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GIS based Development of MCDM Model for Flood Risk Management across Godavari Lower Sub-Basin of India

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Abstract: Because of the uncertainty and high cost involved, the Absolute Flood Protection has not been considered as a rational decision. Hence the trend is to replace Absolute Flood Protection strategy by Flood Risk Management Strategy. This Paper focus on the development of Multiple Criteria Decision Making (MCDM) model towards Flood Risk Management (FRM) across Godavari Lower Sub-Basin of India using GIS based methodologies for Flood Hazard Zonation in order to achieve global minimum of the Flood predicted Risk level. Flood Hazard Zone Map for the historical flood events obtained with the use of GIS based Digital Elevation Models across the study area have been presented and used for the estimation of Hazard Risk. Uncertainty (or Control) Risk levels of each Flood estimated using various Flood Forecasting methodologies have been compared for the selected locations of the study area. Effectiveness of Passive Flood Protection Measures in the form of Flood Levees has been quantitatively analyzed for the increase in the Opportunity Risk and corresponding reduction in the Flood Hazard Risk. Various types of Multi-Objective Evolutionary Algorithms (MOEAs) have been used to determine a Compromise solution with conflicting criteria between Hazard Risk and Opportunity (or Investment) Risk and the results were compared for each of the selected levels of Flood estimated with corresponding uncertainty. Traditional optimization method in the form of Pareto-Optimal Front have also been graphically depicted for the minimization of both Hazard Risk Objective function and Opportunity Risk Objective Function and compared with those obtained using MOEAs. Watershed wise distribution of optimized Flood Risk variation across the Sub-basin has been presented graphically for both the cases of with and without active Flood Routing Measures. **Keywords:** Flood Risk Management; GIS based Flood Hazard Zonation; Multi-Criteria Decision Making; Multi-Objective Evolutionary Algorithms; Godavari Lower Sub-Basin of India;