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EVALUATION OF THE STATUS IN ENVIRONMENTAL FLOW MAINTAINANCE AT MANGALATHIRIYA ANICUT IN ATHTHANAGALU OYA, SRI LANKA

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Determination of the volumes of flows that should be maintained for the sustenance of the natural eco systems under pristine conditions (Environmental Flows [EF]), remains complicated and difficult, causing a challenging situation for the sustainable management of water resources in many countries. As a tropical developing country with agriculture based economy, Sri Lanka is in need of utilizing the available lentic and lotic water sources heavily to support its economy. Yet, the management of such water sources in an ecofriendly sustainable manner without significantly affecting, both the environment and the economy, requires the maintenance of environmental flows. Thus, the quantification and long-term maintenance of EF requirements of lotic waters has emerged as a crucial requirement in sustainable management of water resources. Therefore, the Range of Variability Approach (RVA) was devised to evaluate the sufficiency of the flows at the downstream of the Mangalathiriya anicut for the sustenance of downstream riverine ecosystems. The Hydrologic Engineering Centre - Hydrologic Modelling System (HEC-HMS) version 3.5 model was calibrated and validated for the Aththanagalu Oya catchment and the daily river flow values for the past twenty years (1994-2014) were generated at the pre weir of the Mangalathiriya anicut. The downstream flows were calculated by deducting the drinking water requirements of the anicut. The existing flow regime at the post-weir was subjected to a RVA analysis, while utilizing 32 different hydrological parameters. The RVA targets (set based on the flows of pre weir site) and rate of non-attainment (for the flow at the downstream of the weir of Mangalathiriya anicut) were calculated to evaluate the sufficiency of the downstream flow regime to cater the EF requirements of downstream ecosystems. The rate of non-attainment of the IHA group 1 and group 2 parameters range in between 33 - 100 % suggesting a moderate to severe level of ecological degradation of the downstream ecosystems. In the IHA group 3, inability of calculating the timing of lower limit of annual extreme water condition due to the prevalence of similar minimal flow levels for several days forced the annual minima to be left uncalculated. Yet the annual maxima reflect a rate of non-attainment of 43 %, while the rate of non-attainment of both IHA group 4 and 5, range in between 48 - 100% and 53 - 100 %, respectively suggesting an ecological degradation of moderate to severe degree. Furthermore, the mean rate of non-attainment of 57.15 % predicts an overall moderate degree of ecological degradation of downstream ecosystems due to the operation of the Mangalathiriya anicut of Aththanagalu Oya. Thus, the results of the current study emphasizes that an adequate level of EF regime is not maintained at the downstream of the Mangalathiriya anicut in Aththanagalu Oya in accordance with the RVA.