

Environmental flow requirements for Kinigama anicut in Uruwal Oya, Sri Lanka

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Quantification of amounts of flows that should be maintained for sustaining the natural ecosystems in pristine conditions, i.e., the environmental flows, often remains complicated and difficult, resulting in a challenging situation for the sustainable management of water resources in many countries. Being a tropical country with an agriculture based economy, Sri Lankan lotic waters have been highly influenced by irrigational water diversions along with other water extractions. Even though the estimation and maintenance of environmental flows for lotic waters is of prime importance, the lack of required data especially hydrological information remains a challenge, which could be mitigated via stream flow generation through reliable computer modeling approaches. Therefore, this study was focused on the calculation of environmental flow requirements for Uruwal Oya along with the application of a calibrated and validated model to simulate daily flows and to evaluate the sufficiency of the flows at the downstream of the Kinigama anicut for sustaining downstream riverine ecosystems. The Hydrologic Engineering Centre - Hydrologic Modelling System (HEC-HMS) version 3.5 model was calibrated and validated for the Uruwal Oya catchment and the daily river flow values for the past twenty years (1994-2014) were generated at the pre-weir of the Kinigama anicut. The downstream flows that were calculated by deducting the agricultural water requirements of the Kinigama anicut, were evaluated via 32 different hydrological parameters, where Range of Variability Approach (RVA) targets that were set based on the flows of pre weir site, and rate of non-attainment for the flow at the downstream of the weir of Kinigama anicut were employed to evaluate the sufficiency of the downstream flow as environmental flow. The results of the RVA denoted that the flows that are maintained at the downstream of the Kinigama anicut at present, are insufficient to cater for the requirements of the ecosystems. Approximately a 52% mean rate of non-attainment was resulted signifying a moderate level of hydrologic alteration due to the irrigational diversion at Kinigama. Thus the results of this study emphasizes that an adequate environmental flow is not maintained at the downstream of the Kinigama anicut in Uruwal Oya in accordance with the RVA.

Keywords: Environmental flow, HEC-HMS, river flow modeling, Range of Variability