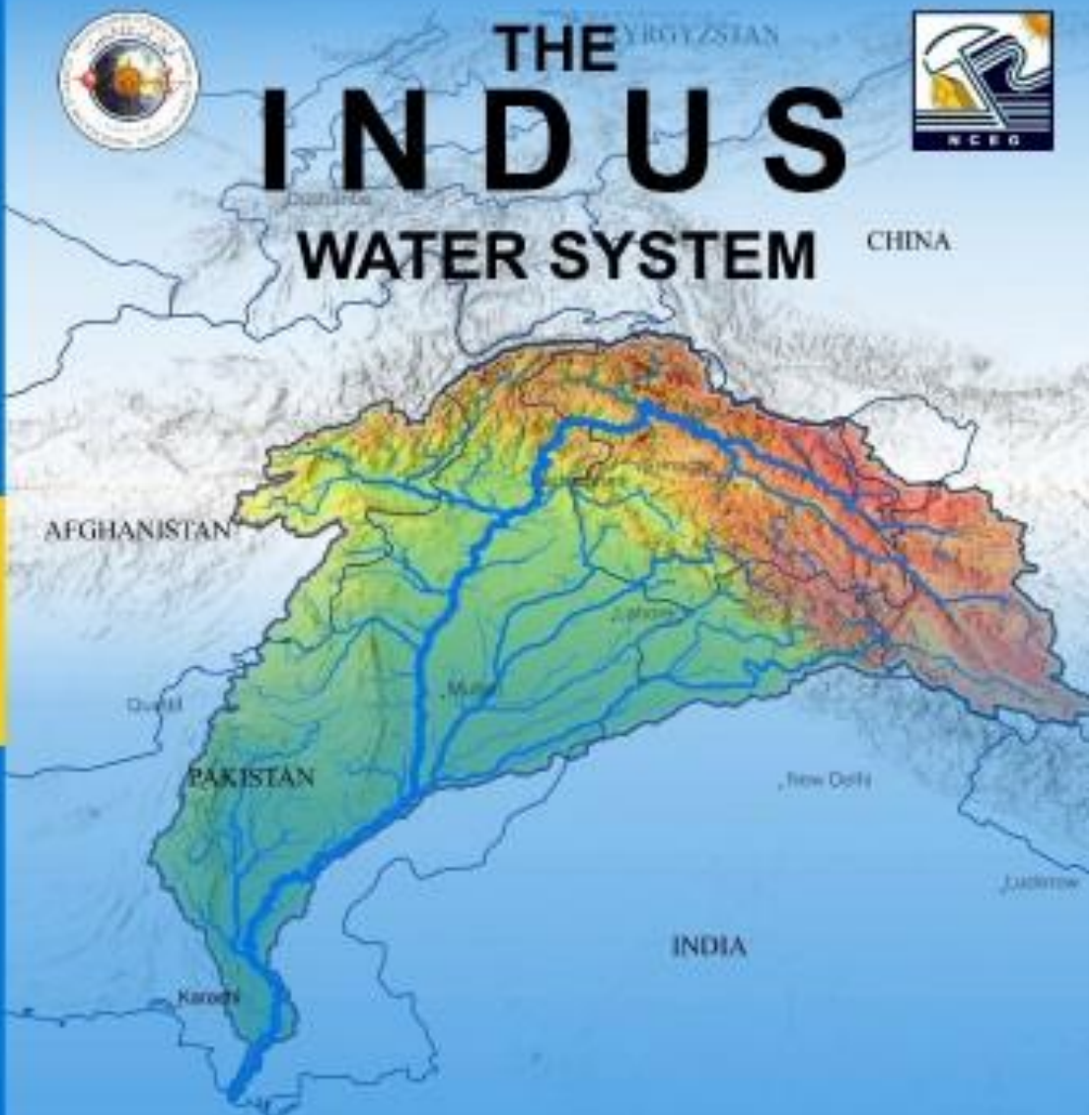
THE INDUS WATER SYSTEM



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Impacts of climate change on cryosphere and streamflow in the Upper Indus Basin

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Abstract

During the past several decades, global climate change has exerted a profound impact on high mountain environments, notably the cryosphere, which is highly susceptible to atmospheric changes due to its fragility. Climate change is quite evident in the Indus Basin and is adversely impacting various natural resources and the livelihoods of communities inhabiting the catchment areas of its rivers. In the Jhelum basin, a tributary of the Indus, the temperature has increased by 0.8 °C from 1980–2016 and is projected to further rise by 3°C and ~5.2 °C by the end of the century under the RCP4.5 and RCP8.5 emission scenarios respectively. Similarly, in the Chenab and Indus basins, temperatures are projected to rise by 3.5 °C and 4.8 °C and 4.8 °C and 6.5 °C, respectively, under the two scenarios. Concerns persist over the potential shrinkage of glaciers, reduced water storage capacity, and diminished seasonal snow availability. According to IPCC reports, Himalayan glaciers have receded faster since 1850 than anywhere else globally- a trend expected to continue. Over the last decade alone, glaciers in the Upper Indus Basin (UIB) have melted at a rate of -0.35 ±0.33 m a^{-1}, with considerable variability across different mountain ranges. As there is no substitute for glaciers-melt in the long run, continued glacier recession could lead to significant water shortages in the basin, severely affecting livelihoods and economy in the basin. Global climate change projections also suggest significant decreases in river flows originating from the UIB, raising serious concerns. For instance, in the Jhelum basin, snowmelt contribution is projected to decrease by 44% by the end of the 21st century under the RCP 8.5 emission scenario. However, significant knowledge gaps remain regarding the precise impacts of climate change on glaciers and other water resources in the basin. It is worth noting that the Indus waters, originating from the Himalayas, are shared between India and Pakistan under the Indus Water Treaty (IWT). Given the critical importance of these waters, It is imperative for both countries to collaborate in developing effective mechanisms to better understand and address the impacts of changing climate across various sectors in the basin.

Keywords: Upper Indus Basin; Climate Change; Cryosphere; Streamflow

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