

Flood Mitigation of Tarlac City Through 3D Simulation of Groundwater Discharge to Flood Inundation Using Rainfall Prediction and Integration of Spatio-Temporal GIS in Hydrodynamic Models

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The Philippines, ranking as the third most vulnerable nation to natural disasters on a global scale, faces escalating danger posed by typhoons and floods, resulting in significant human casualties, property destruction, and economic repercussions. Among the regions susceptible to such hydrological threats, Tarlac City stands out as particularly prone to inundation. This research aims to address this challenge by proposing the development of a 3D spatio-temporal Geographic Information System (GIS) along with a hydrodynamic model, specifically designed to replicate flood inundation induced by rainfall, groundwater discharge dynamics, and surface flooding occurrences in Tarlac City. It emphasizes its proficient application of advanced methodologies for flood prediction and risk assessment within Tarlac City. Results showed that the Long- Short Term Memory Neural Network effectively anticipates rainfall patterns, while hydrological data facilitated the development of a 3D digital elevation map. The elevation of the areas ranges from 44.69 ft to 57.55 ft, while the low-lying area, Amucao, has an elevation of 24.38 ft to 32.5 ft. This information supplements groundwater discharge data to create a flood inundation model, enabling the identification of flood-prone regions. Moreover, areas in San Vicente, San Roque, Part San Sebastian, San Isidro, Maliwalo, Matatalaib, Tibag, F. Tañedo were prone to minimal to severe risks of flooding. In conclusion, this research augments the disaster preparedness within barangays in Tarlac City susceptible to flooding, contributing significantly to risk mitigation.