

Title: Perturbation in meander behaviour of a subtropical river in India under variable natural and anthropogenic controls

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Abstract: Meander morphology is perturbed worldwide by human interventions to a certain extent in the Anthropocene. To this end, the present study aims to investigate the meander behaviour, including its deformations, of the Kopai River, a subtropical river in India in the last 50 years (1970–2020). A total of 394 loops (134 loops each in 1970 and 1995 and 126 loops in 2020) were selected for the four river reaches – the upper, middle-upper, middle-lower, and lower reaches. The meandering behaviour was assessed using Mueller's sinuosity index (SI), meander form index, meander shape index, and radius/wavelength ratio. The study found a higher meandering tendency in the lower and upper reaches controlled by fluvial hydraulics, and topographic factors. However, the middle reaches were comparatively stable. The meander loops along the middle reaches regular meander is the dominant meander type, however, more than 50% of meander loops for the lower reaches were intense meander types. Positive extensions were the predominant type of meander deformation in all the reaches. However, few negative extensions are found in the middle-upper and lower reaches, while irregular changes and cut-offs were only found in the lower reach. Thus, the upper and lower reaches exhibited more natural controls dotted with regular meander progression. The middle reaches characterized by higher Bouguer anomaly and steep basement gradient led to channel confinement. Besides, profuse sand mining and the brick kiln industries are perturbing the meander behaviour through human channel straightening, dwarfing the meander evolution in the middle reaches.

Keywords: Meander morphology, Meander deformation, Sinuosity index, Meander form index, Fluvial hydraulics, Topographic controls, Bouguer anomaly

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