Impact of Climate Change on Water Resources in View of Contribution of Runoff Components in Stream Flow: A Case Study from Langtang Basin, Nepal

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ABSTRACT

Observation and model-based studies suggest substantial hydrological flow pattern changes in mountain watershed where hydrology is dominated by cryospheric processes (IPCC 2007). The response of cryospheric processes to warming climate in mountain areas can be analysed by examining the responses in the seasonal and annual hydrologic regimes of rivers where snowmelt contributes significantly to the runoff. This study is carried out in Langtang basin, which aims to assess the impact of potential warming on snowmelt contribution and river discharge utilizes a Snowmelt Runoff Model (SRM), which is one of a very few models in the world today that requires remote sensing derived snow cover data as a model input. In this study, snow cover and hydrometric data were derived from Moderate Resolution Imaging Spectro-radiometer (MODIS) snow product and Snow and Glacier Hydrological Unit (SGHU) of Department of Hydrology and Meteorology, Government of Nepal. The model is calibrated for the year 2006 and validated in 2005. Different climatic scenarios are used (only change in temperature) to run the model in order to understand the impact of changing climate on runoff component and river discharge. In 2006, snow and glacier melt component contributes 35% in winter, 18% in summer and 19% annually in the stream flow. In this study, model predicts that snow and glacier melt contribution in stream flow will increase approximately at the rate of 2% in winter, 5% in summer and 4% in annual flow per 1°C temperature rise. Due to increase in snowmelt contribution, river discharge will also increase at the rate of 2% in winter, 6% in summer and 5% in annual flow under the projected temperature rise of 1°C.

Key words*: Climate change, Himalayas, Langtang basin, MODIS snow, Snow Melt*