access. The database will be a useful resource for researchers, sponsors of village piped water supply, and decisionmakers.

At project closure, the database included screening results of the existing shallow tubewells in most of the country; more comprehensive data from the 270 upazilas where arsenic levels exceeded the Bangladesh standard; water quality and GPS coordinates of a large number of the new deep tubewells constructed; and household and hydrogeological data. However, it is known that additional shallow tubewells have continued to be constructed by private households since completion of the national screening effort and data from these are not yet included in the database. The Bank has agreed that water quality testing, GPS coordinates, and validation of water quality results of the BAMWSP program be completed under the BWSPP.

The above activities have helped to improve the understanding of the occurrence and the spatial distribution of arsenic in groundwater. However, uncertainties remain as to the source, mobilization, and transport of arsenic in groundwater. The monitoring carried out so far is insufficient to understand the variations in arsenic levels in groundwater over time.

An ironic twist of painting unsafe wells red is that while most people have avoided taking water from those wells, some have instead drilled new shallow tubewells on the presumption that the new wells were safe. Since shallow well drilling is an ongoing activity in communities, the project was not equipped to screen these new shallow wells. A program for communities to undertake screening of wells, and to continue education and awareness-raising on arsenic issues, is necessary.

Strengthening of implementation capacity

The project financed the establishment and operating costs of the consultants in the PMU and NAMIC; consultant services for research and studies; support organizations to assist communities; numerous training programs for all partner organizations (support organizations, community-based organizations, WAMWUGs, union parishad officials, DPHE and PMU staff and officials, local government officials, and sponsors of rural piped water supply); water quality test kits and testing; and vehicles and equipment. The Government of Bangladesh financed about 74 key positions in the PMU, including the project director and senior staff.

Through the above support and experience gained in implementation, the capacity of the PMU and the DPHE were strengthened. Despite earlier setbacks, the implementation capacity was significantly strengthened under strong leadership, especially in the last three years of the project. This period coincided with the integration of the PMU into the DPHE, and this will enable the DPHE to replicate these approaches in the future. Whether willingness exists among senior DPHE management to follow this course will be demonstrated in time.

NAMIC is planned to become part of DPHE's proposed National Water Supply and Sanitation Information Center, until which time it will be supported by the BWSPP. Being the repository of data and information on arsenic-related issues, NAMIC is expected to play an important role in keeping the arsenic problem to the forefront, and facilitating integration of arsenic issues into water sector policy, planning, and investment.

The project succeeded in building the capacity of communities to plan and construct simple arsenic-safe water supplies using a participatory demand-driven approach with capital cost sharing. Working closely with the union parishad chairpersons, the project also empowered the union parishads and demonstrated a model for decentralized infrastructure construction with communities taking responsibility for planning (based on affordability and preference), managing funds passed on directly to the communities, organizing construction, and managing the assets created. Support organizations, primarily local NGOs, played a key role in the mobilization of communities, informing them of mitigation options, opening bank accounts, fostering participatory decisionmaking and preparation of proposals and MoUs, and supervising construction.

Through the intensive training received under the project and experience gained, a cadre of capable support organizations has been created.

Annex 3. Economic and Financial Analysis

(including assumptions in the analysis)

As the necessary information was not available at appraisal, a cost-benefit analysis was not carried out. The primary aim of the project was to provide arsenic-safe water to as many people as possible, focusing on minimum needs and health. The preferred mitigation option developed with each community-based organization was the least-cost solution acceptable to the community. Arsenic-safe water provided through the project benefited between 2 million and 3 million people in the project areas. Potentially, an additional 40 million to 50 million people benefited from the countrywide well screening and health messages delivered through the mass information campaign.

Least-cost analysis was carried out during implementation for each option, using guidelines developed by the project. Working closely with community-based organizations or WAMWUGs, support organizations helped communities identify least-cost solutions acceptable to the communities to meet their minimum needs for drinking and cooking, as well as meeting arsenic and other water quality standards. Support organizations engaged by the project were trained on the project's intervention modality, conduct of social and economic surveys, and assessment of demand. Detailed manuals were prepared by the PMU covering all aspects of support organization activities, approved mitigation solutions, cost sharing criteria, schedule of unit rates, and specifications for works.

Four mitigation options were adopted as follows: deep tubewell, ring (dug) well, pond sand filter, and rainwater harvesting system. In accordance with Government of Bangladesh policy, the deep tubewell option was permitted only in coastal areas, and in the last year, in a few other upazilas where no other options were deemed viable. The eligibility criteria for project intervention assured that project resources were targeted toward areas with large numbers of contaminated wells, thus achieving high arsenic-related health benefits.

Benefits

The primary benefit from the project was that about 2 million to 2.5 million people in about 1,800 villages and one urban area now have access to arsenic-safe water, contributing significantly to the reduction in the incidence of arsenicosis, and mortality and morbidity due to arsenic-related illnesses are expected to decrease. Potentially, about 40 million to 50 million people have benefited from information on arsenic ingestion and health impacts, the testing of wells, and clear identification of unsafe wells.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

Task Team Members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Guy Alaerts	Lead Water Resources Specialist	ASUEN	TTL/Water Resources
Arun Banerjee	Sr. Operations Officer	BDO	Financial Analysis
G. Dent	Economist	Consultant	Economic Analysis
J. Phofl	Hydrogeologist	Consultant	Hydrogeology
J. S. Ruz	Community Participation Specialist	Consultant	Community Development
D. McDonnell	Water Supply Specialist	Consultant	Water Supply
Khawaja M. Minnatullah	Sr. Water & Sanitation Specialist	RWSG/NDO	Water Supply & Sanitation
Babar Kabir	Country Sector Leader	RWSG/NDO	Water Supply & Sanitation
Zahed Khan	Sr. Urban Specialist	RWSG/BDO	Water Supply & Sanitation
Supervision/ICR			
Nadim Kouri	Sr. Natural Res. Mgmt. Specialist	LCSER	TTL/Natural Resources
S. Ahmed	Water and Sanitation Specialist	WSP/ SASAR	
Nurul Alam	Procurement Specialist	PSSAR	Procurement
M. Sayeed	Disbursement Officer	RFM	Disbursement
Mozammal Hoque	Sr. Financial Management Specialist	SARFM	Financial Management
Aminul Haque	Sr. Procurement Specialist	SARPS	Procurement
Babar Kabir	Country Sector Leader	RWSG/ NDO	Mission leader/Water Supply & Sanitation
M.A. Ghani	Irrigation Engineer		
Nilufar Ahmad	Sr. Social Scientist	SASSD	Social Scientist
Quanrul Hasan	Sr. Procurement Specialist	SARPS	Procurement
Toshiaki Keicho	Sr. Urban Environment Specialist	SASIN	TTL
Kirsten Hommann	Economist	SASIN	Economics
Shafiul Azam Ahmed	Water and Sanitation Specialist	TWUSA	Sanitation
Lamia Rashid	Social Scientist	SASSD	Social Scientist
Rebecca Robe	Sr. Financial Management Specialist	SARFM	Financial Management
Paul Martin	Sr. Environmental Specialist	Ex SASES/ now AFTSD	TTL/Environment
Rachel Kauffmann	Health Specialist	SASES	Health

M. Khaliquzzaman	Consultant	SASSD	Environment
Roy Boerschke	Program Coordinator/Arsenic Donor Coordination Unit	SASES	Donor Coordination
Zita Lichtenberg	Communications Officer	SAREX	Communications
Suraiya Zannath	Sr. Financial Management Specialist	SARFM	Financial Management
Shahpar Salim	Research Analyst	SASES	Environment
Jeffrey Racki	Sector Manager	SASES	Management
David De Groot	Senior Urban Specialist	AFTU1	Urban Development
Munawer Khalfan	Consultant	SASES	Water Supply
Debabrata Chakraborti	Procurement Specialist	SARPS	Procurement
Burhanuddin Ahmed	Sr. Financial Management Specialist	SARFM	Financial Management
Karin Erika Kemper	Lead Water Resources Management Specialist	SASES/ SASSD	TTL/Water Resources
Cecilia Belita	Senior Program Assistant	SASES/ SASSD	Overall Support/ Support to ICR
Amal Talbi	Young Professional	YPP	Hydrogeology
Tanveer Ashan	Consultant	WSP	Environment/Arsenic
Albert Tuinhof	Consultant	GWMATE	Hydrogeology
Kamal Ahmed	Consultant		Financial Analysis
Sakil Feduosi	Consultant (Water Engineer)		Water Supply
Bernardo Gomez	Consultant (Financial Specialist)	SASES	Water Supply Financing
Ede Jorge Ijjasz-Vasquez	Sr. Environmental Specialist (at the time of involvement)	ENV	Environment/Water Supply
Swarna Kazi	Program Assistant	SACBD	Environment
Pieter David Meerbach	Young Professional	YPP	Environment
Siet Meijer	Operations Analyst	SASES/ SASSD	Environment
Sanjay Pahuja	Environmental Specialist	SASES/ SASSD	Environment
Husein A. Rashid	Consultant (Water Supply Engineer)	SASES	Water Supply Engineering
Mohammad Abdullah Sadeque	Procurement Specialist	SARPS	Procurement
Razia N. Sultana	Program Assistant	SACBD	Overall Admin Support
Guillermo Yepes	Consultant (Water Supply Engineer)	SASES	Water Supply Engineering
Md. Abul Fayez Khan	Program Assistant	ETWSA	Overall Admin Support
Catherine Signe Tovey	Young Professional (Technical Specialist)	YPP	Water Policy/Social Issues
A. D. C. Godavitarne	Consultant	SASES/ SASSD	ICR Main Author
Carla Vale de Holguin	Research Analyst	SASSD	Support to ICR Preparation

Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of Staff Weeks	USD Thousands (Incl. Travel, Consultant Costs)
Lending		
FY97		2.86
FY98		237.78
FY99		37.53
FY00		1.16
FY01		0.00
FY02		0.00
FY03		0.00
FY04		0.00
FY05		0.00
FY06		0.00
FY07		0.00
Total:		279.33
Supervision/ICR		
FY97		0.00
FY98		0.00
FY99		108.57
FY00	114	304.87
FY01	59	80.23
FY02	44	105.79
FY03	60	223.27
FY04	30	142.62
FY05	22	103.06
FY06	14	119.59
FY07	2	95.83
Total:	345	1,283.83

QAG Quality of Supervision Assessment (2000): Summary of Findings

A Quality of Supervision Assessment carried out by QAG in 2000 rated Bank supervision “marginal”. The panel’s main findings were:

(a) The supervision effort lacked strategic thinking in working towards achieving the project’s development objectives, for example how to use the Bank’s leverage to accelerate project decisions, how to introduce international experience, and what risks to take when trying to balance speed and sustainability.

(b) The Bank miscalculated on the practicality of having a PMU independent of the DPHE without prior agreement on the detailed framework that would have enabled the

PMU to operate successfully. It also set the project on a collision course with the DPHE. The ad hoc arrangement for the PMU, outside the DPHE but within the same ministry, had not worked, as there were many delays in establishing an operational PMU, and this arrangement was seen as the root cause of the slow take-off of implementation.

(c) Two “unsatisfactory” ratings within three months of credit effectiveness, nonstart of the well screening program, and lack of disbursements should have signaled to regional country management that greater and higher-level attention was warranted, and differences of views within the supervision team were not dealt with decisively or expeditiously.

(d) Supervision was not well planned; over 30 staff from the field and headquarters were involved, and the large supervision budget was overspent. This was corrected after over four years of difficult implementation, during which there had been little cooperation from the DPHE’s senior management. In recognition of the prospects of successful completion of the project, the Bank extended the credit closing date four times. This proved to be the correct course of action.

(e) The Bank performed well in supervising fiduciary safeguards, bringing to light tensions that had developed between the emergency nature of the project and the long-term sectoral and institutional agenda, and in successfully coordinating with donors and the Water and Sanitation Program-South Asia (WSP-SA).

Annex 5. Beneficiary Assessment Results

Context

As part of this Intensive Learning ICR, a beneficiary assessment was carried out. The aim was to learn from a project with significant public health implications, and to obtain feedback from the ultimate beneficiaries – water users in mostly rural arsenic-affected communities – in order to enhance the lessons learned and apply them in follow-on operations where applicable.

Scope

A comprehensive and an in-depth beneficiary assessment for a limited number of randomly sampled households in rural areas and in one urban pourashava were undertaken. The beneficiary assessment covered 13 rural upazilas and Chapai Nawabganj pourashava.

In the rural areas, the surveyed population consisted of one upazila from phase 1, six from phase 2, five from phase 3, and one with a rural water piped supply system. The impact and general effectiveness of these services were assessed using quantitative and qualitative sampling methods.

Three surveys were administered, covering six rural subdistricts and Chapai Nawabganj town, and assessing (a) arsenic awareness and water uses in 616 randomly sampled households; (b) the condition of 148 randomly sampled project deep tubewells and a few other options provided under the three different phases; and (c) satisfaction with and levels of interest in piped supply water among 150 randomly sampled Chapai Nawabganj piped water users and nonusers.

Respondents were mainly women responsible for the households. The qualitative part of the study was done through data collected by a team of six to eight experienced field workers.

Summary findings

Overall

(a) The period of this project's existence, 1998–2006, has been one of immense changes in water-related policy, arsenic removal technology development, and mitigation program approaches. Alongside the World Bank, several other donors and organizations have supported the government's response. Each assumed responsibility for some part of the nation's 270 affected upazilas. BAMWSP had responsibility for the single largest number of 190 upazilas with a population of over 46 million.

(b) The evaluation reaffirmed the project's findings that user choice was directly influenced by the convenience of service levels and aesthetically acceptable water quality. Arsenic does not have any taste or color and it is difficult to sustain continuous use of arsenic-safe water when a safe source is located farther than alternative unsafe sources. Union parishad (local council) chairpersons were the chief local decisionmakers

regarding distribution of safe water options and the arrangement of installations. Their role gradually became stronger as they came to understand the project's procedures and benefits. Involving local government institutions in local safe water options planning and distribution was the project's most important contribution in the arsenic mitigation field.

(c) Transparency in the entire implementation cycle is equally important as participation to ensure equitable and effective access. Comparing phase 2 (35 upazila program) and phase 3 (17 upazila program), the study found that in phase 2 project benefits were more equitably distributed than in phase 3. Phase 3 work was carried out in the last phase of the project, under a very tight deadline and by bundling decisionmaking to the ward level (and the phase was not entirely completed when the survey was administered). This combination resulted in respondents feeling that mitigation activities were done in a less transparent manner in phase 3 than in phase 2, which was more cumbersome administratively (for both beneficiaries and for project staff), but worked with smaller groups (community-based organizations specifically created for each mitigation option).

Specific findings

(a) Problems were noted with some alternative water supply options as these need careful implementation and routine and substantial operation and maintenance compared to the shallow tubewell handpumps that households have been using through their own financing. Two different mitigation options (dug wells and pond sand filters) had failed due to poor quality construction, lack of people's technical knowledge, and lack of follow-up support from the project.

(b) The community-based organizations fulfilled their immediate purpose of obtaining a safe water option, but did not endure beyond that.

(c) The project has provided a larger number of safe water options in places where there existed more energetic union parishad chairpersons. The project being demand-based, distribution was influenced accordingly.

(d) Time limits and deadlines for community contribution results in putting the poor segment at a disadvantage, as poor members are either short of cash or can arrange to pay seasonally only. In both phase 2 and phase 3, around half of all deep tubewell recipients reported paying more than the officially required cost share amounts. In the majority of cases cost share amounts were paid by only one, two, or three households, rather than by the 10–100 who signed application papers. Seasonality and alternative resource sharing should be taken into account to ensure the poor's participation.

(e) The demand-based approach, while having many benefits, does not result in a logical distribution of safe water options by union, according to established public health principles; there was no evident relationship to arsenic contamination levels, population percentages, or identified patients within the project upazilas, except for the fact that the project-targeted areas had relatively higher overall arsenic contamination percentages.

(f) Mainstreaming the PMU under the DPHE enhanced project performance. As a result of the changes made in 2003 in the project pro forma, BAMWSP became more closely associated with the sponsoring line agency, the DPHE.

(g) The technical quality of deep tubewell installation was, for the most part, satisfactory, largely because of the high degree of local control over materials procurement and regular checking by local users and others on the progress of work.

(h) The project's regional PMUs were a strong and decisive presence in the project.

(i) Acceptability of NGOs as project implementing partners has been a difficult challenge for the centralized agency. NGOs contracted to work on awareness raising and mitigation worked more effectively in some areas than others for various reasons. The role of the NGOs remained somewhat controversial and ambiguous as the project drew to a close.

(j) Record keeping was not satisfactory. The project headquarters did not thoroughly maintain records or document the precise status of its activities. This shortcoming made it difficult to measure precisely the achievements of BAMWSP.

(k) Awareness raising calls for repeat campaigns. A 2004 evaluation study of BAMWSP awareness raising activities, which was conducted by 19 NGOs in 147 upazilas, found that the campaign had been successful in about half of the locations. The present study found people to have been generally informed but alarmed by the screening campaigns, during which their household tubewells were painted either red (indicating "unsafe" arsenic contamination levels) or green ("safe" water). Awareness of the arsenic problem among household survey respondents was found to be generally satisfactory: for example, around 74 percent could describe symptoms of arsenicosis; around half said, correctly, that the illness was not contagious; and two thirds said, correctly, that it was not hereditary.

(l) Claim of ownership of safe deep tubewells is generally low. In the survey of deep tubewell caretakers, 10 percent of poor households covered by the household survey were found to have ownership share in a BAMWSP-provided deep tubewell, compared to 25 percent of high-income households. The poor are less capable of paying the required cost share amounts than others. Perhaps more importantly, local government officials, not expecting them to be able to pay, failed in some cases to inform poor neighborhoods of the opportunity to obtain safe water through this project.

(m) The participatory process enabled local women's active involvement. A positive feature of the project was that it employed local women to do tubewell screening and awareness raising, thus ensuring that women confined to small areas by purdah were able to hear some arsenic messages. In virtually all places visited by the evaluation team, however, women were found to have been excluded from decisions about options distribution or siting of options. Their lack of inclusion in the project's processes notwithstanding, it is women who travel long distances in search of arsenic-safe water, bearing the physical burden of decisions in which they have no part.

(n) As regards urban piped supply water in Chapai Nawabganj pourashava, a large proportion of the households with existing piped supply connections reportedly also made use of tubewells and other water sources; 86 percent of sample households from the core area and 70 percent from the extended area drank piped supply water; all the households in the sample had taken half-inch pipe connections and were paying Taka 80 as a monthly tariff; on average, two households were using water from a single house connection; all respondents said that water was supplied twice a day; the average daily supply was

available on average 10.1 hours in the core area and 8.3 hours in the extended area; a majority of the households (58 percent in the core and 72 percent in the extended area) did not have any underground or overhead water reservoir or tank; those who complained of low pressure or inadequate supply tended to be those with neither underground nor overhead tanks; 78 percent of households in the core area could not say that their water quality was good; they mostly said that the piped supply water was “unclean” or “dirty”; with a few exceptions, respondents in fringe areas currently spent nothing on water. Nonetheless, almost all expressed their willingness to get piped connections in their houses; they expressed their willingness to pay specific amounts mentioned as connection charge (Taka 500) and monthly tariff (Taka 80); in making general comments about water issues, core area respondents emphasized the iron problem more than others; and in the extended area, there was an expressed interest in increased supply. In fringe areas the emphasis was on obtaining arsenic-safe water.

Health-related findings

The project supported a large-scale training of healthcare providers by the Bangladesh Medical Association in 2004. A change occurred around 2003, when the Ministry of Health and Family Welfare took over all responsibility for health services to arsenicosis patients; so BAMWSP did not have any formal obligations to them beyond the provision of safe water sources. The results of the project-sponsored training were not investigated in depth. The evaluation team’s health-related findings, in brief, are:

- (a) Trained doctors and health workers were not deployed by the Ministry of Health and Family Welfare to upazila health centers in any rational or consistent manner, in relation to arsenic-related health problems.
- (b) The governmental health service was not actively identifying, confirming, or managing arsenicosis cases in most upazilas visited by the evaluation team. The exceptions were Hajiganj, where records were maintained and field staff had been trained for some time; and Raipur and Gournadi, where the health complexes had recently arranged arsenicosis training and begun to rescreen the population in search of patients.
- (c) There was no coordination or communication between BAMWSP and the governmental health services in the areas visited.
- (d) Of 616 respondents to the household survey, 1.5 percent (9 respondents) reported having at least one arsenicosis patient in the home. Another 2.1 percent said there was at least one such patient among their neighbors.
- (e) A good number of patients were found to lack access to both safe water and health services. Two visited villages known to have large numbers of arsenicosis cases had received no project safe water options. Nor were the patients recognized by the respective upazila health complexes.
- (f) Neither patients nor other community people knew much about where to go for diagnosis and treatment of arsenic-related illnesses.
- (g) A great many patients were yet to be identified by the responsible health authorities.
- (h) The government’s health service was actually keeping its records properly and health field staff were knowledgeable about the symptoms of arsenicosis.

Key conclusions and lessons learned

- (a) The alternative options distribution and installation procedures of BAMWSP in the DPHE have been more successful technically than the normal DPHE procedures. Giving local people some control over materials and quality of work enhances technical quality.
- (b) Screening data on populations and risk factors (contamination of shallow tubewells) have been organized through NAMIC in a way that could easily support rational planning of mitigation work.
- (c) Awareness raising activity is never finished. It should be a continuous process.
- (d) Ward-based planning may improve if it is implemented in a less centralized manner; provided with enough time for adequate communication and information dissemination; and organized as part of a well-structured, widely understood system of resource distribution.
- (e) In a demand-driven approach, demand among some of the highest-risk sectors of the population must be developed. Due to the late full-scale start of mitigation activities, BAMWSP did not have sufficient time to build such demand or to more strongly mobilize disadvantaged community residents.
- (f) The project introduced a number of new procedures, giving local leaders (union parishad chairpersons) primary responsibilities. Many leaders, however, took a long time to understand the project and extract benefits from it for their people. Leaders need time to learn, and they need even more time to communicate with their constituents. This type of process is slower than the purely top-down, technically driven processes more familiar in the Bangladesh context; but it probably produces more beneficiary satisfaction in the long run. The central role of the union parishad chairpersons in this project has produced mostly positive results. The project experience shows, however, that in any program managed by locally elected leaders, it is necessary to ensure that public services are made available on an equitable basis to the population. Leaders must take responsibility to conduct business according to certain guidelines, and to distribute benefits to the whole population. Monitoring is essential.
- (g) Rushed work as the project's end approached resulted in some unfinished installations and in some groups not getting options despite having paid money and started the application process. This was mitigated by moving implementation of these options to the follow-on BWSPP.
- (h) The changes in project cost share requirements and other requirements, while done for understandable reasons, have been generally confusing to rural people. Any national-scale project such as this one must be conducted in a highly clear and consistent manner, with similar rules for all. Indeed, the whole country should have some uniform pricing standards, to avoid confusion and unnecessary competition that might hinder acceptance of new domestic water options and opportunities.
- (i) The future emphasis on piped supply schemes is based on some interesting assumptions and research findings. As rural schemes are developed on a pilot basis in the follow-on BWSPP, some important issues that will require close attention are delivery of services, cost recovery, and long-term implementation.

Annex 6. Stakeholder Workshop Report and Results

In the context of the Intensive Learning ICR, a BAMWSP stakeholder workshop was held on 21 June 2006 at the Spectra Convention Center, Gulshan-1, Dhaka. The workshop was attended by union parishad chairpersons, representatives of the community-based organizations, a few women members of the community-based organizations, officials from the Ministry of Local Government, Rural Development and Cooperatives, PMU head office and regional staff, DPHE headquarters staff, and representatives of UNICEF, SDC, the World Bank and the World Health Organization.

The project director welcomed everyone to the workshop, and gave a summary of the achievements of the project. These included:

- Screening over 3 million tubewells, both public and private
- Making people aware of the arsenic problem
- Providing mitigation options in more than 60 upazilas through the innovative approach of giving money to union parishad chairpersons and involving local people in construction
- Carrying out emergency mitigation, mostly through provision of dug wells, which were not successful because of poor water quality
- Maintaining high standards of technical quality in deep tubewell installations
- Introducing a management innovation through which, for the first time, the DPHE involved local leaders and union parishad chairpersons in planning and implementation (“Management is what matters”)
- Training of doctors and health workers through financial support to the Bangladesh Medical Association
- Modernizing and establishing laboratories where water samples can be tested properly
- Helping the central laboratory of the Bangladesh Council for Scientific and Industrial Research to acquire new equipment
- Upgrading the Chapai Nawabganj municipal piped water supply system
- Carrying out groundwater surveys
- Establishing NAMIC as a uniquely comprehensive central source of information
- Streamlining the management system of BAMWSP.

The World Bank task team leader gave an overview of the project’s activities, emphasizing the overall goal of the project, namely “To reduce mortality and morbidity in rural and urban populations caused by arsenic contamination of Bangladesh’s groundwater”. Three types of activities have been conducted in order to achieve this end:

- On-site arsenic mitigation in rural and urban areas
- Improved understanding of the arsenic problem
- Strengthening of implementation capacity

The task team leader posed the following questions for discussion by the participants:

- Has BAMWSP reached its objectives?
- Has it contributed to better understanding of arsenic?
- Has it strengthened capacity?
- Has its on-site mitigation activities been successful?
- What has been learned?

The field survey evaluation team summarized its preliminary findings and presented its recommendations. Some observations and recommendations that stimulated discussion were:

- Maintaining a good technical standard by including local people in material selection and site supervision
- The valuable contribution of this project in strengthening local government institutions
- A recommendation to increase the role of NGOs by engaging them for at least one year and working in a spirit of partnership
- Poor coordination between BAMWSP and the Ministry of Health
- The project has not provided safe water options evenly in the targeted populations; specifically, poor households have been bypassed
- Inadequate services for arsenicosis patients in the upazilas visited
- Poor transparency in BAMWSP processes and poor maintenance of project files.

Ministry participant

The Deputy Chief, Ministry of Planning, who has had a longstanding involvement with the project, said that BAMWSP was considered by most people in government to have been a failed project for its first three or four years. He said that performance improved rapidly after responsibility was transferred from directly under the Ministry of Local Government, Rural Development and Cooperatives into the DPHE, and after the present project director was posted. He emphasized the importance of using projects such as this one to strengthen local government institutions.

Union parishad chairpersons, community-based and support organizations, NGOs

Eight union parishad chairpersons made comments. All were pleased at having been given important responsibilities by the project. Most said that it had taken some time for them and their constituents to understand the nature of the project and its potential benefits, so they did not move as quickly as they might have. All of them said that the numbers of deep tubewells provided was hardly sufficient to meet demand. Their union populations were not adequately covered.

A couple mentioned problems with local expectations not being met, or many households having deposited money in the required bank accounts but not having received any safe water options due to the closing of the project.

Some expressed the view that the NGO work could just as easily have been done by union parishad people. One said the NGO work in his union was entirely unsatisfactory and caused people to mistrust the whole project. This issue of the proper role of the NGOs, or whether NGOs were necessary or not, was hotly debated in the discussion period. One of the NGO representatives argued that NGOs deserve appreciation for usually supporting local government institutions (union parishads) more than governmental agencies do.

There were a few complaints from participants (both NGOs and union parishad chairpersons) about bureaucratic procedures, delays, and problems with delayed payments.

One NGO that is setting up a rural piped supply system said that people would prefer the new piped supply systems to handpump tubewells.

The representative of the Environmental Health Unit of the World Health Organization (WHO) stated that the only way to reduce morbidity and mortality related to arsenicosis was to provide arsenic-safe water to the population. These were ambitious objectives. The impact of BAMSWP on health indicators may only be seen in a few years and people may have to be rescreened.

Conclusions

World Bank

BAMWSP was a complex project that involved multidisciplinary approaches. The evaluation study suggests that a major part of the outputs was achieved; yet about US\$6 million of the available grant will be canceled. Some reasons for weaknesses in BAMWSP have been the slow implementation due to bureaucratic problems, and the differences between the DPHE and BAMWSP. This project has seen major improvements after the restructuring: capacity building and technology development have occurred in this project; local government assumed monitoring responsibility; and well screening was carried out effectively with the help of ward members and union parishad chairpersons. Arsenic mitigation is not just a technical issue; it is in fact more an institutional issue. Participants were encouraged to learn from this project's experience and use the lessons to improve approaches in future work.

Project Management Unit

The project director challenged the evaluation team's statement that transparency was weak in BAMWSP. Use of community bank accounts fostered transparency, he argued. Although certain difficulties overshadowed his efforts at times, he did his best to make this a transparent project. The project director thanked all participants and invited them to a festive lunch.

Annex 7. Borrower's ICR and/or Comments on Draft ICR

Borrowers' Implementation Completion and Results Report (ICR)

**Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP)
Department of Public Health Engineering (DPHE)
Government of the People's Republic of Bangladesh**

1. Introduction:

Bangladesh achieved tremendous success in rural water supply with the assistance from different donors agencies, and bilateral agreements with donor countries between 1980 and 1995. About 97% rural population had their access to safe water through hand tubewells during this period. Ground water is the principle source of water supply in Bangladesh. But suddenly in 1993 arsenic contamination in ground water was detected first at Chapai Nawabganj district. Afterwards DPHE conducted water analysis from tubewells from different western districts of the country. Arsenic contamination in ground water was found almost in all districts. In 1997 British Geological Survey, with the assistance from DFID initiated a survey on ground water quality in Bangladesh and published its report in 1999. The study revealed that the shallow aquifer of ground water in entire Bangladesh was affected by arsenic contamination. As a result the coverage of safe water came down to 75% from 97%.

To address the arsenic problem in the country and to ensure the safe water for the people the Government of Bangladesh took the project styled as "Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP) in 1998 with a credit from the World Bank (WB) and grant from SDC. The WB provided US \$ 32.4 million for the project, and SDC contributed US\$3.0 million to the project as co-financing.

2. Objectives:

- 2.1** The overall objective of the project was to reduce mortality and morbidity in rural and urban population caused by arsenic contamination of ground water within sustainable water supply, health and water management strategies. This Project is the first phase of long-term effort to mitigate the impact of naturally occurring arsenic contamination of ground water.

Project consists of following components (a) On-site Mitigation, (b) Improved Understanding of the Arsenic Problem and (c) Strengthening of Implementation Capacity.

The specific objectives were as follows:

- (i) Identifying the causes of arsenic contamination through exhaustive surveys of tube wells, and in-depth assessment of the extent of arsenic contamination of water sources and developing an improved data management system;
- (ii) Identification of alternate sources and development of a range of affordable technological options and levels of service for long term and sustainable solution;
- (iii) Construction, rehabilitation and augmentation of water supply and sanitation schemes including emergency activities needed to mitigate arsenic free community water supply;
- (iv) Awareness building on arsenic hazard & hygiene education on environmental sanitation;
- (v) Development, testing, and scaling up of decentralized, community based, cost effective, and demand responsive institutional mechanisms for water supply service delivery;
- (vi) Capacity building at community level, at the levels of Union Parishad, and Municipality and various stakeholders, Government agencies and Support Organizations;
- (vii) Preparation of detailed proposals for a national rural and urban water and sanitation program for arsenic mitigation based on lessons learnt for the subsequent phases of investment;
- (viii) Creating employment opportunities at the grass root level and to promote private initiative in the sector development;
- (ix) Set up of National Arsenic Committee, Secretaries Committee, National Expert Committee and Project Steering Committee to oversee and promote project activities. Set up of Ward, Union, Upazila & District Arsenic Mitigation Committees to supervise project activities at their terrains.
- (x) Partnership building up with DGHS, GSB, and BCSIR etc. to address arsenic related multi-sectoral issues.

3. Funding Arrangements, Financial Performance and Project Implementation Timeline:

The Project was originally designed for fifteen years from 1998 onwards. Initially the project was started in July 1998 and supposed to be completed in June 2001. It was revised and extended up to June 2002. Because of many practical reasons, specially different implementation modalities the project implementation could not be completed with in the stipulated period. As a result the project was extended up to June 2006.

BAMWSP Implementation Completion Report Project Cost by component (US \$ million)

<i>Project Cost Component</i>	Appraisal Estimated US \$ million	Actual/Latest Estimated US \$ million	Percentage of Appraisal
1. On site mitigation :	26.10	11.731	44.95
2. Improved Understanding of the Arsenic Problem :	3.80	11.712	308.21
3. Strengthening of Implementation Capacity :	14.50	4.959	34.20
Project Total	44.40	28.40	
Percentage of total			63.96

Note: Total expenditure of the Project is BDT 1681.183 million. Among the total expenditure of the project the expenditure under IDA is BDT 1370.764 million (including RPA & DPA), under SDC BDT 10.498 million, under GoB BDT 212.401 million and under Community BDT 87.52 million respectively.

As per client connection the (historical) disbursement made under IDA shown US \$ 23.160 million and under SDC the disbursement is US \$ 0.207

Using the conversion rate as per last revised PP of BAMWSP We use the conversion rate as 1 US \$ = BDT 58.00 the GoB expenditure stands at US \$ 3.66 million and community US \$ 1.51 million. As per PAD the allocation kept in GoB is 4.9 and in Other (Community) is US \$ 4.10 million. Considering the allocation of PAD the uses of GoB funds is stand as 74.69% and in Community fund 36.83% respectively.

4. Assessment of Project Design and Implementation:

BAMWSP launched a drive to mitigate the arsenic crisis from the very early stage of its implementation. After experiencing lesson from five years of its implementation, some new concepts (on Program Approach & Implementation Mechanism) were developed; this project will directly deal with water supply and sanitation sector and support other relevant government agencies to address multi-sectoral arsenic related issues. Partnership approach will be developed with i) Ministry of Health for health treatment of patient, ii) GSB-BWDB for ground water investigation, iii) ITN for R & D and technical matters, iv) BCSIR for Technology verification issues, v) Unicef/Ministry of Information for communication and vi) Others as and when required. Besides, restructured approach will be brought to project implementation, in which the technical strengths of DPHE will be combined with community-based planning and implementation of water-supply schemes; Village piped water supply schemes will be added with the range of options available in the CAP; urban pourshava piped water supply is included, NGO, private sector organization or local government institution may act as potential SO, who will provide support to the project in CBO formation, scheme preparation and complete implementation; and (iv) Short-term & long-term infrastructure development works will be initiated in Chapai Nawabganj.

The project commenced with three main components: (1) On site mitigation, (2) Improved understanding of the Arsenic Problem, and (3) Strengthening of Implementation Capacity. Field activities were identified as Screening, Community Development & Mitigation (under new concept preparation of Community Action Plan) and implementation of sub-project (or CAP or scheme). Field Activities under Screening Program includes: (i) identification of arsenic affected tubewells (including the extent of arsenic contamination); (ii) primarily identification of arsenic affected persons; and (iii) awareness creation in the community. Field Activities under Mitigation Program or CAP/WAP includes: (i) Formation & Capacity building of Community Based Organization (CBO); and (ii) Developing & implementing Community Action Plan (CAP) through community initiatives. For implementing

CAP, a separate account has been maintained in which the Union Parishad Chairman is a co-signatory. BAMWSP provided final approval of the proposed scheme, and transferred half of the 80% of the total cost (WAMWUG/WAP 90%) of the approved grant amount to the community's account. The amount of community's contribution was fixed in the context of the National Policy for Arsenic Mitigation. As already established under BAMWSP, no single household may provide more than 40% of the community's contribution, while each beneficiary must provide 2% of the contribution, whether in cash or labor. Local Government and Communities purchased construction materials for the options with the first installation of the fund transferred in their bank account. The second half of the approved grant amount transferred to the community's account once the initial tranche was drawn based on certification by DPHE engineers of satisfactory progress in construction. During the supervision mission it was agreed that the further consideration would be given during preparation of the revised Operational Manual to the possible establishment of a threshold contract value above implementation of CAP, expenditure statement, voucher/CAP documents have been kept in union parishad's office for further audit.

Beside the normal mitigation, immediate emergency relief intervention was provided to the community in villages where more than 80% of households lacked access to arsenic safe water. On emergency basis, mitigation options one per 50 families were provided in those villages where there was no nearby alternate water sources. A rapid assessment was done in consultation with the local government entities and the communities, to select suitable technological options. Water sources installed at the community level in public places and public places authorities will bear the operation and maintenance cost.

Project design and its implementation procedures was appropriate in the context it was designed/prepared. The PP was revised and extended three times. The original PP was from July 1998 to June 2001. It was later revised and extended up to June 2007.

Cost sharing of option installation by the community should be at par with other donors, NGOs etc. to avoid confusion

Modality of the project was appropriate provided the intervention period was longer, one year. The community would then have been able to vividly understand the process and procedures of their involvement in getting not only the option but also of its O and M. Local government along with community would be able to think about the fund generation and its utilization especially for O and M. The decision of the community along with the Local government would have been strengthened. In the field the process had to be "rushed" under this project design.

5. Assessment of objectives:

Achievement of outcomes against the objectives:

- Ex-post evaluation is yet to be conducted by a third party in the project implementation areas. However, mortality rate arising out of arsenicosis has been reduced to a large extent. The morbidity rate was also found very low for the same reason. People of the project areas are very much aware of the adverse impact of arsenic poisoning. They are using arsenic-safe water from alternative sources. This outcome is very much matching with the overall objective of the project.
- All available data were processed and analyzed at the National Arsenic Mitigation Information center (NAMIC). The upazila-wise data were compiled in book format and distributed among all relevant officials and stakeholders at central, regional as well as field level.
- Alternative options for arsenic free safe water have been promoted in the affected areas. Deep Hand Tubewells, Dug wells, Pond Sand Filter (PSF) and Rain Water Harvesting System were promoted in the project areas. Cost effective and affordable alternative water sources were identified, including deep tubewells, dug wells, pond sand filters and rainwater harvesting. Due to the incidence of iron and odor, the dug well and pond sand filter options were not popular. The deep tubewell was recognized as the safest alternative for arsenic-safe water supply.
- Chapi Nawabganj water supply system was upgraded and the town has a arsenic-safe water supply. In addition, the coverage area has been expanded, and the financial reforms have improved sustainability of the service.
- Massive awareness campaign was launched using all form of media to make people aware of the adverse impacts of arsenic contamination and importance of the use of arsenic free safe source of water. People of the country are now fully aware of the arsenic problem and need for safe drinking water.
- The project has successfully decentralized community-based water supply delivery using a demand-based approach. The capacities of communities to undertake construction of preferred facilities has been achieved. In addition, sustainability has improved because of community cost-sharing of capital and O&M costs. The local governments have been strengthened through involvement of the Union Parishad Chairmen, who assuming a key role.
- The capacity of the local government has been developed to use it in further program.
- Through implementation of BAMWSP many important lessons have been learnt. These lessons have helped much to take actions on preparation of new projects on Water supply. Bangladesh Water Supply Program Project is a unique example of the follow-up activity. The new project has been designed based on the lessons learnt of BAMWSP project.
- The overall capacities of DPHE laboratory facilities have been increased.
- For screening of tubewells and installation of mitigation activities a large number of grass root level people were engaged who earned their livelihood from BAMWSP activities.

- All these committees were involved in the project activities in the form of providing guidance, implementation and direct supervision of work. All these committees were involved in the project activities in the form of providing guidance, implementation and direct supervision of work.
- Capacity of 2,300 physicians and 12,599 health workers in 229 upazillas has been developed through providing training to address arsenicosis patients.

Achievement of Outputs against the objectives:

- A total of 3.04 million tubewells were screened in 190 upazillas throughout the country covering more than 50.45 million populations. About 9.44 million households were surveyed during screening of tubewells. (Initially the number of upazila was 189. But a new upazila as Mujibnagar was emerged after demarking the Meherpur sadar upazila in Meherpur district and as a result the number of upazila rose to 190 from 189).
- Of the total 9,977 different types of options installed are: 9,272 Deep Hand Tubewells, 393 Dug wells, 12 Pond Sand Filter and 300 Rain Water Harvesting System. 1,008 villages covered providing arsenic-safe water to about 1.7 million (16,10,080) people of 322,016 households.
- Calculation of items under options installed is based on “served”. Villages, unions, CBOs, WAMWUG and household are calculated based on options installed and serving. The number of population was based on 5.5 members per family. The household that are using installed options are counted.
- RWH is family based. PSF serves and covers the geographical area of the pond easily communicable to the user, around 75 HHs. DW serves easy communicable distance to users and a range of 20-25 HHs. DTW serves 10-15 HHs, under 17 upazila and in 6 and 35 upazilas ranging from 40-80 HHs because of project modality.
- Chapainawabganj water supply system has been renovated and expanded to improve the water supply status with the installation of 2 (two) nos of Surface Water Infiltration System (SWIS) well at the bank of the river Mohananda. The old production tubewells have been regenerated and pipe network has been extended. The overhead tank has been also brought into service by repair and renovation. The number of street hydrant has been increased with repair of the existing ones. All old production tubewells have been provided with new pumps. People of the town are now getting improved services
- A total of 4,549 CBOs and 477 WAMWUGS were served.
- Four zonal laboratories upgraded and 5 new laboratories constructed, thus increasing DPHE capacity for water quality monitoring.

DTW is recognized as the “safest” option in the community after the detection of arsenic in the wells. DTW is a well accepted and affordable option in the community. It is because the community is familiar with DTW as an easy operating system. The beneficiary cost is affordable.

Reference to surface water (river, pond, etc) as mentioned in the NAMP, the community is unwilling to go back to surface water. They think it is not safe to drink and a hassle and burden to carry may be in many places, even from a distance. TW is within the community reach in most places and they have become accustomed to this system. In many places they collect water from TW as and when required which may not be the case in surface water. Even children can go and collect water from TW.

Surface water has to be purified by boiling or using alam. Boiling means were collecting and or cutting wood, another hassle and time consuming. Social mobilization about using surface water has to be encouraged and its benefits propagated to the community. This activity is not possible within a short time of the project period (five / six months).

6. Assessment of Project Implementation:

BAMWSP has undertaken screening of tube wells and mitigation program since October 1999. After the screening of tube wells and the hot spot upazilas are identified the mitigation activities are under taken. Hot spot upazilas were unions in which more than 40% and 60 % respectively in phases of households were found not to have access to arsenic safe water. The objective of the arsenic mitigation was to harness the potential of the hot spot communities and local government institutions to deal with the problem of arsenic safe water supply.

In the first phase of the mitigation in five upazilas local Support Organizations (SO) were involved in the process of carrying out mitigation works. During this phase, it was noted that the local government institutions were not adequately involved, resulting in lack of community ownership of the activities. Consequently, a revised approach was tested in one location, in which Members of the Union Parishad, Ward Members and Upazila administration were more directly involved.

A demand driven approach was adopted to mobilize local resources at the community level for cost sharing; 20% contribution from community was deposited at the CBO account.

Under the five upazila mitigation program all types of options were installed, like dugwell, deep tubewell and PSF.

As a result, the Local Government Division and BAMWSP restructured arrangements for screening in the subsequent phase covering 35 upazilas. To assist in the implementation of the revised approach, the Government issued a circular requiring the formation of Arsenic Committees at Ward, Union, Upazila and Zila levels.

Drawing on the recommendations and experience arising from prior phases, BAMWSP intended to contract SOs to help build the capacity of communities and local government institutions to respond to the arsenic crisis through awareness raising, training and management of arsenic mitigation activities in hot spot upazilas.

Under this arrangement CBOs were developed in each village in the hot spot upazilas. This process required capacity building of Local Government entities and CBOs

involvement in identifying and planning low cost options to provide sustainable supplies of arsenic safe water.

A demand driven approach was adopted to mobilize local resources at the community level for cost sharing; 20% contribution from community. Arrangements for financial management, fund flow and opening of CBO bank accounts in villages are an integral part of the institutional development. Under the thirty five upazila mitigation program dugwell and deep tubewell are installed.

Again, based on the results of the 35 upazilas mitigation program the previous approach will be further modified not only to expedite the process but also to streamline the financial process with emphasis on involving Union Parishad more vigorously.

To assist in the implementation of the modified approach, the Government issued a circular requiring the formation of Arsenic Committees at Ward, Union, Upazila and Zila levels.

Drawing on the recommendations and experience arising from prior phases, BAMWSP now intends in the 17 upazilas community development and arsenic mitigation program to help build the capacity of communities and local government institutions to respond to the arsenic crisis through awareness raising, training and management of arsenic mitigation activities in hot spot unions. Here, hot spot is defined as 60% contamination of ground water sources were detected, not to have access to arsenic safe drinking water.

To assist in this process SOs were be engaged to manage locally to help build the capacity of communities and local government institutions to respond to the arsenic crisis through awareness raising, training and management of arsenic mitigation activities in hot spot Unions. Ward arsenic mitigation water user group (WAMWUG) were developed in each ward of the hot spot unions

A demand driven approach will be adopted to mobilize local resources at the community level for cost sharing; 10% contribution from community. Arrangements for financial management, fund flow and opening of WAMWUG bank accounts ward wise became an integral part of the institutional development

Under the 17 upazila mitigation program deep tubewell were installed

In unions where more than 80% of households lack access to arsenic safe water, immediate emergency relief interventions were provided to the community in public places in villages as an interim arrangement. The modality was involving local government and community to select sites for installations of different types of options, namely, deep tubewell, dugwell, PSF and RWH.

7. Major factors affecting project achievements:

- 7.1 Different modalities: The implementation modalities of the project were new and different from the usual modalities exercised by the DPHE. Normally DPHE gets work done by contractors. But under BAMWSP the project activities were carried out

by support organizations and user groups. This different process involved a signing of MOU between BAMWSP and UP Chairman and community head. The selection of NGOs for screening of tubewells was a lengthy process and it took a long time to complete the work. Different stakeholders like local administration, local government institutions and the user groups were involved in the process. Similarly the mitigation activities were carried out involving support organizations and users. Preparation of TORs and other formalities involved in the selection of NGOs/SOs was not only cumbersome but also lengthy. But ultimately the project activities were successfully implemented as planned in the project document. This is also an important lesson learnt as how the community is involved in the development work.

- 7.2 Institutional arrangement of PMU independent of the DPHE: PMU itself has no manpower and office set up at the grass root level. So, it was difficult to participate in the community mobilization and ensure coordination of work. It was also not possible to provide manpower and establish office set up at local level under the available arrangement. But DPHE has network up to union level across the country. So, initiative had been taken to utilize the institutional arrangement of DPHE.
- 7.3 Changes in the management: Frequent changes in the top management of the project delayed project implementation. Lack of efficient management also slowed down project progress. Timely support of logistics and transport delayed the implementation process.
- 7.4 Absence of long-term planning: The presence of long-term planning is congenial to effective and speedy implementation of any project. The long term planning was lacking. As a result the project activities were undertaken and implemented on casual basis in absence of preplanned objectives and targets.

8. Evaluation of performance by the WB, co-financers and other partners:

- 8.1 The WB's role in assisting BAMWSP: In the initial period of the implementation there were changes in the management of the project from the Bank's side. This slowed the progress of the project. The Bank's role in implementing the project is laudable. Since inception of the project the Bank monitored the progress and problems of the project. But, in the initial period of the project it was a trial and error method for the WB itself. Supervision Mission in every 2-3 months helped very much implement the activities. The Bank was flexible enough to adapt to situations and decisions of Bank were well taken by the Government.
- 8.2 Technical collaboration provided by the WB: The WB provided technical support in implementing the project activities. Particularly, observation and suggestions made during supervision missions largely helped improving the pace of activities.
- 8.3 Quality of WB assistance and analytical advisory services: The Bank's assistance for the last few years is of highest degree and the service rendered by the Bank was congenial to the smooth implementation of the project.

- 8.4 WB's interaction with other donors: The Bank interacted not only with the GoB but also with other donors like Unicef, WHO, Danida and NGOs like Dhaka Community Hospital, RDA Bogra and other development partners in connection with implementation of the project.
- 8.5 Monitoring by the WB: Bank intensively monitored the project activities and resolved issues that hampered the progress of the project promptly.
- 8.6 The WB's processing of trance release, waivers or modification of conditions, delay or complications: Everything was positive from the Bank side. The project was to be closed two years back because of poor performance. The Bank agreed to extend the project for another two years and provided all sorts of assistance to the project management. This is why the complete implementation of the project has been possible

9. Evaluation of borrower's performances:

- 9.1 Arrangement for monitoring implementation: The project implementation was regularly monitored by the Local Government Division every month. The monthly progress report of the project was reviewed in the monthly coordination meetings chaired by the Hon'ble Minister of LGRD & Cooperatives or the Secretary of the LGD. Besides, the Steering Committee reviewed the progress and problems of the project in every 3-4 month. This committee is also headed by the Secretary of LGD.
- 9.2 Impacts: The overall impact of the project implementation is positive. Through this project the entire people of the country have understood the problem of arsenic contamination and its adverse impacts. They have been aware of the safe water from the alternative options. A large number of the arsenic affected people have been served from installation of 9,977 options. The people of Chapainawabganj pourashava are now getting arsenic free safe water through this project. The strengthening of DPHE laboratory and the new construction of five laboratories have definitely enhanced the capacity of DPHE for monitoring water quality.
- 9.3 Implementation of actions and decisions agreed-upon in the Loan Agreement: Implementation was made as agreed upon.
- 9.4 Review of agreed actions: Review was done in the wrap up meetings of the Bank's mission each time held at the Local Government Division.
- 9.5 Review of the WB funded procurement: Procurement was reviewed by the Bank in different times and it was found satisfactory in general. But in some cases it was rated as marginally satisfactory.

10. **Lessons learnt and recommended actions:** Many lessons were learnt through implementation of the project. Some of the key lessons are as follows-

1. A project with different modalities can be implemented if management is active and dedicated.
2. Project can be implemented with the involvement of the community.
3. The community (CBO, WAMWUG) itself can take up implementation work if guided by the project management.

11. Sustainability

Arsenic safe water provided by installation of DTW to the community is sustainable. Regular arsenic testing, may be, along with other toxic element/s by the community is a question, because of the generation of fund by the community. Social mobilization for awareness of regular testing of water has not been focused enough because of time constraint. Though O&M of the DTW is an important factor it is unknown how this will be carried out under this local government modality.

**Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP)
Intensive Learning Implementation Completion and Results Report (ICR)**

Comments on the ICR

Reference	Statements in ICR	BAMWSP Remark
Item-C: Ratings Summary C .1 Performance rating by ICR at page i C.2 Detailed Ratings of Bank and Borrower Performance (by ICR) at page i	ICR rated the performance as moderately satisfactory. Borrower Performance has been rated as moderately satisfactory. Overall Borrower Performance has been rated moderately satisfactory.	Aide Memoire of June 2005 reflects that the performance is satisfactory.
PDO Indicator 1: Coverage of sustainable safe water supply. Page iii.	(a) Screening done in about 3.04 m wells in 190 Upazilas and 400 production wells in 100 Pourshavas.	The number of production wells that were screened is 390 Not 400.
PDO Indicator 3: Treatment of arsenicosis patients. Page iv.	(b) 2330 doctors and 12590 health workers were trained	The figures should be changed to 2300 physicians and 12599 health workers trained by BAMWSP.
Intermediate Outcome Indicator 2: Arsenic – safe drinking water coverage in 4000 villages at Page v. Intermediate Outcome Indicator 3: Implementation capacity strengthened at page v.	(a)Covered: 130 villages in Phase 1; 1026 villages in Phase 2; and 660 villages in Phase 3. (b) 9270 deep tube wells. (a) Local stakeholder capacity increased through 4123 community action plans.	(a) BAMWSP has covered 122 villages in Phase 1 instead of 130 villages. (b) BAMWSP has installed 9272 deep tube wells. (a)Local stakeholder capacity increased through 4331 community action plans.
1.4: Revised Beneficiaries at page 6. para 1: Number of beneficiaries. para 2: Nation wide well screening program by British Geological Survey.	Following adjustment of the 4000 village target, project benefits accrued to between 2 million and 2.5 million people through implementation of about 10,000 mitigation option in 1800 villages and wards, and in one Pourshava which would not have been possible if the 4000 village target had been pursued. Other beneficiaries remain unchanged. the British Geological Survey, which carried out a nation wide well screening programme before the start of the project	The numbers of mitigation option is 9977 in place of 10,000 and number of villages is 1008 in place of 1800 This should be noted that the well screening program was carried out under Grid Pattern except Chittogonj and four Hill Tracts to assess the arsenic contamination levels by not only BGS but also DPHE and GSB.
Section 2.1: Design criteria at page 9	The beneficiary assessment observed that intervention on this basis had little relation to arsenic concentration levels,	Criteria targeting relation to arsenic concentration levels, population density, or the number of arsenicosis patients as set by the

	<p>population density, or the number of arsenicosis patients.</p> <p>The ICR review further believes that the criteria adopted in the project contributed to enhancing the outcome.</p>	<p>World Bank was followed for implementation of the project activities and achievements that were made led to the ICR review to conclude that the criteria adopted in the project contributed to enhancing the outcome</p>
<p>Section 2.1: Adequacy of participatory process: Para 1at Page 11</p>	<p>Following well screening, women were informed of the unsafe wells that they may be avoided.</p>	<p>After the well screening, the community as a whole were informed that includes both men and women.</p>
<p>Section 2.3: Monitoring and Evaluation Design, Implementation and Utilization: Water quality monitoring and record keeping in Para 1 at Page 13,</p>	<p>In addition, the key activity of water quality monitoring in deep tube wells was carried out under the auspices of NAMIC.</p> <p>The beneficiary assessment also notes that the monitoring and evaluation of project achievements did not receive much attention from PMU, and that records were not maintained in a consistent manner.</p>	<p>In fact, the key activity of water quality monitoring in deep tube wells were carried out by PMU and data was recorded in NAMIC.</p> <p>The beneficiary assessment was carried out in March –April 2006, when the project was trying to rush the activities to come to a close. Full documents and records are now in place.</p>
<p>Section 2.4: Procurement at page 15</p>	<p>Findings on procurement administration by the PMU on post reviews conducted on a number of contracts were: (a) in general, the procurement capacity of the project staff for the types of contracts processed was weak; (b) the frequent turn over of procurement staff was reflected in variations in the quality of procurement processing.</p>	<p>It may be mentioned that there were no frequent turn over in procurement section in BAMWSP.</p>
<p>Section 2.5: Post completion operation /Next Phase: transfer of works from BAMWSP to BWSPP at page 15.</p>	<p>The works of BAMWSP not completed by project closure – about 600 ward action plans for which the MOUs had been signed, water quality testing of new deep tube wells , measurement of GPS coordinates of the tube wells, building a GPS – based deep ground water quality data base, further testing of surface water infiltration schemes, implementation of the ten pilot rural piped water supply projects, and follow –up to the completed pilot rural pipe water supply project –have all been transferred to the BWSPP.</p>	<p>In fact the number of option to be transferred is over 600 under CAPs and WAPs.</p> <p>Water quality testing is being undertaken from BWSPP.</p> <p>Rural piped water supply schemes of BAMWSP were transferred to BWSPP.</p>
<p>Section- 3.5 Overarching Themes, Other Outcomes and Impacts at page 22</p>	<p>Participation of women in the community –based organizations occurred, as one of the two joint signatories for the community bank account was a woman.</p>	<p>In general both the signatories were men. But in a few cases, women were joint signatories.</p>
<p>Section 3.6(k): coordination on health issues between BAMWSP and government at page 24.</p>	<p>On the health aspects, there was no coordination between BAMWSP and government health services; a few villages having a high concentration of arsenicosis patients did not receive arsenic- safe water; trained doctors were not always posted in upazilas</p>	<p>Coordination was there till the time the health component was included in BAMWSP while physicians and health workers were trained and patients were sent for referral. Later on the health component was dropped from BAMWSP. However, the issue may be taken up by the Health Ministry.</p>

	with arsenicosis patients; and neither the patients nor the community knew where to go for treatment of arsenic-related illnesses.	
Annex 1: Project Costs and Financing at page 32	<p>Financing:</p> <p><u>Actual/Latest Estimate (USD)</u> GOB 1.75 Other (community)1.48</p> <p><u>Percentage of Appraisal</u> GOB 35.71 Other (community) 36.09</p>	<p><u>Actual/Latest Estimate (USD)</u> GOB 3.66 Other (community)1.51</p> <p><u>Percentage of Appraisal</u> GOB 74.69 Other (community) 36.83</p> <p>(Considering the conversion rate 1US \$=Tk 58.00 as per last Revised PP of BAMWSP)</p>
Page 33, Annex 2. Outputs by Component at page 33	In total, 9975 mitigation options for non piped water supply have been constructed. These include 9270 deep tube wells.	9977 mitigation options for non piped water supply have been constructed. These include 9272 deep tube wells,
Annex 5: Specific findings: Over payment by tube well recipients at page 43	In both phase 2 and phase 3, around half of all deep tube well recipients reported paying more than the officially required cost share amounts.	The system was to deposit community's money in a bank account where project's grant money is also transferred to make entire money available for spending by CBO that leaves no scope for receiving money from CBO. However, in consideration of this finding, measures taken to prevent such issue in BWSPP.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Swiss Development Corporation (SDC) comments on Draft ICR, received on May 15, 2007:

Between 1998 and 2005, the SDC was involved in major discussions with the BAMWSP team with regards to project implementation. This was extremely useful to SDC as it contributed to create cross-links to SDC's own Water and Sanitation programme mainly implemented by NGOs.

A general conclusion to the overall programme is that the institutional set-up of BAMWSP was complex which hampered easy decision-making at the project director's level. Nevertheless, important steps could be made to develop nation-wide arsenic mitigation strategies.

Unfortunately, the technical assistance budget foreseen by SDC for BAMWSP was underutilised. After three extensions, SDC decided not to further extend its contribution as the SDC cooperation strategy planned for a phasing-out of the Water and Sanitation sector. SDC's decision was based on the fact that meanwhile major donors had entered the sector and could contribute more significantly to arsenic mitigation.

Department for International Development (DFID, UK) comments on BAMWSP received during the ICR mission:

DFID recognized the significant achievements of BAMWSP: the screening of wells and the important contribution through the NAMIC database; the awareness raising of arsenic problems, resulting in fewer arsenicosis cases; the important contribution to developing sustainable mitigation technologies; expanding the use of deep tubewells; and community management of rural water supplies in Bangladesh.

DFID observed, however, that BAMWSP had less impact on the following: shaping the Government of Bangladesh's strategies and policies on arsenic mitigation; pushing for effective coordination between the health sectors and water supplies; changing the DPHE's approach to one that was more demand driven; widening the delivery of research in hydrogeology or technology; achieving accessibility by other organizations to the NAMIC database; and collaboration with other partners.

Annex 9. List of Supporting Documents

1. Project Concept Note (August 1997)

2. Project Appraisal Document (August 1998)

3. Development Credit Agreement

4. Project Agreement

5. PSRs and ISRs

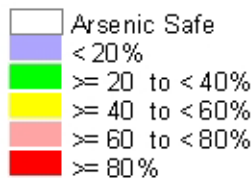
6. Mission Back-to-Office Reports and Aide Memoires

7. Beneficiary Assessment (by Planning Alternatives for Change, LLC)

Maps

Arsenic Contamination In Bangladesh

Percentage of Contaminated Wells above the Bangladesh Standard of 50 Micrograms/Liter



26°00'N

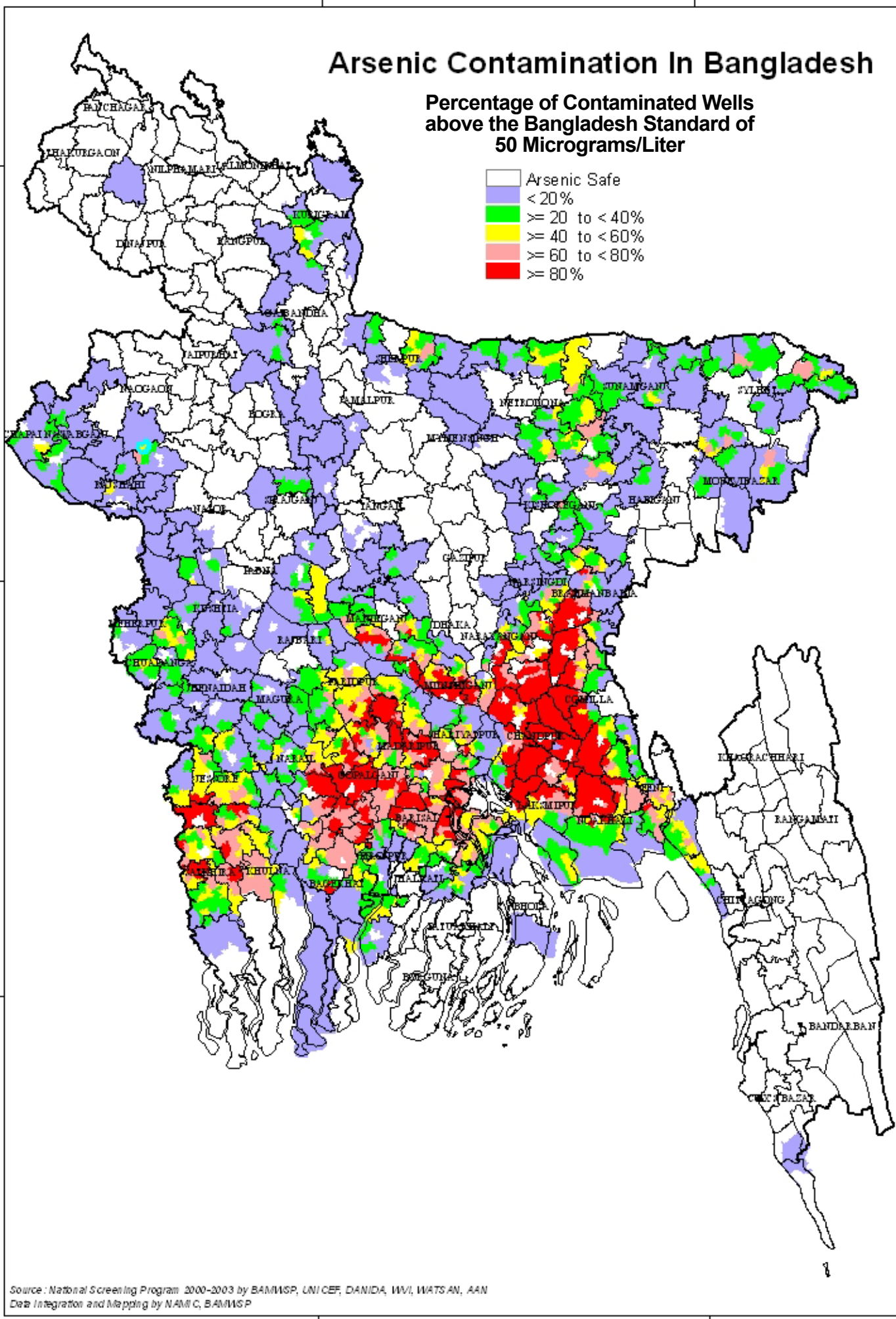
26°00'N

24°00'N

24°00'N

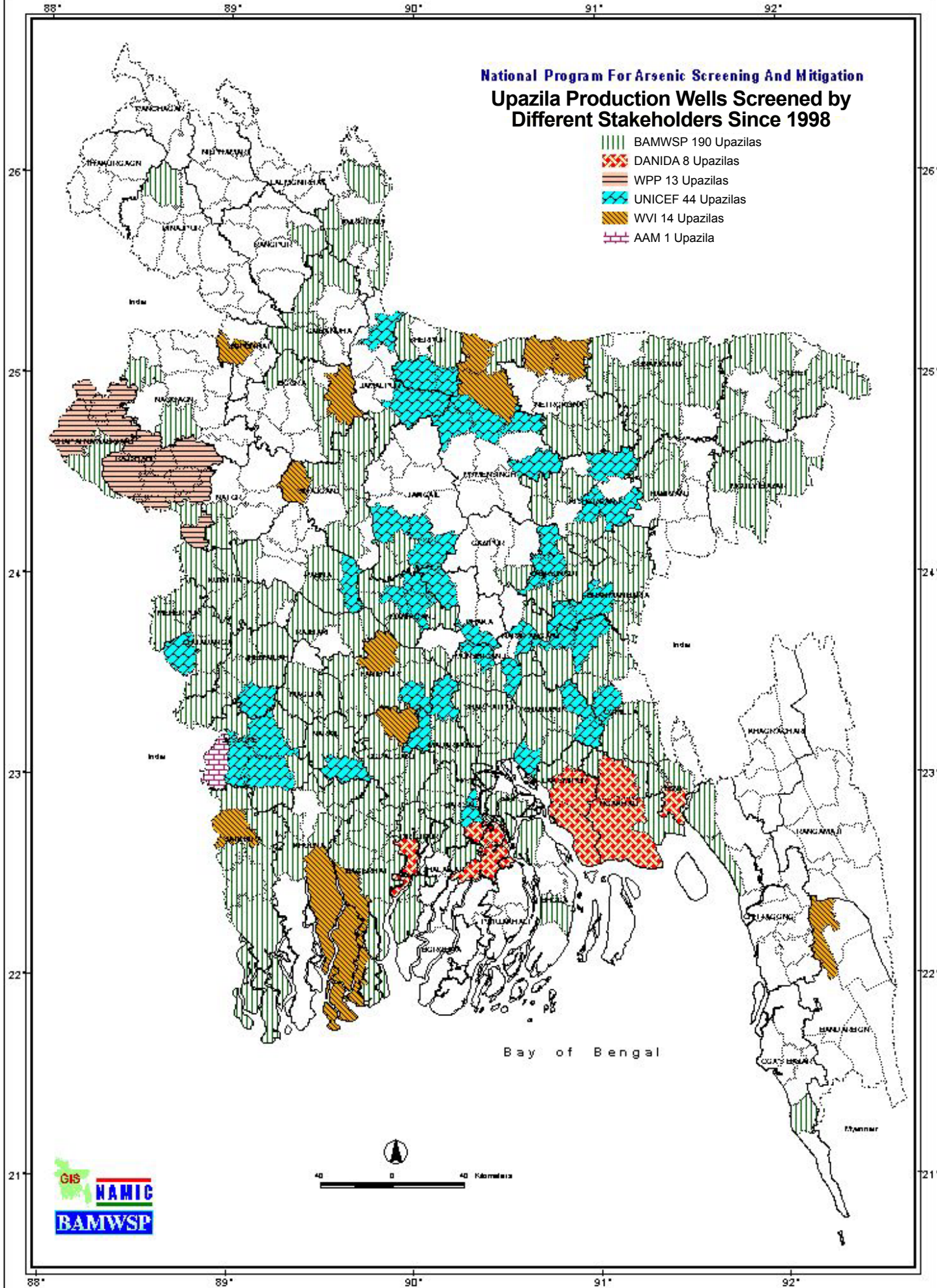
22°00'N

22°00'N

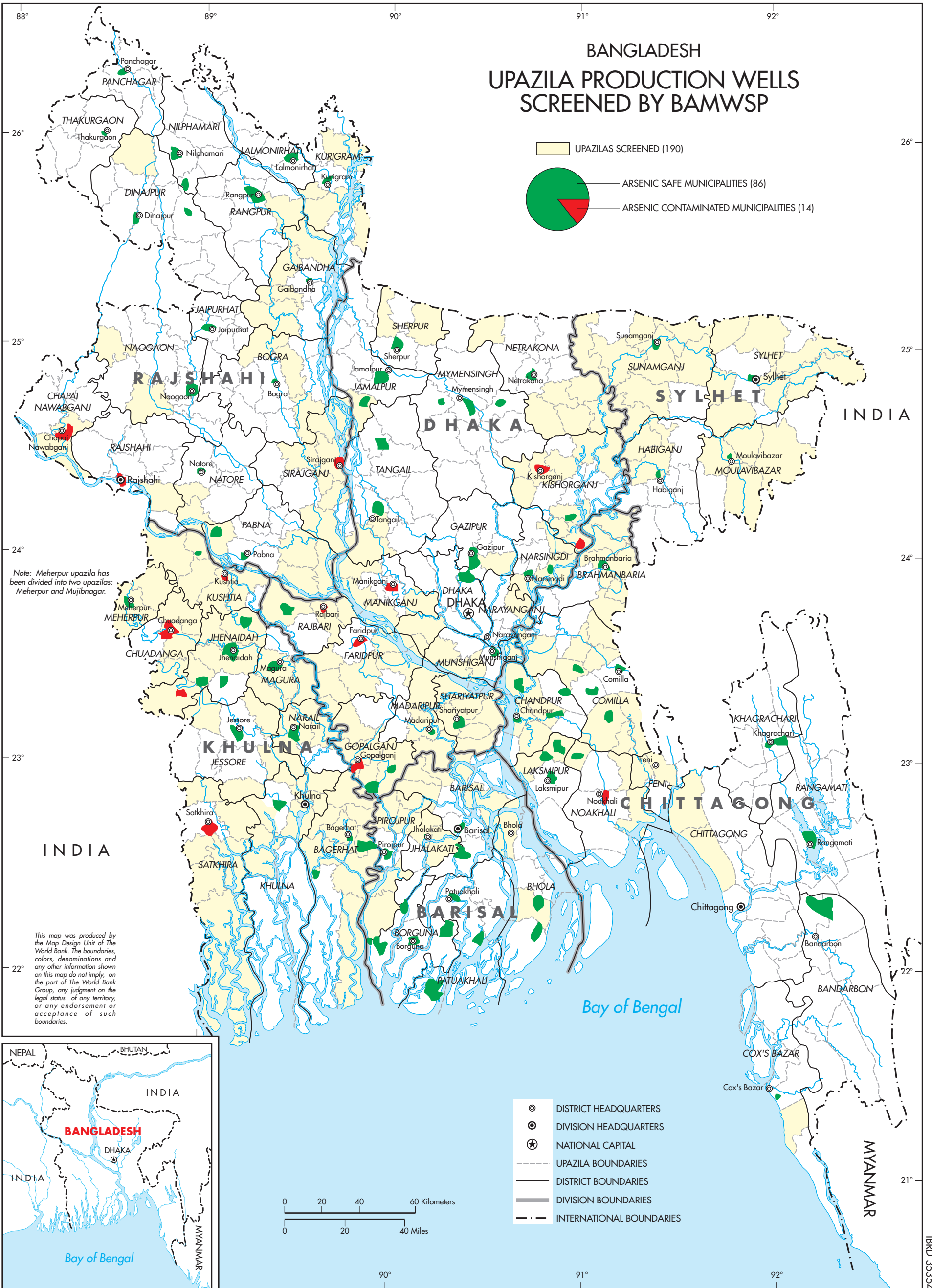


**National Program For Arsenic Screening And Mitigation
Upazila Production Wells Screened by
Different Stakeholders Since 1998**

-  BAMWSP 190 Upazilas
-  DANIDA 8 Upazilas
-  WPP 13 Upazilas
-  UNICEF 44 Upazilas
-  WVI 14 Upazilas
-  AAM 1 Upazila



BANGLADESH UPAZILA PRODUCTION WELLS SCREENED BY BAMWSP



Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP)

BAMWSP Mitigation Activities by Project Phase

- Phase I (17 Upazila Program)
- Phase II (35 Upazila Program)
- Phase III (6 Upazila Program)

