Research Article

Safe Water Supply and Sewage Treatment in Bangladesh

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Abstract

Bangladesh, with a population of approximately 180 million, faces severe challenges in wastewater management and access to safe drinking water. The widespread use of shallow tubewells and unsealed sanitary latrines, especially in rural areas, leads to fecal contamination of groundwater, resulting in waterborne diseases and long-term health issues. Urban areas also suffer due to inadequate sewerage systems and untreated sewage discharge. This article proposes modern, cost-effective solutions to address these issues through decentralized community-based Sewage Treatment Plants (STPs) and Water Treatment Plants (WTPs). The STPs involve plastic and concrete tanks with bio-degradation using bio-blocks and solar pumps, while the WTPs use multi-step purification techniques to ensure potable water. These systems aim to improve public health, protect the environment, and align with the Bangladesh Delta Plan 2100 and Sustainable Development Goal 6. Community participation and government initiative are key to successfully implementing and sustaining these vital infrastructures nationwide.

Keywords: *Bangladesh, Sewage, Water, Treatment and Cost-Effective*

Introduction

Bangladesh has around 180 million people living in a small land and ranks number 8 in the world by population, though the GDP of the country was USD 2551 in 2023 (World Bank, 2024), the country neither has established any sewage treatment system nor safe water supply system for the entire nation. In Bangladesh, waterborne diseases and dengue are the primary health concerns due to the disposal of untreated sewage throughout the country and the lack of a reliable, safe drinking water supply. The article focuses on introducing cost-effective water and sewage treatment systems in Bangladesh. It aims to improve public health and sustainability by using locally sourced materials and aligning with national and global development goals.

Status of Water Supply and Sewage Treatment in Bangladesh

Water Supply in Rural and Urban Areas

Bangladesh is mostly dependent (more than 90%) on groundwater as potable water, which is abstracted through shallow-type tubewells mostly fitted with a hand pump (UNICEF & WHO, 2021).

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These hand pumps, typically 100–120 feet deep with a 20–30 feet strainer, are often purchased by people from local markets. However, the close proximity of unsealed sanitary latrines usually constructed using 3–4 concrete rings with unsealed joints and open bottom, poses a serious contamination risk. During the monsoon season, floodwater often mixes with sewage, increasing the likelihood of fecal contamination in drinking water sources.

On the other hand, groundwater is often used directly without any treatment for drinking and household purposes, which poses a serious threat to public health. Groundwater in Bangladesh commonly contains high levels of iron, hardness, silica, and arsenic particularly in central and southwestern regions making it unsafe for consumption without proper treatment. According to the World Health Organization (WHO), more than 20 million people in Bangladesh are exposed to arsenic-contaminated groundwater, exceeding the permissible limit of 0.01 mg/L (WHO, 2019). These chemical and microbial contaminants have been associated with a range of long-term health effects, including diarrhea, constipation, diabetes, skin diseases, hair loss, nausea, cardiovascular disease, and liver and kidney dysfunction (Ahmed et al., 2006; Chakraborty et al., 2015).

A study by the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) found that waterborne diseases account for nearly 25% of all illnesses in the country, and children under five are the most vulnerable. The lack of safe drinking water and proper sanitation continues to undermine public health and contributes to a wider ecological imbalance due to the continued use of untreated and contaminated water sources (ICDDR, B, 2020).

Urban and suburban areas face similar challenges. Although cities like Dhaka and Chattogram have partial surface water treatment systems, the majority of urban residents still rely on untreated groundwater. In many cases, people boil or filter the water, which, while reducing pathogens, also removes essential minerals, resulting in "dead water" that lacks nutritional value. Additionally, boiling water consumes large quantities of natural gas, adding to environmental and economic burdens.

Sewage Systems in Rural and Urban Areas

A Sewage Treatment Plant collects, treats, and discharges wastewater, providing a service essential to environmental and public health. The sewage treatment infrastructure in Bangladesh remains severely underdeveloped in both rural and urban settings. In urban areas, the capital city Dhaka is the only city with a partial sewerage system, operated by Dhaka WASA. The Dhaka Water Supply and Sewerage Authority is leading the effort, with key projects like the Dasherkandi STP, which is the largest in the country and the first of its kind on a large scale. The Dasherkandi STP, inaugurated in 2023, has the capacity to treat 500 million liters of sewage per day, covering a population of approximately 5 million people. It uses modern biological treatment processes to significantly reduce environmental pollution by treating domestic wastewater before it is discharged into rivers (Islam, 2023). This project is a part of the broader government strategy under the Bangladesh Delta Plan 2100, supported by development partners like Asian Development Bank (ADB) and China CAMC Engineering Co. Ltd., aiming to improve urban sanitation and protect public health.

Even within Dhaka, a significant portion of the sewage is still discharged untreated into nearby rivers via a pipe network. Cities outside Dhaka, including district and sub-district towns, lack any formal sewerage systems and instead rely on septic tanks, which provide only primary treatment. These tanks retain sewage temporarily, but the effluent remains untreated, contaminating surrounding soil, surface water, and groundwater.

In rural areas, the situation is equally alarming. Most households use septic tanks or unsealed pit latrines, which are constructed in close proximity to drinking water sources. The lack of proper containment or treatment allows sewage to seep into the soil, posing long-term risks to human health and the environment. Over time, this has

created a nationwide pattern of groundwater contamination, passed from generation to generation due to inadequate infrastructure and awareness.

Recommendations for Applying Modern and Cost-Effective Plants for Water Supply and Sewage Treatment

Modern and Cost-effective Sewage Treatment

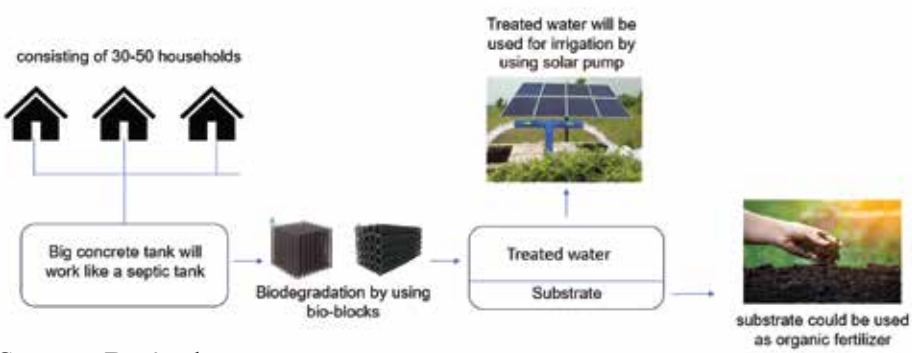
In response to this pressing challenge, a modern and cost-effective Sewage Treatment Plant (STP) for rural areas is suggested below:

First, we must isolate the sewage from the surrounding soil, which could be done by using a plastic tank instead of rings. The Plastic tank should be half-buried under the ground, and the commode/pan should be placed over that tank. This individual plastic tank would be connected to a bigger concrete retention tank (placed in a common place consisting of 30-50 households in the rural community) by pipeline to carry the sewage into that bigger concrete tank, as shown in Figure 01. This bigger tank will work like a septic tank. The overflow from the concrete tank should then be taken for biodegradation by using bio-blocks and solar pumps. Treated water from the bio-degradation tank will be safe for disposal or used for irrigation. The substrate from the biodegradation tank could be used as organic fertilizer after dehydration. The technology of sewage treatment is easy, and the equipment is available in the local market. This biodegradation system could also be used in the urban and suburban areas where there are no sewerage systems and people are using septic tanks only. This initiative could be implemented as a small community-based project consisting of 30-50 or a maximum of 100 households where the community members will take the responsibility to operate and maintain the system by their own. The total system will be operated by solar electricity.

Modern and Cost-effective Water Supply System

A water treatment plant could also be designed for the targeted people in the community-based project based on groundwater or surface water treatment basis. Traditional water treatment systems used in the country are often limited by high operational costs, complex maintenance, and dependency on electricity and skilled operators.

To address these challenges, we recommend that modern technologies for water treatment include Membrane bioreactors (MBR) or Activated Filter Media filtration system (Membracon. (n.d.)) could be considered. Figure 2 shows that the primary step in treating the water involves screening,



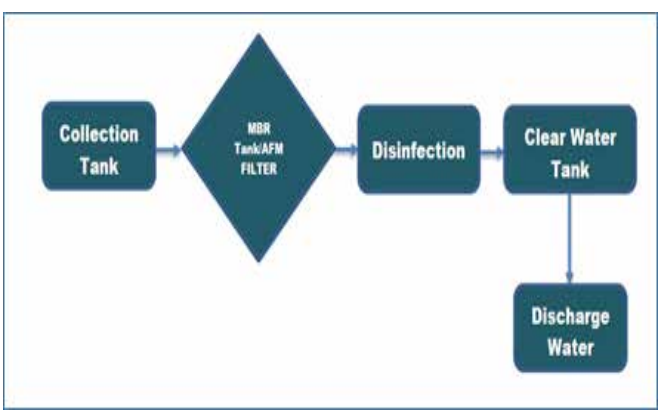
Source: By Author

Figure 1: A Modern And Cost-Effective Sewage Treatment Plant (STP)

where large debris and objects are removed to prevent equipment damage. After screening, water will be taken to a holding tank and later pumped to ultrafiltration or activated filter media (which consists of recycled glass sand). Finally, the treated water will be collected in a treated water tank for distribution after passing through disinfection by chlorination or UV filter. The entire water treatment system could be operated by solar electricity, so, the WTP could be placed anywhere to meet the SDG goal, which should highlight the proximity to residence, availability onsite and free from pollution & germs. This is the best way to treat well water, groundwater, or surface water. This water treatment plant will supply only the drinking water from the project and the residents

under the project should collect their daily drinking water from the project in a regular basis.

Modern water treatment technologies are increasingly recognized as more effective than traditional methods due to their higher efficiency, reliability, and adaptability in addressing complex water contamination issues. While traditional systems like sand filtration, boiling, and basic chlorination are still used in many parts of Bangladesh, they often fail to remove harmful contaminants such as arsenic, fluoride, and heavy metals, which are prevalent in the country's groundwater.



Source: By author

Figure 2: Cost effective Water Treatment Plant (WTP)

In contrast, modern solutions such as reverse osmosis (RO), ultrafiltration, and UV disinfection provide consistently high-quality water by effectively eliminating both microbial and chemical pollutants. For instance, a study by UNICEF (2018) highlighted that RO units in arsenic-affected regions of Bangladesh successfully reduced contamination levels below WHO standards, whereas conventional sand filters had minimal impact. Moreover, automated and solar-powered treatment systems reduce human error, operate off-grid, and can be quickly deployed during natural disasters—advantages that traditional methods cannot offer. Therefore, modern water treatment technologies offer a more sustainable, safe, and scalable approach to ensuring clean water access across diverse environments in Bangladesh.

By implementing such initiative step by step, we can bring the whole nation under the sewage treatment and safe water supply network which also saves huge amounts of money from the health sector by eliminating or reducing the waterborne and other diseases every year. It is evident that sewage treatment and safe water are not a luxury for the citizen, but it is a civil right irrespective of their race, religion, and geographical location.

Conclusion

This article proposes a comprehensive plan for establishing a modern community based Sewage Treatment Plant (STP) and Water Treatment Plant (WTP) aimed at improving wastewater management, reducing environmental pollution, and contributing to the national goals outlined in the Bangladesh Delta Plan 2100 and Sustainable Development Goal 6 (Clean Water and Sanitation). The proposed plan is presented with it's technical approach, expected outcomes, and implementation strategy to support long-term sustainable sanitation infrastructure in Bangladesh.

References

World Bank. (2024). *GDP per capita (current US$)—Bangladesh*. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=BD

UNICEF & WHO. (2021). *Progress on household drinking water, sanitation and hygiene 2000–2020: Five years into the SDGs*. https://washdata.org/report/jmp-2021-wash-households

WHO. (2019). *Arsenic in Drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality*. https://www.who.int/publications/i/item/arsenic-in-drinking-water-background-document-for-development-of-who-guidelines-for-drinking-water-quality

Ahmed, M. F., Ahuja, S., Alauddin, M., Hug, S. J., Lloyd, J. R., Pfaff, A., Pichler, T., Saltikov, C., Stute, M., & Van Geen, A. (2006).

Ensuring Safe Drinking Water in Bangladesh. Science, *34*(5806), 1687–1688. https://doi.org/10.1126/science.1133146

Chakraborty, M., Mukherjee, A., & Ahmed, K. M. (2015). A Review of Groundwater Arsenic in the Bengal Basin, Bangladesh and India: From Source to Sink. *Current Pollution Reports*, *1*(4), 220–247. https://doi.org/10.1007/s40726-015-0022-0

ICDDR, B. (2020). *ANNUAL REPORT 2020: Solving public health problems through innovative scientific research*. icddr,b. https://www.icddrb.org/storage/file/Document/icddr,b%20AR2020_22Feb2022.pdf

Islam, M. J. (2023, July 13). PM Hasina inaugurates Dasherkandi sewage treatment plant, largest in South Asia. *The Business Standard*. https://www.tbsnews.net/bangladesh/pm-hasina-inaugurates-dasherkandi-sewage-treatment-plant-664494

Hammer, M. J. (2000). *Water and wastewater technology* (5th ed.). Recording for the Blind & Dyslexic.

Membracon. (n.d.). *What is a Sewage Treatment Plant & How does it work?* Retrieved July 23, 2025, from https://www.membracon.co.uk/blog/what-is-a-sewage-treatment-plant-how-does-it