



Assessment of the land use/land cover and climate change impact on the hydrological regime of the Kulsī River catchment, Northeast India

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Abstract

The present study has shown the changes in climatic variables and land use/land cover to observe the long-term changes in the hydrological characteristics of the Kulsī River. Mann–Kendall test, Expert Team on Climate Change Detection and Indices Index, *t* tests, and Analysis of variation were used to analyze the change and variation. The Mann–Kendall test shows a significant declining trend of rainfall at Chamaria (– 26.76 mm/year) annually, the seasonally significant declining trend was noticed in the winter season at the rate of (– 1.47 mm/year) at Ukium, whereas Chamaria showed a declining trend of rainfall in the post-monsoon season at the rate of (– 5.62 mm/year). Among all stations, maximum temperature showed a significant increasing trend at the rate of (0.03 °C/year) at Chaygaon, while minimum temperature showed a significant increasing trend at the rate of (0.02 °C/year) at Ukium and Chamaria, respectively. Consecutive dry days have shown significant positive trends at the rate of (0.85 days/year), (0.67 days/year) and (1.35 days/year) at Chaygaon, Ukium, and Chamaria. The areas under forest cover and water body have decreased, whereas cropland and transition areas have increased. In the case of the hydrological variables, only the water level has shown significant annual variation (*p* value is 0.002). However, both water level and discharge show seasonal variation significantly. The water level has shown a significant negative relation with maximum temperature (*R* and *p* values are – 0.78 and 0.00 respectively) and a significant positive relation with forest cover (*R* and *p* values are 0.6 and 0.01 respectively). On the other hand, water discharge has a significant positive relation with annual rainfall (*R* and *p* values are 0.5 and 0.03, respectively). The findings of the research show that increasing maximum temperature and decreasing forest cover are responsible for the decline of water level in the Kulsī River. Whereas, a decrease in rainfall leads to a decrease in discharge and vice versa. The findings of the present research will be helpful to the policymakers and government in preparing a suitable sustainable river management plan to address the declining water resources to mitigate water scarcity issues.

Keywords Climate change · ETCCDI · LULC · Trend analysis · Hydrological regime · Kulsī River catchment

Abbreviations

CWC	Central Water Commission	Max	Maximum
ETCCDI	Expert Team on Climate Change Detection and Indices	AVG	Average
MODIS	Moderate resolution imaging diameter	Temp	Temperature
IGBP	International geosphere-biosphere programme	ANOVA	Analysis of variance
IMD	Indian Meteorological Department	LULC	Land use land cover
Min	Minimum	AWY	Annual water yield
		LCP	Land cover product
		WMO	World Meteorological Organization
		WCRP	World Climate Research Program
		CDD	Consecutive dry days
		SDII	Simple daily intensity index
		CWD	Consecutive wet days
		R10mm	Heavy precipitation days
		R95p	Very wet days
		R99p	Extremely wet days

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