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Survey on Crowd Sourced Collaborative Water Problem Mapping

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ABSTRACT: Water scarcity, pollution, flooding, and uneven distribution are major global challenges, impacting communities, ecosystems, and economies alike. In response, the Crowdsourced Collaborative Water Problem Mapping project leverages the collective knowledge of communities to create an accessible platform for reporting and visualizing water-related issues in real time. This platform allows individuals, local communities, researchers, and policymakers to contribute data on water challenges, from polluted sources to areas at risk of flooding, building a comprehensive and localized view of these issues. The platform features an interactive public map where users can view and analyze the reported data, encouraging transparency and collaboration. This user-generated data can inform local authorities, NGOs, and researchers, who may use it to guide targeted interventions, allocate resources more effectively, and develop sustainable strategies. By empowering communities to take an active role in water resource management, this project fosters a collaborative approach to addressing water challenges, ensuring a healthier environment and more sustainable future.

KEYWORDS: Crowdsourcing, Water Issues, Collaborative Mapping, Real-Time Data, Public Health, Community Engagement.

I. INTRODUCTION

Water is one of the most essential resources on the planet, yet communities worldwide continue to face numerous water-related challenges, including scarcity, contamination, inefficient distribution, and flooding. Addressing these complex problems requires comprehensive and collaborative efforts that harness both local knowledge and advanced technology. The project —CROWD SOURCED COLLABORATIVE WATER PROBLEM MAPPING# aims to tackle these issues by developing a platform that allows individuals and communities to collectively report and map water problems in real-time. By leveraging crowdsourcing, geospatial technologies, and mobile applications, the system encourages users to contribute data related to water issues, such as polluted water sources, waterlogging, or areas prone to flooding. This user-generated content is then analyzed and visualized on an interactive map, providing critical insights into problem hotspots. The ability to capture localized water issues from diverse geographical locations can help government agencies, NGOs, and environmental groups to better allocate resources and prioritize solutions.

By empowering individuals to participate in the identification of local water issues, the platform provides a comprehensive, up-to-date view of global water challenges. This crowdsourced information, coupled with advanced geospatial analysis and machine learning, enhances the ability to detect, visualize, and respond to water-related problems, paving the way for more sustainable water resource management practices globally.

II. LITERATURE SURVEY

[1] This study tackles the challenges of traditional water quality assessments, which can be slow and require extensive manual effort. To make monitoring more efficient, it introduces a mobile application that simplifies data collection and interpretation. By incorporating Google Earth Engine, the app enables large-scale satellite image analysis, processing vast amounts of data quickly to visualize water quality across regions. The research proceeds in two phases: first,

Geographic Information System (GIS) techniques are applied to gather baseline water quality data from satellite images; next, Machine Learning algorithms conduct a more in-depth analysis to identify patterns and trends. The final product is a user-friendly mobile application that provides communities with real-time water quality information, promoting public awareness and helping to reduce waterborne health risks.

[2] This paper highlights the critical role that inland water bodies (IWBs)—including lakes, ponds, and wetlands—play in providing essential ecosystem services like water storage, irrigation support, flood control, and groundwater replenishment. With growing urbanization and population pressures contributing to the degradation of these water resources, the study focuses on accurately mapping and estimating the water volume of IWBs in Tamil Nadu's Madurai district. Using a combination of machine learning techniques and linear regression, the researchers analyzed 431 multispectral images from Sentinel-2 satellites, captured over three years (2019–2021) 3] This paper provides an overview of Geographic Information Systems (GIS), detailing their core components—hardware, software, and data—and their role in managing, analysing, and visualizing geographical information. GIS offers a flexible platform that allows users to interpret complex spatial data through visualization, patterns, and trends, which can then be shared and integrated into enterprise systems.

III. METHODOLOGY

The methodology for the Crowd-Sourced Collaborative Water Problem Mapping project begins with defining core requirements and designing essential features like user authentication, interactive mapping, and report submission. An intuitive user interface is planned to simplify the reporting process. Using React.js, the frontend will be developed as a dynamic, responsive interface, integrating Google Maps API to allow users to search locations and submit water issue reports seamlessly. The backend will be built with Node.js and Express.js, using MongoDB to store user and report data. This setup supports report submission, user management, and efficient data retrieval. For security, JWT -based authentication will be implemented, with role-based permissions to ensure only authorized users can mark issues as resolved. A voting system will allow users to upvote high-priority issues, which, once reaching a threshold, are flagged for review by authorities. Additionally, email notifications will alert authorities to high-priority reports. The project will undergo rigorous testing, including unit and acceptance testing, to ensure compatibility across devices. Finally, the frontend and backend will be deployed on cloud platforms with scalability options to support increased usage, making this solution both responsive and scalable for real-time, community-driven water problem reporting and resolution.

IV. PROPOSED SYSTEM

The block diagram in Fig. 1 gives an overview of the steps involved in the water problem mapping system. It shows how different components interact to achieve the goal of identifying, reporting, and resolving water-related issues. The workflow for Water Problem Mapping works in following manner

1. User Interaction:
 - Visit Website- Users visit the website to access the water problem reporting platform.
 - Submit Report: Users can submit reports about water-related issues, providing details such as location, description, and images.
 - Upvote/Downvote Report: Users can interact with existing reports by upvoting or downvoting them.
 - Submit Feedback: Users can provide feedback on the resolution of reported issues.
2. Data Processing :
 - Store Report: The system stores the submitted reports in a database.
 - Update Vote Count: The system updates the vote count for each report based on user interactions.
 - Check Upvote Threshold: The system monitors the number of up votes for each report and triggers a notification if the threshold is met.

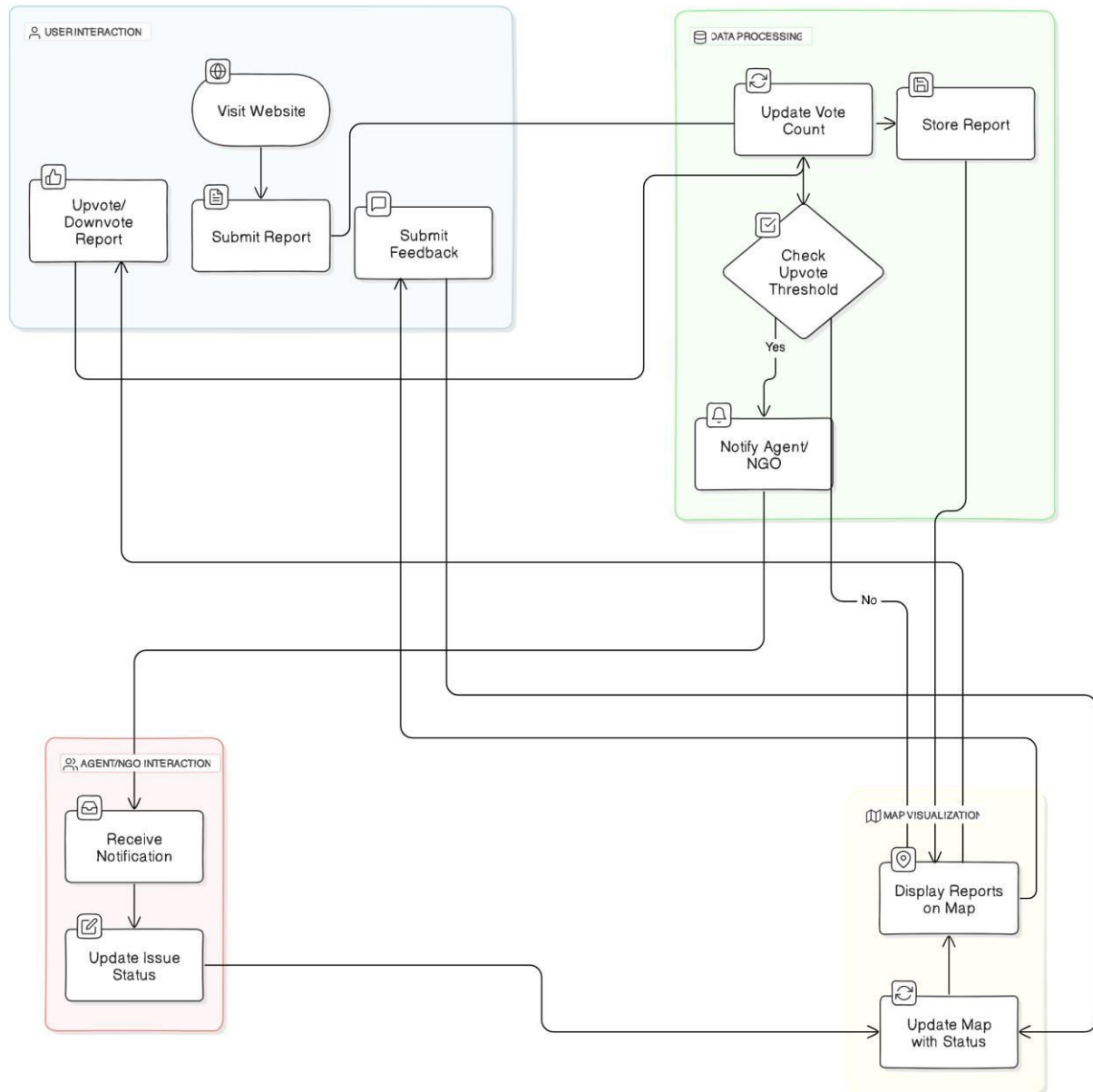


Figure 1: System Architecture for Water Problem Mapping

3. Agent/NGO Interaction-

- Notify Agent/NGO: If a report reaches the upvote threshold, a notification is sent to the relevant government agency or NGO.
- Receive Notification: The government agent or NGO receives the notification and reviews the reported issue.
- Update Issue Status: The agent/NGO updates the status of the issue (e.g., resolved, unresolved) in the system.

4. Map Visualization-

- Display Reports on Map: The system displays reported water issues on an interactive map, providing a visual representation of their locations.
- Update Map with Status: The system updates the map to reflect the current status of each reported issue.

V. CONCLUSION

The water problem mapping project is a community-oriented platform designed to address key water-related issues such as contamination, shortages, and areas prone to flooding. By enabling users to report and view real-time information about local water concerns, the project brings together communities, researchers, and authorities in a collaborative effort to tackle these challenges. The map visualizations generated by this crowd-sourced data offer critical insights, helping authorities identify problem areas quickly and make data-driven decisions on interventions. This approach not only raises public awareness about local water quality but also empowers people to actively participate in environmental stewardship. As a result, the project fosters a more engaged and informed society, creating a pathway for sustainable water management practices that can positively impact communities and enhance overall water resource resilience.

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