# **Project:** Hydrological Processes and Characterization of Lesser Himalayan Catchments (Project Henval-I)

The Himalayan basins are very critical to the water security of the northern Indian plains. Himalaya is also a data-sparse region leading to a lack of in-depth understanding of the various physical processes. The scanty availability of hydro-meteorological databases further accelerates the complexity of understanding Himalayan hydrology and its interaction with other processes such as orographic forcing. To address this question, a thorough understanding of the coupling between surface hydrologic systems and the overlying atmospheric system under orographic moisture flow is essential. **NIH** initiated this project in 2016 to better understand climate-hydrology interaction in a lesser Himalayan catchment called Henval (102km2), located in the Upper Ganga basin near Chamba Tehri-Garhwal (Uttarakhand). Due to the importance and uniqueness of the project, NIH could get funding from MoES and DST-NMSHE to support creating the monitoring facilities in the watershed. All the instrumentation envisaged (viz. AWS. AWLR, EC Flux, SMS, etc.) towards establishing a classical hydro-meteorological field observatory in the Lesser Himalayan environment has been completed in the first phase of the Project-Henval.

The project's goal was to produce baseline data on weather and hydrology of the lesser Himalayan mountains, leading to a better understanding of climate-hydrology interaction under changing climate of the region. The primary activities of the project deal mainly with the hydrological measurements and actual field experiments in the experimental catchment of one of the direct tributary of River Ganga, viz. Henval. This study was focused on monitoring evapotranspiration (ET) by using the latest available technology of eddy covariance tower and ET modelling for the lesser Himalayan region. The ET estimated using the energy balance method from the flux tower was compared with the ET estimated using other methods like the Penman-Monteith equation, remote sensing/ SEBAL, and Pan. The water balance study evaluated the catchment response to the various hydro-climatic forcing within the Lesser Himalayan catchment through the hydrological modelling using the SWAT model. Simulations of the streamflows at the Devnagar gauging site has carried out. The modelling results show that the model is underestimating the flows; this may be attributed to the slow hydrological response of the catchment as well as fine-tuning of the model parameters. The results can be improved by incorporating specific catchment data such as intensive soil parametrization. These need to be done to achieve better model efficacy. The main focus of the project's first phase was to establish a state-of-art field hydro-meteorological observatory and ET estimations with various empirical methods and actual field measurements. In this second phase, the main focus of the study is on hydrological modelling and analyses of the interaction between the different observed variables.