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River health analysis of a Himalayan river: A hydrogeomorphic approach

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The relationship between fluvial processes and form is being increasingly controlled by human activities. A river of sound health possesses the ability to maintain its natural structure and functions. The dynamic rivers of the Himalaya have not been analyzed for their morphological characteristics. Ramganga river is a spring fed river, a major tributary of river Ganga. The basin lies dominantly within the Sub Himalaya and Lesser Himalaya, resulting in a rugged topography. The river has been dammed since 1967, and major cities are present along its banks. We analyze the health of the river based on its hydrologic, hydraulic and geomorphic aspects, with the objective to characterize its physical habitat and processes at reach to site scales, to aid in stream management decisions. Initial geomorphic classification of five reaches over decadal time scales (1974-2014) suggests a disconnectivity from the Himalayan control in the river. Morphodynamics of different river reaches is mostly governed by sediment reworking and tributary contribution. Planform mapping also revealed changes in channel morphology, such that a previously meandering reach close to an urban area is developing large islands, yet the system has not crossed the geomorphic threshold. Future work includes testing the combination of parameters including evaluation of long-term river evolution, flow regime, sinuosity, stream power, vegetation buffer, and channel cross section, for developing an index for river health. Such a study on habitat mapping and its dynamics will provide opportunities to assess ecosystem behavior and future tipping points, to enable scientists and policy makers in developing strategies for mitigating adverse impact on river health.