

EGU21-6963

<https://doi.org/10.5194/egusphere-egu21-6963>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Multi-Criteria Decision Analysis of Coastal Inundation at Regional scale

Vinay Shivamurthy and Bharath Aithal

RCG School of Infrastructure Design and Management, Indian Institute of Technology Kharagpur, Kharagpur, India
(vinay.s@infra.iitkgp.ac.in)

Coastal flooding are natural processes that are both i) essential (providing nutrients to the coastal vegetation, habitats) and ii) hazardous (negatively impact human activities, livelihood, assets, livestock and so on). Climate changes have induced higher frequency of floods, rising sea levels, high amplitude tides and other climatic extremes at regional to global scales. The increasing intensity, duration of floods is proportionately increasing the risks associated with coastal human habitations. The regional risks are defined based on the physical, demographic, socio-economic vulnerability of the habitants. Sea level rise would further enhance the coastal inundations permanently breaching these productive, densely populated regions. This necessitates the need for spatially assessing the relative hazard, vulnerability and risks at regional scales to reduce/mitigate risks.

Indian subcontinent supports the second largest global population, with numerous megacities, towns and villages along the coast and mainland. This study's main objective is to quantify the risk associated with inundations caused by rising sea levels, tidal surge at the regional level. As a case study, Sagar Island located in the verge of Sundarbans, south of West Bengal is considered. Flood risk assessment in the island has been carried out using Multi-Criteria Decision Analysis (MCDA) framework based on 23 spatial parameters.

Results indicate, within a century (1922 – 2020), the island has lost most of its natural vegetation (mangroves - Sundarbans) (47% to 3%), with increasing cultivated (agriculture, horticulture) spaces (77.4 %) and built-up environs (8.2%). Sea level rise varies from 4.4 mm/year (South) to 5.25 mm/year (North) and in the last century has breached over 2824 hectares of mainland. The study's findings reveal 19.8% of horticulture and 33.3% of agriculture assets are highly exposed to natural hazards. 1.34% population are at relatively very high-risk levels, 17.81% at high-risk levels. The study's findings reveal the variable importance of socio-economic, demographic, topographic and proximity to public service, in defining the flood vulnerability and risk towards the habitants. The approach and findings of paves the way for planning authorities to prioritise risk mitigation strategies that are region-specific to reduce the impact of inundation due to natural hazards

Keywords: Sea level rise, Flood risk, MCDA, Vulnerability, flood hazard