

Government of Bangladesh
Local Government Division, Policy Support Unit

Sector Development Plan (FY2011-25)

Water Supply and Sanitation Sector in Bangladesh

WORKING DOCUMENT NUMBER 6

Strategies to Address Arsenic Issues in Water Supply

Prepared by

Thematic Group on Arsenic

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The working documents were used as background materials for preparing the Sector Development Plan (SDP). The factual information and views expressed in the working documents are of the authors and does not necessarily of the Policy Support Unit or of the agencies that the authors belong to.

REPORTING FORMAT FOR EACH THEME

Name of Theme: Arsenic Mitigation

1. Introduction

Mitigation of arsenic contaminated groundwater in Bangladesh is a multi-sectoral issue that has health, water supply, and agriculture policy implications. Evidence thus far indicates concentration of arsenic above the permissible level of 50 microgram per liter ($\mu\text{g/L}$) in groundwater in many parts of Bangladesh. An estimated 10 million tube wells, about 90% percent of them privately owned, provide drinking water to 97% of Bangladesh's 150 million people. Despite progress made in arsenic mitigation in the last decade, recent data indicate that an estimated 15 to 20 million people are still drinking unsafe water with too much arsenic, with dire and well known health consequences. Tube wells for drinking extracts only 5% of groundwater. In comparison, irrigation of 2.65 million hectares of land primarily for boro rice production accounts for 95% of groundwater extraction. To date, evidence is not strong enough yet to suggest that arsenic in groundwater has adversely impacted agriculture, crops and livestock. However, there are sufficient concerns to support a proactive approach in arsenic mitigation in all sectors.

Therefore, the arsenic mitigation thematic group endorses the recommendation of the Implementation Plan for Arsenic Mitigation (in review, 2009) that calls for a multi-sectoral approach with components on water supply, health and agriculture. The revised Implementation Plan is perhaps more appropriate as a strategic plan for arsenic mitigation and has outlined the overall framework for the related sectors. The relevant ministries and agencies may formulate and administer the sectoral component with the coordination taking place through the Secretaries' Committee on Arsenic and with technical support and advice from a National Committee of Experts on Arsenic.

This group draws on a recent situation analysis of arsenic mitigation conducted by DPHE and JICA in 2009 to make recommendation on the priority areas for arsenic mitigation in the water supply sector. Priority in the health and the agricultural sectors are also discussed. A preliminary cost analysis is conducted to estimate the cost of arsenic mitigation. Arsenic mitigation experience through capacity building at union level that has been implemented and piloted in several upazilas is summarized. This group also recommends that this local management strategy be adopted and promoted to achieve the safe water for all goal.

2. Public Safe Water Coverage Status in 2009

Several policy documents have outlined the timeline to achieve safe water coverage for all (Table 2.1). Arsenic mitigation was to reach 100% by 2010 according to the NWMP (2001). The Implementation Plan of Arsenic Mitigation (2004) has also outlined a time line that considers the severity of arsenic contamination as determined in early 2000s by a nation-wide arsenic screening of 4.7 million tube wells. With the mitigation effort that has taken place, it is necessary to examine the present status of safe water coverage.

Table 2.1 Summary of Timeline for Safe Water Provision

WSS Policy (1998)	50 users per tube well	Covered Percentage			
		2005	2010	2025	2050
NWMP (2001)					
Provision of arsenic mitigation facilities		70	100		
Access to safe water for basic need		95	100		
Provision of household piped water (urban)		50	70	90	100
Provision of household piped water (rural)		10	10	40	90
water quality surveillance		40	60	100	
MDGs	by 2015	100%	minimum service		level
GoB	by 2011	100%	minimum service		level
IPAM2004	<i>Emergency Response</i>	Within 1 year			
	More than 80% area	arsenic contaminated			
	50 HH/tube well,	No contribution			
	<i>Medium-Term Response</i>	Within 3 year			
	40 to 80 % contaminated area				
	25 to 30 HH/tube well,	No support to private water option			
	<i>Long-Term Response</i>				
	Same criteria with Response	Mid-term			
	Include piped water supply				

The results of the arsenic mitigation situation analysis by JICA and DPHE (2009) are summarized in Table 2.2. Note that this analysis considers safe water options that are installed using public funds and do not take into account private safe water options. That data are summarized to the union level for a total of 3132 unions in 301 upazilas. The break down to union level is essential because the

large degree of spatially uneven distribution of arsenic concentration in tube wells. The percentage of tube wells with arsenic contamination, a measure of the extent of arsenic problem in early 2000s, was based on the NAMIC data compiled and published in 2005. The public safe water coverage is a measure of how much progress there has been over the last decade. For example, public safe water coverage is >100% (or beyond the present service level of 13 households per water point, see Table 2.2.1) for 13 unions with 80% of arsenic contaminated tube wells. These 13 unions are thus considered to have achieved the arsenic mitigation goal.

However, the public safe water coverage for all arsenic affected unions is approximately half. This indicates that there is still a long way to go to complete arsenic mitigation. Especially worrisome are the 188 unions where safe water coverage is <20% and where > 80% tube wells are contaminated with arsenic (Table 2.2.2). These unions have approximately 4.6 million people (Table 2.2.3) and 7,204 arsenic patients (Table 2.2.4). These unions should receive the highest priority in terms of arsenic mitigation (Table 2.3, highlighted in red).

Similarly there are 145 unions with >80% tube wells contaminated with arsenic and yet still with only 20% to 40% safe water coverage, and another 67 unions with >60% tube wells contaminated with arsenic and yet still with only 20% to 40% safe water coverage. Together, those 212 unions with , 400 unions with 5 million residents should also receive high priority in terms of arsenic mitigation (Table 2.3, highlighted in yellow).

Provision of safe water to the 400 unions with very high and high priorities will reach an estimated 9.5 million who are still exposing to unsafe level of arsenic today (Table 2.3).

It is worth noting that despite of relatively high safe water coverage and low percentage of wells contaminated by arsenic, the number of patients can be high in some unions (Tables 2.2.2 and 2.2.4). These are recommended to be high priority areas for health sector.

Additional Statistics

- ✓ The total population is 82 million in the arsenic affected area in 2009 (Table 2.2.3). Of those, an estimated 22.6 million do not have public safe water coverage (Table 2.3). This does not mean that all 22.6 million people are

exposed to high arsenic because in some areas the residents have take actions on their own.

- ✓ Approximately 37 thousand arsenic patients are registered by the Department of General Health Service by 2009.
- ✓ Of the approximately 1 million public water options installed (Figure 2.1), 69% are active, defined as functioning and with < 50 microgram per liter arsenic, and 31% are inactive, defined as either not functioning or with > 50 microgram per liter arsenic.

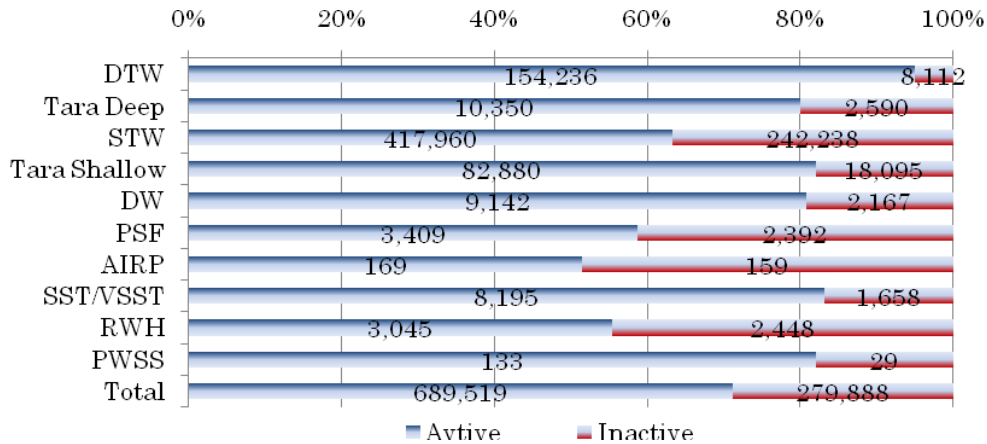


Figure 2.1 Type and Number of Installed Public Water Options

(DTW: Deep Tube Well, STW: Shallow Tube Well, DW: Dug Well, PSF: Pond Sand Filter, AIRP: Arsenic Iron Removal Plant, SST/VSST: Shallow Shrouded Tube Well/Very Shallow Shrouded Tube Well RWH: Rain Water Harvesting, PWSS: Piped Water Supply System)

Another useful result that can be derived from the arsenic mitigation situation analysis by JICA and DPHE (2009) is an estimate of population in need of public safe water supply in each of the 3,132 unions. To do so, the following method is used:

1. Estimate population in each union in 2009: Using population census data of 2001 and a population growth rate of 1.12%, population in each union in 2009 is calculated.
2. Estimate population with public safe water options in each union in 2009: The number of each active safe water device in each union is multiplied by the number of people served by each of option (Table 2.2.1), and then summed and summarized (Table 2.2.5).
3. Estimate population in need of public safe water option in each union in 2009: First, the population already with public safe water option as calculated in step 2 is subtracted from the total population in each union to

calculate population potentially in need of public safe water. But, not all are in need of public safe water because the extent of arsenic contamination varies in each union. Therefore, the population in need of public safe water option is estimated by multiplying the value of percent of tube wells contaminated by arsenic by the population potentially in need and again multiplying the value of percentage of public safe water non-coverage. Then, the results are summed and summarized in Table 2.3. Note in this final estimate, the government's recommended minimum level service is used (see footnote, Table 2.3).

Table 2.2
Arsenic Contamination and Status of Public Safe Water Coverage at Union Level in 2009

Table 2.2.1 Number of people served by each water option*

Safe water device	Number of Family	Number Of People (5 persons/family)
Pond Sand Filter	18	90
Deep Tube Well	13	65
Shallow Tube Well	13	65
Tara	13	65
Dug well	8	40
Shallow Shrouded Tube Well	4	65
Piped water	500	2500
Arsenic-Iron Removal Plant	13	65
Rain Water Harvesting	1	5

*The government's minimum service level of service is 10 household for each water point, 1 household for rain water harvesting, and 420 households for piped water supply system.

Table 2.2 (Continued)

Arsenic Contamination and Status of Public Safe Water Coverage at Union Level in 2009

Table 2.2.2 Number of Union

Public Safe Water Coverage	% Tube Wells with Arsenic Contamination					Total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	143	35	51	67	188	484
20% to 40%	115	75	86	94	145	515
40% to 60%	449	140	89	68	76	822
60% to 80%	507	120	37	57	31	752
80% to 100%	213	46	21	14	12	306
>100%	149	32	22	25	13	241
No data	9	1	1	0	1	12
Total	1585	449	307	325	466	3132

Table 2.2.3 Total Population

Public Safe Water Coverage	%Tube Wells with Arsenic Contamination					Total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	5,213,864	1,037,466	1,598,260	1,761,024	4,590,076	14,200,690
20% to 40%	3,369,757	2,026,384	2,299,894	2,184,499	3,263,110	13,143,644
40% to 60%	13,334,719	3,693,906	2,058,542	1,551,929	1,885,350	22,524,446
60% to 80%	13,285,351	3,098,964	815,468	1,329,754	740,151	19,269,688
80% to 100%	5,331,784	1,090,922	439,917	292,176	302,374	7,457,173
>100%	3,131,482	732,463	405,768	469,817	232,581	4,972,111
No data	486,052	23,062	17,662			526,776
Total	44,153,009	11,703,167	7,635,511	7,589,199	11,013,642	82,094,528

2.2.4 Number of Arsenic Patient

	%Tube Wells with Arsenic Contamination					
Public Safe Water Coverage	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	total
<20%	189	223	370	535	7,204	8521
20% to 40%	428	666	935	1,034	8,888	11951
40% to 60%	1,885	1,890	1,213	792	1,708	7488
60% to 80%	1,682	1,049	631	1,348	509	5219
80% to 100%	770	490	148	214	245	1867
>100%	418	674	483	274	118	1967
No data	18	8	0	0	0	26
Total	5390	5000	3780	4197	18672	37039

2.2.5 Population with Public Safe Water Coverage by Criteria Described in Table 2.2.1

	%Tube Wells with Arsenic Contamination					
Public Safe Water Coverage	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	Total
<20%	380,045	110,870	157,755	192,485	536,120	1,377,275
20% to 40%	1,062,255	643,020	730,075	625,975	924,170	3,985,495
40% to 60%	6,897,885	1,842,945	1,041,440	775,190	936,480	11,493,940
60% to 80%	9,091,165	2,124,060	556,740	920,855	488,695	13,181,515
80% to 100%	4,696,885	954,785	395,040	269,015	270,110	6,585,835
>100%	5,062,840	1,386,980	503,650	587,115	278,010	7,818,595
No data	4,875				260	5,135
Total	27,195,950	7,062,660	3,384,700	3,370,635	3,433,845	44,447,790

Table 2.3 Estimated Population in need of Safe Water in 2009 by National Policy*

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	1,056,393	503,211	1,020,232	1,770,389	5,446,964	9,797,189
20% to 40%	1,179,649	1,079,494	1,267,050	1,328,378	2,107,453	6,962,023
40% to 60%	1,972,498	872,474	532,916	728,662	701,390	4,807,941
60% to 80%	412,627	168,762	103,955	116,534	117,274	919,153
80% to 100%	30,751	11,587	15,477	30,199	11,145	99,160
total	4,651,918	2,635,528	2,939,630	3,974,163	8,384,226	22,585,465

* For DTW, DW, PSF, AIRP, SST, 10HH/option or 50 persons per option, for RWH, 1HH/option or 5 persons per option, for PWSS, 420HH/option, or 2100 person per option. This is the minimum service level recommended by the National Policy and is higher than the values used in Table 2.2.1. Therefore, the population in need of safe water is ~ 2.3million

3. Theme Specific Issues and Recommendations

We have identified the following issues that require attention in order to accelerate the progress in arsenic mitigation. The issues range from policy, governance, technical challenge, to social-economical issues from local community and user perspective.

- 1) The National Policy for Arsenic Mitigation (NPAM) issued in 2004 by 2004 lacks a strategic plan for arsenic mitigation. It also has a very specific implementation plan that does not fully consider the technical and social-economical aspects in providing safe water options for Bangladesh where availability of water and social-economical conditions vary from region to region.

Recommendation: Develop a strategic plan for arsenic mitigation that will guide the implementation plan. The strategic plan with funding support

should be part of the policy whereas the more technical implementation plan should not be part of the policy.

- 2) Lack of government oversight and supervision of privately installed water options.

Recommendation: Establish a national groundwater authority to provide oversight of groundwater utilization for domestic use and for irrigation by private and public sector. For example, a well registry can be maintained by such authority.

- 3) Lack of regular water quality monitoring system.

Recommendation: Major investment into water quality monitoring system by the Government of Bangladesh is needed to ensure the quality of water supply.

- 4) Sustainable safe water options are not well defined in areas where good source water is difficult to find due to either arsenic or salinity or both.

Recommendation: Further research and technical assistance from donors to find sustainable safe water options in these difficult areas is urgently needed.

- 5) The cost sharing structure of public safe water option is too rigid.

Recommendation: The contribution to public safe water option should be based on ability to pay. The contribution by private sources should be linked to the wealth and income.

- 6) Site selection process for public safe water option is not demand driven enough.

Recommendation: An independent agency such as a groundwater authority to be established, can review and then approve safe water option installation to ensure that it is indeed demand driven, technically and social-economically sound.

- 7) Social acceptance of safe water options that does not assemble a hand pump is low.

Recommendation: Major campaign to promote social acceptance of technically and economically feasible safe water option at union level is needed before safe water option installation.

- 8) Lack of willingness or ability to pay for water quality testing of privately installed water options

Recommendation: Major campaign to promote social acceptance of technically and economically feasible safe water option at union level is needed before safe water option installation.

4. Implementation Plan for Water Supply: Cost Analysis

A cost estimate is made for a short term (2010-2015), a medium term (2015-2020) and a long term (2020-2025) implementation plan that involves primarily provision of safe water options (e.g. hardware), with only 10% to support community mobilization, and monitoring and evaluation. Because the unit price for each safe water option, e.g., 75,000 taka per option, is based on existing experience and does not take into account potential increase in areas that is technically challenging to work, this cost estimate is likely reflecting a minimum amount of funds required. It is also likely that 7,500 taka for the software support of the implementation is also an under estimate that only includes only water quality measurement for one time upon installation and only for arsenic. The difference among the short, medium and long term implementation plan is the service level provided, with the short term plan providing safe water for all at the minimum service level with increasing level of service in medium and long term. The sector developmental plan is expected to begin in July 2010.

4.1. Priority in provision of safe water options

When the arsenic contamination condition and the current safe water option are considered together, we have identified five areas with different priority for provision of safe water to mitigate arsenic (Table 4.1). We note that arsenic patient number is also a factor, although that should also be a health sector priority especially if patients already receive safe water.

- A) Very high priority unions

- Unions with greater than 80% arsenic contamination and less than 20% public safe water coverage
 - 188 Unions 5.5 million peoples including 7,200 arsenic patients
- Arsenic patient who have no access arsenic safe water point
 - 37 thousand patients are living 301 upazilas. An investigation is needed to determine the water quality that the arsenic patient is still drinking.

B) High priority unions

- Unions with 60% to 80% arsenic contamination and less than 20% public safe water coverage
- Unions with greater than 80% arsenic contamination and 20% to 40% public safe water coverage
 - 212 Unions 3.9 million peoples including 9,400 arsenic patients

C) Medium priority unions

- Unions with < 60% arsenic contamination and < 20% public safe water coverage
- Unions with <80% arsenic contamination and 20% to 40% public safe water coverage
- Unions with >20% arsenic contamination and 40% to 60% public safe water coverage
- Unions with >60% arsenic contamination and 60% to 80% public safe water coverage

D) Low priority unions

- Unions with <20% arsenic contamination and 40% to 60% public safe water coverage
- Unions with <60% arsenic contamination and 60% to 80% public safe water coverage
- Unions with > 80% public safe water coverage

Table 4.1 Very High, High, Medium and Low Priority for Arsenic Mitigation

Public Safe Water Coverage	%Tube Wells with Arsenic Contamination				
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%
<20%	139	35	51	67	188
20% to 40%	11	16	94	145	
40% to 60%	446	140	89	68	76
60% to 80%	497	120	37	57	31
80% to 100%	2	21	12	12	
>100%	154	32	22	26	13

(A) Very High Priority Area

(C) Medium Priority Area

(B) High Priority Area

(D) Low Priority Area

(E) Not consider for As mitigation

4.2. Service level target for 2015, 2020 and 2025 implementation plan

The service level of water supply suggested by the National Policy is 50 persons per option. This is also known as the minimum level of service. Each option is a publically shared water point that may be a well with a hand pump or a stand post from a piped water supply system. But even this minimum level of service is difficult to reach within a short-time. Therefore, the initial target of service level is set at level below the minimum level of service for 2015, and gradually increase over time to reach 10 house hold per option or 50 persons per option (Table 4.2).

Table 4.2 Service level target for 2015, 2020 and 2025

	2015	2020	2025
(A) Very High Priority Area	20HH/Option	20HH/Option	10HH/Option
(B) High Priority Area	20HH/Option	20HH/Option	10HH/Option
(C) Medium Priority Area	50HH/Option	20HH/Option	10HH/Option
(D)Low Priority Area	50HH/Option	20HH/Option	10HH/Option

4.3. Estimated population in need of public safe water options

Using the same method described earlier to estimate population in need of public safe water options (section 2) and applying the service level target described in Table 4.2, populations in need of public safe water coverage are estimated and summarized in Table 4.3.

Table 4.3 Estimated populations in need of public safe water options

	2009	2015	2020	2025
(A) Very High Priority Area	5,446,964	5,823,403	6,156,901	6,509,498
(B) High Priority Area	3,877,842	4,145,840	4,383,266	4,634,289
(C) Medium Priority Area	10,503,657	11,229,564	11,872,665	12,552,594
(D)Low Priority Area	2,757,002	2,947,537	3,116,339	3,294,806
Total	22,585,465	24,146,344	25,529,171	26,991,187

4.4. Cost estimate

Without further and more detailed technical assessment of safe water options specific to each union, the cost of water options that can range widely is not easy to assess. A simple assumption is used. DPHE has installed many safe water options, primarily deep tube wells. Based on past arsenic mitigation experience, the cost of a safe water option is estimated to be tk 75000 per option on average. Furthermore, the software part of the safe water provision is estimated to be 10% of the installation cost, at tk7,500. This would cover awareness, water quality test, training for users committee, etc.

1) Short-term Investment Plan (2010-2015)

Table 4.4 Cost estimate in Short-Term

Area Priority	Target population in 2015	option criteria (HH/option)	Necessity Option	Necessity Cost (million TK)
(A) Very High Priority Area	5,823,403	20	58,234	4,804
(B) High Priority Area	4,145,840	20	41,458	3,420
(C) Medium Priority Area	11,229,564	50	44,918	3,706
(D)Low Priority Area	2,947,537	50	11,790	973
total	24,146,344		156,401	12,903

2) Mid-term Investment Plan (2015-2020)

Table 4.5 Cost estimate in Mid-Term

Area Priority	Target population in 2020	option criteria (HH/option)	Necessity Option	Provided Option Number by 2015	Water Option Needs	Necessity Cost (million TK)
(A) Very High Priority Area	6,156,901	20	61,569	58,234	3,335	275
(B) High Priority Area	4,383,266	20	43,833	41,458	2,374	196
(C) Medium Priority Area	11,872,665	20	118,727	44,918	73,808	6,089
(D)Low Priority Area	3,116,339	20	31,163	11,790	19,373	1,598
Total	25,529,171		255,292	156,401	98,891	8,158

2) Long-term Investment Plan (2020-2025)

Table 4.6 Cost estimate in Long-Term

	Target population in 2025	option criteria (HH/option)	Necessity Option	Provided Option Number by 2015	Water Option Needs	Necessity Cost (million TK)
(A) Very High Priority Area	6,509,498	10	130,190	61,569	68,621	5,661
(B) High Priority Area	4,634,289	10	92,686	43,833	48,853	4,030
(C) Medium Priority Area	12,552,594	10	251,052	118,727	132,325	10,917
(D)Low Priority Area	3,294,806	10	65,896	31,163	34,733	2,865
total	26,991,187		539,824	255,292	284,532	23,474

Installation cost tk75,000 / option
 Soft ware (awareness, water quality test, training for Users committee) 10% of Installation cost
 In case of 10HH/Option tk1,650 / caput
 In case of 20HH/Option tk825 / caput
 In case of 50HH/Option tk330 / caput
 In case of PWSS tk1,666 / caput

Table 4.7. Cost Estimate for Arsenic Mitigation with Public Safe Water Options

4.7.1 Estimated population who needs SWO in 2015.

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	1,129,401	537,988	1,090,740	1,892,741	5,823,403	10,474,273
20% to 40%	1,261,174	1,154,097	1,354,615	1,420,182	2,253,099	7,443,167
40% to 60%	2,108,817	932,771	569,746	779,020	749,863	5,140,217
60% to 80%	441,144	180,425	111,139	124,588	125,379	982,675
80% to 100%	32,876	12,388	16,547	32,286	11,915	106,012
total	4,973,412	2,817,669	3,142,787	4,248,817	8,963,659	24,146,344

4.7.2 Water Option Needs (20HH/Option for Area A &B, 50HH/Option for Area C & D) in 2015

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	4,518	2,152	4,363	18,927	58,234	88,194
20% to 40%	5,045	4,616	5,418	5,681	22,531	43,291
40% to 60%	8,435	3,731	2,279	3,116	2,999	20,561
60% to 80%	1,765	722	445	498	502	3,931
80% to 100%	132	50	66	129	48	424
total	19,894	11,271	12,571	28,352	84,314	156,401

4.7.3 Estimated Cost Water Option (20HH/Option for Area A &B, 50HH/Option for Area C & D) in 2015

million taka

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					Total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	373	178	360	1,562	4,804	7,276
20% to 40%	416	381	447	469	1,859	3,572
40% to 60%	696	308	188	257	247	1,696
60% to 80%	146	60	37	41	41	324
80% to 100%	11	4	5	11	4	35
total	1,641	930	1,037	2,339	6,956	12,903

4.7.4 Estimated population who needs SWO in 2020.

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					Total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	1,194,080	568,798	1,153,205	2,001,135	6,156,901	11,074,119
20% to 40%	1,333,400	1,220,190	1,432,192	1,501,514	2,382,131	7,869,427
40% to 60%	2,229,586	986,189	602,375	823,633	792,807	5,434,590
60% to 80%	466,408	190,758	117,504	131,723	132,559	1,038,952
80% to 100%	34,759	13,097	17,495	34,135	12,597	112,083
total	5,258,233	2,979,032	3,322,771	4,492,140	9,476,995	25,529,171

4.7.5 Target of Water Option number (20HH/Option) in 2020.

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	11,941	5,688	11,532	20,011	61,569	110,741
20% to 40%	13,334	12,202	14,322	15,015	23,821	78,694
40% to 60%	22,296	9,862	6,024	8,236	7,928	54,346
60% to 80%	4,664	1,908	1,175	1,317	1,326	10,390
80% to 100%	348	131	175	341	126	1,121
total	52,582	29,790	33,228	44,921	94,770	255,292

4.7.6 Water Option Needs in 2020. (Target of Water Option number in 2020-Provided Option Number by 2015)

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	7,423	3,536	7,169	1,084	3,335	22,547
20% to 40%	8,289	7,586	8,903	9,334	1,290	35,403
40% to 60%	13,861	6,131	3,745	5,120	4,929	33,785
60% to 80%	2,900	1,186	730	819	824	6,459
80% to 100%	216	81	109	212	78	697
total	32,689	18,520	20,657	16,570	10,456	98,891

4.7.7 Estimated Cost Water Option in 2020.
million taka

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	612	292	591	89	275	1,860
20% to 40%	684	626	735	770	106	2,921
40% to 60%	1,143	506	309	422	407	2,787
60% to 80%	239	98	60	68	68	533
80% to 100%	18	7	9	18	6	57
total	2,697	1,528	1,704	1,367	863	8,158

4.7.8 Estimated population who needs SWO in 2025.

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	total
<20%	1,262,463	601,372	1,219,247	2,115,737	6,509,498	11,708,317
20% to 40%	1,409,762	1,290,068	1,514,212	1,587,503	2,518,552	8,320,097
40% to 60%	2,357,271	1,042,667	636,872	870,801	838,210	5,745,821
60% to 80%	493,118	201,682	124,233	139,267	140,150	1,098,450
80% to 100%	36,750	13,847	18,497	36,090	13,318	118,502
total	5,559,364	3,149,636	3,513,061	4,749,398	10,019,728	26,991,187

4.7.9 Target of Water Option Numbered (10HH/Option) in 2025

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	total
<20%	25,249	12,027	24,385	42,315	130,190	234,166
20% to 40%	28,195	25,801	30,284	31,750	50,371	166,402
40% to 60%	47,145	20,853	12,737	17,416	16,764	114,916
60% to 80%	9,862	4,034	2,485	2,785	2,803	21,969
80% to 100%	735	277	370	722	266	2,370
total	111,187	62,993	70,261	94,988	200,395	539,824

4.7.10 Water Option Needs in 2025. (Target of Water Option number in 2025-Provided Option Number by 2020)

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	13,308	6,339	12,853	22,303	68,621	123,425
20% to 40%	14,861	13,599	15,962	16,735	26,550	87,708
40% to 60%	24,850	10,991	6,714	9,180	8,836	60,571
60% to 80%	5,198	2,126	1,310	1,468	1,477	11,579
80% to 100%	387	146	195	380	140	1,249
total	58,605	33,202	37,034	50,067	105,625	284,532

4.7.11 estimated Cost Water Option in 2025
million taka

Public Safe Water Coverage	Tube Wells with Arsenic Contamination					total
	<20%	20% to 40%	40% to 60%	60% to 80%	>80%	
<20%	1,098	523	1,060	1,840	5,661	10,183
20% to 40%	1,226	1,122	1,317	1,381	2,190	7,236
40% to 60%	2,050	907	554	757	729	4,997
60% to 80%	429	175	108	121	122	955
80% to 100%	32	12	16	31	12	103
total	4,835	2,739	3,055	4,130	8,714	23,474