Commentary

Geospatial Approach for Understanding Flood Risk in Tamil Nadu's Coastal Plains

Ajit Pratap Singh[*]

Department of Environmental Engineering, Central University of Tamil Nadu, Neelakudy, Tamil Nadu, India

ABOUT THE STUDY

The coastal plains of Tamil Nadu (India) are a high-risk area for coastal floods, the most common natural disaster. In the study, the coastal plain is delineated through a watershed approach with 5020 micro-administrative units covering an area of about 3,000 sq.km. A comprehensive flood risk assessment was carried out by preparation of hazards, vulnerability, and exposure layers using multiple data sources including from field surveys, satellite data and secondary data sources. The flood prone regions are delineated initially from Sentinel-1 Synthetic Aperture Radar data coupled with SRTMDEM on a probability scale (0–1) and validated with the District Disaster Management Plans of 13 coastal districts. In addition, National Resources Conservation Service–Curve Number (NRCS-CN) method was adopted to estimate surface runoff potential for flood risks.

The population's vulnerability and exposure to flood hazards was determined using census and household data-based indicators. A focused group interview was conducted at 514 locations in the study area, targeting deprived communities in all major settlements. Public perceptions were used to better understand flood risks and validate the hazard and vulnerability layers. Built-up areas of various categories were delineated and intersected with the flood hazard to estimate location-specific flood risks within the micro-administrative units. The results show that there is a very high flood risk in the northern parts of coastal Tamil Nadu, particularly the stretch between Chennai and Cuddalore. The study offers a pragmatic methodology for sustainable development measures in general and flood risk management in particular, in addition to providing baseline datasets for the first time at micro-administrative units for entire coastal plains of Tamil Nadu.

India is one of these countries that have been severely impacted by floods on numerous occasions. Due to the topographic situation, India's east coastal areas are often prone to tropical cyclones/depressions and associated floods, where the bulk of India's population is also concentrated. With no exception, coastal districts of eastern Tamil Nadu and Puducherry usually bear heavy rains during the northeast monsoon which becomes prone to flooding with numbers of swelling rivers and wetlands. Identifying flood-prone areas at micro-level unit in the coastal Tamil Nadu is important for effective mitigation and management of flood risks. Although various studies attempted to assess flood risk, they all either covered a smaller region with micro-units or covered entire plains with districts as units. In addition, there are global flood risk assessment system based on global hydrological models and global impact assessment models for river floods with no scope of downscaling to micro-levels.

The surface runoff potentials and socio-economic vulnerability hint that Cauvery delta region is also susceptible to flood risks. The high proportion of denser settlements and the dominance of primary activities are further aggravated the situation and makes the northern coastal plains of Tamil Nadu as severe flood prone regions. To reduce disaster risks and ensure sustainable socio-economic development, these regions should undertake disaster mitigation measures and effective disaster preparedness strategies. A much localized flood mitigation measures should be implemented in northern coastal plains of Tamil Nadu to reduce disaster risks and achieve sustainable socio-economic development. The methodology proposed in the study can be extended to all flood prone regions of the country for effective flood risk management.

Correspondence to: Ajit Pratap Singh, Department of Environmental Engineering, Central University of Tamil Nadu, Neelakudy, Tamil Nadu, India, E-mail: ajithsingjipr@gmail.com