

**Government of Bangladesh
Local Government Division, Policy Support Unit**

Sector Development Plan (FY 2011-25)

Water Supply and Sanitation Sector in Bangladesh

WORKING DOCUMENT NUMBER 20

Water Quality and Water Safety Plan

Prepared by
World Health Organization

November 2009

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.

Water Quality Monitoring and Water Safety Plans

1. Introduction

Disease burden due to the use of unsafe water or inadequate supply of safe water is alarming in Bangladesh. Diarrhoea, dysentery and pneumonia still remain the main cause of deaths of children in the country. Nearly 62 out of 1000 children under five die each year (MHFW, 2006); Children suffer from 3-5 episode of diarrhoea each year and suffer 2-3 days and sometimes more than 2 weeks resulting in severe dehydration malnutrition which may cause death. On an average 188 per 1000 persons become ill of which most are attributable to unsafe water and poor sanitation. About 20 million people drink water with arsenic more than 0.05 mg/L and 50 million more than 0.01 mg/L;

Ground water is generally regarded as microbially safe and thus the hand pump tubewells yield microbially safe water. However, water samples from many such tubewells are found to be microbially contaminated. A study carried out by ITN-Bangladesh and DFID found that 29% of the shallow tubewells and 9% of deep tubewells are contaminated with bacteria. The main factor that led to contamination was poor maintenance of tubewells and its surroundings and poor hygiene practice (Risk Assessment of Arsenic Mitigation Option, 2005).

The rural water supply system in the country is predominantly point source based comprising hand tubewell, dug wells pond sand filters etc. There are huge numbers of such water sources (about 10 million) whose operation and maintenance is being taken care of by the individual owners or group of users. Institutional support in this regard does not exist therefore ensuring safety of the drinking water from these sources is a difficult task for the community or the government.

Apart from this problem, low level of awareness does exist towards safety of water and its health impact. Therefore contamination occurs at various process steps like at source, during collection/transportation and at the point of consumption.

Bangladesh is a disaster prone country. Flash flood, monsoon flood, cyclone and tidal surge hit the country frequently and like other infrastructure these calamities also damage water supply systems. Water sources are contaminated and require treatment like disinfection, filtration etc. however chemicals for disinfection or fuel for boiling water are not adequately available in post disaster situation. As a result water borne diseases outbreak in the affected areas.

Country's capacity for surveillance of water quality is also limited. Department of Public Health Engineering (DPHE), Department of Environment (DoE) and BSTI are responsible for water quality surveillance, however, their capacity in term of manpower and other logistics are limited compared to the task to be performed for a huge number of water points exist in the rural country.

A regulatory commission is yet to establish in the sector. The Sector Development Plan 2005 has outlined the setup of the commission and its future functions to set the service standards and to protect the rights of the consumers through advising and guiding government and the urban suppliers. Asian Development Bank is now facilitating to establish WRC in the sector through its secondary town water supply and sanitation project which is being implemented by DPHE.

2. Present Status

Water Quality

National Drinking Water Quality Standard (1997), Environmental Conservation Act
Bangladesh Water quality standard 1997, as embodied in its environmental conservation Act 1995, covers the relevant drinking water quality parameters with standards as well as some important inland and surface water quality parameters with standard. These standards were probably set following the previous WHO guidelines applicable at that time. WHO have subsequently revised its drinking water quality guideline and published in 2004. To conform to and to be consistent with the latest WHO guidelines which are most authentic and scientifically established the Bangladesh standards need to be reviewed and modified as required. As substantial changes in source-water quality (surface & ground) is believed to have taken places over the past years due to indiscriminate disposal of industrial and agricultural waste in the water systems the reviews should take into account of these changes based on findings. It is also imperative to include in the review the health problems and diseases vis-à-vis water quality in the context of Bangladesh on the basis of epidemiological evidence, intervention studies, historical precedent and surveillance.

/May give some example of WQ parameters/

Agencies with mandate to monitor WQ

Water quality monitoring is supposed to be carried out in three levels as mentioned below:

Level-1: Testing water quality parameters critical to a specific drinking water supply system as an obligatory routine function of the water suppliers/providers under its responsibility for operational monitoring.

Water supply systems of Bangladesh are distinctly demarcated into three categories i.e. rural water supply, urban water supply and WASA systems.

Level-2: Monitoring quality of drinking water being supplied by different suppliers/providers/authorities/owners by the government as its regulatory function through some designated national organizations/agencies.

This state sponsored monitoring function may be termed as third party surveillance of drinking water quality.

Level-3: Monitoring trend/change in water quality (such as increase or decrease in concentration of certain parameters and addition of new harmful organic, inorganic and other substances to) of source (surface, ground) waters by the government as its regulatory functions through some designated national organizations/agencies. This

state sponsored monitoring function may be termed as water quality surveillance of national water resources.

It is understood that some regulatory acts exist for Level-2 & 3 monitoring, but no such regulatory act exist for level-1 monitoring. It is needless to over emphasize the importance of obligatory quality assurance role of the water suppliers/providers as per Level-1, because the consumers' health risk lies at the water quality at this point. It seems that it will be necessary to review the existing protocols for Level-2 & 3 monitoring and the ToR of the national agencies/organizations responsible for these functions and there coordination mechanism, especially how these are mutually complementary including the end-use of their products to improve the situation.

As for Level-1 monitoring, regulatory act befitting the capacity and accessibility of the respective water suppliers/providers to testing facilities will have to be introduced including separate monitoring protocols and ToRs.

May mention or add a box on the resent High Court Ruling on DWASA

Suggest the actions and regulations and capacity needs for three levels of monitoring

Level-1 rural – may consider LGI regulation (ref Mark Ellery's horizontal learning)

Water Safety Plans

Introduction of WSP in Bangladesh

Bangladesh is one of the front line countries in this region that made an early response to WHO's initiative of WSP for ensuring safety of water through out the system. To introduce the concepts and approaches of WSPs grounds works like consultative meeting among the stakeholders of the sector was carried out. Later a workshop was organized on water quality management in 2004.

Rationale of Water Safety Plan in Bangladesh context and WQ issues were discussed and recognized WSP as an appropriate approach to water safety. Sector professional were agreed to work jointly in developing Guiding framework and applying Water Safety Framework in Bangladesh based on the GDWQ.

During November and December of the same year ITN and APSU organized workshops and developed a Guiding framework for Technology specific WSPs through a consultative process.

Development of guiding framework for WSP

The agreed guiding framework for applying water safety plan includes following components:

- a) Developing 'model' WSPs for each technology
- b) Identifying few tool to support application and development of WSPs including monitoring tools
- c) Developing outlines of verification mechanism of WSPs including testing, inspection, frequency of visits and feedback; and
- d) Implementing pilot projects to field test the model WSPs to observe whether all risks are identified, whether the model WSPs worked under local conditions and to document the experience gained from the piloting.

Developing model WSPs and monitoring tools

Later based on the guiding framework the following WSPs were developed: Shallow, Deep tubewells, Dug wells, Rainwater harvesting, Pond sand filters, Piped supplies (springs, borehole and surface water sources) and Pourashava piped supply system (ground water source) and arsenic removal technologies. After development of these model WSPs they were field tested through a number of pilot projects between 2005-2007.

The rural water system in Bangladesh is predominantly point source based. There are user's committees that select a person from the community as caretaker to look after the small repair and maintenance of each water source. In some cases the users select two caretakers to take one person from male group and one from female members of the user's community. As there are no formal institutional setup in rural water supply system Caretakers are only the focal person for repair and maintenance of the water sources. The caretakers are basically a volunteer with limited knowledge on technology. It was apprehended that caretakers would be unable to understand the WSPs and to turn them into action as they are very technical documents. Therefore WSPs were modified to a simple pictorial tool and was called as caretakers monitoring tool. A set of such tool was developed for each of the technology. These tools tell the caretakers how he would monitor the risk events that could affect their water supply, and what actions are required to stop contamination. It illustrates the desired or corrected condition of the water sources through pictures.

Are the private water sources addressed?

Developing surveillance tools

Verification as a final component of a water safety plan and for rural water supplies is usually undertaken under a surveillance programme. Verification includes water quality testing, sanitary inspection to support ongoing assessment of risks. In Bangladesh, some verification tools are widely available and routinely used (for example sanitary inspection and water quality testing methods) and these have been incorporated into a DPHE surveillance protocol. In addition, a number of projects have developed for capturing information about hygiene practices which were also used. Under the pilot projects, the various NGOs and DPHE also developed systems for feedback to water supply management committees or village development committees.

Implementation of WSP pilots in Bangladesh: Rural WSP

From 2005 to 2007 four national NGOs and DPHE and a couple of projects have implemented pilot projects to test the practical application of the WSPs under local conditions. The pilot projects were several locations in rural communities with community-managed water supplies, and six pourashavas piped water systems. The DFID and ITN-BUET provided support to the pilot project implementation.

WSP Type (technology)	Implementing NGO/Organization	Pilot Project Areas
Arsenic Removal Technologies (READ-F, SONO, ALCAN & SIDKO)	OCETA	<ul style="list-style-type: none"> • Muradnagar, Comilla • Bera, Pabna
Rural Piped Water Supply	Dhaka community hospital, EPRC, NGO-Forum,	<ul style="list-style-type: none"> • Daudkandi, Comilla • Sirajdikhan, Dhaka • Kalia, Narail • Sylhet • Rajshahi
Urban Water Supply	WHO-DPHE	<ul style="list-style-type: none"> • Muktagacha, Mymensing • Singra, Natore • Kumarkahli, Kushtia • Amtoli, Borguna • Srimangal, Sylhet • Raipur, Laxmipur
	BAMWSP-DPHE	<ul style="list-style-type: none"> • C'Nawabganj

Are there no pilots on rural point sources??

BRAC experiences in rural water supply/WSP, if any?

Findings

The WSP pilot project was implemented in 38 communities in 7 districts of Bangladesh. After implementation of the pilots improvements in operation and maintenance, sanitary integrity, water quality and hygiene behaviour have been observed in various communities. Lessons from the pilots were positive and encouraging to go for roll out across the country.

The WSP pilots have benefited from expert input from a number of national and international resources. Future scaling up requires adequate number of expertise which needs to be made available in the WASH sector that will guide and provide technical assistance.

Challenges

The key challenge is the scale of activity required, as there are about 10 million shallow tubewells in the country, most of which are owned by households.

Contamination of shallow tubewell water by arsenic is another challenge. As arsenic mitigation measure some alternative technologies are being provided which are vulnerable to microbial contamination. This means risk are shifting from chemical to microbial but are not eliminated.

For some of the actions to improve water safety, such as relocation of latrines, there are serious space constraints. Furthermore, at present there is no scientifically accepted local minimum safe distances available. This requires further work to

define minimum safe distances and where these cannot be assured to define other interventions that could improve water safety.

Health based targets

To be written...

3. Theme specific issue

a) Water quality

DPHE WQ surveillance protocol

Parameters testing procedures/methods and sampling frequency prescribed in the protocol are ideal, but the question is who will do it? Total number of samples that will be generated out of millions of water systems at the prescribed frequency will be so huge that no institution in Bangladesh can handle this enormous task. The protocol will have to be redesigned reducing the number of parameters as well as frequency and most importantly decentralizing the testing responsibility as much as possible.

Did not understand

Legal Review

All existing laws and regulatory frameworks under various ministries especially under Local Government Division and Ministry of Environment related to water source protection, treatment process, industrial and various waste disposal, drinking water safety etc. to gather with institutional obligation and responsibility should be scrutinized to ascertain effectiveness and relevance to the proposed WSF implementation. New provisions, if required, such as establishment of National Water Safety Regulatory Commission should be incorporated.

(or is this one of the functions of Water Regulatory Commission??)

b) Water safety plans

Limited pool of master trainers

Although steps and actions have been put in place to introduce WSP in Bangladesh immediately after the emergence of the concept in 2004, the scale and dimension of its application are still rather limited. The activities so far initiated and undertaken can best be termed as pilot interventions. The scale of activity required is enormous, given that there are about 10 million water points in the country in the rural areas, let alone urban water supplies. The prime constraint on way to addressing the issue of wider application of WSP is acquiring requisite capacities of respective organizations. This can further be analyzed which would result in the issue of 'limited pool of master trainers', the sector is experiencing today.

Since 2005, ITN-BUET is organizing training courses on WSP for the potential trainers and field professionals of different organizations planning to get WSP introduced in their respective programmes. Although these courses are run on a regular basis the general experience is that the pool of the master trainers is rather

limited in number. As a result at this stage, the frequency of running this kind of training courses is difficult to increase to a required degree.

Urban suppliers required to introduce WSP, lack of authority to introduce higher tariffs

As opposed to WSP in rural water supplies, the one in urban context is different from a number of perspectives. The systems often are of higher level technological functions. Importantly, the organizational and management aspects are formal and complex as well. In order to ensure safer water from taps, water utilities need to introduce WSP in urban systems as well. Taking care of operational and management cost with integration of WSP would logically demand a higher level tariff. At this point of time the utilities, be it municipalities or even WASAs are not enjoying authority to impose tariffs straightaway. Individual utility needs to get clearance or approval from government prior imposing a higher tariff. Apparently, lack of authority to apply higher tariff is an issue in introducing WSP in urban supplies. (tariff is a different issue)

Need for WSP to become part of standard practice

In order to reap benefit of the concept of WSP it is required that all WSS projects and programmes should fully integrate the concept and ensure implementation which is consistent in totality. But, all the major recent and ongoing programmes in the country, by and large have been developed prior to the emergence of WSP concept. Similarly, in the national policy document of WSS, there is no candid mention of WSP. However, obligation to provide safe water by mandated institutions and utilities suffice the arguments to introduce WSP in their respective projects and programmes. Now, in reality there is a need for WSP to become part of standard practice. To facilitate such aspiration translated on the ground there is a need for WSP and its implementation guidelines duly endorsed by the designated authority. This document is under preparation and is forthcoming. Future projects and programmes would then spell out the details to ensure practice of WSP. Ongoing programmes similarly can make necessary adjustment to accommodate WSP implementation.

Need to establish audit/verification system and linkage to WQ monitoring

The features of WSPs are such that they ought to be dynamic and would require regular review and updating as new information is obtained about performance of WSPs, hazards and risk events. Apart from that, on a broader perspective, for the overall WSP implementation vis-à-vis identification of its limitations, area of improvement etc. a workable but adequately robust surveillance system is a prerequisite. Further more, there is also a strong urge to have close linkage with WQ monitoring system. A well built WSP with implementation guidelines is expected to provide such system and linkages in place.

c) Health Based targets (HBT)

Need to be further developed and dissemination to Water Safety Sectors

Sectoral policy makers, authorities, agencies and managers should be made aware of the relationship between water and human health in very concrete terms

(diseases/health problems caused by unsafe water, definition of unsafe water, definition of safe water and its standards against critical parameters, safety-preservation-protection measures at various stages from source to ingestion etc.). Awareness creation interventions are to be appropriately developed and disseminated following an effective strategy.

Is there any quantitative relationship between HBT and safe water

Need to obtain sustained coordination with health sector and LGIs

What inputs have so far been received from health sector? What difficulties are being faced now for minimal or no input from and least coordination with health sectors? What inputs and in what form inputs are required from health sector? Had it asked for any intervention from water sector and vice-versa?

Coordination if not need-based will not sustain. There is certainly a need to harmonize water & health sectors services at the client level i.e. the common beneficiaries of both sectors. Only with a harmonized/synchronized service delivery at the grass root level by both sectors will the health of the people be protected. Therefore the coordination has to be based at union/upazilla level and moved upward.

4. Strategies

Advocacy and awareness raising

The WSP was piloted in the country in several communities of rural and urban areas representing different geographical and technological areas. The objective of the pilots was to examine whether the new WSP was appropriate in the local context. The piloted WSPs were fine tuned in the light of lessons learnt from pilots and made ready for scaling up.

However, at presently it is felt that WSP concept is not well familiar to policy makers. Therefore, advocacy for the WSPs is needed to take it to the policy makers and peoples representatives so that scaling up process can get their support and with their support WSP can be included eventually in all water supply system as a part of routine water quality management.

At present there are two high level forums that reviews and coordinates water and sanitation issues of the country. The one is National Water Supply and Sanitation Forum. The forum is chaired by the Secretary to Ministry of LGRD&C and is represented by high level officials and professional of the sector. The other is Local Consultative Groups (LCG) for water and water and sanitation. The LCG is well represented by members from donor communities and discussed current issues of the sector

The National Water Supply and Sanitation Forum has already taken a decision to develop a water safety frame work for the country including setting up of Health Based Targets for the water supply providers. This work is under process of development now. One of the merits of advocacy is that the present government is committed to ensure safe water and sanitation facilities to all by 2013. Therefore it

is expected that the issue of water safety i.e. WSP can easily be brought to the attention of ministers and will get due priority. It is planned to develop an advocacy booklet on WSP for the policy makers and pourashava mayors and peoples representatives.

Build capacity in the sector institution and create a pool of trainers

To address challenges in the capacity front the pre-eminent task is to develop skilled human resource base in the sector with particular focus on WSP concept. This would entail 'general skilled human resource base', 'a pool of trainers' as well as 'a pool of master trainers'. The WSP training courses organized by ITN-BUET can be further strengthened where from the sector will get trainers and master trainers from different government organizations, NGOs, Development Partners and academic institutions. In turn, all these organizations are to transfer the concept and skill gradually down the line up to grassroots level. This will take place rather gradually.

Networking with key Stakeholders

Networking with key stakeholders is essential for successful implementation of a programme as each of the network members are benefited from each other by their experience and knowledge. Moreover, water safety plan process involves multiple actors. For example VDC for catchment management, pourashavas for water supply management, consumers for better hygiene maintenance, Primary Education and NGOs for hygiene promotion, DPHE/DOE for verification or validation. Furthermore, there are development partners like Unicef, Dutch, WSP, ADB who are implementing programmes covering large geographical areas or has substantial impact on the sector. Building network with them also help promoting, resource sharing and rolling out WSP through inclusion of WSP approaches in regular programme. Therefore a network comprising key stakeholders will be established to implement WSP scale up smoothly.

Implement WSP and establish linkage to WQ monitoring

Three levels of monitoring described in earlier paragraphs may be referred to. All these monitoring are actually integral part of WSP to measure its efficacy and efficiency. Monitoring independently carried without applying its outcome to water safety management will be useless, therefore natural linkage between WSP & monitoring is to be established through vibrant information/need/demand sharing and mutual supporting.

Phased implementation under WSF

Implementation of WSF should be carried out in phases following pragmatic strategies as proposed below:

First Phase:

- Familiarization of the water suppliers and there controlling authorities with the WSF through sharing abridged version of WSF and orientation meetings, seminars, discussions at pourashavas, upazilla, union, ward levels and WASA offices

- Training of the responsible personnel who will be the anchor persons for the WSPs at different organizations
- Each water system starts with a WSP it can handle with its present knowledge, skill and all capacity
- Create capacity of access to testing facilities (test kits & lab capacity)
- Establish National Water Safety Regulatory Commission

Second Phase:

Establish a regulatory framework

Bangladesh has its own drinking water quality standards which by any international standard is quite comprehensive. {But earlier you said it need improvement!} Any water supply system established in Bangladesh is supposed to meet the Bangladesh Standards for the relevant parameters. Recently criteria to maintain sanitary condition in the vicinity of different water supply systems have also been introduced. It can be claimed that any water system meeting the Bangladesh drinking water standards and sanitary condition is safe. The sectoral professionals on their own initiatives have been endeavouring to help the actors in the sector to fulfil these requirements for the safety of the drinking water to minimize the health burden of the people. In view of this they produced a number of water quality surveillance and monitoring protocols to be followed by various water suppliers. Unfortunately, as there is no regulatory framework and body in the country to regulate this critical function as a mandatory requirement for water safety, compliance to water safety requirement is carried out on ad-hoc basis by the water suppliers/providers. There is no designated & authorized institution either for surveillance, monitoring and to take corrective action with legal authority. The facilities for testing of water are also not adequate. Therefore to streamline the whole sector, especially to ensure safety of drinking water at all stages from source to ingestion a national water safety regulatory commission is to be set up with specific TOR and regulatory legal authority.

5. Implementation plan

Preparatory works (HBT, WSP Protocol, Surveillance/Monitoring)

BETS have been entrusted with the task to formulate National Guideline on Water Safety Framework in Bangladesh. The major components of the framework are HBT, WSP development guidelines, third party water quality surveillance/monitoring. The final product will contain health based parameters, health based targets/standards., guideline to prepare water safety plans for RWS water systems, Pourashavas water systems and WASA's water systems including operational monitoring, verification, management & documentation and surveillance. BETS are endeavouring to accomplish the assignment on Schedule.

Development of guideline for implementation of WSF (under preparation) which include: Institutional arrangement for implementation and monitoring the WSF; Identify institutions for implementing various component of WSF:

BETS will also formulate phase wise strategies for WSF implementation for RWS, Pourashavas and WASA water systems separately. The strategies will indicate the

institutions for implementation of the WSPs and independent agencies for monitoring and surveillance. It is obvious that the Pourashavas and the WASAs will be responsible for preparing and implementing their respective WSPs. However, the greatest challenge lies in identifying appropriate institutions/agencies for preparing and implementing WSP for each RWS water system.

6. Progress monitoring Indicators

- a) Number of cities adopting WSP
- b) Service quality (continuity, coverage, complaints, water quality samples meeting Bangladesh standard for drinking-water quality)
- c) Capacity building (number of water supply staff with recognised qualification in water quality, water safety plans)
- d) Coordination (existence of minutes addressing water quality issues)

7. Risk and mitigation

The risks to the WSP scaling up and water quality monitoring were assessed and summarised in the table below. The approach involved the use of the professional judgement of the thematic group members to assess risks using likelihood and consequence matrix. The mitigation measures to be used to reduce risks to tolerable levels, or to reduce risks to as low as reasonably practicable, were identified.

Risk factors	Likelihood	Consequence rating	Risk rating	Mitigation
1. National government does not maintain commitment to WSP	Possible	Major	High	<ul style="list-style-type: none"> ▪ PSU-WHO to continue to proactively advocate WSPs to partner governments ▪ PSU-WHO to work collaboratively with partner governments to build ownership
2. A significant proportion of the key stakeholders don't support the	Unlikely	Moderate	Low	<ul style="list-style-type: none"> ▪ WHO, PSU and DPHE to continue to proactively advocate WSPs to key stakeholders ▪ WHO to work collaboratively with key stakeholders to build ownership
3. A significant proportion of the water supplier do not implement WSPs	Possible	Moderate	Moderate	<ul style="list-style-type: none"> ▪ WHO to demonstrate the benefits to water supply entities of having WSPs in place
4. WSP programmes do not become self sustaining and WSPs are not maintained beyond the life of the funding support	Possible	Moderate	Moderate	<ul style="list-style-type: none"> ▪ PSU to complete the institutional development activity to mainstream WSPs in a sustainable way
5. Construction quality of water supply options (TW, plants etc.) is poor and does not produce safe water	Likely	Major	High	<ul style="list-style-type: none"> ▪ Safer water improvement plans will be developed for all WSPs completed. These plans: 1) support the provision of the safest possible water within the constraints of the current system through the completion of immediate system improvements and 2) support the implementation of longer-term investments through identification of the longer-term improvement requirements.