

Integrating Spatial Planning and Flood Risk Management: A GANN Model for the River Basin Kerala State, India

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Abstract

Flooding is a widely occurring natural hazard that noticeably damages property, people, and the environment. In the context of climate change, the integration of spatial planning with flood-risk management has gained prominence as an approach to mitigating the risks of flooding. The effect of floods has risen drastically over the recent years across the world due to a wide variety of reasons. According to the National Disaster Management Authority, in India, floods make up one thirds of the natural calamities. Among the Indian states, Kerala stands out as one of the worst floods affected in the recent years. 2013, 2018, 2019 and 2020 were the worst effected years and have caused severe damage to life and property. In 2018, 14 out of 14 districts were affected causing approximately 4.5 billion dollars of loss. Keeping the aforesaid knowledge in mind, the Muvattupuzha River Basin Region chosen for further detailed investigation. In the past few decades rapid urbanization happening within the basin causing the disappearance of wetlands and sharp increase in the built-up area. There exists complex relationship between the diverse factors identified by employing Artificial Neural Network (ANN) and Geospatial Technology, the flood levels with different alternative scenarios were developed and Flood Risk Map was generated. The approach for mitigation devised based on the intensity of risk and future land cover that would be predominant within each zone in the study region. Water Quality Index developed, as water quality affected in post flood scenario. Based on the findings, the study concludes by evolving GIS-based Artificial Neural Network (GANN) Flood Model and to suggest planning guidelines through integrated spatial planning approach to reduce the flood risk in the study region.

Key Words: Spatial planning, Flood-risk management, Geographic Technology, GANN Flood Model, Integrated Planning Approach