POLICY BRIEF, APRIL 2018

Understanding river water quality risks to promote economic growth and reduce poverty in Dhaka

In rapidly developing economies, untreated wastewater is a serious and growing problem. Untreated wastewater impacts human health and well-being, economic growth and ecosystems. The poor and vulnerable are often most at risk. Sustainable Development Goal (SDG) 6.3 aims to improve water quality by reducing pollution, eliminating dumping, and minimising the release of hazardous chemicals. The Government of Bangladesh is working to meet the indicators of success for this goal, which include halving the proportion of untreated wastewater. In this policy brief, we present new data and provisional findings from river water monitoring sites together with a survey of over 1,800 households. We assess regulatory compliance at these sites along the Tongi-Turag-Balu Rivers using spatial analysis and suggest strategies to support progress toward achieving target reductions in wastewater and improving safe water for all.

Summary

- Similar to other Asian mega-cities, economic growth in Dhaka depends on the health of its rivers which support communities, industry, and agriculture.
- However, as Dhaka rapidly grows, water demand increases while wastewater treatment lags behind. Only 25% of households are serviced by sewage treatment facilities, and industrial pollution contributes 60% of total pollution in the Dhaka watershed (Islam et al. 2015).
- We present water quality data collected from 2016-18 for both dry and wet seasons on turbidity, Chemical Oxygen Demand (COD), Dissolved Oxygen (DO), ammonia, nitrate, Total Coliforms (TC), and E. coli.
- While Bangladesh national water quality regulations are striving to meet global standards, few of the water quality samples met minimum requirements across biological, chemical, or physical parameters.
- From December 2017 to January 2018, enumerators conducted a socio-economic and river use behaviour household survey linked to the river modelling sites.

Key Findings

1. **Wastewater treatment has not kept pace with the growth of Dhaka City:** Dhaka is a megacity with a population around 17 million, projected to exceed 27 million by 2030. Satellite images show rapid conversion from cultivated agricultural land to urban uses in recent decades. This transition, alongside unregulated industrial expansion and insufficient wastewater treatment infrastructure, threatens both human health and ecological functioning.

2. **Water quality classification by Bangladesh national standards:** water quality for the rivers around Dhaka is very poor, with low DO, high organic loading, and high levels of pathogens such as E. coli which greatly exceed national standards. Several water quality parameters tested at sample sites, shown in Figure 1, exceed national standards in every examined reach on average in the dry season, including COD, DO, ammonia, total coliforms, E. coli and suspend solids.

Figure 1: Location of sample sites

3. **Poorer households expressed more concerns related to water compared with wealthier areas:** within the study area, Abdullahpur (51%), Rausadia (46%), and Kathaldia (29%) have the highest percentages of poor by wealth quartile. These communities also have the highest occurrence of 'tenant' or 'free/public land' occupancy status. Kathaldia respondents expressed waterlogging and flooding as water-specific concerns, and reported 'clean environment' and 'drinking water services' highly among general concerns. 58% of all households surveyed ranked 'dirty river' as their top environmental specific concern.

4. **Variation of water quality indicators by seasonality:** as Figure 2 shows, the averages across all reaches for DO and COD do not meet national standards (6 mg/L for DO and 4 mg/L for COD) for wet or dry seasons (values are averages over an observed period). In the wet season, reaches in the upper catchment have substantially better DO levels above 5.6 mg/l. However, at reach 9 the DO levels drop off substantially, declining to a low of 0.25 mg/l in the dry low flow periods. Mean COD exceeded the national standard, with a high of 129 mg/l in the dry season and 76 mg/l in the wet season (Whitehead et al. 2018).

5. **A combined control strategy would be most effective to reduce pollution effects:** Figure 3 illustrates exploratory hydrological and water quality modelling to combine supplementing low flow and improved effluent treatment for Ammonia reduction. This work from Whitehead, et al. (2018) provides a baseline to understand the magnitude of pollutant risks in the study area and identify possible institutional responses.

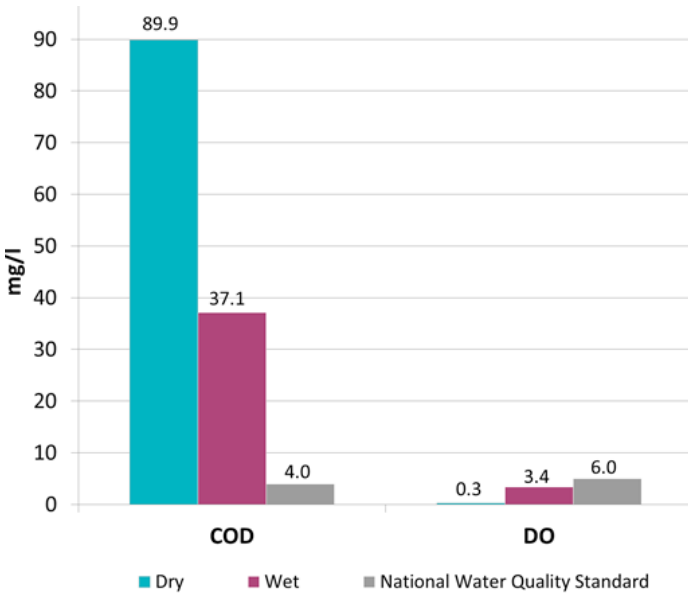

Figure 2: COD and DO averages variation between dry and wet season

Policy Implications

1. Current monitoring data on water quality over time are inadequate. Consistent water quality monitoring can support the development of detailed scenario analysis and contribute to better understandings of river water quality-poverty-economic growth dynamics.

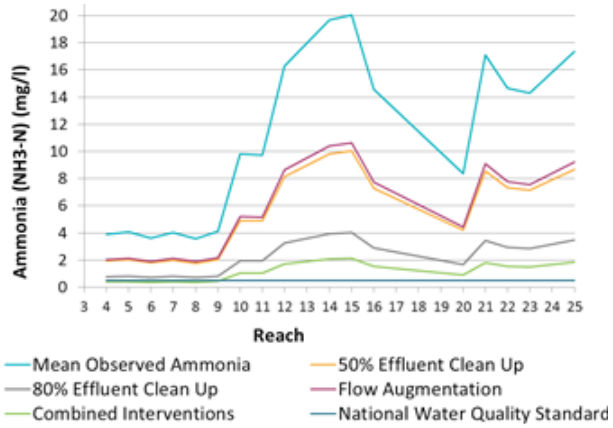

Figure 3: Ammonia clean up scenarios

2. Water quality models suggest that multiple strategies, such as combining both improved effluent treatment and flow augmentation, may be more successful for pollution reduction than a regulatory only approach or only engineering-based solution. The combination of household surveys and observed water quality data may inform further qualitative and quantitative assessment of regulatory compliance.

3. Achieving the SDGs in Bangladesh will require strengthening institutions for enforcing regulations and overcoming barriers to controlling pollution. The Government of Bangladesh may usefully adopt progressive pollution control systems for new industries and incentivize disclosure of end of pipe water quality information.

4. The growing challenges of wastewater are an opportunity for industries to advance solutions collectively to complement government regulations. Industry investment in technological initiatives to improve river health such as the adoption of zero liquid discharge (ZLD) should align with revisions to update existing regulatory approaches.

5. This work will seek to contribute to conceptual understandings of river-related water quality and public health dynamics to guide a larger programme of work. Further research on barriers and solutions will consider the interactions of industry and urban development patterns under uncertain climate and economic growth futures.

Contact and Acknowledgements

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