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Integrated Data-Driven Approach for Early Pollution Detection and Management in the Thames River Ecosystem

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The increasing pollution levels in rivers have become a serious concern worldwide due to their detrimental impact on ecosystems and human health. Recently, there has been a growing recognition of the need for early warning systems (EWS) to monitor and manage water quality in river ecosystems [1]. EWS is a method that is used to detect and predict potential risks or hazards before they occur. It helps alert individuals, organisations, or communities and provides them with timely information to take necessary precautions and actions to minimise the impact of the anticipated event [2]. EWS for water quality management also can be efficient when real-time data (both water quality and quantity) can be combined with real-time flood forecasting [3].

This study presents a new method based on data-driven models for early warning pollution detection in the Thames River. The proposed method collects and analyses various types of data, including weather data and water quality parameters obtained from water samples and sensing systems. These inputs are integrated into a robust computational framework to forecast and identify potential pollution incidents in the Thames River system. The data-driven model incorporates real-time weather data to encompass the dynamic nature of pollution levels. The model can identify high-risk situations and issue timely warnings to prevent further pollution by analysing historical weather patterns and their correlation with pollution incidents. The system's computational framework utilises a deep neural network to analyse and interpret the collected data. The model is fine-tuned and calibrated using historic data, allowing it to effectively recognise and predict pollution events in real-time for every flood event through combined sewer overflow structures. By integrating historical and real-time data, the model can enhance predictive capabilities of pollution spread in the river system and hence prepare the relevant bodies to take appropriate actions in time.

The proposed method holds great promise in mitigating the adverse impacts of pollution on the river's ecosystem and the surrounding communities. By integrating diverse data sources, including in-situ measurements, sensing systems, and weather information, the model provides a holistic understanding of pollution dynamics and enables proactive pollution control measures. Implementing this model can contribute significantly to preserving the health and ecological integrity of the Thames River, serving as a blueprint for other river systems facing similar pollution challenges worldwide.

References

[1] Yuxi, X., Weihua, Z., Jie, Q. (2023). Integrated water risk early warning framework of the semi-arid transitional zone based on the water environmental carrying capacity (WECC). [illegible]. 15(2), pp. 145–163.

[2] Piadeh, F., Behzadian, K., Alani, A. (2022). A critical review of real-time modelling of flood forecasting in urban drainage systems. [illegible], 607, p.127476.

[3] Waidyanatha, N. (2010). Towards a typology of integrated functional early warning systems. [illegible]. 6 (1), p.31.