

**IMPACT OF CLIMATE CHANGE ON SEDIMENT FLOWS BY USING
SPATIAL DISTRIBUTED MODELING FOR SELECTED
CATCHMENTS IN UPPER INDUS BASIN**

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ABSTRACT

Climate is globally changing at an alarming rate and the river flows are directly affected by the rainfall patterns and snowmelt. The discharge in river, rainfall intensity and erodibility affects the soil erosion and sedimentation. The soil which erodes from one place is transported to another with the water and settles down which adversely affects the water availability, reducing the storage capacity of reservoirs. As per IPCC (2013) earth's general temperature has been increased up to 0.89 °C from 1901 to 2012. The increase in temperature has significant effect on precipitation and glacier melts which may cause increase or decrease in discharge and sediment yield of any basin so it is very important to access the relationship between the climatic parameters and their impact on discharge & sediment yield. This study investigated the assessment of hydro-meteorological parameters in upper Indus Basin using the available historical data and their impact on snow cover and glaciers of Gilgit & Ghorband river basins. Furthermore, the climate model SDSM was applied on seven stations for projection of the future climate at the end of 21th century (2099). The output of the model was fed into SWAT model to access the impact of climate change on discharge and sediment.

Statistical test has been applied on historical climate data and result has indicated that in upper region (snow covered) of UIB the annual maximum temperature is increasing whereas, in lower region it is decreasing. T_{max} is increasing more than T_{min}. Temperature in Winter and Spring season is also increasing at most of the stations. Annual and seasonal precipitation in the region is increasing; it increases with the increase in elevation and decreases with decrease in elevation. Average Annual flows in highly elevated areas (Snow Cover)/ tributaries is increasing

and in low elevated region it has decreased whereas, during the winter and spring season monthly flow has been increased due to the increase in temperature (earlier melt of snow), during the summer it has decreased due the decrease in temperature,. Annual and seasonal snow cover area has decreased in Ghorband river catchment, annual and seasonal snow cover area has also increased in Gilgit river basin. At the end of 21st century in Gilgit river basin annual temperature estimated to be increased by 2.33 °C, which may increase surface runoff and sediment yield 14 and 24 % respectively. In Ghorband river catchment annual temperature estimated to increase 1.99 °C, may increase in surface runoff and sediment yield 13 and 20 % respectively by the end of 21st century which lead to the primary outcome of this research.,

Furthermore, Options for the reduction of erosion and consequent sediment origination control were simulated and compared. The provision of sediment basin for management of sediment yield in the Gilgit and Ghorband river basin can reduce sediment yield upto 65%. Analysis of temperature, precipitation and stream flow that the phenomenon of the climate change has been occurring in the upper Indus basin and has significant effect on mountainous watershed, as aforesaid situation is alarming for the planner and water experts to guide and adopt the Integrated Watershed Management to fulfill the fore coming food and water demands. Thus, it is recommended that climate change study should preferably be made prior to the construction of water resources & agriculture related projects