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# Premises for a knowledge driven adaptation strategy to address potential climate change impact in the Eastern Himalayas

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The thermal and dynamic influence of the Tibetan Plateau plays a significant role in the evolution and formation of the Asian monsoon circulation. Due to scarce data, how much of the recent changes can be attributed to climatic variability needs further investigation, but the magnitude and direction of climate change impacts could be significant both in relative and absolute terms. Early signs of climate change appear earlier in the places of most sensitive nature – places like the Brahmaputra basin, a high discharge sediment hot spot that is located at the transitional climatic zone between that of the cold dry climate of the Tibetan plateau and the warm tropical climate of the Assam-Bangladesh plains, where temperature contrast will occur earlier than other regions. Vast floodplains and areas including coastal ecosystems could experience diverse impacts due to modified hydrological and biogeochemical cycles leading to changes in vegetative cover and constrained ecosystems. The role of such modified flux in the evolution of the fluvial ecosystems of this globally critical region could be vital with several irreversible changes. Climate change induced temperature and pressure variation in the future would have implications on the water and sediment quantity and quality along with the nutrient and trace element carrying capacity of the sediments due to modified discharged and load. With temperature increase, glacial melt would also increase which will ensue increased water flow into the river systems. The monsoonal floods may make way to glacial floods. There can be profound changes in the relation between water and sediment load during both dry and wet seasons. On the other hand, prolonged monsoons may contribute to more frequent flooding and increase the depth of inundation in many parts of the large river basin. If precipitation

increases, dry-season river flow may increase because of increased recharge during the monsoon season. Changes in local runoff and water balances will produce major changes to the types and availability of aquatic systems. Similarly, as occurred under slight warming (<1-2˚C) in the Holocene, many ponds and wetlands will completely disappear and lakes will become increasingly disconnected from their drainage systems. Major associated water quality and productivity changes (i.e., altered growth rates, life cycles and generation times of biota) will accompany the drying of these systems, and significantly affect those remaining. Warmer thermal regimes will create conditions more conducive to the invasion of warm-water species and the competitive replacement and extinction of native species. Furthermore, warming will lead to a reduction in the range (both in altitude and latitude) of some cold water, stenothermic species (Lodge 1993; Rahel et al. 1996). Projected increases in water demand and use will also enhance the need for inter-basin water transfers or diversions, contributing further to physical habitat alterations of both the donor and recipient basins, corresponding alterations in their water quality, and the potential introduction of foreign biota and disease. In the backdrop of intensified human impacts in the basin, the results of the current investigations, though limited for such an understudied and hence less understood river, can still point at some possible scenarios. For example, an assessment of the implications of climate change for hydrological regimes and water resources in the Brahmaputra basin using scenarios developed from the Hadley Center model simulations indicates that, by the year 2050, the average annual runoff in the Brahmaputra River will decline by 14 percent. Building a strong knowledge base incorporating GIS modeling technologies and feeding into a climate change decision support system appears to be the need of the hour for the eastern Himalayan states of Northeast India. It is not clear whether climate change has been incorporated into the current plan analysis at all. A key adaptation measure is the need to incorporate climate change responses into long-term planning. For instance, dealing with existing climate variations through good construction quality of hydrological structures and strengthened operation and maintenance can be one way of preparing for dealing with climate change.