International Journal of Engineering Science Invention Research & Development; Vol. 12, Special Issue 11, May 2026
www.ijesird.com, E-ISSN: 2349-6185

GIS BASED MAPPING AND STATUS OF WATER QUALITY IN LAKES FOR SUSTAINABLE RESTORATION

Dr. BC Nagendra Prasad
Prof. and Head, Department of Civil Engineering, Maharaja Institute of Technology, Thandavapura, Mysore, Karnataka,
Kusuma R , Chaithra R, Darshan D R, Thanusha Ningaraja, Anjali N
Department of Civil Engineering, Maharaja Institute of Technology, Thandavapura, Mysore, Karnataka, India

***Abstract*- Lakes play a crucial role in maintaining ecological balance and supporting human activities; however, rapid urbanization, sewage discharge, and increasing anthropogenic pressures have significantly degraded their water quality. This study presents a GIS-based assessment of water quality and lake-wise restoration planning for six lakes in and around Nanjangud, Mysuru district Yennehole, Shetty Kere, Dalvoy, Kalale, Gonathagala, and Halepura. Water samples were collected bi-weekly from September to December from selected sampling locations in each lake and analyzed for physicochemical and bacteriological parameters such as pH, turbidity, alkalinity, electrical conductivity, total hardness, total dissolved solids (TDS), dissolved oxygen (DO), chlorides, and E. coli using standard laboratory methods.The generated water quality data were integrated with Geographic Information System (GIS) software. Lake boundary shape files were prepared from satellite imagery and secondary spatial data. Attribute tables were created by linking laboratory results with corresponding lake locations. Water Quality Index (WQI) values were calculated for each lake based on weighted arithmetic index method, and thematic maps were generated to visualize spatial variation in water quality classes. GIS mapping enabled clear identification of pollution hotspots and comparative assessment of lake conditions. The results showed slightly alkaline pH values ranging from 7.1 to 8.2. Total hardness varied between 200 and 389 mg/L, and TDS ranged from 126 to 333 mg/L, with higher concentrations observed in Dalvoy and Gonathagala lakes. Dissolved oxygen levels remained satisfactory (7.1–8.8 mg/L) across all lakes. The presence of E-coli in Yennehole, Shetty Kere, Dalvoy, and Gonathagala lakes indicated contamination from untreated sewage. WQI analysis classified Kalale Lake as having good water quality, Yennehole and Shetty Kere as moderate, and Dalvoy, Gonathagala, and Halepura lakes as poor. Based on the spatial analysis and water quality results, lake-specific restoration measures were proposed. Yennehole Lake requires diversion of untreated sewage, desilting, and artificial aeration. Shetty Kere needs regular water quality monitoring, inlet filtration maintenance, and protection of feeder canals. Dalvoy Lake demands immediate sewage interception, establishment of sewage treatment facilities, and removal of polluted sediments. Kalale Lake, showing relatively better quality, requires preventive management such as controlled tourism, shoreline vegetation development, and periodic monitoring. Gonathagala Lake requires solid waste removal, sewage diversion, and construction of wetlands for natural filtration. Halepura Lake demands strict regulation of industrial effluent discharge, aeration to improve dissolved oxygen levels, and ecological restoration using native aquatic plants. The study concludes that integration of laboratory analysis with GIS-based spatial mapping and lake-wise restoration planning is an effective approach for sustainable lake management and protection of public health and the environment.**

Keywords : **Water Quality Index (WQI), Sustainable Water Management, GIS Mapping, Sewage Contamination, Lake Restoration Planning, Spatial Analysis, Sustainable Lake Management.**

1. INTRODUCTION

Water is one of the most essential natural resources that sustains life on Earth. Lakes and other surface water bodies play a vital role in maintaining ecological balance, supporting biodiversity, recharging groundwater, and providing water for domestic, agricultural, and industrial purposes. However, with the rapid pace of urbanization, population growth, and unregulated land-use activities, the quality of freshwater bodies has been severely degraded in recent years. Pollution from domestic sewage, solid waste dumping, agricultural runoff, and industrial discharges has led to the deterioration of lake ecosystems, making them unsuitable for their intended use. Lakes act as natural storage and self-purification systems, but when the rate of pollution exceeds the lake's natural cleaning capacity, their water quality declines drastically. The assessment of water quality is therefore an essential step in understanding the health status of a lake. It provides valuable insight into the physical, chemical, and biological characteristics of the water, indicating whether the lake is fit for drinking, irrigation, or aquatic life. The Water Quality Index (WQI) is a scientific tool that simplifies complex water data into a single value that expresses the overall quality of water, making it easier to understand and compare between different sites. In this study, an attempt has been made to assess the water quality of selected lakes in Nanjangud Taluk, Mysuru District, by determining key physicochemical parameters such as pH, Dissolved Oxygen (DO), Total Dissolved Solids (TDS), Turbidity, Hardness, and Chloride. The

obtained results were compared with the standard permissible limits prescribed by BIS IS 10500:2012 and CPCB surface water quality criteria to determine the suitability of water for various purposes. To visualize spatial variation in lake water quality, Geographic Information System (GIS) techniques were used to generate thematic maps showing parameter distribution and pollution intensity zones. This integration of laboratory analysis with GIS-based mapping helps identify critical polluted regions and supports decision- making for future lake restoration measures. The study ultimately aims to promote sustainable lake management by providing scientific data and visual tools that can help authorities and communities implement effective restoration and conservation strategies. By understanding the current water quality status, preventive actions can be taken to protect and restore these valuable freshwater ecosystems for future generations.

2. METHODOLOGY

The study was carried out to assess the status of water quality in selected lakes using GIS-based mapping techniques. The lakes were chosen based on their size, accessibility, and importance to the local community. Primary data was collected through field visits, during which water samples were taken from different points of each lake. The collected water samples were analyzed in the laboratory for various physical, chemical, and bacteriological parameters such as pH, dissolved oxygen (DO), total dissolved solids (TDS), turbidity, e -coli. The test results were compared with BIS and WHO standards to assess the quality of water. The analyzed data was then imported into GIS software mapping of different water quality parameters. A Water Quality Index (WQI) was calculated to classify the lakes into categories such as good, poor, or unsuitable for use. Based on the analysis, appropriate restoration measures were suggested, including desiltation, prevention of sewage inflow, pollution control, and the development of green buffer zones. The study also highlighted the importance of public awareness and community participation for the sustainable restoration and management of lakes.

2.1 IDENTIFICATION OF LAKES

- **Yennehole lake**

Fig 1.1: This figure shows the GPS image of Yennehole Lake

Yennehole Lake, located in Dadadahalli village, is a significant water body known for its ecological importance and role as a bird habitat. It was primarily used for agricultural purposes & by surrounding villages for non- drinking water needs, such as for cattle. Specifically, farmers used the lake's water for irrigating paddy fields, village & its non-potable water. Additionally, the lake supported aquatic life,

including fish & provided a habitat for various bird species. Reasons of pollution water are

- **Sewage Inflow:** Untreated sewage from residential areas like Bogadi, Vijayanagara, and others directly enters the lake, carrying a high load of pollutants.
- **Agricultural Runoff:** Rainfall washes pollutants like fertilizers and pesticides from agricultural lands into the lake, further degrading the water quality.
- **Siltation:** Lack of coordination between local authorities and villagers has led to the lake's bed filling with silt, hindering water flow and increasing pollution.

- **Shetty kere**

Fig 1.2 : This figure shows the GPS image of Shetty Kere

Shetty Kere is a manmade lake located in near Mandakalli. The lake is known for attracting various bird species and abundant fish. The Shetty Kere is primarily used for agricultural purposes. It also serves as a source of water for surrounding areas and attracts various bird species. Shetty Kere in Mysore is not currently known to be heavily polluted. While some studies indicate that Dalvoy Lake, which is connected to Shetty Kere, has faced water quality issues due to sewage and urban runoff, Shetty Kere itself is described as relatively free from pollution due to its filtration through Dalvoy Lake and its connection to a major feeder canal.

- Relatively Clean Water: Because of this filtration process, Shetty Kere is reported to have relatively clean water, with rich dissolved oxygen and moderate levels of nitrates.
- **Dalvoy lake**

Fig 1.3: This figure shows the GPS image of Dalavayi Lake

Dalavayi Lake, also known as Dalvoy Kere, is a lake in Mysore, India, constructed during the rule of the Maharaja of Mysore to provide irrigation water. The lake is a significant water body for the region, acting as a source for agriculture, fisheries, and other household activities for the local population. Dalavayi Lake receives water from rainfall, urban runoff through storm drains, sewage from the city, and irrigation return flow from canals. Reasons of pollution water are

- Untreated Sewage: A major contributor to the pollution is the inflow of untreated sewage water into the lake. This sewage carries various pollutants, including organic matter and pathogens, which degrade the water quality.
- Urbanization and Drainage: The rapid urbanization and inadequate drainage system in Mysore have led to increased sewage discharge into the lake. Improper drainage systems also contribute to the problem by carrying pollutants from residential areas directly into the lake.
- **Kalale lake**

Fig 1.4: This figure shows the GPS image of Kalale Lake

Kalale lake is a large lake located in Kalale village, near Nanjangud in Mysore district, Karnataka.
It's known for its serene beauty and is a popular spot for picnics, swimming, and photography. The lake is also known for birdwatching and fishing, with some locals using coracles and nets for fishing.

- Location: Kalale village, Nanjangud taluk, Mysore district, Karnataka.
- Size: It's a large lake, described as a "hidden beauty".
- Features: Offers a peaceful environment, cool breeze, and opportunities for recreation like swimming and fishing.
- Surroundings: The lake is surrounded by scenic views and is a good spot for nature lovers.
- Accessibility: Easily accessible by road, with a good road network around it.

Kalale Kere, located in Nanjangud, is likely the same as Kalale Lake, which is experiencing pollution due to industrial effluents, sewage, and solid waste. The lake is facing issues like eutrophication and bacterial contamination, impacting its water quality and suitability for recreation.

- **Gonathagala lake**

Figure 1.3: This figure shows the GPS image of Gonathagala lake

Gonathagala lake is located in the village of Gonathagala, within the Nanjangud taluk of Mysore district in Karnataka, India. While the provided search results don't detail a specific history for the lake, they confirm the village's location and the broader context of Nanjangud as a place with historical significance and ongoing urban development.
The search results don't offer specific historical details about Gonathagala lake itself. However, given Nanjangud's history and the presence of other historical sites and structures, it's plausible that the lake has a history tied to the region and its development.
It is unclear whether Gonathagala Lake in Nanjangud is currently polluted. Information about its specific pollution status is not readily available in search results. However, some general information about the condition of lakes in the Nanjangud and Mysuru area, and specifically about Dalvoy Lake in Mysuru, indicates that many water bodies in the region are facing pollution challenges due to urbanization, industrialization, and sewage discharge.

- **Halepura lake**

Figure 1.4 : This figure shows the GPS image of Halepura Lake

Halepura Lake, located in Nanjangud, is reportedly polluted due to industrial effluents and sewage discharge, leading to fish kills and deteriorated water quality. The lake's water is unsuitable for aquatic life, and the pollution is linked to anthropogenic activities and industrial presence near the lake, according to a review of literature from Sci-Space. Sources of Pollution are

- Halepura Lake is one of the many water bodies in the Mysuru-Nanjangud region facing threats from sewage and encroachments, according to The Times of India.
- Industrial effluents and sewage from residential areas are significant sources of pollution, causing fish deaths and impacting water quality.

3. RESULT AND DISCUSSION

3.1 WATER QUALITY INDEX

Lake name	WQI	Water quality	Possible usages
Kalale	58.4	Fair	Irrigation and Industrial
Gonathagala	82.7	Poor	Irrigation
Halepura	69.2	Fair	Irrigation and Industrial
Yennehole	76.5	Poor	Irrigation
Shettykere	73.9	Fair	Irrigation and Industrial
Dalvoy	78.1	poor	Irrigation

Table 1.1: Water quality index

Table 1.1 shows the values of WQI of the six selected lakes show that most of the lakes fall under the poor water quality category, indicating significant levels of pollution and reduced suitability for domestic or recreational use. Among all the lakes, Kalale Lake has the lowest WQI value of 58.4, placing it in the slightly polluted category, which means its water quality is comparatively better than the others but still requires monitoring and improvement. All other lakes including Gonathagala Lake (82.7), Halepura Lake (69.2), Yennehole Lake (76.5), Shetty Kere (73.9), and Dalvoy Lake (78.1)—fall within the poor category. These higher WQI values suggest the presence of pollution sources such as domestic sewage discharge, agricultural runoff, organic waste, and lack of proper waste management around the lakes. Overall, the results highlight the urgent need for conservation measures, pollution control practices, and

sustainable lake management strategies to improve water quality in the region.

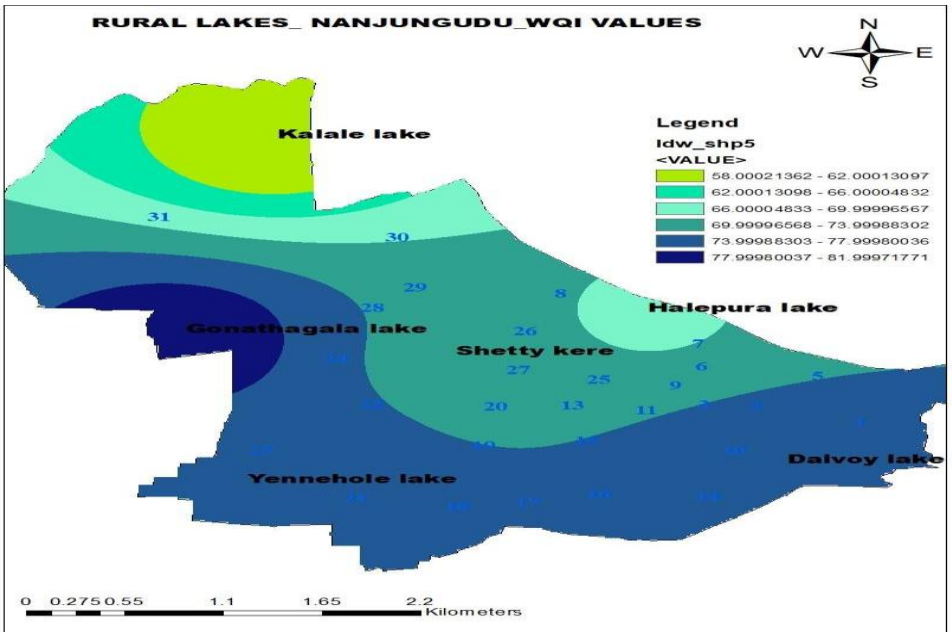

Figure 1.7: This Figure shows the GIS mapping of rural lakes

The Fig 4-13 displays six lakes with interpolated Water Quality Index (WQI) zones Kalale lake has the lowest WQI (58.00–62.00, yellow-green zone 31), Halepura and Shetty kere show moderate WQI (66.00–73.99, green zones), while Dalvoy, Yennehole, and Gonathagala have higher WQI (73.99–81.99, blue zones), indicating better water quality. The IDW interpolation (Idw_shp5) and a 0–2.2 km scale are used for spatial analysis.

3.2 RESTORATION METHOD

LAKES	**WQI**	**RESTORATION METHODS**
KALALE	58.4	Preventive Catchment Management. Shoreline Stabilization and Green Buffer Development. Periodic Desilting (Low Intensity), Continuous Monitoring.
Gonatahala	82.7	Sewage Interception and Diversion. Mechanical Desilting and Dredging, Constructed Wetlands. Aeration Systems and Bioremediation.
Halepura	69.2	Selective Desilting and Buffer Zone, Riparian Vegetation Control of Agricultural Runoff Community-Based Lake Protection
Yennehole	76.5	Aeration and Oxygen Enhancement and Phytoremediation. Partial Desilting, Inlet Treatment Systems
Shettykere	73.9	In-situ Bioremediation, Constructed Wetland Systems Aeration and Regulation of Human Activities
Dalvoy	78.1	Complete Desilting and Dredging and Floating Wetlands. Sewage Diversion and Treatment. Long-Term Monitoring and GIS Mapping.

4. CONCLUSION

The study conducted on six selected lakes Kalale, Gonathagala, Halepura, Yennehole, Shetty kere, and Dalvoy through bi-weekly sampling has helped us understand the present condition of these surface water bodies. Analysis of key parameters such as pH, alkalinity, turbidity, chlorides, hardness, dissolved oxygen, TDS, conductivity, and E-coli showed that certain lakes fall under moderately polluted and poor quality categories based on the Water Quality Index (WQI). Yennehole and Shetty kere lakes exhibited higher levels of turbidity, chlorides, total hardness, and microbial contamination, indicating direct discharge of domestic wastewater and agricultural runoff.

The variations observed between sampling weeks reflect continuous external influence on lake water quality due to urbanization, unregulated waste disposal, and reduced natural inflow. Lakes such as Kalale and Halepura showed relatively better water quality but still displayed early signs of eutrophication and declining dissolved oxygen levels. Overall, the results highlight that none of the lakes are suitable for direct consumption, and long-term degradation may lead to ecological imbalance, loss of biodiversity, and reduced groundwater recharge.

REFERENCES

[1] Manas Kumar JHA, Yuvraj MARKANDE,DilipKumar:“RESTORATION AND REJUVENATION OF WATER BODIES ACROSS DELHI-NCR - AN OVERVIEW”
[2] Rutuja Kendre, L.G. Patil, and Sandeep Zade:"Rejuvenation and Beautification of River and Nala“
[3] Shamanth Kumar Hosabettu, Rasikh Mohammed Kazi, Dr. Radhakrishnan K:“GEO-HYDROLOGICAL STUDIES FOR THE REVIVAL OF 15TH CENTURY KAVOOR LAKE FOR MANGALORE SMART CITY SUSTAINABILITY”
[4] Ramachandra T.V., Sincy V., and Asulabha K.S: "Efficacy of Rejuvenation of Lakes in Bengaluru, India"
[5] Ramachandra T.V et al. (2020) work on “Efficacy of rejuvenation of lakes in Bengaluru, India”
[6] Balakrishnan Lekshmi et al. (2021) work on “Science & Technology Agenda for Blue-Green Spaces Inspired by Citizen Science: Case for Rejuvenation of Powai Lake”
[7] Martin Obada Eduvi et al. (2021) work on “Assesment of water quality using GIS Techniques and Water Quality Index in Reservoirs affected by Water Diversion”
[8] Manas Kumar et al. (2022) work on “Restoration and Rejuvenation of Water bodies across Delhi-NCR- an overview”
[9] Raghav Chawala et al. (2022) work on **“**Social Impact of Gujjar kere lake Rejuvenation”