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1 Regional climate change impact on future carbon sequestration in the Indo-Tibetan Brahmaputra watershed

C. Mahanta and N. Pathak

Department of Civil Engineering, IIT Guwahati, India

chandan@iitg.ernet.in / Phone: 91-361-2582407 / Fax: 91-361-2690762

Potential climate change impact on carbon sinks like plants, soils and sediments of the *Brahmaputra* basin could be phenomenon of critical consequence to the current C-sequestration capacity of the watershed. Strategic watersheds like the Brahmaputra are such that early signs of global climate change would appear earlier in such places of most sensitive nature as it is a biogeochemical hot spot located at the transitional climatic zone between 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. As a result, basic characteristics of C sequestration, especially sinks for anthropogenic CO_2 can be severely affected. The present study shows that the Brahmaputra carries almost 5% of the global POC input (computed as 6.3 x 10^6tons C/year) due to its enormous sediment load alone. The open sea connection to this high carbon flux is of particular importance as time-series studies revealed sediment load fluctuations of an order of magnitude over two decades indicating one of the highest variability in the world. Distribution of C in the deep Indian Ocean suggests that this sediment flux may serve as a major carbon source. The current uncertainty about the future climate change effect on carbon sequestration processes of the watershed is increasing, having potential implications for a range of ecosystems from the highlands (5300 m) of the Himalayas to the coastal zone of Bay of Bengal. Due to scarce historical data, precise evaluation of C source and sink in the Brahmaputra

Basin needs further investigation, but the magnitude and direction of climate change impacts could be significant both in relative and absolute terms. Vast floodplains and areas including coastal ecosystems could experience diverse impacts due to modified biogeochemical cycles of C leading to changes in vegetative cover and constrained ecosystems. Long term natural and deliberate C sequestration is still an early concept in the region, however, the role of modified C flux and altered sequestration processes in the evolution of the ecosystems of this globally critical region could be vital with several irreversible changes. In the backdrop of intensified human impacts in the basin, the results of the current investigations, though limited for an understudied and hence less understood river basin, point at some possible scenarios. There is evidence that the future transformation of natural C sequestration in the entire watershed is likely to be impacted significantly by the modified C flux due to changing climatic variables.