

5. Summary

Lake water quality assessment is equally important like that for rivers as they are also important natural resource, and their sustainable maintenance is required to fulfil the upcoming needs of future generation. Not only humans but animals and plants are dependent on lake bodies for water, food, habitat etc. Thousands of flora and fauna reside in lakes adding to the biodiversity of that particular state or country. Since the concept of WQI came into existence, monitoring water bodies and communicating the status to the people have become easier as WQI is a simple tool which converts scientific data into a digit form which can be made understood the authorities and locals.

WQIs are essential tools for making water quality information more accessible and understandable to everyone. They are also critical for monitoring water quality trends and identifying potential problems. However, it is important to note that WQIs are not always true measure of pollution, and their accuracy and reliability depend on the methods and procedures that are used to develop them. WQI developers must carefully consider all the alternative methods and select the most appropriate ones for each step in the development process. They must also avoid subjective judgments and biasness, otherwise the WQI will not be reliable.

Some of the learning points from work:

- Lake ecosystem should be monitored on daily, monthly, and quarterly basis for knowing the health of the water body and data be stored, tracked and compared with the past data for easy assessment and interpretation.
- Assessment should not be limited to only few parameters, parameters selection, inclusion, exclusion should be done based on the pollution load received by the water body.
- People participation programme should be organised on frequently to make people value water body, understand their importance, educate them on which anthropogenic activities can pollute the water body and guide them to take measures to avoid pollution on ground level.
- WQIs cannot be used to evaluate the quality of water for all applications. For example, a WQI developed for drinking water may not be suitable for assessing the quality of water used for irrigation or recreation.

- WQIs cannot outline all the water quality hazards that may be present in a water body. For example, a WQI may not include parameters related to emerging contaminants or pathogens.
- WQIs cannot deliver a complete and comprehensive analysis of water quality. A WQI is typically based on a limited number of parameters, and it does not take into account all of the factors that can affect water quality.
- WQIs are developed for a particular region and are source specific. This means that a WQI developed for one watershed may not be applicable to another watershed.
- WQIs identify a set of parameters that are relevant to all water uses and can be used to assess water quality in all types of watersheds.
- WQIs develop a method for weighting and aggregating the parameters in a way that accurately reflects the overall quality of the water.
- A single Universal Index should not be applied everywhere.
- Modification should be done in previously developed index depending on the basis of location, past and present data for example parameters weightage if needs to be change should be done on basis of how that particular parameters values are increasing gradually so index value might get affected if weightage is low for that particular parameter. Addition or deletion of the parameters should be accepted which is not seen in case of all Indices. According to the pollution load, climatic conditions parameters should be decided for index calculation.
- One challenge with using statistical methods to select parameters is that the results can depend on the choice of data that is analyzed. For example, if the data is not representative of the water body that is being assessed, then the results may not be accurate.
- Analysed data should be presented in a pictorial form like Eco- Heart Index as mathematical formulas, number and models might not be understood to all and may confuse common people.
- Depending on the regional conditions and dominating parameters contributing to the water pollution Specific Index was developed for Vadodara region.

The ultimate goal is to develop a WQI that can overcome these limitations and be applied across various watersheds. This would be a significant achievement, as it would provide a more accurate and reliable way to assess water quality and identify potential hazards.

Current Research Area	Research themes	Research Directions
Highly Regional Consideration of specific parameters depending on the problems associated to that area.	Specific Indices	Benchmarking Indices which can be applied on a global scale. Comprehensive assessment of parametric consideration for different indices, independent of the requirements of the area of interest.
Highly subjective Considers ranking of parameters depending on the responses recorded by people or experts. Parameters are considered based on the problems associated to a specific region of interest.	Human Intervention	Challenges like rigidity, eclipsing and ambiguity needs careful assessment. Domain or reach of expert should be expanded. Subjective methods may be followed by certain mathematical statistical based techniques
No specific tool to determine the efficacy of use of WQIs. Very limited studies carried out on regression modelling and prediction through artificial neural network models.	Performance Assessment	Indices developed or proposed methodologies need performance assessment. Sensitivity analysis of different parameters considered for developing various indices need to be carried out.
Multivariate statistics Probability Randomness of water quality datasets.	Emerging Technologies	Modification in existing mathematical models. Integrating one or more mathematical techniques for a more reliable and effective WQI.

Source : (Dash and Kalamdhad 2021)