

TROPIC STATUS OF HUSSAIN SAGAR LAKE

Water bodies which are subjected to pollution due to anthropogenic and other sources are classified based on their trophic State. This phenomenon of describing the state of a lake is identified with biological activity arising out of the presence of carbon as organic source and nutrients in the form of Nitrogen and Phosphorous (nourishment). Eutrophication is predominantly is due to nutrient enrichment. The progresses of trophic state of lakes are oligotrophic, mesotrophic, eutrophic and hypertrophic is based on the availability of nutrients in the water body. The natural time scale for the ageing of lakes is of the order of hundred to thousands of years based nutrient inputs, sediments and climatic conditions. The boundary conditions for Classification of lakes and reservoirs are defined by the Organization for Economic Cooperation and Development (OECD) is presented in the Table -1.0.

Status of the Lake

The boundary conditions for classification of lakes and reservoirs are defined by the Organization for Economic Co-operational Development (OECD) presented in the Table- 3.12 Chlorophyll-a is a measure of the total phytoplankton content and is an important parameter in lake classification and its status. The Secchi depth is a measure of the degree of transparency of water and is a function of algal concentration and the concentration of dissolved components.

Table -1.0 OECD Boundary values for lakes Classification (1982)

Sl.No	Parameter	Oligotropohic	Eutrophic	Hypertrophic
1	Total Phosphorus($\mu\text{g/L}$)	<10.0	35-100	>100
2	Mean Chlorophyll-a ($\mu\text{g/L}$)	<1.0	8-25	>25
3	Maximum Chlorophyll -a ($\mu\text{g/L}$)	<2.5	25-75	>75
4	Mean Secchi depth (m)	>6.0	3-1.5	<1.5
5	Minimum Secchi depth (m)	>3.0	1.5 -0.7	<0.7

Source: OECD

Phosphorus, especially when present as orthophosphate, is widely accepted as being the critical nutrient in determining the degree of Lake Eutrophication, but in some cases inorganic nitrogen (NH_4 or NO_3) can be the limiting nutrient.

Chlorophyll-a is a measure of the total phytoplankton content and is an important parameter in lake classification and characterization. The Secchi depth is a measure of the degree of transparency of water and is a function of the algal concentration and the concentration of dissolved components.

Total phosphorus (TP) is a “cause” parameter, while chlorophyll-a and Secchi depth are “effect” parameters. When TP increases, that means there is more food available for algae, so algal concentrations increase. When algal concentrations increase, the water becomes less transparent (cloudier) and the Secchi depth decreases. By measuring each of the three parameters, we can better pinpoint the source of water quality improvement or decline.

NEERI Studies (1996-97 & 2000)

Based on the studies, NEERI classified the lake condition as Hypereutrophic which is ultimate trophic status which suggests that the lake is in bad condition in terms of DO, BOD, Coliform count, phytoplankton and unfit for any recognized uses as stipulated under BIS 2496. NEERI also suggested mitigative measures which includes diversion of dry weather flow/provision of sewage treatment facilities and treated waters are allowed into the lake to maintain the hydrology of the lake/stopping all kinds activities which results in the pollution of the lake and aeration facilities to impart dissolved oxygen to lake waters. These recommendations are in line with earlier recommendation by other consultants/agencies/organizations.

EPTRI Study, March 2015 – Trophic Status of Lake

At the initiative of GHMC, EPTRI has undertaken one time sampling of Hussain Sagar lake water and sediments on priority basis during March 2015 to assess the present condition of the lake. Keeping in view of the time constraint, the water samples and sediment (grab) samples were collected and analyzed as proposed during second week of March, 2015.

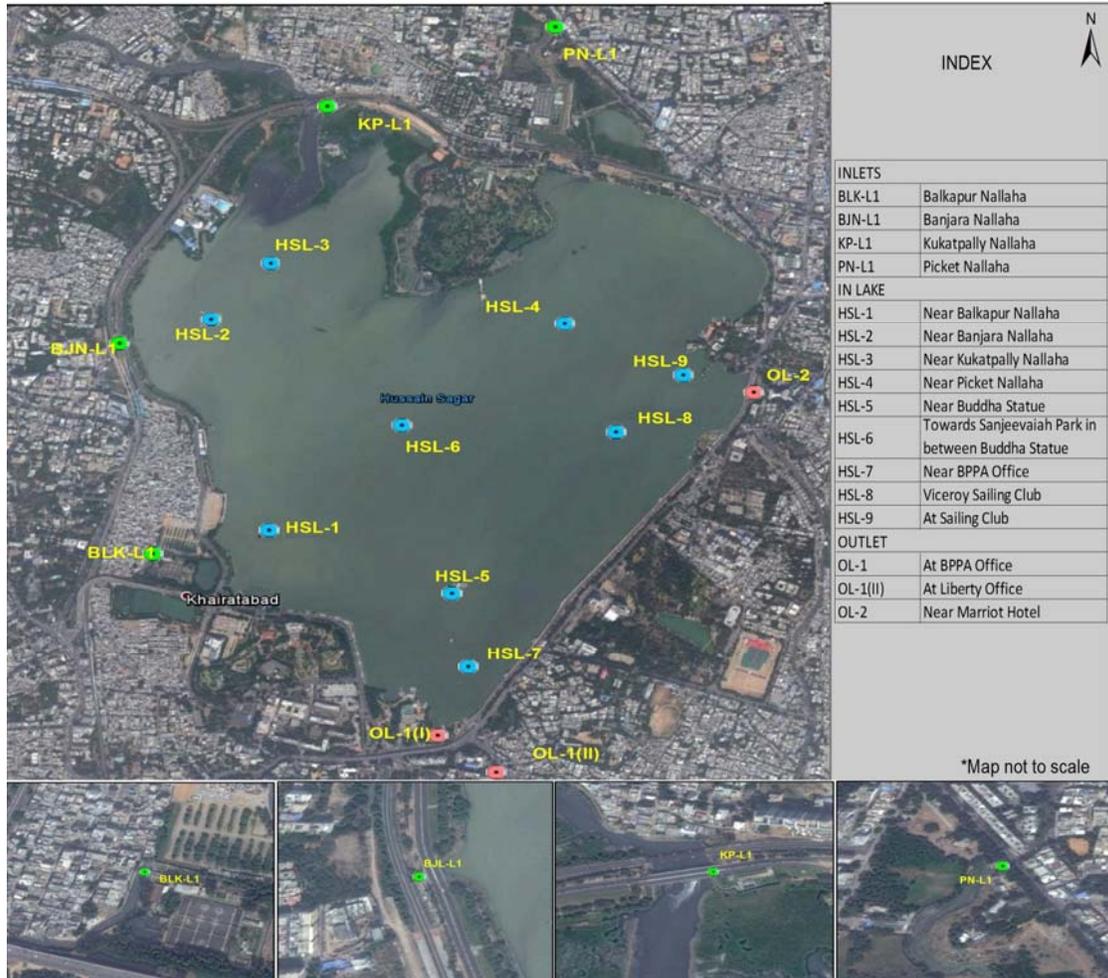
The Table 2.0 given below provides the comparative status of the lake water based on NEERI studies (1996-97, 2000) and present studies by EPTRI (2015) in terms significant parameters.

Table -2.0
Comparative Status of Lake Water based on NEERI and EPTRI Studies

Sl.No	Parameter	EPTRI (2015)	NEERI (1996-97,2000)
1	BOD (mg/L)	42-80	20-48
2	COD (mg/L)	110-183	76-203
3	TDS (mg/L)	940-1200	700-1100
4	Phosphate ($\mu\text{g/L}$)	410-1540	1500-5000
5	Mean Secchi depth (m)	0.11-0.30	0.18-0.24
6	Mean Chlorophyll- a ($\mu\text{g/L}$)	2-8.3	153-241
7	Trophic Status	Hypereutrophic	Hypereutrophic

It can be observed from the above table, that the present studies carried out by EPTRI shows much higher COD, BOD and TDS values compared to that of NEERI work carried in 1996-97. There is no perceptible difference in Secchi Depth where as phosphate and Chlorophyll-a has declined considerably over this period. Decline in phosphate levels may due to sewage treatment provided at Lumbini Park and Picket nalla. The performance of these treatment units are not evaluated during the present studies. In 1996-97 the sewage treatment plant at Madrasa Matka was working well and at expected efficiency.

The present studies suggests that the trophic status of the lake remains Hypereutrophic indicating the lake water quality is very fragile and needs attention and human intervention to achieve positive results.



Water and Sediment sampling locations of Hussain Sagar Lake-EPTRI studies 2015

References:

1. EPTRI - A Pilot Study on Hussainsagar Lake Environment , March 2015
2. NEERI - Environment Monitoring of Hussainsagar Lakewater and Sediments, June 2000