

A Remote Sensing Approach to Estimate the Paleo-Discharge of the Lost Saraswati River of North-West India

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Abstract : The lost Saraswati is described as a large perennial river which was 'lost' in the desert towards the end of the Indus-Saraswati civilisation. It has been proposed earlier that the lost Saraswati flowed in the Sutlej-Yamuna interfluvium, parallel to the present day Indus River. It is believed that one of the earliest known ancient civilizations, the 'Indus-Saraswati civilization' prospered along the course of the Saraswati River. The demise of the Indus civilization is considered to be due to desiccation of the river. Today in the Sutlej-Yamuna interfluvium, we observe an ephemeral river, known as Ghaggar. It is believed that along with the Ghaggar River, two other Himalayan Rivers Sutlej and Yamuna were tributaries of the lost Saraswati and made a significant contribution to its discharge. Presence of a large number of archaeological sites and the occurrence of thick fluvial sand bodies in the subsurface in the Sutlej-Yamuna interfluvium has been used to suggest that the Saraswati River was a large perennial river. Further, the wider course of about 4-7 km recognized from satellite imagery of Ghaggar-Hakra belt in between Suratgarh and Anupgarh strengthens this hypothesis. Here we develop a methodology to estimate the paleo discharge and paleo width of the lost Saraswati River. In doing so, we rely on the hypothesis which suggests that the ancient Saraswati River used to carry the combined flow or some part of the Yamuna, Sutlej and Ghaggar catchments. We first established a regime relationship between the drainage area-channel width and catchment area-discharge of 29 different rivers presently flowing on the Himalayan Foreland from Indus in the west to the Brahmaputra in the East. We found the width and discharge of all the Himalayan rivers scale in a similar way when they are plotted against their corresponding catchment area. Using these regime curves, we calculate the width and discharge of paleochannels originating from the Sutlej, Yamuna and Ghaggar rivers by measuring their corresponding catchment area from satellite images. Finally, we add the discharge and width obtained from each of the individual catchments to estimate the paleo width and paleo discharge respectively of the Saraswati River. Our regime curves provide a first-order estimate of the paleo discharge of the lost Saraswati.

Keywords : Indus civilization, palaeochannel, regime curve, Saraswati River

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