

## ABSTRACT

Flood risk management serves to reduce the negative consequences of flood disaster to a certain extent. In agriculture dominated countries, the extent of damage incurred in crop land by heavy and frequent floods is quite high. The present study aims to develop an optimal rice planning procedure considering the flood risk through hydrodynamic floodplain modeling in flood-prone delta region of Mahanadi river basin in Odisha, India. As high resolution topographic data and surveyed river cross-sections are unavailable for the study area, MIKE FLOOD model setup is prepared using river cross-sections and floodplain elevation model derived from freely available Shuttle Radar Topography (SRTM) Digital Elevation Model (DEM). The other data used in this study are the time series of discharge or water level or both at various gauging stations, rainfall data, embankment data, structural and operational data of escape structures, IRS-P6 LISS III imagery, RADARSAT-1 imageries for the entire study area, soil map for the entire region, and performance details of various flood resistant rice varieties. MIKE 11 model is calibrated for the year 2003 and validated for the years 2002 and 2004. Flood inundation extent obtained from MIKE FLOOD is compared with RADARSAT-1 image based inundation extent for the years 2001 and 2006. A multi-parameter flood hazard assessment approach is followed to develop a 100-year return period flood hazard map of the study area. L-moment based flood frequency analysis is carried out to obtain the 100-year return period flood peak. For vulnerability analysis, depth-duration-damage data for different rice varieties are extracted from experimental data collected from various government agencies. Subsequently, flood risk is evaluated for cropping pattern in floodplains using functional relationships between flood characteristics and the expected damage of different rice varieties. Based on the flood risk, an optimal rice planning model is developed for maximising the net benefits in the floodplain. The average annual expected net benefit of optimal rice allocation model for the study area is to the tune of INR 628.68 million compared to INR 451.34 million for normal rice variety cultivation throughout the study area.

**Key words:** RADARSAT, MIKE 11, MIKE FLOOD, flood hazard, L-moment, rice planning.