Paper Number: 300

Impact of a megacity on the connectivity of a large river system

Chakraborty, N. B.[1], Jain, V.[2] and Shekhar, S.[3]

[1]Geological Survey of India Training Institute, Hyderabad, India-500068, nupur.geology@gmail.com [2] Discipline of Earth Sciences, IIT Gandhinagar, Gujarat, India – 382424 [3]Department of Geology, University of Delhi, Delhi, India -110007

The present work comprises of a detailed connectivity analysis on the Yamuna River in India and its interaction with the National Capital Region (NCR), Delhi. The nature of connectivity in the river system is analysed in the framework of material transfer between different compartments. Sediment and water flux analysis is a vital parameter in geomorphic studies because of its dominance in geomorphic processes and control over the morphology within the system and thus holds key role for the understanding of the river evolution, its functions and understanding of its spatio-temporal variability. This work defines the nature of connectivity based on its movement of water and sediment.

The analysis is done on the Yamuna River, which is the largest tributary of the Ganga River, having basin area of 345 x 10^3 km^2. Geomorphological and hydrological connectivity was measured by the difference in water and sediment fluxes at two gauging stations located upstream and downstream of the Delhi. Disconnectivity was defined as the lack of water and sediment fluxes reaching the downstream station. Further, the analysis focused on understanding the temporal (seasonal) variability in (dis)connectivity structure, magnitude of (dis)connectivity, its controls and defining a threshold of geomorphic change in (dis)connectivity.

This work is based on the 20 years daily data and 30 years peak discharge data. Results reveal that the river remains hydrologically disconnected for 47% of times and geomorphologically disconnected for 43% of times. This geomorphic disconnectivity between the upstream and downstream of Delhi has caused trapping of sediments to a magnitude of 5 million tons (60% of the total available upstream sediment load) in the past decade. Systematic analysis of peak discharge data reveals that flood events were also unable to connect the system with downstream stations in terms of water and sediment fluxes. The resultant aggradational processes are responsible for significant degradation in channel morphology and biodiversity.

The present set of work displays the scenarios in the megacity where excess pressure on river is resulting in an unhealthy river. Thus effective management plans must be aimed at maintaining the lost connectivity for hydrological and geomorphic processes.