
DESIGNING A WATER QUALITY INDEX FOR KESBEWA LAKE

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Water Quality Index (WQI) is a rating reflecting the composite influence on overall quality of a number of individual quality parameters in a selected water body. The objective of this research project is to establish a comprehensive Water Quality Index (WQI) for the Kesbewa Lake by using physical, chemical and microbiological water quality parameters, to identify the pollution levels. These results could be used to maintain the quality of water, and conserve flora and fauna, and also to advise the individuals, organizations and funding bodies associated with the lake.

The Water Quality Index is defined as, $WQI = \sum WiQi$ where, WQI = Water Quality Index, a number between 0 - 100, Qi = Quality of the i^{th} parameter, Wi = The weighting factor of the i^{th} parameter, a number between 1 and 0, such that, $\sum Wi = 1$ for n number of parameters, $Wi = Xi / Y$, Xi = Points given by reference material data for i^{th} parameter, Y = The total points for n number of parameters.

The raw analytical results for each parameter, having different units of measurements, are transformed into unit less Q-values by using the respective function of quality value of each parameter in the Q-value graphs. These Q-value graphs are plotted with respect to the each measured parameter value and their relative Q-values assigned by a points system.

Based on the World Health Organization (WHO) guidelines, points system for the Q-values for a parameter is assigned and Central Environment Authority (CEA) standards were used, where the WHO guidelines are not available. The highest Q-value 100 is assigned for the best value of a particular parameter that falls within the above guideline values. Separate ratings for Quality values were given for drinking and bathing, irrigation water, and for fish and aquatic life. These three Quality values were averaged to one value, which gives the Q-value for the measured value of that particular parameter in the Q-value graph. By using the functions of these graphs, the Q-value (Qi) for any measured value of i^{th} parameter can be obtained.

The weighting factor, (Wi) was determined by considering a large number of reference material data obtained from different water quality indices, in which the relative contribution of a parameter for the overall water quality has been weighted in different manner, according to the different point of views of scientists. The Q-value (Qi) is then multiplied by the weighting factor (Wi) and resulted values of all n number of parameters are summed to yield the total value of the WQI.

Twenty samples were collected from ten different locations of the lake over a period of eight months. According to the analyzed results, the prepared WQI for the Kesbewa lake gets a general ratings of 49.74, which falls, in the region of Bad in the water quality index. In comparing the average values of measured parameters with WHO and Sri Lankan Standards, it can be concluded that the water of Kesbewa Lake is relatively polluted and water quality should be improved for aquatic life, irrigation and drinking and bathing purposes.