Real-Time Water Quality Monitoring System

Technical Brief

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Technology Summary

The Real-Time Water Quality Monitoring System is an IoT-based sensor system for 24x7 monitoring of irrigation and drinking water quality. It measures parameters like pH, TDS, turbidity, temperature, conductivity, and heavy metals, providing mobile alerts and cloud integration. The technology is at a Technology Readiness Level of 8–9 (Field-tested, deployable).

Background

The fundamental challenge driving this technology is the escalating difficulty in ensuring access to safe and clean water, a problem intensified by increasing urbanization, industrial pollution, and overall water scarcity. The background problem is compounded by the severe limitations of traditional water testing methods. These conventional approaches are predominantly manual, resource-intensive, and infrequent. This results in a lack of real-time visibility into water quality, leading to critical delays in detecting contamination events, creating gaps in regulatory enforcement, and posing significant risks to both public health and the environment.

Technology Description

The IQUA system is an advanced, field-tested (Technology Readiness Level 8-9) solution for 24/7, real-time water quality monitoring. It is a modular, IoT-based system built with a suite of robust sensors to track a wide range of critical parameters, including pH, Total Dissolved Solids (TDS), turbidity, Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), and chlorine. Engineered for durability and autonomy, the system features self-cleaning, waterproof (IP68) sensors and is powered by a low-power (12V DC) design, making it ideal for solar-powered deployment in remote locations with minimal maintenance.

Market Potential / Proposed Deployment

- Global Market: The global market was valued between USD 5.67 billion and USD 6.18 billion in 2024. It is projected to expand significantly, with forecasts predicting it could reach over USD 12 billion by 2030, driven by a strong Compound Annual Growth Rate (CAGR) of up to 12.3%.
- Indian Market: In India, the market was valued at USD 224.0 million in 2023 and is expanding rapidly. It is projected to grow at a CAGR of 10.9% through 2030, fueled by national initiatives like the Jal Jeevan Mission and stricter industrial compliance rules.

Applications

- Agriculture: Prevents soil degradation and crop loss from poor water quality, ensures safe water use in irrigation and livestock, and promotes data-driven water governance in rural areas.
- Municipal Water: Ensures safe distribution & compliance with regulations.
- Industry: Useful for process water control in dairy, textile, and chemical industries.
- Aquaculture: Leads to improved fish health & productivity.

- Environment: Can be used for river and lake monitoring to track pollution.
- Wastewater/STPs: Helps in maintaining compliance with discharge norms.
- Healthcare/Labs: Ensures the availability of sterile, contamination-free water.

Value Proposition

- Portable and solar-powered, requiring minimal maintenance.
- Provides real-time alerts and AI-based analytics via mobile/web dashboards.
- Features self-cleaning, waterproof (IP68) sensors.
- Built on a modular, low-power (12V DC), and scalable design.
- Suitable for both farm and community water sources.

Technology Status

The system is at a Technology Readiness Level (TRL) of 8–9, indicating it is field-tested and ready for deployment.