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Title: IMPACT OF LAND USE/COVER AND CLIMATE VARIABILITY UPON HYDROLOGICAL PROCESS OF USRI WATERSHED, JHARKHAND, INDIA

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Abstract: Land use/land cover (LULC) and climate are the two important environmental component influencing watershed hydrology. This study assessed separate and combined hydrological impacts of land use change and climate variability in the Usri watershed of Giridih district Jharkhand, India, for the period of 1976-2014. Land use and land cover statistics and map were prepared by using the data of year 1976, 1989, 2000 and 2014. To understand and quantify changes in landscape structure, pattern and dynamics, spatial statistics programs like FRAGSTAT has been used. Trend analysis of past climatic variables is found out by using Mann-Kandall test. Using SWAT (Soil and Water Assessment Tools) model, impact of land use change and climate change on surface hydrology was further assessed. Result of land use land cover indicates that Agriculture showed overall change in area from 21673.67 to 34810.92 ha from 1976 to 2014. The settlement area was also increased. Dense forests showed a continuous declining trend in a very high rate. The area under dense forest reduced from 12943.33 ha in 1976 to 1757.66 ha in 2014. Barren lands decreased in area from 31094.16 ha to 20681.46 ha during the studied periods. However, there was only a small change in area of open forests which decreased from 11806.89 to 11064.87 ha during the 38 years. The result of trend analysis indicates that there was no significant trend observed in monsoon and summer session for maximum and minimum temperature. Whereas, a significant increasing trend in the region was observed for the winter season. As far as rainfall is concerned, there was a significant decreasing trend of 2.04 mm/year observed during the monsoon season. Results of SWAT indicate that model is powerful tool to simulate the effect of change in surface hydrology. High values of the coefficient of determination of 0.83, Nash-Sutcliffe efficiency as 0.82, Index of agreement of 0.94, modified form of Nash-Sutcliffe coefficient as 0.90, modified form of index of agreement as 0.79 and low value of percent bias as 0.53 and RMSE-observations standard deviation ratio is 0.42 indicate satisfactory validation of model simulation of discharge at the outlet of Usri watershed. Water balance of study area were calculated and found out that total runoff of the area is 55.95% of the rainfall. Results of this study explain that both LULC and climatic variability have a significant and combined effect upon the hydrology of Usri watershed.

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