



আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম  
الجامعة الإسلامية العالمية شيتاغونغ  
International Islamic University Chittagong

## *PROJECT REPORT*

*TOPIC: AI-Integrated Water Quality and Crisis Management System*

COURSE TITLE: Tools and Technologies for Internet Programming

COURSE CODE : CSE-3532

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## Project Title: *AI-Integrated Water Quality and Crisis Management System*

### 1. Introduction:

*Access to clean and safe water is a growing concern due to pollution, overuse, and climate-induced water shortages. This project addresses the need for an intelligent system to monitor water quality in real-time, predict potential crises, and guide users with effective recommendations.*

### 2. Objective:

*To design a web-based application that:*

- 1. Continuously monitors water quality metrics using sensors and data inputs.*
- 2. Predicts crises such as water contamination and shortages using AI.*
- 3. Offers guidance and regional insights through interactive tools and dashboards.*

### 3. Project Description:

*The AI-Integrated Water Quality and Crisis Management System is a modern web application that brings together real-time monitoring and predictive analytics to address key challenges in water management. By combining sensor data with advanced AI models, the system provides early warnings, actionable insights, and visual analytics to households, industries, and policymakers.*

### 4. Key Features:

#### 1. Real-Time Water Quality Monitoring

- Tracks essential metrics like pH, turbidity, and contaminant levels.*
- Displays trends and detects anomalies using data collected from sensors and sources.*

## 2. Predictive Crisis Alerts

- *Uses AI to forecast water shortages, contamination risks, and availability issues.*
- *Sends real-time notifications and provides recommendations for immediate action.*

## 3. Regional and Historical Insights

- *Visualizes long-term water quality trends and regional patterns.*
- *Shows high-risk areas using an interactive map with predictive overlays.*

## 4. AI-Driven Recommendations

- *Suggests purification methods for contaminated sources.*
- *Provides conservation tips during crises or drought scenarios.*

## 5. Technical Architecture:

Frontend: *Developed Using React.js*

- *Dashboard:*
  - *Displays water quality metrics, crisis alerts, and regional insights.*
  - *Clean and responsive UI for users to interact with real-time data.*
- *Map Visualization:*
  - *Built using Leaflet.js or Mapbox for visualizing high-risk zones and crisis likelihood.*
  - *Highlights trends across regions based on sensor input and predictive models.*
- *Charting Tools:*
  - *Implemented using Chart.js or Recharts for graphing trends over time.*
- *Styling:*

*Utilizes Tailwind CSS for responsive, consistent, and modern design.*

Frontend: React, Vite, Tailwind CSS, shadcn/ui

State Management & Data Fetching: Redux Toolkit Query (@reduxjs/toolkit/query)

Charts: Recharts

Regression: regression.js

Backend : Static controllers serving JSON at `http://localhost:1338`

- Database:
  - MongoDB for storing:
    - Sensor readings
    - Historical water quality records
    - User settings and alerts

## 6. Data Sources:

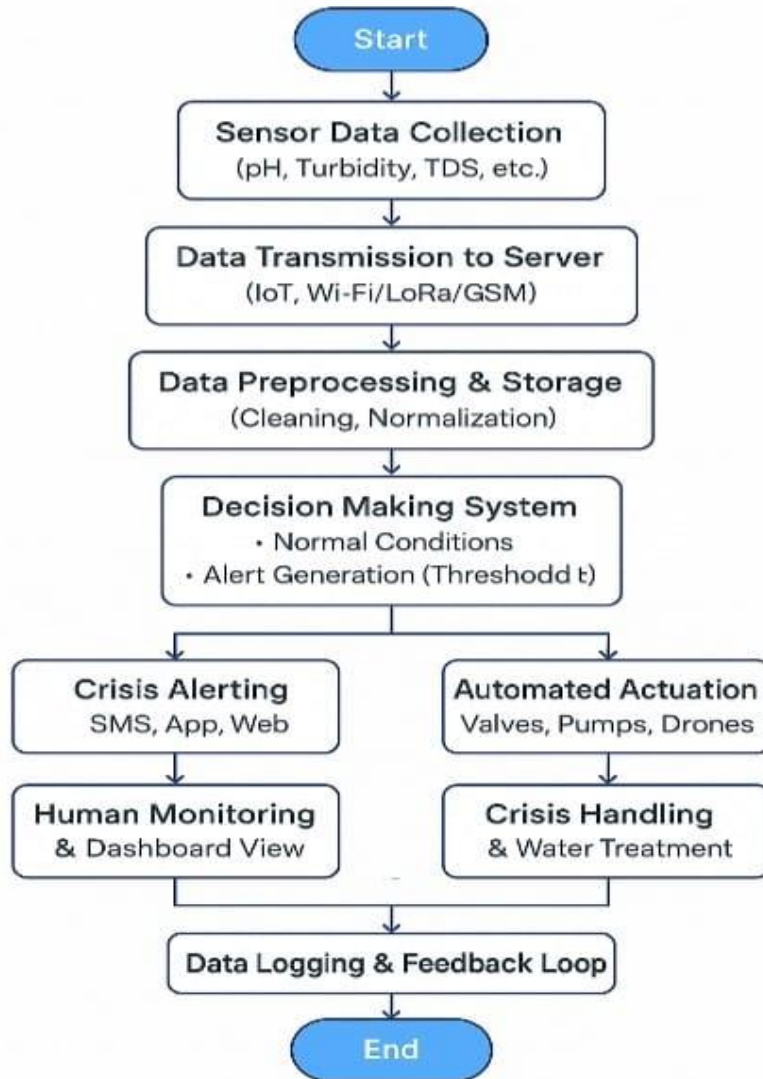
- IoT Sensors:
  - Real-time data such as pH level, turbidity, and temperature.
  - Optionally simulated using JSON datasets for development.
- External APIs: Weather and environmental data fetched from APIs (e.g., OpenWeather, Gov. Water Boards).

## 7. Key Benefits

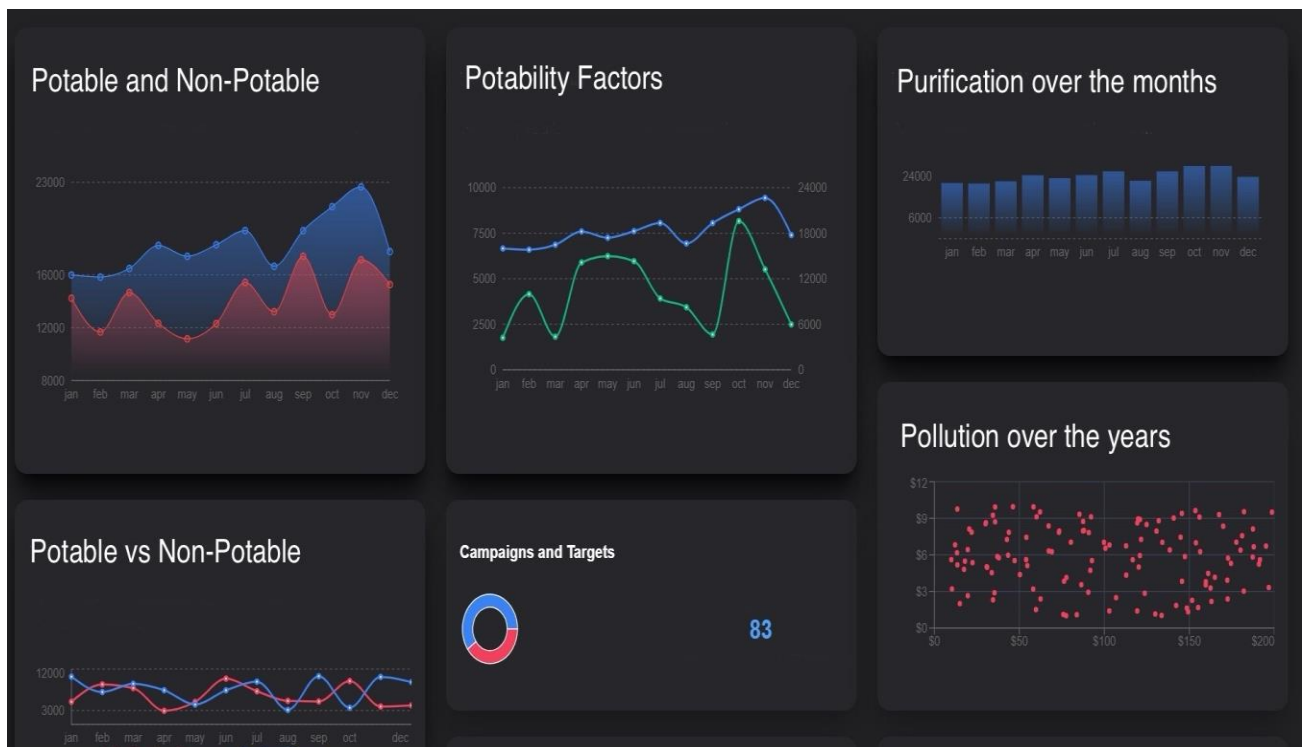
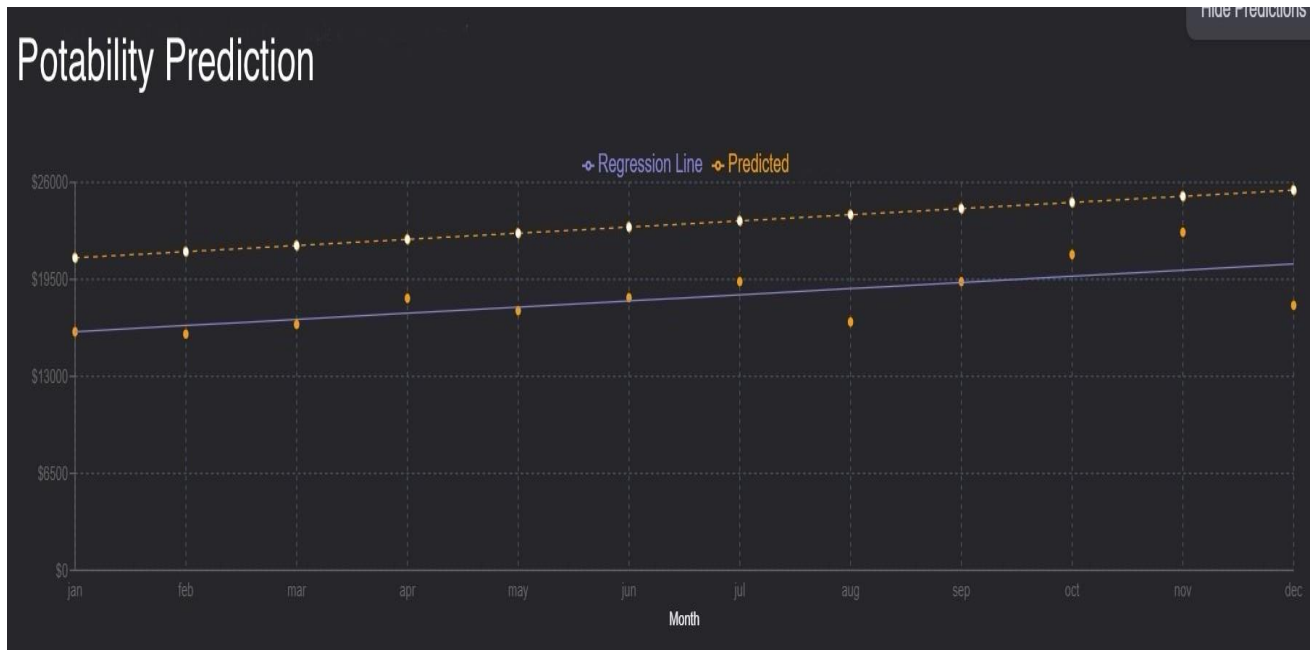
- 1.. Early Detection and Crisis Prevention
2. Improved Water Resource Management
3. Data-Driven Decision Making
4. Public Health and Safety.
5. Scalability and Accessibility
6. Environmental Protection

8.Flowchart:

### AI-Integrated Water Quality and Crisis Management System



## 9.OUTPUT:



## 10. Conclusion:

*This project bridges modern AI technology with real-world environmental monitoring. The AI-Integrated Water Quality and Crisis Management System:*

- *Enables early detection of water-related crises.*
- *Supports data-driven decisions.*
- *Offers an accessible platform to ensure water safety, especially in vulnerable regions.*

*By leveraging modern web development and AI techniques, this system offers a comprehensive tool for communities, governments, and industries to proactively manage water resources.*

## 11.Future Enhancements:

- *Integration with mobile apps for wider accessibility.*
- *Use of real-time satellite data for deeper environmental analysis.*
- *Addition of automated alert systems (SMS/email) for faster community response.*