



**M.KUMARASAMY**  
COLLEGE OF ENGINEERING

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Thalavapalayam, Karur, Tamilnadu.



# **DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS**

FIRST REVIEW - BATCH

SMART FIRST-FLUSH  
CONTAMINATION ALERT SYSTEM FOR  
INTERMITTENT MUNICIPAL WATER  
SUPPLY



**Problem Statement:** In many areas, people remain unaware when municipal water arrives, often missing or collecting unsafe first flush. A smart alert system is needed to notify households instantly and ensure safe water storage.

**Objectives:** To develop a smart first-flush contamination alert system using flow, turbidity, and conductivity sensors with an ESP32 microcontroller to detect water arrival and quality.

**Theme:** Empowering Households with IoT: Smart Alerts for Safe and Efficient Water Storage

**Type:** Hardware & Software

**Team Name:** Hydrosentry

**Innovators Guided By:** Ms.M.SHOBANA

**Team Members:** RAKSHITHA P  
MAITHILI RG  
SRIDEVI S  
SUBHIKSHA S

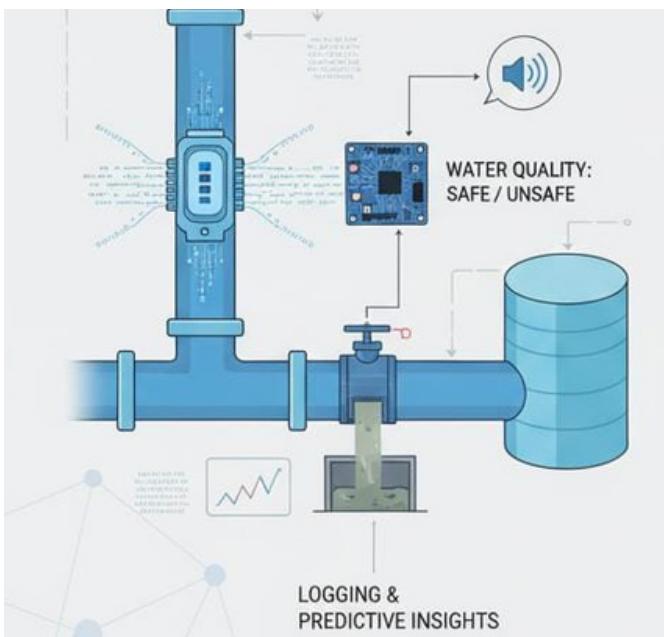
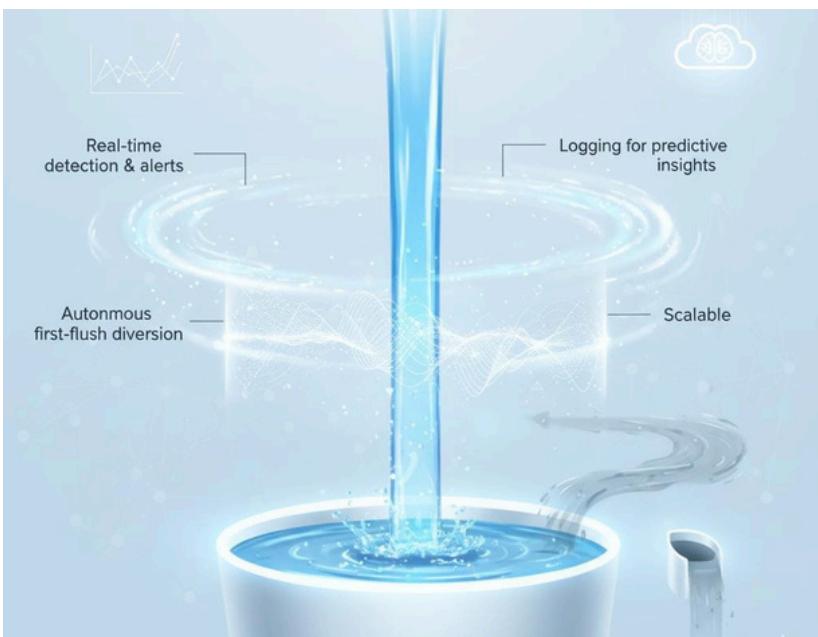
# ABSTRACT

- The Smart First-Flush Contamination Alert System helps households and communities manage intermittent municipal water supply by detecting and preventing unsafe first-flush water from entering storage tanks. It uses a flow/pressure sensor to detect water arrival and turbidity and conductivity (TDS) sensors to monitor quality. The ESP32 microcontroller processes this data, classifies water as safe or unsafe, and triggers LEDs, buzzer alerts, and voice messages. An optional motorized valve diverts contaminated water until it is safe.
- The system is low-cost, reliable, and scalable, running on a 12V adapter with battery backup and optional solar support. It logs supply timings and contamination patterns for predictive insights. With easy installation for homes, apartments, and community points, it ensures safe water storage, reduces health risks, prevents wastage, and promotes trust in municipal water supply.

# IDEA & SOLUTION

## IDEA AND SOLUTION

The Smart First-Flush Contamination Alert System detects water arrival and monitors quality using flow, turbidity, and conductivity sensors. An ESP32 microcontroller classifies water as safe or unsafe, triggering LEDs, buzzer, and voice alerts. An optional motorized valve diverts unsafe water, and the system logs supply timings and contamination patterns for predictive insights.



## UNIQUENESS AND INNOVATION

Real-time detection & alerts – Sensors and ESP32 classify water quality and notify users via LED, buzzer, and voice instantly.

Autonomous first-flush diversion – Optional motorized valve prevents unsafe water from entering storage tanks.

Scalable & low-cost design – Plug-and-play system with logging for predictive insights, suitable for homes, apartments, and community points.

# TECHNICAL APPROACH

- **Flow/Pressure Sensor:** Detects water arrival and activates the system.
- **Turbidity Sensor:** Measures cloudiness and sediments to identify first-flush contamination.
- **Conductivity (TDS) Sensor:** Detects dissolved contaminants and sewage intrusion.
- **ESP32 Microcontroller:** Processes sensor data, controls alerts, and operates motorized valve.
- **Alert Units (LED, Buzzer, Voice):** Provides real-time notifications of safe/unsafe water.



ESP32 Microcontroller:



Turbidity sensor

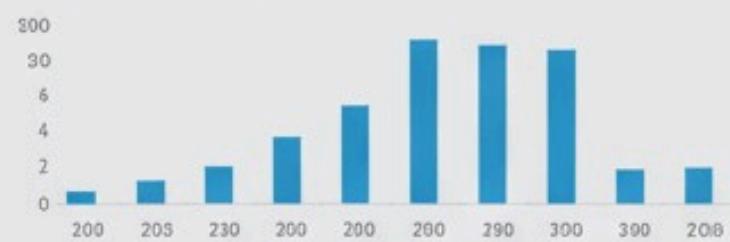


Conductivity (TDS) Sensor

## Water Supply Log

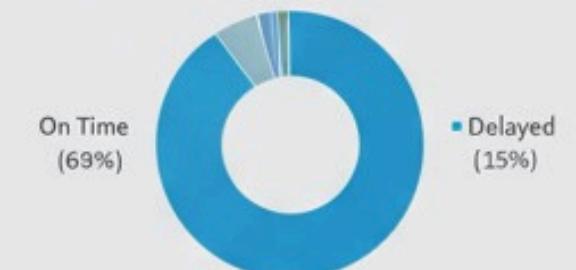
Date/Time	Start Time	Safe Time	Status
04/10/24	06:15	5m	Contaminated
04/10/24	06:20		Contaminated
04/10/24	06:20	5m	
04/08/24	05:81	1m	Clean
04/06/24	05:40		Clean

## Contamination Duration Trend

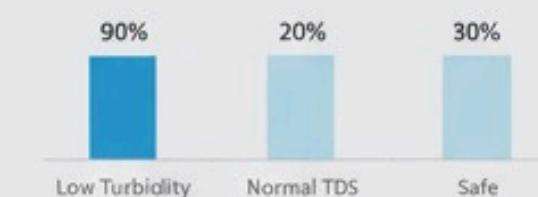


## Community Supply Insights

### Monthly Supply Trend



### Water Quality Index



UNDERSTAND YOUR WATER, IMPROVE COMMUNITY HEALTH

- **Motorized Valve (Optional):** Diverts unsafe first-flush water automatically.
- **Data Logging Module:** Records supply timings and contamination patterns for analysis.
- **Power Supply:** 12V adapter with battery backup, optional solar support.
- **System Logic & Algorithms:** Classifies water safety and controls alerts and valve automatically.

# FEASIBILITY AND VIABILITY

## FEASIBILITY

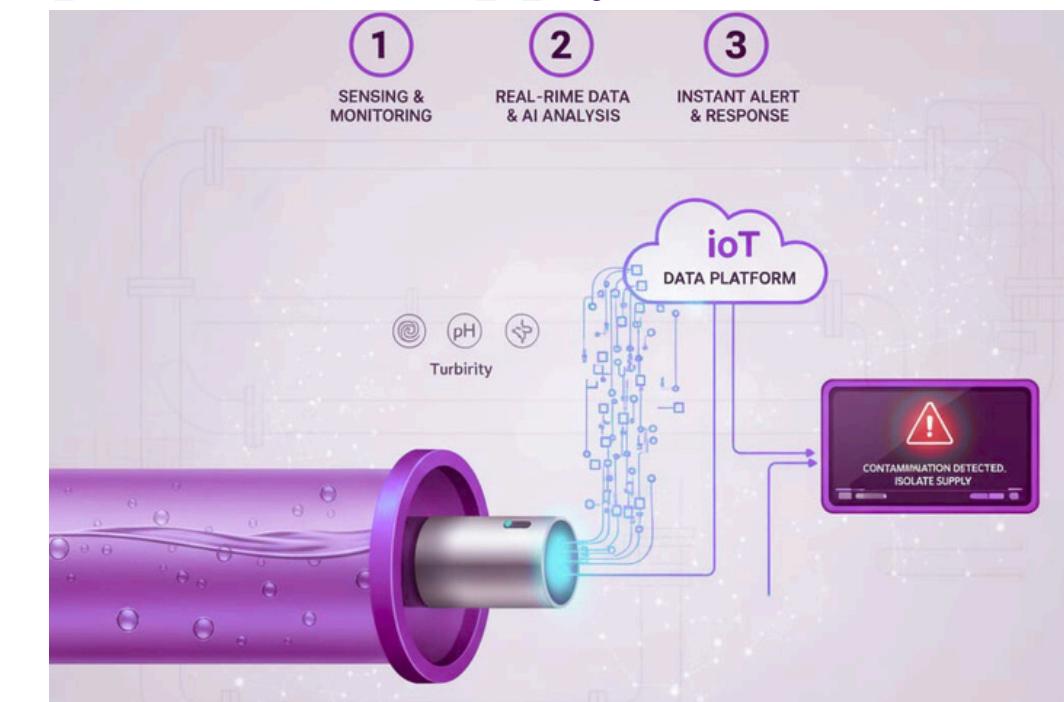
**Technical Feasibility:** Uses readily available sensors (flow, turbidity, conductivity) and ESP32 microcontroller for automated water quality monitoring.

**Operational Feasibility:** Minimal maintenance required; real-time alerts reduce manual monitoring and ensure reliable performance.

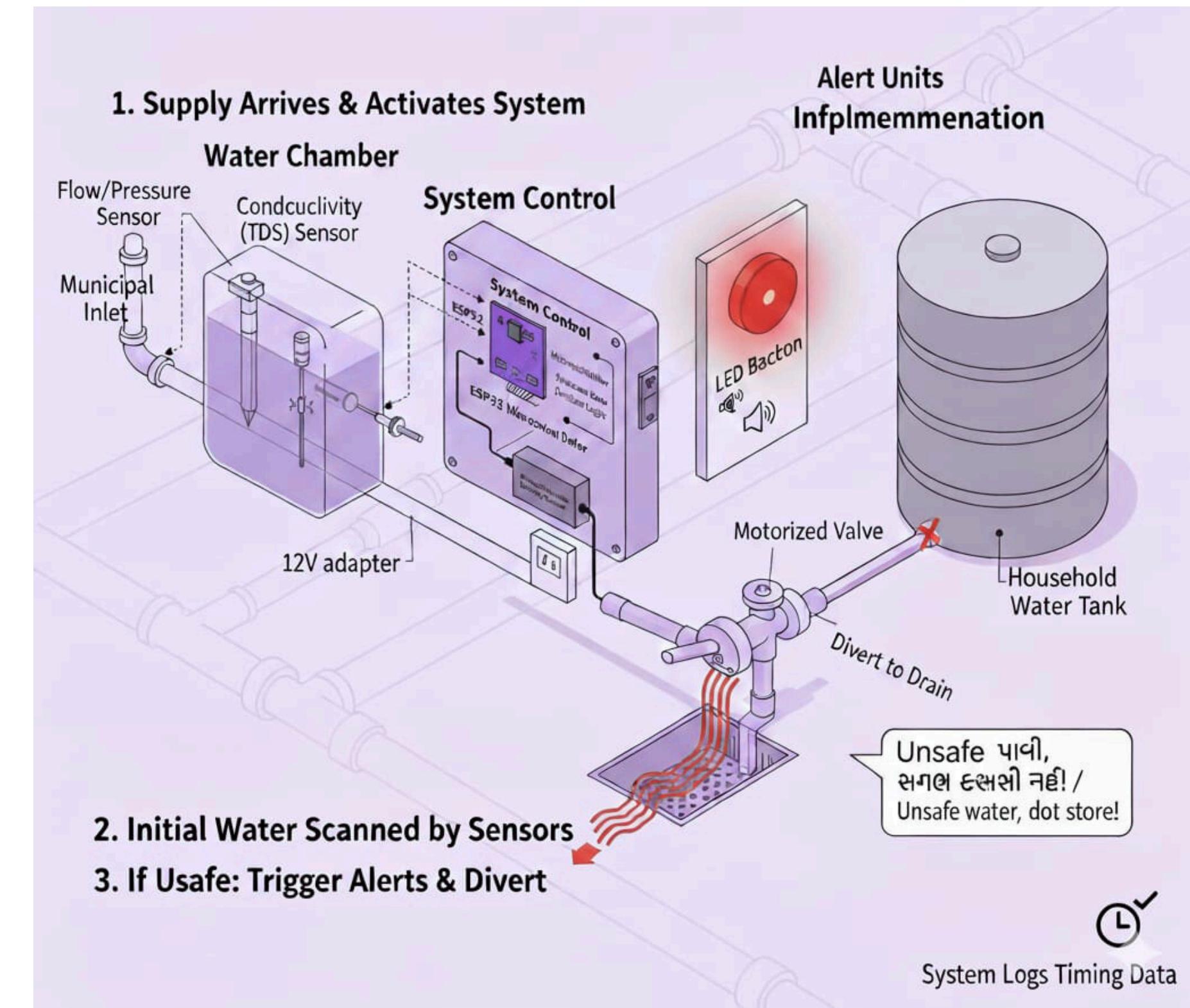
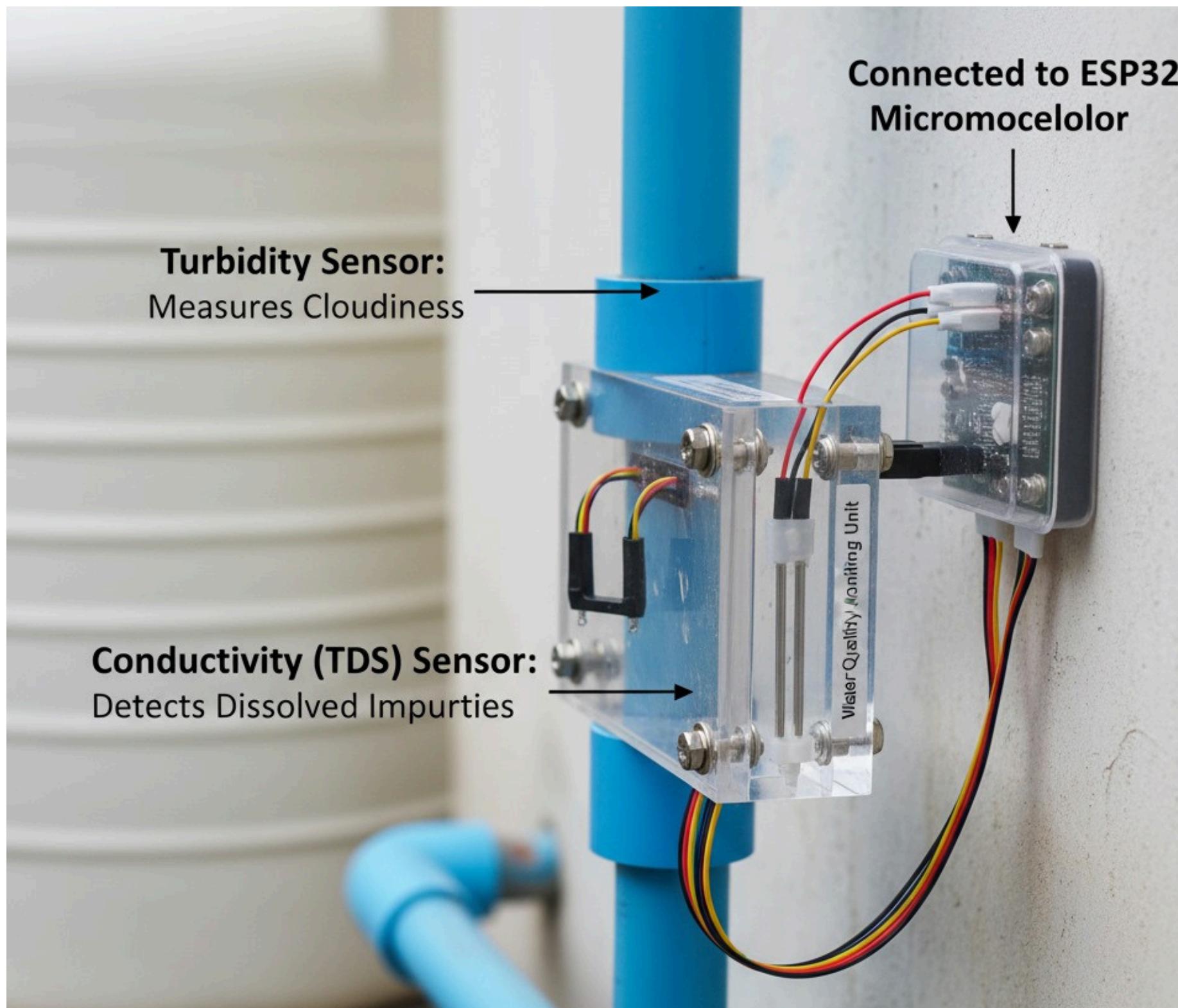
**Social Feasibility:** Promotes safe water practices, supports public health, and is easily adoptable by households and communities.

## VIABILITY

The Smart First-Flush Contamination Alert System is viable due to its modular and scalable design for homes, apartments, and community points. It provides reliable operation with sensors and microcontroller logic, battery backup, and real-time alerts, reducing water wastage and health risks while improving trust in municipal water supply.



# MODEL



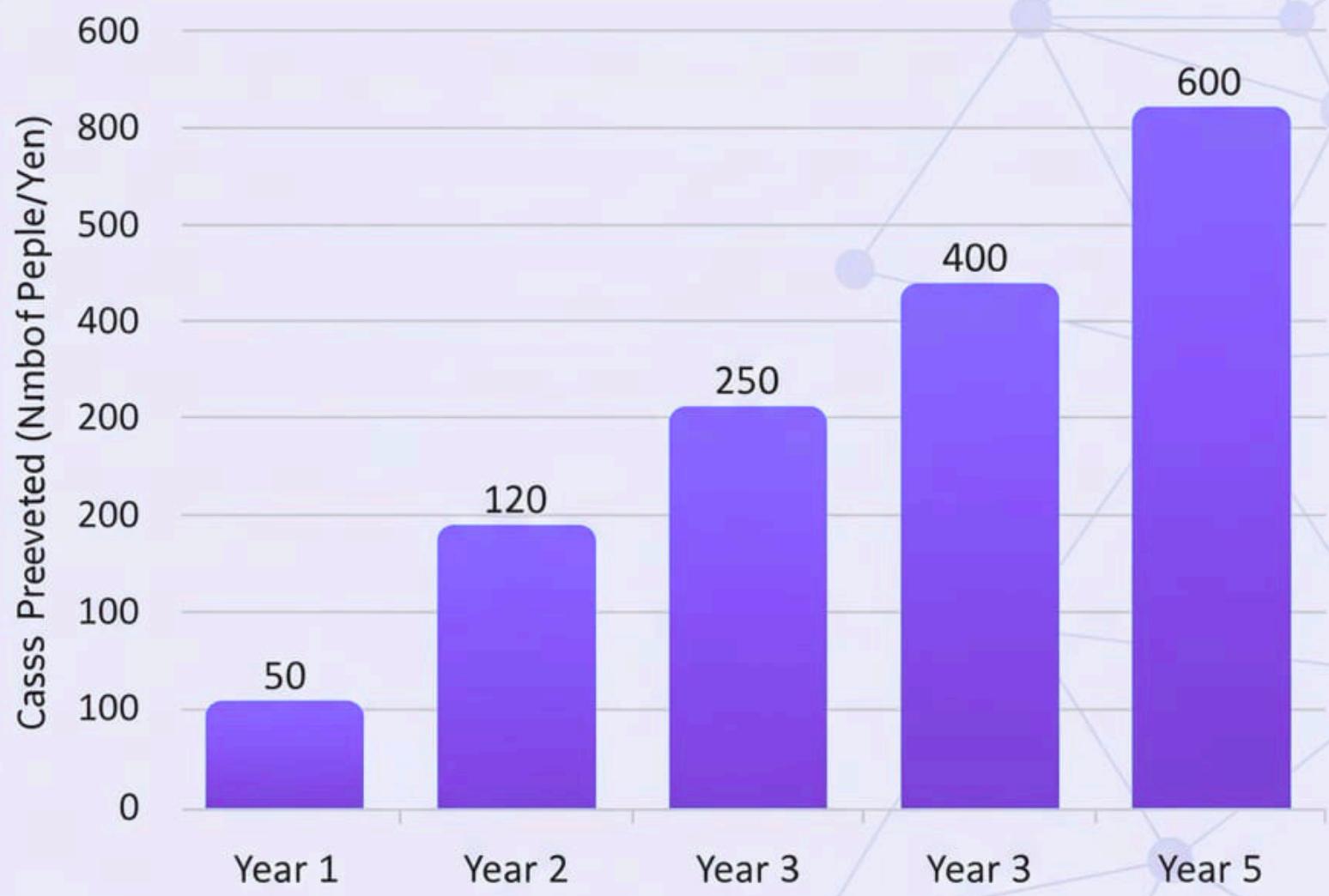
# IMPACT AND BENEFITS

## IMPACT



### IMPACT ON PUBLIC HEALTH: WATERBORNE DISEASE CASES PREVENTED

Smart First-Flush Contamination Alert System



## IDEATION AND BENEFITS

Instant Alerts: LED, buzzer, and voice notifications inform users immediately about safe/unsafe water.

Real-Time Quality Monitoring: Turbidity and conductivity sensors ensure first-flush water safety.

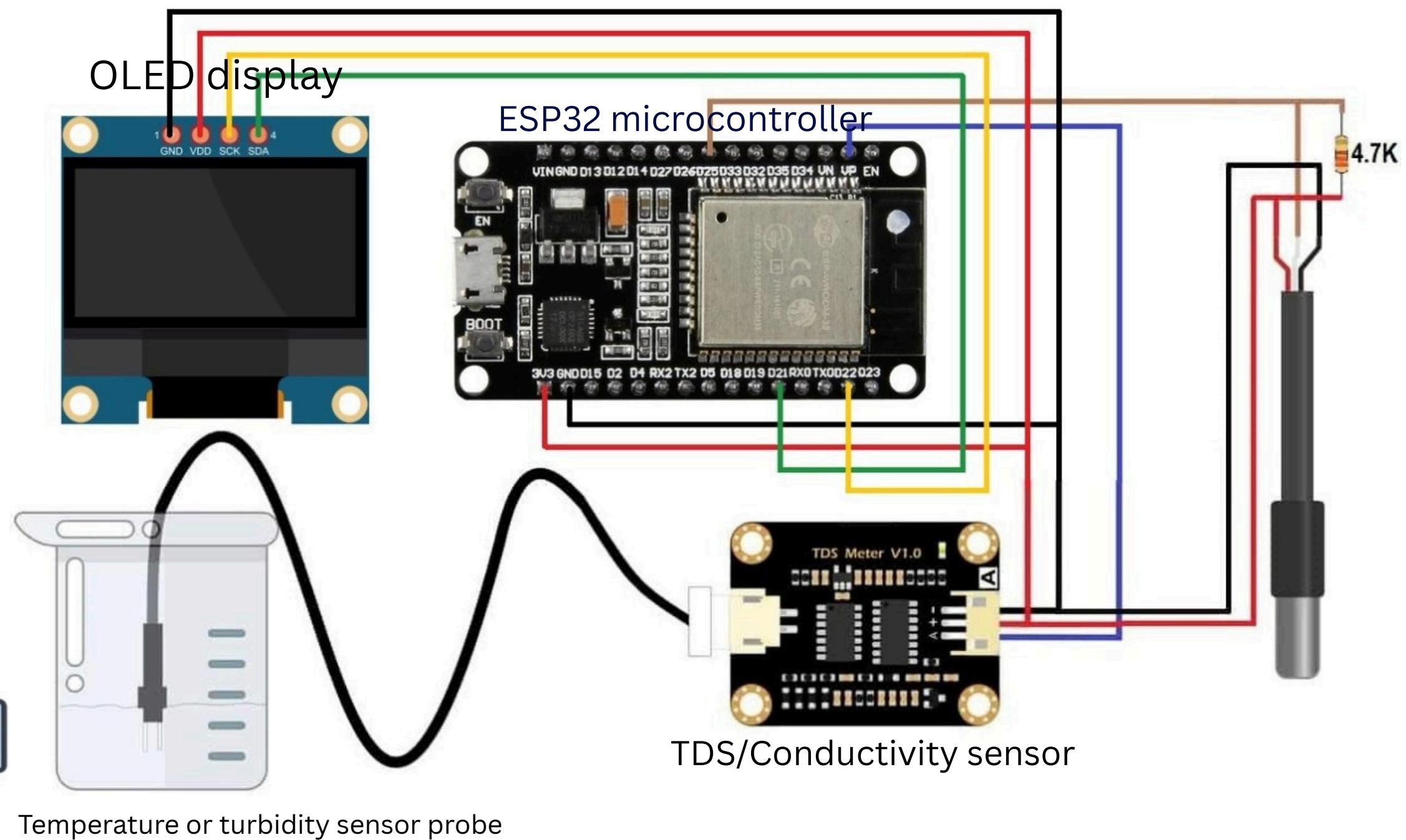
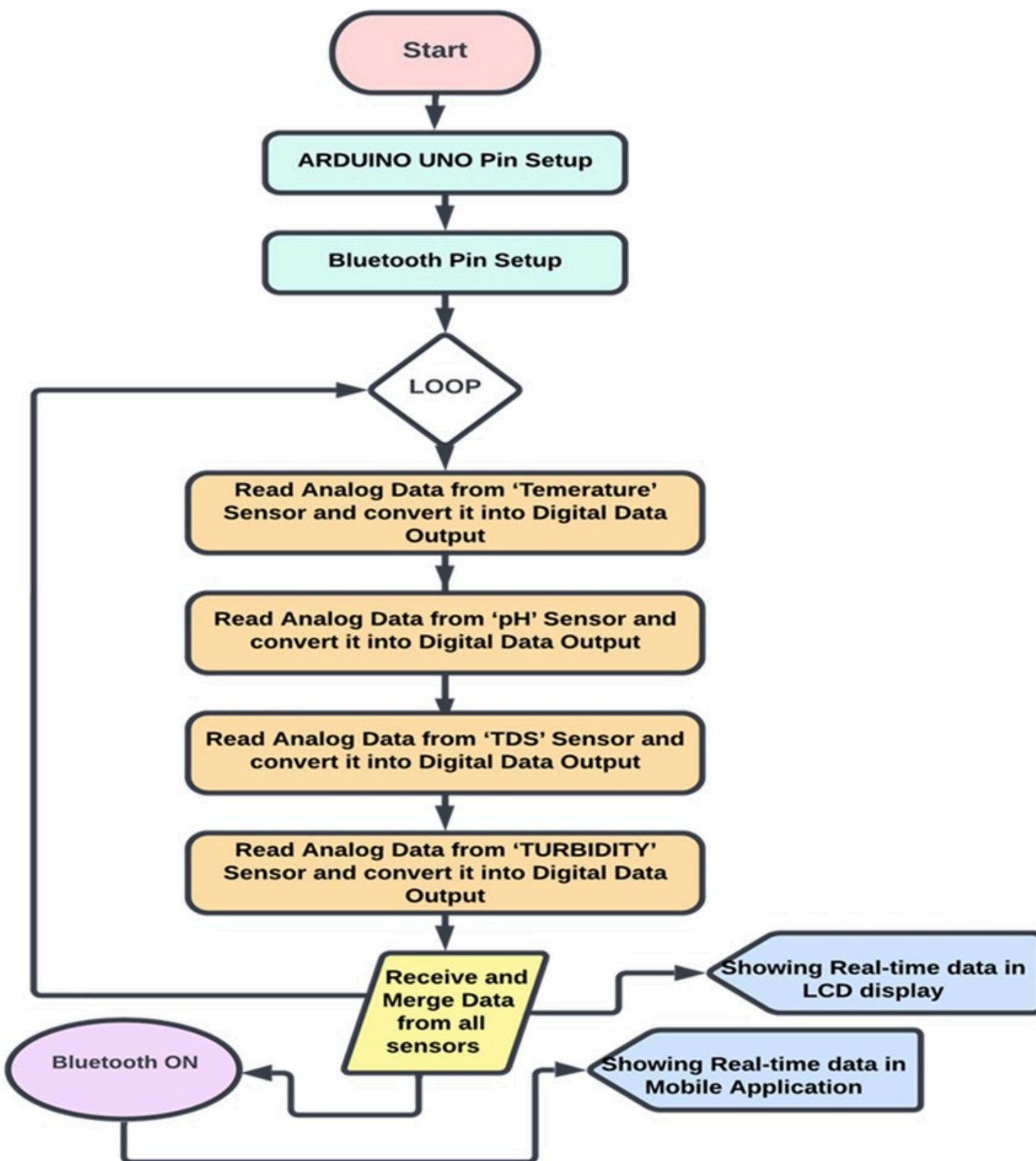
Data Logging & Community Awareness: Records supply timings and contamination patterns for predictive analysis and better water management.



Automatic Water Detection: Flow sensor triggers the system as soon as municipal water arrives.

Autonomous First-Flush Diversion: Optional motorized valve diverts contaminated water, preventing health risks.

# WORKFLOW



# RESOURCE AND REFERENCES

Category	Item/Task	Estimated Cost (₹)
<b>Components</b>	Flow/Pressure Sensor	300
	Turbidity Sensor	500
	Conductivity (TDS) Sensor	400
	ESP32 Microcontroller	600
	LED, Buzzer, Voice Module	200–300
	Optional Motorized Valve	200
	<b>Subtotal (Components)</b>	2,000–2,200
<b>Implementation &amp; Integration</b>	Installation, wiring, calibration, programming	800–1,300
<b>Grand Total</b>		3,000–3,500

**Existing Water Quality Monitoring Systems:** Current IoT-based systems track TDS, pH, and turbidity in municipal pipelines, providing a foundation for sensor integration but are mostly app-dependent and costly.

**Smart First-Flush Contamination Alert System:** Integrates flow, turbidity, and conductivity sensors with an ESP32 microcontroller, enabling real-time detection of unsafe first-flush water. LED, buzzer, and voice alerts notify households instantly, and an optional motorized valve diverts unsafe water autonomously. Cost per unit: ₹3,000–3,500.

**References:** BIS Water Quality Standards (IS 10500:2012); research papers on IoT-based smart water monitoring; studies on intermittent municipal water supply and first-flush contamination; ESP32 microcontroller documentation from Espressif Systems.

**THANK YOU**