

DEFINING 'HIMALAYAN CATCHMENT' FOR BETTER UNDERSTANDING OF CLIMATE CHANGE IMPACT ON HIMALAYAN GLACIERS AND RIVER FLOWS

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ABSTRACT

River flow response to the glacier change is a major concern in the Himalayan region. There are three distinct glacio- hydrological regimes in the Himalayan arc such as Alpine, Himalayan and cold-arid regimes. Present understanding regarding the impact of glacier shrinkage on the river flow variations is summarized in the IPCC 2007, which stated that "as these glaciers retreat due to global warming, river flows are increased in the short term, but the contribution of glacier melt will gradually decrease over the next few decades" and "the enhanced melting of glaciers leads at first to increased river runoff and discharge peaks and an increased melt season" (IPCC, 2007b). This paper argues that this conclusion is overwhelmingly biased towards the Alpine glacier systems, where glacier melt occurs during otherwise low flow regime of the annual stream hydrograph. Mountain glacier systems across the globe are generally described as Alpine systems and the river flow response to the glacier change is often viewed through the conceptual frame work Alpine systems. A close look at the glacio-hydrological regime of Alpine region and Himalayan region east of Chenab basin reveals the distinct differences in characteristics of these two glacier systems. Major parts of the Himalayan glaciers are in a precipitation dominant system, where western disturbances in winter and monsoon in summer dominate the regional hydrology. Monsoon also suggested to be playing an important role in the glacial processes by influencing the growth and decay of these glaciers. Here the Himalayan catchment is defined as the glacier catchments experiencing snowfall in winter and monsoon precipitation in summer, where peak discharge from the glacier contributes to the crest of the annual stream flow hydrograph produced by the monsoon rains. In a Himalayan catchment July and August months experiences highest monsoon rains,

highest solar insolation and temperature and highest glacier and stream discharge. Contrary to this, discharge peak of annual stream hydrograph in an Alpine catchment is produced by the snow and glacier melt. It is proposed that the highest runoff in a glacier fed stream of 'Himalayan catchment' is always occurs as a result of high precipitation, so the melting of glaciers will not produce any high discharge in a glacier fed stream within the Himalayan catchment as suggested by the IPCC 2001 and IPCC 2007. Moreover, in a resource management perspective, the glacier melt component in the mountain streams would be highest during the years of low summer runoff.