Briefing note: January 2023

SafePani: Improving drinking water safety for schools and healthcare centres in Khulna district, Bangladesh

Summary

By 2019, over 98% of the population of Bangladesh had access to improved drinking water sources (BBS/UNICEF, 2019).[1] However, drinking water safety remains a challenge, with hazards including faecal contamination, geogenic contaminants such as arsenic and manganese, and increasing salinity. The SafePani model uses a professional water service provider operating with a Water Safety Plan (WSP) approach to improve drinking water safety in schools and healthcare centres in Khulna district, Bangladesh. This brief sets out how the WSP approach is incorporated in the SafePani model.

1. Piloting a professional rural water service delivery model

The SafePani model is testing how to reallocate service delivery responsibilities from individual schools and healthcare centres to a professional water service provider operating within an exclusive service area.

Since 2021, the SafePani model has been piloted in eight unions of Khulna district covering 294 drinking waterpoints across 171 schools and 33 healthcare facilities.

The pilot phase was launched with the formation of a National Steering Committee and a District Working Group chaired by the Additional Secretary of the Local Government Division and the Deputy Commissioner of Khulna district, respectively. The SafePani model comprises three main packages of work:

- Rehabilitation and maintenance of all water supply infrastructure, with any reported breakdowns being repaired within 48 hours;
- Water safety assessment involving sanitary inspection, baseline tests for arsenic, manganese and chloride, and seasonal tests for *E. coli*, followed by prompt disinfection of sources upon detection of faecal contamination; and
- Development and maintenance of a data storage platform highlighting key performance metrics related to water quality, service reliability, volumetric use, and costs.

1 Bangladesh Bureau of Statistics and UNICEF Bangladesh. (2019). Bangladesh Multiple Indicator Cluster Survey (MICS).

2. Ensuring safe water in schools and healthcare centres

While 98% of the population of Bangladesh has access to improved drinking water sources (BBS/UNICEF, 2019), drinking water safety remains a challenge owing to multiple water quality hazards including faecal contamination, geogenic contaminants such as arsenic and manganese, and increasing salinity. Around 40% of the population collect drinking water from waterpoints that have microbiological contamination and an estimated 11% consume drinking water with arsenic concentrations above the national standard of 0.05 mg/L (BBS/UNICEF, 2019).

To address these well-established hazards, SafePani adopted a Water Safety Plan (WSP) approach which embeds water safety monitoring in a risk-based framework to inform prioritisation of actions and decision-making for safe drinking water services in all schools and healthcare centres. This includes integration of water quality monitoring and sanitary inspections, with rapid actions by the service provider to address water safety concerns. The WSP includes the assessment and prioritisation of actions to mitigate and manage water safety risks. It aims to embed a continuous improvement approach toward safer water, balancing the need for actions where there is an acute threat to health (e.g. microbiological contamination) with the needs to address threats to longer term health (e.g. arsenic).

3. SafePani water safety principles and targets

Water safety principles and targets were agreed by the Steering Committee in November 2021. These have been revised and updated with new evidence gathered during the pilot phase.

For all waterpoints or systems identified as being used for drinking water, the professional service provider will be responsible for characterising the risks and verifying that the waterpoint can provide appropriately safe water. A system assessment will include:

- Seasonal sanitary inspections to assess the risk of faecal contamination;
- Water sampling (after decontamination of the point of collection) and analysis for *E. coli* in two different seasons in the first year, paired with field tests for pH and electrical conductivity; and
- Assessment of arsenic, manganese and salinity (for all waterpoints that supply surface or ground water) once in the first year, based on samples collected by the service provider with analysis undertaken in the Department of Public Health Engineering (DPHE) laboratory.

Based on this system assessment, the service provider will put controls in place to mitigate risks. The service provider is responsible for: repairs to reduce sanitary inspection risk, notifying waterpoint managers within 24 hours of faecal contamination (detection of *E. coli*), undertaking shock chlorination, and resampling water quality after a week. If contamination is still detected, further effort will be directed towards reducing sanitary hazards, implementing appropriate treatment, and retesting. All water quality results, water safety risks, and actions taken, will be reported to the Steering Committee. Once a waterpoint has been verified to be producing safe drinking water, routine monitoring will be implemented including regular sanitary inspections, annual monitoring for *E. coli*, pH and electrical conductivity, and chemical assessment every five years. Additional water quality monitoring may be instigated in response to other indicators of changes in risk, such as after storm surges and other extreme events.

These principles and targets will be reviewed and revised by the Steering Committee. Key areas for review include identifying the potential to adapt these actions for different system types, to compare the costs and benefits of proactive actions, and to further prioritise testing based on results across the sites.

Table 1: Rationale for monitoring selected water quality parameters

Contaminant	Why is SafePani measuring this?
Faecal contamination	Contamination of water with faecal matter from humans and animals can lead to diarrhoeal disease and stunting. It is an immediate threat to health as one drink can cause illness. Faecal contamination varies seasonally, with highest levels generally expected in the monsoon period. *E. coli* is recommended by the World Health Organisation (WHO) as the most precise indicator of recent faecal contamination. 40% of Bangladesh households use a water source that is contaminated with *E. coli* (BBS/UNICEF, 2019). Pilot results from Khulna indicate a similar level of waterpoint contamination, with rainwater harvesting systems most commonly contaminated.
Arsenic	When consumed over a long time, arsenic can cause chronic health problems like skin damage, numbness, leg pain and cancer. It can affect children's development, for example by causing cognitive impairment. As a result of these health threats, arsenic contamination can also cause psychosocial distress and social stigma. 17.5 million people in Bangladesh drink water that is above the national standard (BBS/UNICEF, 2019).
Manganese	Consuming low amounts of manganese is healthy for humans. But consuming high amounts can affect children's neurological development leading to intellectual impairment and behavioural issues. Manganese in water can also cause staining of laundry. The WHO released revised guidance for manganese in 2020, suggesting a guideline of 0.08 mg/L. Only 39% of groundwater samples met the Bangladesh target of 0.1 mg/L in a national survey in 2009 (BBS/UNICEF, 2011).[2]
Salinity	In coastal Bangladesh, high salinity leads to drinking water being a significant source of daily sodium intake. This can contribute to high blood pressure and the likelihood of hypertension. High salinity can also cause people to switch to using less protected water sources that may taste less salty but have a higher risk of faecal contamination.

4. Reporting water safety and the Steering Committee's role

At the Steering Committee's quarterly meetings, the service provider will report on the following:

- System assessment and risk characterisation: The status of the assessment including sanitary inspections, water quality sampling (*E. coli* and chemical contamination), and current risk characterisation status in line with the action levels (Table 2) as a high-level summary of each system.
- Controls: The status of implementation of controls will be reported, including shock chlorination, reporting to managers, repairs or cleaning to address sanitary inspection risk and any other controls.
- Recommendations for revisions to principles: The water safety team will report on trends and patterns from the data collected and make recommendations on changes to key principles and targets.
- Communicating results: Water quality results will be reported in full to DPHE, who maintain the government water quality database, and the Steering Committee.

The Steering Committee will prioritise actions and nominate responsibilities to implement controls or address risks for systems that require action beyond the service providers' responsibility.

2 Bangladesh Bureau of Statistics and UNICEF Bangladesh (2011). Bangladesh National Drinking Water Quality Survey, 2009.

Table 2: Summary of SafePani action levels

Contaminant	Relevant guideline values	SafePani action level	Response by service provider	Identifying lower priority risks
Faecal indicator bacteria	Bangladesh standard: 0 cfu / 100 mL faecal coliforms WHO: 0 cfu / 100 mL *E. coli*	>0 *E. coli* / 100 mL	Notifies water manager within 48 hours, implements shock chlorination and remedial actions based on sanitary inspection. Follow up testing of site.	Reports any remaining concerns based on sanitary inspection, prioritised by risk category
Arsenic	Bangladesh standard: 0.05 mg/L WHO: 0.01 mg/L provisional	>0.05 mg/L	Reports to Steering Committee for action	Reports sites with >0.01 mg/L
Manganese	Bangladesh standard: 0.1 mg/L WHO: 0.08 mg/L draft	>0.1 mg/L	Reports to Steering Committee for action	Reports sites with >0.08 mg/L
Salinity	Bangladesh standard: 1000 mg/L Cl in coastal areas	>1000 mg/L Cl	Reports to Steering Committee for action	Reports sites with >600 mg/L
Organoleptic issues including iron and salinity		Concerns about taste, colour or other properties that limit use	Reports to Steering Committee for action	N/A

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