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Assessment of historical hydrologic alteration due to dam construction in upper Godavari River basin

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Hydrologic regime of a river basin plays an important role in natural functionality as well as resource conservation and sustainable management plans. Anthropogenic activity such as dam construction can substantially induce hydrologic alteration, and thus affects the natural system. In developing countries, dams are being historically constructed to provide water resources availability for irrigation, drinking and power generation. Thus, the study on hydrologic alteration is required to understand their influence on pre-impoundment natural flow. In India, Godavari river basin (GRB) is one of the most focused area for the construction of many water storages and diversion projects. In the upper part of GRB, Jayakwadi dam was constructed at stage-I (Paithon dam in 1976) and stage-II (Majalgaon dam in 1987) for irrigation and hydro-power purposes, respectively. Therefore, in the study, GRB area has been focused for assessment of the hydrologic alteration within pre- and post-change point periods using historical observations. The analysis includes estimation of 171 Indicators of Hydrologic Alteration (IHA) indices for change detection study. Then, each IHA index was grouped into no- (0%), low- (0-50%), medium- (50-100%) and high-change (>100%). Furthermore, Pettitt's test was also employed to detect the shift in flow regime, and linked to IHA. Results show that the combination of IHA indices and change point detection test is reliable to improve comprehensive investigation and understanding of hydrologic alterations. The study result also demonstrates the historical impacts of dam construction on flow regimes of the upper GRB area. Thus, this approach can be used as a basis for natural resource conservation and sustainable management plans in a human impacted river basin.