EFFECT OF INDUSTRIAL EFFLUENT ON SURFACE WATER QUALITY OF MEDCHAL LAKE HYDERABAD CITY

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ABSTRACT

Water is a natural resource (lakes and rivers) which is decisive for the survival of living organisms. Due to rapidly increasing population, exponential industrialization and urbanization, etc. various water bodies, all over world are exposed to various forms of environmental degradations. This leads to aggregations of phytoplankton, macro algae and occasionally colourless heterotrophic protists can discolour the water giving rise to foam. Due to this, there is reduction in DO (Dissolved Oxygen) level which ultimately disturbs the ecological balance of the lake and finally leads to eutrophication in water bodies. In the present work, the Medchal Lake situated in Medchal District, Telangana, India has been selected for sampling collection. This study reveals the current status of the Medchal Lake in terms of water quality.

The physico-chemical parameters were analyzed. Higher values recorded containing salts, land fill leachates and animal.Over the due course of time various parameters regarding the water quality were analysed. Most of the parameters were not found to be in the desirable range for drinking water & hence, appropriate measures were suggested to improve the quality of water.

Keywords: lake water; water quality; physico-chemical analysis.

INTRODUCTION

Water is the most abundant and most useful compound in the world and hence it is called "Jeevan" (Life) in Sanskrit. Life is not possible without water, the 2/3rd mass of our body is water and 70% surface of the earth is covered by water. The contamination and pollution of water is of great concern in the world for the developing countries like India. The evaluation of water quality in most countries has become a critical issue in recent years, especially due to concerns that freshwater will be a scarce resource in the future.

The physico-chemical methods are used to detect the effects of pollution on the water quality. Changes in the water quality are reflected in the biotic community structure. Water pollution occurs when water body is adversely affected due to the addition of undesirable materials to the water. When it is unfit for its intended use, water is considered polluted.

A lake is an area filled with water, localized in a basin, that is surrounded by land, apart from any river or other outlet that serves to feed or drain the lake. Lakes can be contrasted with rivers or streams, which are usually flowing. Most lakes are fed and drained by rivers and streams.

Lakes can provide us with prime opportunities for recreation, tourism, and cottage or residential living. They are also respected by many people for their historical and traditional values and may be a source of raw drinking water for a municipality. Lakes can also be used as a water supply for industry and an irrigation source for agriculture. So you see lakes are more than just a simple body of water used by many people to enjoy recreational activities.

Ever increasing population, urbanization and modernization are posing problems of sewage disposal and contamination of surface waters like lakes. Natural water gets contaminated due to weathering of rocks, leaching of soils and mining processing, etc. Various types of problems in lake which cause nutrient enrichment in lake have been reviewed. Land use change and longer growing seasons could increase the use of fertilizers with subsequent leaching to watercourses, rivers and lakes, increasing the risk of eutrophication and loss of biodiversity

Hyderabad Metropolitan Development Authority (HMDA) developed from the 400 years old Bhagyanagar city, geographically situated land locked arid zone and no perennial; river but a seasonal River Musi flowing through it. For longer periods, it is the capital city of so many rulers and in long run expanded to the 8,005sq.km in Telangana State, India.

Due to the expansion of the Hyderabad city and rapid urbanization of surrounding areas the water quality of lakes is destroying. Present study deals with a Medchal Lake which is situated in Hyderabad in Telangana.

Objective:

- To study the water quality of Medchal lake (Peddacheru).
- Analyzing of water quality of the samples and comparing with Indian Standards

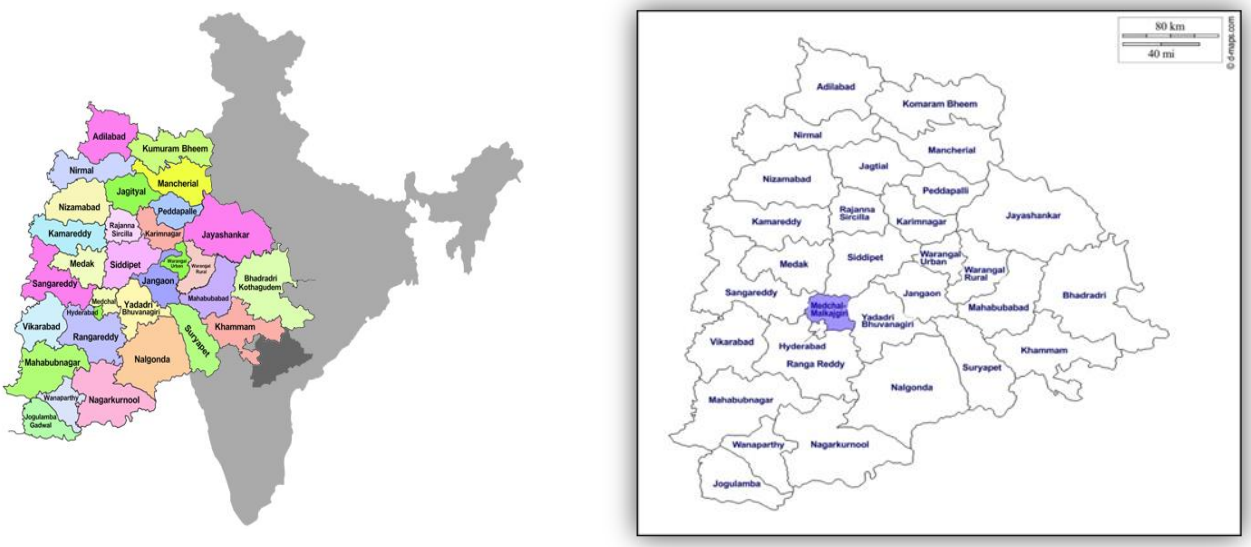

Figure 1: Shows the Location of Medchal District in Telangana State

Figure 2: View of Medchal Lake

Figure 3: Sampling Location

Figure 4: Collected Water Samples for chemical analysis

Study Area:

According to locals, Medchal lake is the largest lake in the Mandal consisting 18 villages including the Medchal village. Hence it is popularly known as PeddaCheruvu. Location of the Medchal district is shown in figure 1 and figure 2 shows view of the lake considered for the study. It is said that the lake has been in existence since the Nizam's Era.

Location: Medchal, Hyderabad, Telangana
Latitude: 17º62'23" N
Longitude: 78 º48'30" E
Area covered: 6070.28 sq. m
Bund Length: 1200 m
Maintained by: Hyderabad Metropolitan Development Authority (HMDA).

Some forty years ago, fish rearing ponds were constructed. But they have been abandoned since two decades. This is due to two reasons: the depleting level of water in the lake and second one is the inlets being blocked for the construction of the Outer Ring Road and for other government projects. The lake has no major inflows and its water supply is chiefly derived from internal springs and precipitation. It has assumed the look of a small kunta where water has been left to stagnate. Due to immersion of Ganesh idols or any idols there is largely deposited of Plaster of Paris in lake. Adjacent to the study area, there

exists a temple. The waste from the temple including polythene bags and the flowers were directly added into the lake. Beside, solid wastes and contaminated water which are utilized by the local peoples are also released into the lake.

Study site:

The present work carried out at different direction of Medchal lake as shown in figure 3 and table 1 shows latitude and longitude of sampling points, collecting total of 16 samples as shown in figure 4.

1. (North East side): samples 1, 2, 10
2. (North Westside): samples 5, 16
3. (South Westside): samples 4,7,8,15
4. (South Eastside): samples 9,6
5. (Centre of Lake): sample 3,11,12,13
6. (South side): sample 14

Table 1: Location on SamplingPoint

Samples no.	Latitude	Longitude
1	17°62'29.7"N	78°48'26.2"E
2	17°62'39.9"N	78°48'30.4"E
3	17°62'22.6"N	78°48'21.9"E
4	17°61'93.7"N	78°48'31.9"E
5	17°62'30.5"N	78°48'18.0"E
6	17°62'.26.2"N	78°48'38.5"E
7	17°62'06.1"N	78°48'19.2"E
8	17°62'20.2"N	78°48'20.7"E
9	17°62'14.5"N	78°48'42.6"E
10	17°62'33.2"N	78°48'24.2"E
11	17°62'19.2"N	78°48'17.6"E
12	17°62'14.2"N	78°48'18.4"E
13	17°62'12.2"N	78°48'21.2"E
14	17°62'15.2"N	78°48'44.3"E
15	17°62'07.3"N	78°48'28.1"E
16	17°62'30.6"N	78°48'11.8"E

METHODOLOGY

- Collected Samples are subjected to water quality analysis (Physical and Chemical analysis).
- Unstable parameters such as temperature and pH are measured at the sampling site.

WATER QUALITY PARAMETERS AND ASSESSMENT

Temperature

The mercury thermometer was employed to record the temperature of the Atmosphere Temperature and for Water temperature. Temperature is a measure of the average energy (kinetic) of water molecules. It is

measured on a linear scale of degrees Celsius or degrees Fahrenheit.It is one of the most important water quality parameters. Temperature affects water chemistry and the functions of aquatic organisms. It influences the: amount of oxygen that can be dissolved in water, rate of photosynthesis by algae and other aquatic plants, metabolic rates of organisms, sensitivity of organisms to toxic wastes, parasites and diseases, and timing of reproduction, migration, and aestivation of aquatic organisms.

pH

The pH was measured by pH meter. pHis basically a measure of the acidity or basicity of an aqueous solution. Solutions having pH less equal to 7. pH measurements have significant importance in the field of biology, environmental science, chemistry, medicine, oceanography, food science, agriculture, nutrition,civil engineering, chemical engineering, forestry, water treatment & water purification and many other applications. Mathematically, it can be said that pH is the negative logarithm of the activity of the hydrogen ion.

Electrical Conductivity

The conductivity of water was measured directly with the help of Conductivity Meter. The instrument was checked constantly by using standard potassium chloride solutions. Conductivity will vary with water source: ground water, water drained from agricultural fields, municipal waste water, rainfall. Therefore, conductivity can indicate groundwater seepage or a sewage leak.Solids can be found in nature in a dissolved form. Salts that dissolve in water break into positively and negatively charged ions. Conductivity is the ability of water to conduct an electrical current, and the dissolved ions are the conductors. The major positively charged ions are sodium, (Na+) calcium(Ca^{+2}), potassium (K^{+}) and magnesium (Mg^{+2}). The major negatively charged ions are chloride (Cl^{-}), sulfate (SO_4^{-2}), carbonate (CO_3^{-2}), and bicarbonate (HCO_3^{-}). Nitrates (NO_3^{-2}) and phosphates (PO_4^{-3}) are minor contributors to conductivity, although they are very important biologically.

Alkalinity

Alkalinity was measured by titrometric method using phenolphthalein and methyl orange indicator. Alkalinity refers to the capability of water to neutralize acid. This is really an expression of buffering capacity. A buffer is a solution to which an acid can be added without changing the concentration of available H+ ions (without changing the pH) appreciably. It essentially absorbs the excess H+ ions and protects the water body from fluctuations in pH.Alkalinity is important for fish and aquatic life because it protects or buffers against rapid pH changes. Living organisms, especially aquatic life, function best in a pH range of 6.0 to 9.0. Alkalinity is a measure of how much acid can be added to a liquid without causing a large change in pH. Higher alkalinity levels in surface waters will buffer acid rain and other acid wastes and prevent pH changes that are harmful to aquatic life.

Total Dissolved Solids

Total dissolved solids refer to the suspended and dissolved matter in water. They are very useful parameters describing the chemical constituents of the water and can be considered as edaphically relation that contributes to productivity within the water body [18]. Total solids are determined as the residue left after evaporation of the unfiltered sample. Total dissolved are determined as the residue left after evaporation of the filtered sample. Total Suspended Solids are determining as the difference between the total solids and the total dissolved solids.

Chloride

Chloride was measured by titrometric method using potassium chromate indicator. Chloride ion may be present in combination with one or more of the cations of calcium, magnesium, iron and sodium. Chlorides of these minerals are present in water because of their high solubility in water. Each human being consumes about six to eight grams of sodium chloride per day, a part of which is discharged through urine and night soil. Thus, excessive presence of chloride in water indicates sewage pollution.

Dissolved Oxygen

Dissolved oxygen (DO) was measured by modified Winkler's method. The higher value of dissolved oxygen indicates good aquatic life. Dissolved oxygen refers to the level of free, non-compound oxygen present in water. It is an important parameter in assessing water quality because of its influence on the organisms living within a body of water. In limnology (the study of lakes), dissolved oxygen is an essential factor second only to water itself. A dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality. Dissolved oxygen is necessary to many forms of life including fish, invertebrates, bacteria and plants.

RESULTS AND DISCUSSIONS

The physico-chemical parameters such as pH, electric conductivity, TDS, alkalinity, dissolved oxygen, and chloride of water were analyzed for the water samples collected from lake. Water samples from the Medchal lake were collected at 16 points in sterilized polythene bottles of one litter capacity (figure 4).All parameters with the mean values of the data are shown in the Table 2 and same values are represented graphically from figure 5 to figure 10.

Table 2: Values of Physico-Chemical Parameters of Water Sample Collected from Medchal Lake

Sample No. ⇨	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Parameters ⇩																
Colour	GREENISH															
Temperature (°C)	27.1															
pH	8.8	8.7	7.79	8.51	8.8	7.42	7.4	7.3	8.6	8.7	7.7	7.7	7.9	8.61	7.5	8.7
TDS (Mg/L)	1239	1224	1010	1112	1215	1100	1000	999	1219	1220	1010	1010	1011	1211	1015	1210
Alkalinity (Mg/L)	232	230	199	221	222	200	202	202	222	230	201	201	198	220	198	221
Chloride (Mg/L)	156	158	182	193	221	310	270	258	304	161	193	189	185	266	264	228
Conductivity(µS/cm)	2.40	3.56	2.15	3.00	2.88	2.10	2.15	2.15	2.46	3.45	2.10	2.10	2.12	3.15	2.19	3.15
Dissolved Oxygen (Mg/L)	3.2	3.13	5.4	3.19	3.1	4.6	4.99	5.01	4.82	3.13	5.4	5.4	5.4	3.19	4.71	3.11

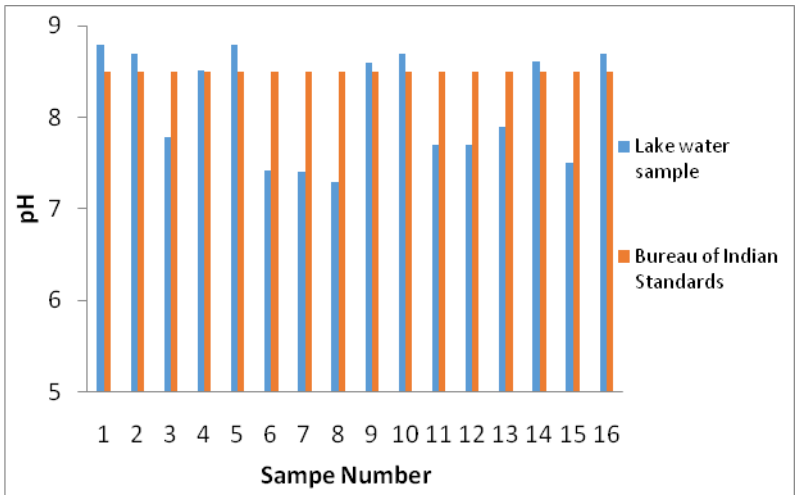

Figure 5: Graphical Representation of Lake Water Sample showing pH Values

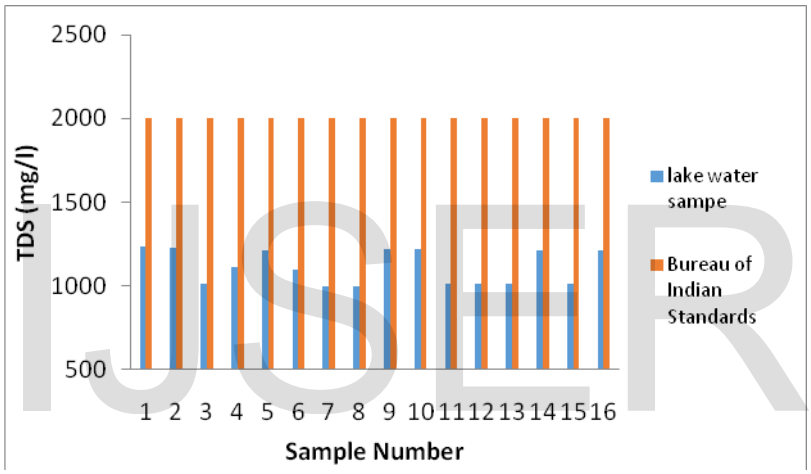

Figure 6: Graphical Representation of Lake Water Sample showing TDS Values

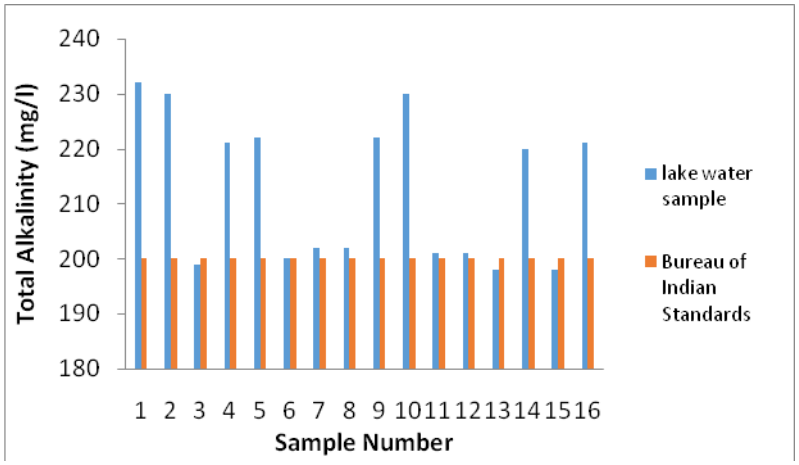

Figure 7: Graphical Representation of Lake Water Sample showing Total Alkalinity Values

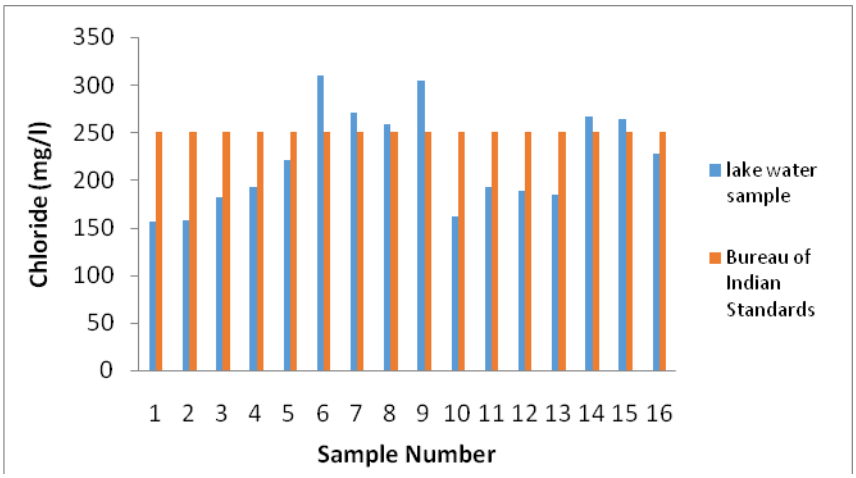

Figure 8: Graphical Representation of Lake Water Sample showing Chloride Values

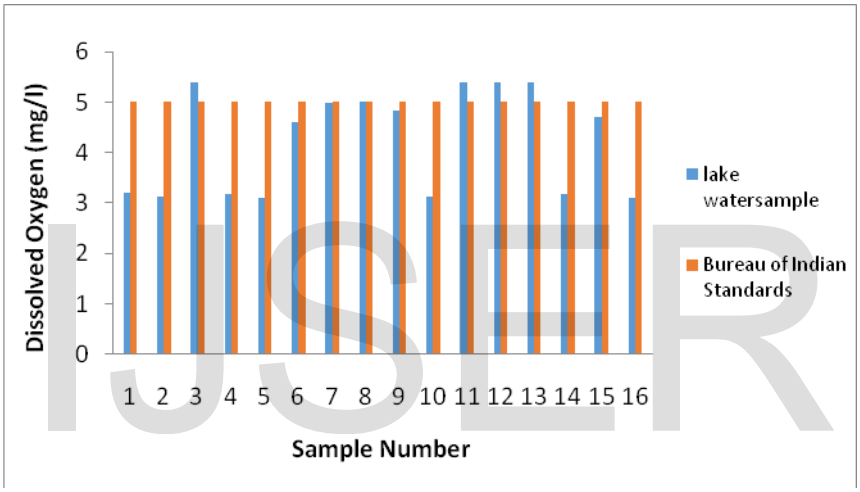

Figure 9: Graphical Representation of Lake Water Sample showing Dissolved Oxygen Values

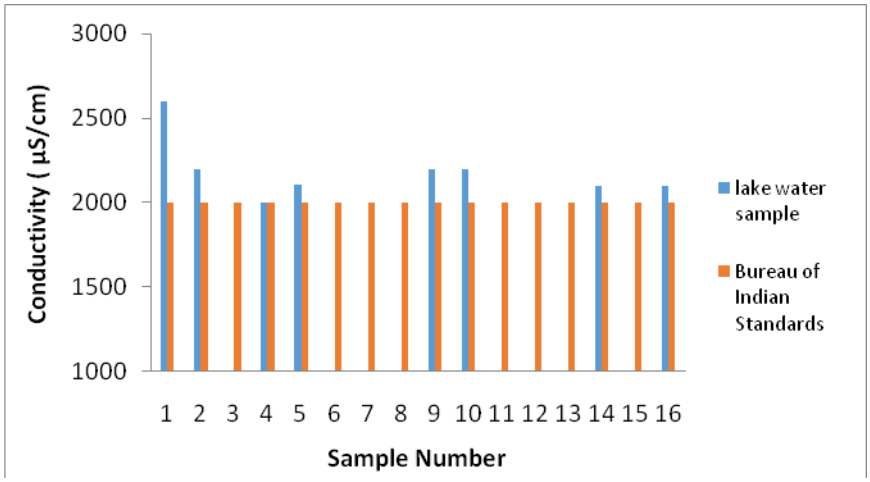

Figure 10: Graphical Representation of Lake Water Sample showing Conductivity Values

CONCLUSION

It is perceived that parameters such as total dissolved solids, electrical conductivity and chloride values are within permissible limits. Sample Number 1,2,4,5,9,10,14 & 16 have pH, alkalinity and dissolved oxygen values are higher the desirable limits as prescribed by Indian standards. It indicates that the water quality ispoor and is not used for public consumption. If this situation continues then it will put an end to the ecosystem of the lake.

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