Achieving and sustaining safely managed drinking water in Bangladesh

Findings from a water audit

Ensuring safely managed drinking water for everyone is a global policy priority. The Government of Bangladesh remains at the forefront of the global effort to define and achieve the expanded Sustainable Development Goals (SDGs). The SDGs recognise that 'access' is only one step towards achieving safe and reliable drinking water for everyone, every day. Here we report on a water audit of 3,830 tubewells across 10 villages in Chandpur and Comilla Districts in order to support national policy strategies seeking to achieve safely managed water for all. In the study area, an estimated 44% of the population uses water that exceeds the national arsenic standards reflecting similar risks for millions of people across Bangladesh (MICS, 2013).

Summary

- Significant growth (230%) in the number of tubewells installed after 2008; increasing preferences for electric pumps and water points located within premise and built structures.
- Improved access to tubewells has reduced the number of users per handpump by over 50%; the 2010 national average was 14 people per tubewell compared to 2017 10 village average of 7 people per tubewell.
- The majority of tubewells (90%) are functioning and maintained by private users similar to other national estimates.
- 94% of the new tubewells are privately financed and owned.
- Water quality testing is sporadic with no coordinated monitoring. Water users reported that 23% of deep tubewells and 5% of shallow tubewells were tested when first installed.
- Increasing demand for improved water infrastructure indicates alternative management models could be developed.

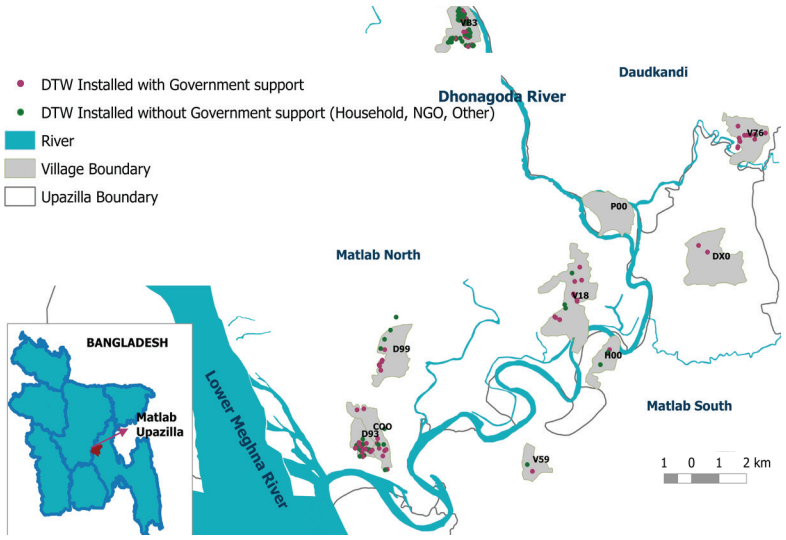

Figure 1: Location of public and privately installed deep tubewells (DTW). DTW are defined as 490 feet or deeper as reported by well owners or managers.

Introduction

Between March and May 2017 a 'water audit' of all public and private tubewells was conducted in 10 villages out of icddr,b's 142 long-term study villages in Chandpur and Comilla Districts. Ten local female field workers interviewed 3,830 tubewell owners and users, covering all abandoned and functioning water points in the spatially defined villages of 25,485 people living in 6,036 households.

The audit builds on previous methodologies and standards set by the Department of Public Health and Engineering (DPHE) and the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b).

Key Findings

1. Doubling of water points in 10 years.

230% increase in number of tubewells in the past 10 years, with 93% of those being privately-funded and managed. Only 11% of the baris, or clusters of households, reported non-functioning tubewells (Figure 3). This number of people per tubewell has halved since previous inventories, falling from 17 people per tubewell in 2008 to seven in 2017.

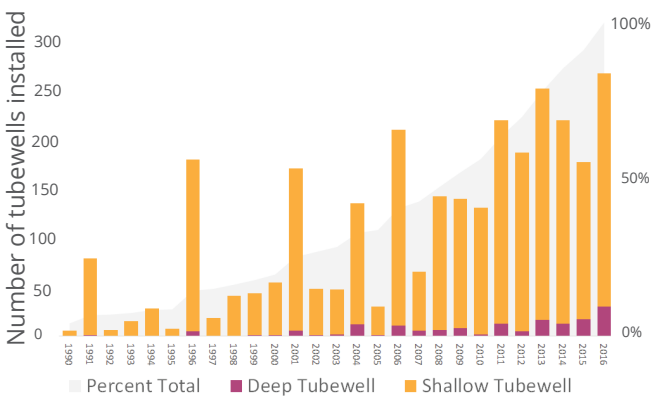

Figure 2: Shallow and deep tubewells installed per year in the 10 villages since 1990

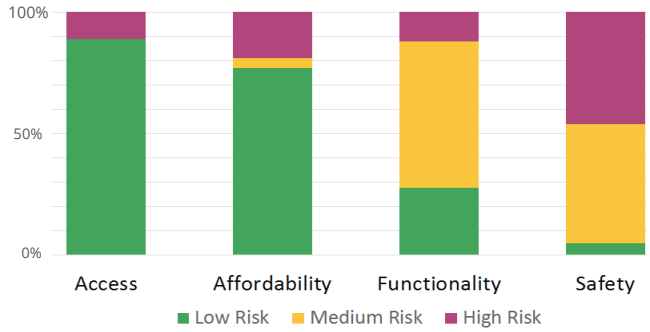

Figure 3: Rapid assessment of tubewells risk categories
(**Access:** proportion of Baris with tubewells; **Affordability:** proportion of household that can cover annual operating cost; **Functionality:** proportion of tubewells that are fully functional; **Safety:** proportion of tubewells tested at installation)

2. Changing preferences on water infrastructure.

Since 2008, the number of deep tubewells and infrastructure modifications has greatly increased. 6% of the tubewells installed are over 490ft deep, almost two thirds of these were funded and installed privately. 10% of the total tubewells are now using electric pumps and 15% of tubewells in the 10 villages are now located on premise within a built structure defined as four walls and roof.

3. Annual private maintenance keeps infrastructure functioning and reliable.

90% of tubewells are operational (Figure 3), reflecting similar rates to the DPHE's water point report. In the past year, three out of five tubewells received annual maintenance, with costs covered by the owner or manager.

4. Water quality risk and perception remains a concern.

There is significant spatial variation in testing rates between villages. Half of the total tubewells have never been tested. Only one in twenty were tested when first installed, with 49% tested at a later date (Figure 3). In 4 out of 10 villages, the majority of tubewells are considered "unsafe" to drink. Depth is closely linked to these perceptions of safety with 90% of deep tubewells reported as "safe" compared to only 30% of shallow tubewells. Finally, 71% of the tubewells have no legible red or green paint to signify arsenic levels.

5. Affordability reflects maintenance not water payment costs.

77% of respondents say they were able to afford the repairs and annual maintenance in the past 12 months (Figure 3). Three out of five respondents report post-installation investment in new handpumps, concrete platforms, electric pumps and tanks. One in ten plan to invest further in large changes with growing interest in electric pumps.

6. Management systems are informal.

Only one per cent of tubewells has formal water management committees, all located in mosques or schools. Private ownership allocates responsibility at the household level with no identified formal process for managing infrastructure growth or operations. DPHE estimates that there are 158 people per safe functioning public water point in Matlab in 2016, compared to national average of 88 people per safe public water point (DPHE 2016).

Policy Implications

1. Demand and willingness-to-pay for privately owned groundwater sources continue to multiply, with changing preferences on infrastructure type. To achieve the SDGs on safe drinking water, regulatory and monitoring oversight is needed to ensure private providers and drillers meet safety standards and reliability measures.
2. Investments in new infrastructure and ongoing annual maintenance payments are predominantly financed by private households. The growth of private investment may be improved by new service models currently being investigated.
3. Information on water quality is limited, with high levels of uncertainty in user-perception of safety-related risks. No data are available on water usage over time, though a remote monitoring system will soon be launched. The monitoring gaps are largest for privately installed tubewells.
4. Institutions to manage or coordinate water supply are largely informal and household-based, leading to limited coordination or collective planning. Government investments reinforce this when assigning responsibility to individual managers for deep tubewells instead of collective management structures. Concerns over equity of access are part of the ongoing research and analysis.
5. New initiatives by DPHE to automate and digitize local engineers' reporting of administrative data could help advance monitoring of public water points. There is an opportunity to combine administrative data with smart sensors and SDG monitoring tools to improve safety and sustainability of the drinking water system.

Contact and acknowledgements

Alex Fischer, University of Oxford:
alexander.fischer@smithschool.ox.ac.uk;

The study is part of a collaboration between the Department for Public Health and Engineering, UNICEF, icddr,b, BUET and the University of Oxford. It was coordinated by Alex Fischer (University of Oxford), in partnership with Zakir Hossain (icddr,b), Tazrina Ananya (BUET), Syed Adnan (UNICEF) and Firoza Akter (DPHE). The study was supervised by Dr. Md. M. Sirajul Islam (icddr,b) and Dr. Rob Hope (University of Oxford).

The REACH programme is funded by UK aid from the UK Government. www.reachwater.org.uk