Water Quality Monitoring: Driving Decision Making through Actionable Data and Collaborations

Key insights and recommendations from the Roundtable on January 11, 2019
Background and Motivation

In September 2015, the UN adopted ‘Clean Water and Sanitation’ as one of the Sustainable Development Goals for 2030. Access to clean and safe water resources is central to this vision. In India, about 70 per cent of surface water is not fit for consumption. This is the water that the poorest and most marginalised people have to drink and use for their daily needs. Every day, almost 40 billion litres of wastewater enters rivers and other water bodies, and even percolates into the ground, with only a tiny fraction being adequately treated. This comes with huge ecological and economic costs.

Various organisations, including the government, have been monitoring water quality regularly using traditional lab testing approach. Parallel attempts are being made to innovate the way we measure water quality by organisations such as IBM Research, Foundation for Environmental Monitoring (FFEM) and WaterScope. However, to bring about real change on the ground, some fundamental questions need to be answered:

- How do we align the methodology and frequency of data collection to our monitoring objectives?
- How do we curate this data to make it actionable for various levels of decision making (individual, municipal, state or national level)?
- What are the best ways to disseminate data to drive decision making?
- What partnerships/platforms should be forged to ensure cross-linkages among government departments?

To find answers, the Tata Centre for Development (TCD) at UChicago and the International Innovation Corps (IIC) hosted a roundtable discussion in January 2019. The discussion brought together civil society, researchers, practitioners, technologists and entrepreneurs to deliberate on these questions. Key insights that emerged from the discussion are put together in this report to spur research and action.
Key Insights / Recommendations

A. Develop Greater Trust on Institutional Data
Greater transparency in methodology of data collection, protocol followed and measures taken for quality checks helps in building trust between agencies collecting data and its users. This is where the need emerges for strengthening institutions by building their capacity and convincing them to share ancillary information.

1. Increase data availability & accessibility
Different government agencies are gathering water quality data, but not all of it may be available to public. For instance, the satellite data collected by ISRO may not be easily accessible. If the data we gather does not inform and inspire those in a position to make a difference, we cannot expect to bring change on the ground. For example, there is immense potential in using satellite data for geospatial sensing to measure water quality. If this data is made public, it can be used to map water quality of our rivers and lakes in an economical and effective manner. Improving access to such government data may encourage other organisations to share data more openly.

2. Develop a protocol for data collection
Preparing and adhering to a protocol that considers various data collection approaches including, lab sampling, in-situ sensing and satellite data gathering, is the first step towards generating comprehensive and actionable data. Disclosing not only the collected data but also other details such as date, time, GPS position and methodology is crucial. Such a protocol allows data integration among various agencies having different objectives and approaches to data collection.

3. Certify professionals to encourage crowdsourcing of data
The CPCB is the primary source of water quality data in India. It has made large-scale efforts to collect this data across rivers on a monthly basis. Despite the scale, it is too burdensome for a single agency to measure water quality comprehensively across the country. This is exactly why most water quality monitoring agencies across the globe are democratising the process of data collection. They are crowdsourcing data by involving communities and other stakeholders. This bottom-up approach reduces the cost, improves comprehensiveness of data collection and builds trust on the collected data. A publicly available formal training to certify water quality monitoring professionals can support the crowdsourcing exercise.
B. Establish Cross-Sectoral Linkages

Huge efforts are made for conducting national-level surveys to collect data on water quality, health, livelihood, aquatic life, etc. However, there is little information on the correlation between these indicators. Not many of us know how river water quality impacts health or what's the economic cost of water quality. Thus, there is a need to establish cross-sectoral linkages to bring about meaningful policy-level changes.

1. Correlate water quality data with health indicators

The government collects data on water quality and health separately. There are limited number of studies linking surface water contamination to diseases. To bring about a change at a policy level, water quality data needs to talk to data on health. A causal link between water quality and human health can convince decision makers to take necessary action.

2. Study economic costs of water pollution

Very few attempts have been made to study the economic impact of water pollution. To understand the economic costs of water pollution, we need to correlate water quality data with data on socio-economic indicators. Pilot studies conducted around River Yamuna in Delhi have shown that apart from negatively impacting human health, deteriorating water quality affects livelihoods such as fisheries, boating and farming.

3. Assess impact on biodiversity

Assessing changes in local flora and fauna species and patterns over time will help in understanding the changing water quality in any given area. For example, Gharials are indicators of clean river water. Similarly, an improvement in number of dolphins in Ganga also alludes to improving water quality and aquatic life. On the other hand, deteriorating water quality may drive out certain species while also making waters unsuitable for agricultural use.
C. Issue Action Advisory
The data that we collect is useful only if it is consumable, curated to the need of the stakeholder, and spurs one to act. These things need to be kept in mind when large-scale efforts are made in collecting, processing, analysing and presenting data.

1. Disseminate data in easy-to-understand formats
Various government and non-government bodies often collect data and make it available on their own platforms. However, technical information on water quality may not be useful for decision makers across all levels. Hence, having a single online platform for making data available in near real-time in an easy-to-understand format will ensure its usability. We should also come up with new statistical indices to analyse data creatively and conduct a proper error analysis while reporting any data publicly.

2. Augment the ongoing efforts
One must recognise the value that the current data collection and dissemination system adds in terms of using robust laboratory testing of parameters, having trained staff to collect data across various rivers and the government buy-in it has. Instead of creating parallel competing systems, one may want to work within the existing system and supplement the current efforts.

3. Analyse and interpret the results
Providing relevant data analysis through colour-coded heatmaps may help maximise the reach of the data. Based on the insights derived from data visualisations, action advisories such as checking the STP functioning and improving water flow can be issued to help relevant stakeholders take necessary actions. Sending out SMS notifications to the stakeholders with action advisories may also be effective.
Next Steps

A common sentiment that emerged from the roundtable was the need for putting a collective effort towards water quality monitoring and translating our ideas into action. To keep this momentum going, next steps have been proposed. These are based on the suggestions given by the panelists during the roundtable and offline discussions.

1. **Build a common platform for India’s water quality data**
   The objective is to support organisations by providing them a platform to visualise their data and gain insights for better decision making. We are creating a single go-to dashboard that will crowdsource India’s water quality data and present it in a visual format that is easy to comprehend.

2. **Create a policy advocacy group to support Government with policy decisions on water**
   TCD is working on developing a platform that will allow organisations to interface with the government and suggest policy-level changes. To begin with, the recommendations that emerged from the roundtable will be submitted to the CPCB.

3. **Continue to collaborate towards addressing water quality challenges**
   We will continue to meet and deliberate over layered challenges of water quality monitoring and work collaboratively on establishing a knowledge repository that will shape our course of actions in the immediate and distant future.
“With the merger of physical and social sciences, this is the right time for water experts, environmentalists, social scientists and policy advocates to collaborate.”
Supratik Guha

“New technology like cyber physical systems can be integrated with traditional methods to increase efficiency and accuracy of measurements.”
Pawan Labhasetwar

“A common portal where everyone can put their data for others to use can be the first step to collaborate.”
Kavita Shah

“To mobilise policymakers, we need strong evidence linking water quality data with health data.”
Sumit Gautam

“Need to look at more than just the averages of water quality data, and come up with new statistical indices.”
Aditya Sharma

“We need a way to disseminate water quality data at a policy level, municipal level and individual level.”
Smita Rakesh
“Policymakers should be presented with the economic costs incurred due to water pollution.”
D B Gupta

“We need to move from a policy-based evidence approach to an evidence-based policy approach.”
Raman VR

“Geo-sensing using satellite data is the way forward for measuring water quality.”
Sukanya Randhawa

“Bottom-up approach of data collection via crowdsourcing can democratise the process and make it cheaper.”
Alexander Patto

“Identifying surrogate parameters for those which can’t be monitored in-situ is the need of the hour.”
Jagdish Kumar Bassin

“Colour coding technical parameters data is one simple and efficient way to communicate technical data to masses.”
Devin Miller
"Simplifying data collection ensures its scalability and also empowers citizens."
Samuel Rajkumar

"Bringing diverse datasets to a central platform may help establish cross-sectoral linkages."
Priyank Hirani
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