

Developmental Trends in The Water Quality Monitoring Techniques

A. Water Quality: What to Measure?

- ☐ **Physical Properties** – Colour, Temperature, Turbidity, Suspended, Sediment, Density, Heat Capacity
- ☐ **Chemical Properties** – Salinity, Dissolved Oxygen, Conductivity, Hardness, Nutrients, pH
- ☐ **Biological Properties** – Algal Bloom/Chlorophyll-a, Dissolved Organic Carbon, Microorganism

B. Water Quality: Latest Trends?

Artificial Intelligence

- ☐ Artificial Neural Networks (ANNs) like MLP and MLR
- ☐ Decision Trees (DTs) to forecast the water quality

The inputs that can be Related:

- ☐ Chemical oxygen demand (COD)
- ☐ Dissolved oxygen (DO)
- ☐ Oxidability
- ☐ total suspended solids (TSS)



Figure 1: Under Water WQM platform



Figure 2: Unmanned Aerial Vehicles (UAVs) or Drones over a River

INNOVATIVE TECHNOLOGIES FOR MONITORING RIVERS AND STREAMS

A. Underwater, Networked Drones Monitoring Water Quality

Source- <https://www.fondriest.com/news/underwater-networked-drones-monitoring-water-quality.htm>

A recent project undertaken by the Rutgers University departments of Mechanical and Aerospace Engineering and Electrical and Computer Engineering is developing drones and underwater robots that will monitor water quality in reservoirs, lakes, and rivers in real-time. The project will eventually help engineers deploy water quality fixes immediately, and keep contaminated water away from the public.

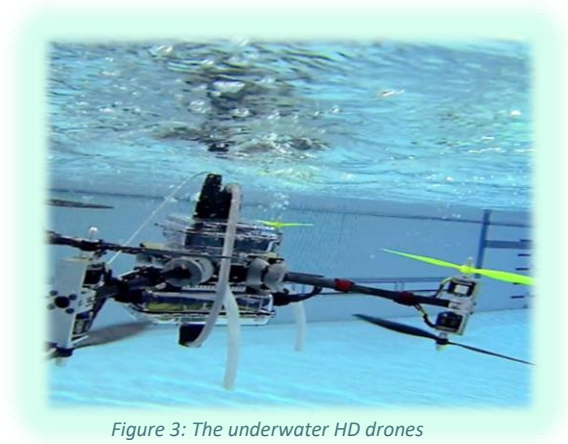


Figure 3: The underwater HD drones

“Near-real-time water quality monitoring in rivers, lakes, and artificial or natural water reservoirs of different physical variables such as dissolved oxygen, pH, turbidity, chlorophyll, temperature, dissolved metals, and

algae concentration is critical in order to prevent contaminated water from reaching the civilian population and to deploy appropriate and timely solutions.

B. Monitoring of Real-time Pollution Data from Ganga

Source- https://mission-ganga.thewaternetwork.com/article-FfV/monitoring-of-real-time-pollution-data-from-ganga-iyv7Av1hkH6OCOQnr_KgDQ

These stations have started sending real-time water quality data but they will be calibrated by the scientists of Central Pollution Control Board (CPCB) before being made available in the public domain," said U P Singh, pointing towards a big LED television screen installed in his office on which pollution data of various stations were displayed on rotational basis. Singh is Director General of Namami Gange, the flagship project of Prime Minister Narendra Modi to clean and rejuvenate the holy river.



Figure 5: The CPCB installed device in Yamuna



Figure 4: Kerala's Fenboat for WQM



Lakes can be Monitored too:

Ten years ago when online monitoring technology was still developing, CPCB had carried out a similar experiment. It was not successful—the probes had to be cleaned frequently because Indian rivers are turbid. The equipment currently in use has a self-cleaning mechanism and is not affected so much by turbidity.

Online monitoring is used for checking water quality in lakes also. Singapore, for instance, has 19 water profiling stations in 17 reservoirs. In India, a private company conducted a 24-hour demonstration for the Karnataka pollution control board in three lakes of Bengaluru. TechSpan Engineering monitored the quality of the lakes at various depths. In one of the lakes, it was found that dissolved oxygen levels in the water declined steeply below the depth of two metres because of algae which prevented sunlight from penetrating the water.

Source- <https://www.downtoearth.org.in/news/instant-quality-check-of-rivers-33502>

The third team would work on developing an aquatic autonomous observatory. This project is also led by IIT-Kanpur, but with Woods Hole Oceanographic Institution (WHOI). The team aims to design and develop low-cost, multi-parameter, water quality platforms with auto-sampling capabilities.

The system would measure parameters like dissolved oxygen, conductivity, temperature, nutrients, carbon-dioxide and select heavy metals. A novel energy harvesting system integrating solar panel, piezo electric system and micro wind turbine is envisaged.

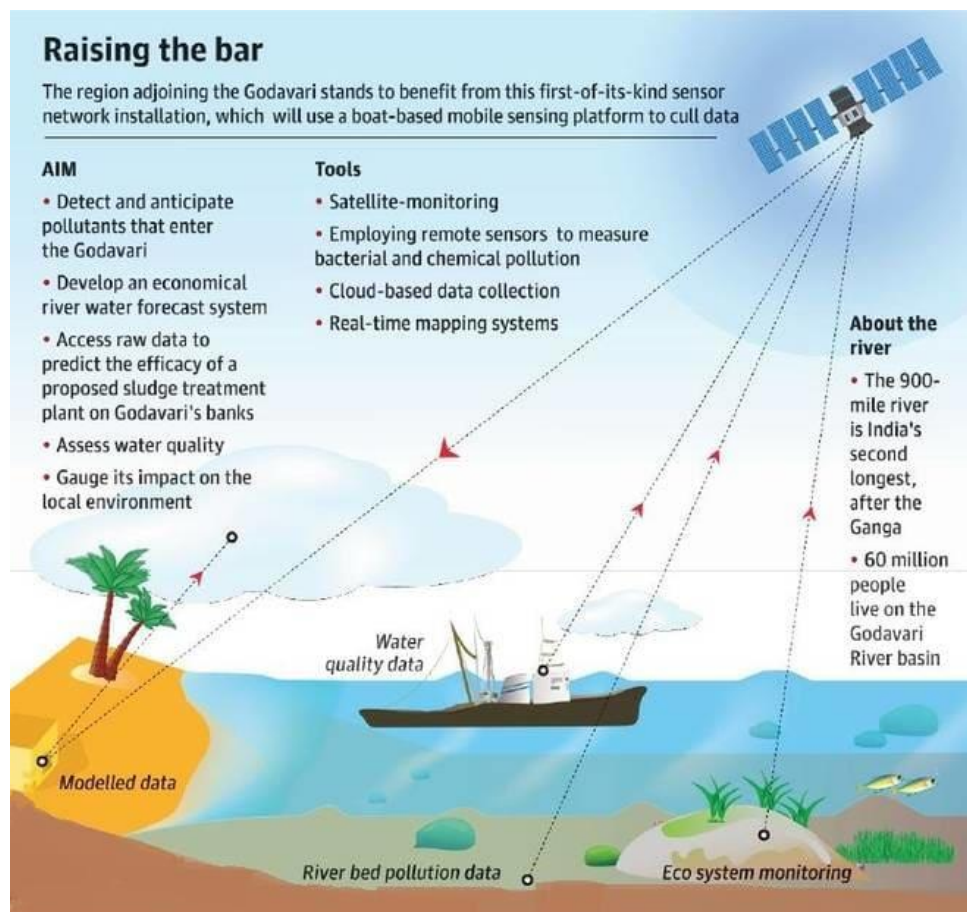
The fourth team would work towards developing sensors for real-time river water monitoring and decision making. The project is co-led by IIT-Delhi and University of California (UCR), Riverside, along with

other Indian and American partners. They would develop sensors for chemical oxygen demand, microbial indicators and water flow for determining water quality.

Source <https://www.downtoearth.org.in/news/new-projects-launched-for-real-time-monitoring-of-air-and-water-quality-59512>

C. Sensor network to map and predict pollution, effluents in Godavari

Source- <https://www.thehindu.com/news/national/the-project-started-eight-months-ago-and-has-so-far-identified-two-hotspots-of-pollution/article19259008.ece>



The Ganga may be the focus of the government's river-cleaning efforts, but a group of U.S. researchers is working on a system to map undulating pollution trends in the Godavari, India's second longest river. Using a mix of methods, including satellite-monitoring, traversing stretches of the river to collect water samples and using special sensors to measure bacterial and chemical pollution, the researchers are trying to develop a cost-effective forecast system.

Source- [Thoreau](#)



The Map of Varanasi Showing near real time data provided by the Thoreau Team

D. An Innovation to Help Swachh Bharat Abhiyan, Kerala Students Launch a Robotic Device to Monitor River Pollution

Source-<https://swachhindia.ndtv.com/innovation-help-swachh-bharat-abhiyan-kerala-students-launch-robotic-device-monitor-river-pollution-9650>



E. Water Quality Monitoring Buoys Protect the Housatonic River

Source- <https://www.ysi.com/ysi-blog/water-blogged-blog/2015/06/water-quality-monitoring-buoys-protect-the-housatonic-river>

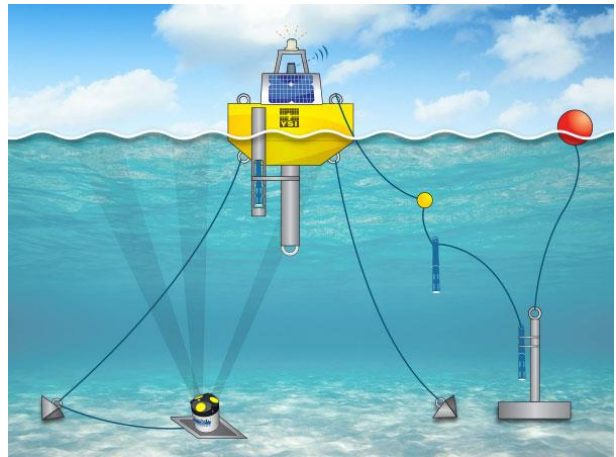


Figure 6: Water quality automatic monitoring system in Hanoi



Figure 7: Varanasi Downstream Floating

F. A very informative presentation on below link: -

<http://cdn.cseindia.org/userfiles/Regulatory-aspects-of-online-water-quality-mmonitoring.pdf>

G. UNESCO launches a pioneering tool to monitor water quality

The tool is accessible at the IIWQ World Water Quality Portal at <http://worldwaterquality.org/>

