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Integrated impacts of climate and land use change on stream flow and water quality in the Songkhram River Basin, Thailand

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The livelihood of people in Songkhram River Basin (SRB) rely heavily on river water especially the fisheries. In recent past, SRB has experienced erratic variability in water quality afflicting the fish catch. Extensive land use changes in the recent past have raised concerns regarding its role in the water quality fluctuation in addition to the looming climate change effect. The current literature lacks a detailed model backed analysis on this matter, most importantly for the future. This study quantifies the future variation in the stream flow and water quality of the SRB using Soil and Water Assessment Tool (SWAT). The analysis is based on future climatic projections from three Regional Climate Models (RCMs) under two Regional Concentration Pathways (RCPs) scenarios. Two future scenarios generated from a dynamic land use change model (Dyna-CLUE) form the land use change scenarios. Results show climate change to be responsible (on an average) for 19.5% and 24% decrease in stream flow and 11.25% and 15.25% decrease in nitrate levels as projected by RCP 4.5 and 8.5 respectively. Land use change is found to be responsible (average) for 5.3% and 6.35% increase in stream flow and 11% and 11.6% decrease in nitrate levels under economic and conservation scenarios respectively. Thus, in conjunction, these two agents are seen to play against each other with a net effect of decrease in future stream flow (16%, average). Whereas, in case of nitrate levels the two works in tandem leading to amplified reduction (24.5%, average). Although land use is found to be the less afflicting agent, its role should not be overlooked land use may very well further exacerbate situation if there is unfavorable climatic variation than projected. The findings of this paper are useful for decision makers in the government bodies for planning/controlling the land use in the basin from the water quality conservation viewpoint.

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