

Environmental flow assessment of a tropical river system using hydrological index methods

ABSTRACT

Tropical rivers and wetlands are recognized as one of the greatest and most abundant ecosystems in terms of ecological and social benefits. However, climate change, damming, overfishing, water pollution, and the introduction of exotic species threaten these ecosystems, which puts about 65% of river flow and aquatic ecosystems under a moderate to high level of threat. This paper aims to assess the environmental flow of the Selangor River based on the hydrological index method using the Global Environmental Flow Calculator (GEFC) and Indicators of Hydrological Alterations (IHA) software. The daily flow data collected by the Department of Irrigation and Drainage (DID), Malaysia, over a 60-year period (1960–2020) was used in this study to assess the Selangor River flow alterations. As per the results, the river flow has had two distinct periods over the last 60 years. In the first period, the river flows without any alteration and has a natural flow with high flood pulses and low flow pulses. While in the second, or post-impact, period, the flow of the river has a steady condition throughout the year with very little fluctuations between the dry and wet seasons of the year. From the overall comparison of the pre- and post-impact periods, it can be concluded that the minimum flow in the dry seasons of the year has increased, while the maximum flow has decreased in the monsoon seasons during the post-impact period. As a result, the Flow Duration Curve (FDC) and Environmental Management Class (EMC) analysis of the river flow recommends that the Selangor River be managed under EMC “C” to provide sufficient water for both human use and ecosystem conservation, which would also help to avoid a water level drop in the reservoirs. However, further holistic studies are suggested for a detailed analysis of the effects of the dams on aquatic biodiversity and ecosystem services in the Selangor River Basin.

Keyword: Environmental flow; River flow; Damming; Hydrological alteration; Aquatic ecosystem; Biodiversity