

ABSTRACT

'River Health' is a recognizable and an increasingly acceptable term now, but its precise scientific method of assessment is yet to be developed. In ecological terms, River Health (RH) reflects the overall state of a river combining the cause (*abiotic drivers*) and effect (*biotic response*). River systems are normally managed by water resource managers. Various water quality indices (WQIs) have been developed from water use perspective. With development of biomonitoring programs, understanding of the ecological health of river system have successively evolved. With such developments, the idea of river health has evolved from the conceptual model to a measurable state. In India, most of the works in the past have focused on water quality monitoring with respect to anthropogenic use perspectives and the concept of Designated Best Use (DBU). Recently, the Central Pollution Control Board, India has made an attempt to assess the biological health of River Ganga considering macroinvertebrates as biotic parameter. In the present study a conceptual Framework for River Health Assessment using water quality indicators divided into 5 Groups, namely Organo-Electrolytic-Bacterial (OEB), Nutrient (NT), Algae (A), Macroinvertebrate (MI) and Fish (F) has been proposed. Water quality parameters have been converted into Indicator Group Scores on a 0-5 scale. Indicator Group Scores have been used to develop an integrated River Health Index (RHI) on a 0-100 scale. In order to report the status or condition of River Health, 'Critical' and 'Target' values for each Parameter/Index are selected. Based on the value of River Health Index (RHI), the River Health Condition (RHC) has been categorized as 'Acceptable' ($RHI > 60$) and 'Poor' ($RHI \leq 60$). The 'Acceptable' category is further divided into 'Excellent', 'Very Good', 'Good', and 'Poor' category is divided as 'Stressed', 'Overstressed', 'Critical' and 'Sick/Dead'. The River Health Condition (RHC) is depicted through a colored circumscribed pentagon, each sector of which represents indicator group condition of a selected class of river water quality. For river health improvement, changes in indicators representing Organo-Electrolytic-Bacteriological (OEB) and/ or Nutrients (NT) qualities are considered to be the causative parameters and biotic indicators as resultant conditions. The river health improvements and restoration plan may be carried out in two phases spread over a period of five years. A tentative phased program has also been

presented. Thus for River Health Assessment, an Indicator Group based approach for River Health Index (RHI) calculation gives insights for identification of critical parameters, which help in strategic planning for restoration. A colored representation of River Health Condition (RHC) based on scores for indicator groups and overall RHI makes it simpler for the scientific community to diagnose and suggest corrective steps for river health improvement/restoration. The novelty of the proposed frame work, include simple calculations, presentation of RHI value on a 0 -100 scale and a colored pictorial presentation of RHC for easy understanding. RHI values can be used to identify the healthy or unhealthy stretches of river. The stretches identified as 'Poor' indicate need of scientific intervention to improve the river health. This framework may be used as a tool for River Health Assessment and may be instrumental to the policy makers to carry out the River Health improvement programs.