IIIT HYDERABAD
Confluence: Industry-Academia Roundtable
Industry -Research Confluence Round Table on Water

27th June 2022

(A confluence session of industry leaders, technologists, innovators, and researchers to understand the use cases, problems, challenges, and the solution possibilities around Water)

Contents

1   Context

There is a plan to set up a COE at IIITH on water to find viable solutions to the problems faced regarding water quality, supply, and non-revenue water by the cities. As a preparatory step, a round table discussion was organised at IIIT-H on 27th June 2022 under the purview of Living lab, IIIT HYD bringing in perspectives from government, technology partners, academia, and start-ups to get a better understanding of how cities and technology players are responding to the problems and to enumerate the state of innovation and research on various aspects like Water Quality and Quantity Monitoring/metrics, Wastewater industrial/sewerage and rain-water management and etc. The key focus of discussion was in the following segments. 1) Water flow /loss measurements; leakage detection. 2) Water billing against water served & district metering areas: NRW/UFW. 3) Sewage treatment plants, functioning: quality / quantity measurements 4) Better services: water leakage detection, sewage overflows. Manholes leakage detection etc. Considering the same, the current position paper objective is to summarise the key points and way forward action plan.

2   Deliberations

Sri M Dana Kishore, IAS ,MD, HMWSSB elaborated various uses cases and cost effective innovation required for Water supply and Sewerage segment, during the meeting the following deliberations and action items were discussed

2.1   To recover from revenue loss – Tariffing to be automated and regularized

Across Hyderabad, NRW is roughly 34%, with a maximum of 55% in India. According to data, the cost incurred for 1000l manufacturing is 48 Rs, while the average pricing charged is 12 Rs per litre. As a result, appropriate tariffing is becoming increasingly important. Water department is contributing to ground water, therefore **ground water assessments and tariffs need to be charged accordingly** in Hyderabad like Bangalore, and other cities in India. Studies on NRW evaluation for each city, as well as cost-effective automation and data accessibility, to be implemented

Ultrasonic digital meters with WiFi, GSM and LoRa interface are presently available to measure the water flow, but it would be preferrable that all mechanical meters are retrofitted with a cost-effective device that can communicate via Lora wan technology and implemented using Machine learning and Deep learning techniques.

2.2   Water quality / STP parameter measurement -Drinking and Domestic Water-Major impact on health

TDS is an important criterion for measuring the quality of drinking water, whereas pH and turbidity are important in domestic water. Hence water quality measurements at various levels must be organised to guarantee that the diagnostics do not contaminate the water and are cost effective.

Sensors to be placed at certain vulnerable points to detect water quality parameters and effluent parameters of STPs and send real time data transmission.

2.3   Unnoticed leakages – Automated leakage detection system

Water management is primarily concerned with preventing water wastage. In general, water waste makes up around 50% of the supply. It is becoming increasingly difficult to manually monitor the identification of leaks and water loss as there might be several reasons for the wastage. Hence the automated leakage detection and water loss detection is the need of the hour.

2.4   Sewage control at source level -To be made Mandatory

According to the National Inventory of Sewage Treatment Plants-2021, there is a significant disparity between the quantity of sewage generated and that which is treated in the state. Technology to identify, monitor, and maintain sewer overflows at source level to be deployed. Sewage separation at the source level must be planned.

2.5   Sensor to regulate Valve operations

A sensor to detect water movement to be retrofitted to monitor valve operations and an SMS alert be sent to section manager. Mapping of CANs to respective valves should be done which enables consumer to get real time alerts on operations on water supply. A dashboard should be created to regulate supply cycles by the management and this real time data transmission should be obtained through LoRa.

2.6   Asset Tracking

Tracking of Water tankers and jetting vehicles via LoRaWAN technology.

2.7   Water real time monitoring and Preventive Maintenance – Need of the hour

To avoid water loss, wastage and misuse, real time monitoring is a must. Apart from water quality and flow monitoring, there are many other areas where lot of attention is needed. Refilling of mobile tankers need to be monitored as lot of water is getting wasted because one is unable to control the flow when the tanker is about to be full.

Cost effective technologies to be used to diagnose situational analysis of quality of Pipelines and rest of water infra to take the preventive action as necessary and save lots of money. For example, there are ball-type drones/ultrasonic sensors that can go through pipes and forecast issues as they go. Manjeera pipeline is nearing its lifetime, hence one needs to deploy something for observation and maintenance.

2.8   Sewerage Overflow

Without safety equipment, workers inside manholes are exposed to three dangerous environments conspiring together: chemical, biological, and legal. Manholes are brutal environments that can quickly translate a callous attitude, lack of emergency response protocols and the absence of basic safety equipment to death. The poisonous gases in the manholes, the people getting into the manholes and valve control need to monitor on real time basis to enable the governance to take the right decision based on the insights.

Sensors to detect level of Sewerage water within manholes and sensor to detect unauthorized opening of Manhole covers is required. An alarm is to be raised on reaching specific threshold level in the manhole. A dashboard should be created to regulate level of sewage water by the management and this real time data transmission should be obtained through LoRa.

2.9   Interference – To be addressed

There are around 120 LoRaWAN towers deployed in Hyderabad and 4nos of LoRa Towers are in Gachibowli area. Interference within LoRa network and GSM interference with Lora are the new upcoming problems which needs to be resolved to establish a reliable communication network across all the deployment.

2.10   Component availability- Becoming a challenge

India is unable to build cost effective sensors and sensors are getting imported. Because of the dependency involved, deployment of the sensors is getting difficult. Calibration of the sensors is also playing a critical role in some of the cost-effective deployments

3   Solutions Proposed

3.1   One Dashboard – To monitor the whole water network

A single solution can be established for instantaneous monitoring of the whole water network comprising the water-related problems like measurement, leakage, sewage, etc. and the water-related infrastructure including septic tanks, water meters, water tankers pipelines, etc. There should also be a docket level water measurement representation of inflow and outflow of water. And the data to make available to the user and the solution provider.

3.2   Authorized Manhole entry – Making it possible

Monitoring of poisonous gases in manholes to ensure the safety to the workers going into the manholes and tracking their movement to avoid unauthorized entry. CCTV network feed can be utilized to detect sewage overflow, manhole breakage, etc. using existing image processing techniques.

3.3   Some of the water/Sewage problems – Can be resolved at source level

Modular STP treatments can be planned at source level only. Strong aquatic systems can be used to aid in the removal of Indian sewage.

Rainwater harvesting can be used at individual house to contribute to the replenishment of water supply.

3.4   Make citizens accountable - Incentives/Penalties

Making the citizen aware and responsible for water consumption and sewage disposal plays a critical role. Sometimes incentivization plays a major rule on getting the plans implemented. Branding for each house based on the water saved and wasted and incentivizing/penalizing people accordingly makes the solution more impactful. Social media is a powerful tool in both propagating citizen awareness and policies on incentivization.

The existing apps can made to reach more people to update immediate issues regarding water infrastructure in their localities.

3.5   Digital Twin – Accurate and reliable data for better insight and maintenance

The need to handle increasing amounts of data while improving capital and operational efficiencies has directed the attention of the water sector towards advanced digital tools such as operational digital twins.

A digital twin is a virtual representation of a physical asset, process, or system. It can be seen as combinations of models and real-time data that provide a digital representation of a specific part of the water system's behavior. Hence entire distribution network can be simulated and a system for monitoring this network can be established. So that many issues can be solved and a lot a visibility can be built in the water board.

The creation of a water system's digital twin involves integrating virtual engineering models with city-scale reality models and GIS data. Additionally, digital twins are continuously updated with virtual operational data from sensors, meters, and other measured sources—creating a real-time model that can be used in operations. The result is an intelligent and connected digital infrastructure model that supports planning, design, construction, and operations for smart water networks.

3.6   An area to be adopted for a pilot run– Solutions to address the water and sewage related problems

Block level planning to demonstrate a pilot to be made to implement solutions addressing the concerns of water quality, supply and conservation, urban flooding, and sewerage/sewage. Focus should be given on Lake centric areas.

A water challenge to be run to enlist and publish the various service providers working in those areas.

4   Action Points

- ❖ Establishment of COE with the think tank team of IIIT H
    - ▪ For review of the proposals received from the various vendors
    - ▪ To conduct a workshop with the aspirants, startups to be conducted in coordination with the IIIT Hyderabad.
    - ▪ Run a challenge specific to the solutions in the areas of Water/Sewerage/Sewage to enlist and publish the various service providers working in those areas
        - • Retrofitting of Mechanical meters with cost-effective solutions
        - • Sensor to regulate Valve operations for water supply
        - • Sewerage Overflow
        - • Asset Tracking
        - • Water Quality / STP Parameters Monitoring
        - • Pipeline Leakage
    - ▪ Case studies on the various problem areas identified in the discussion
    - ▪ Deployment of existing solutions developed by smart city living lab/CIE from IIITH
- ❖ POC should be conducted at Serilingampally area initially for deployment of nodes and dashboard to address the problems related to Water and Sewage and will be expanded to entire city based on the results.
    - ▪ Area selected should be lake centric
    - ▪ Block level planning to demonstrate a pilot to be made
    - ▪ Solutions should address the concerns of water quality, supply and conservation, urban flooding, and sewerage/sewage. Focus should be given on Lake centric areas.
    - ▪ Production should be indigenous, economical, and scalable to industry level.
    - ▪ LORA Network is the preference for communicating the information from the sensors to the Central Server application.
- ❖ Proposal on NRW assessment for a city to be made.
- ❖ Deployment of Retrofit meters in the surrounding area of Gachhibowli as a pilot run.

5   Participants in the panel

Chaired by Sri M Dana Kishore, IAS-Managing Director, HMWSSB
(Moderator: Mr. Murali Talasila. Facilitators: Prof Ramesh Loganathan, Mrs Anuradha Vattem)

Panellists

- ▪ Government: Mr. V.L. Praveen Kumar – Director, HMWSSB and Team
- ▪ Policy: Mr. Amir Ullah Khan -Research Director, Centre for Development Policy, and Practice; Mr. Yalla Prakash – Product Lab, IIIT Hyderabad
- ▪ Startups: Mr. Haritash - Gigagrowth Ventures, Mr. Vikram Gulechha – Oceo Water, Mr. Vinay - Kritsnam Technologies, Mr. Prabhu Chaitanya Gundra – GlobalM, Mr. Ram Ganesh - Cyber Eye
- ▪ IIITH Faculty/Researchers: Prof Aftab Hussain; Prof Syed Azeemuddin; Prof Sachin Chaudhary; Prof Suresh Purini from IIITH
- ▪ Tech Companies: Mr.Krishna, GMR; Mr. Vasudev – GS
- ▪ NGO: Kalpana Ramesh, Founder Rainwater Project, Mr. Ramchandra, WASSAN

6 Snapshots