World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:12, No:04, 2018

Flood Hazard Assessment and Land Cover Dynamics of the Orai Khola Watershed, Bardiya, Nepal

Authors : Loonibha Manandhar, Rajendra Bhandari, Kumud Raj Kafle

Abstract : Nepal's Terai region is a part of the Ganges river basin which is one of the most disaster-prone areas of the world, with recurrent monsoon flooding causing millions in damage and the death and displacement of hundreds of people and households every year. The vulnerability of human settlements to natural disasters such as floods is increasing, and mapping changes in land use practices and hydro-geological parameters is essential in developing resilient communities and strong disaster management policies. The objective of this study was to develop a flood hazard zonation map of Orai Khola watershed and map the decadal land use/land cover dynamics of the watershed. The watershed area was delineated using SRTM DEM, and LANDSAT images were classified into five land use classes (forest, grassland, sediment and bare land, settlement area and cropland, and water body) using pixel-based semi-automated supervised maximum likelihood classification. Decadal changes in each class were then quantified using spatial modelling. Flood hazard mapping was performed by assigning weights to factors slope, rainfall distribution, distance from the river and land use/land cover on the basis of their estimated influence in causing flood hazard and performing weighed overlay analysis to identify areas that are highly vulnerable. The forest and grassland coverage increased by 11.53 km² (3.8%) and 1.43 km² (0.47%) from 1996 to 2016. The sediment and bare land areas decreased by 12.45 km² (4.12%) from 1996 to 2016 whereas settlement and cropland areas showed a consistent increase to 14.22 km² (4.7%). Waterbody coverage also increased to 0.3 km² (0.09%) from 1996-2016. 1.27% (3.65 km²) of total watershed area was categorized into very low hazard zone, 20.94% (60.31 km²) area into low hazard zone, 37.59% (108.3 km²) area into moderate hazard zone, 29.25% (84.27 km²) area into high hazard zone and 31 villages which comprised 10.95% (31.55 km²) were categorized into high hazard zone area.

Keywords : flood hazard, land use/land cover, Orai river, supervised maximum likelihood classification, weighed overlay analysis
Conference Title : ICDEM 2018 : International Conference on Disaster and Emergency Management
Conference Location : New York, United States
Conference Dates : April 19-20, 2018