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"Assessment of Water Quality of LakhaBanjara Lake Sagar by Physico-Chemical Parameter."

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***Abstract*—The Historical famous LAKHA BANJARA LAKE is the life line of the SAGAR town as most of the inhabitants of the town particularly living around the lake depends on the lake water for their general use. At present the lake water is full of odour, harmful suspended particles because most of the waste is being discharged directly into it particularly from the population located on the periphery of the lake. Similarly the residents of the hillock areas of the town are also directly discharging the waste into open drain.Sewage is 99 % water carrying domestic wastes originating in kitchen, bathing, laundry, urine, and night soil. A portion of the wastes go into solution and the rest are partly in colloidal suspension and true suspension. Sewage is generated by residential, institutional, commercial and industrial establishments. It includes household waste liquid from toilets, baths, showers, kitchens, sinks and so forth that is disposed of via sewers. In many areas, sewage also includes liquid waste from industry and commerce.**

The objective of this study is to analyse the water quality of LakhaBanjara Lake in the various points and to identify sources of wastewater degrading quality of water of the lake and to propose sewage treatment plant for Sagar city. Here samples of 4 drains and 4 samples of lake water has been collected and tests were conducted to determine various parameters including pH, colour, temperature, COD, BOD, Conductivity, Sulphate, Nitrite, suspended solids, total solids and Total coliform.

Result of the study indicated that LakhaBanjara lake water is contaminated and not totally safe for consuming purpose.

Keywords- Physicochemical parameter; Water Pollution LakhaBanjara Lake; Aquatic life; Water Quality Index.

1. INTRODUCTION

Water is one of the most significant elements on earth. each and every living being needs water for its survival. Without water, animals, plants, microbes everything will perish. Population growth coupled with urbanization and industrialization has resulted in an increasing demand for water thus leading to water crisis and serious consequences on the environment. In this paper LakhaBanjara Lake of Sagar is considered for the study purpose. LakhaBanjara Lake is situated in sagar city of Madhya Pradesh and is surrounded by various Landforms with majority of population around the lake. Geographic location of Lake can be pointed as between $23^0$50' N and $78^0$45' E and 521.50 meters above sea level.

Most of the locality depends on this lake for their survival. It will not be out of position to mention here that this big lake was also the source of water for the generation of electricity and this town was facilitated with electricity in past. At present the lake water is full of odour, harmful suspended particles because most of the waste is being discharged directly into it particularly from the population located on the periphery of the lake. Similarly the residents of the hillock areas of the town are also directly discharging the waste into open drain. This waste is ultimately contaminating the drinking water through seepage and leaked water pipe line. Therefore the overall situation in the town is not good for human health. In other words we can say that the living environment in the town is not fit, for human habitation.

Therefore, in this present study an Initiative is taken to study the Water quality index of the Lake to provide the basic information for the prediction of water quality. This study is conducted with an objective to evaluate the water quality parameters for the usage in drinking purpose, irrigation, and aquatic lives. The results obtained in the study were evaluated against the standards of WHO (World Health Organisation and Indian standard guidelines.

2. MATERIALS AND METHODS

2.1 Study area

In In Sagar City, LakhaBanjara Lake is situated in the mid region of the city. The exact location of it can be defined with the help of main bus stand of sagar as the lake is in front side of it. It is the high dominating skyline of the city surrounded by hillyregions.

Area of Full Lake (x10^3)	1166.4 m^2
Location	In the front sideof Main Bus stand of Sagar, Madhya Pradesh 470001
Latitude	$23^0$50' N
Longitude	$78^0$45'E
Altitude (MSL):	517 m
Maximum Length	1247 m
Maximum Breadth	1207 m
Mean Width	935.2 m

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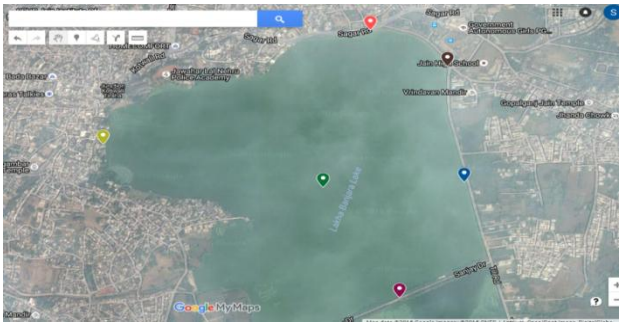
2.2 Selection of sample sites

The study area is shown in Figure 1which shows the satellite image of LakhaBanjara Lake.



2.3 SAMPLING STATIONS

The water samples were collected from nine different points of the lake (Figure 1).

Objective of this study is to analyse the water quality of LakhaBanjara Lake in the various points and to identify Sources of wastewater degrading quality of water of the lake and to propose sewage treatment plant for Sagar city.

Table 1.Sampling sites on LakhaBanjara Lake

S.NO	Sample station	Latitude	Longitude
1	Sanjay drive	23.827461	78.748057
2	Anandnagarnala	23.832097	78.750273
3	Kadambghaatnala	23.836722	78.749706
4	Kadambghaat	23.836722	78.749706
5	Shaneechrinala	23.838039	78.746978
6	Bariyaghaatnala	23.833604	78.737812
7	Bariyaghaat	23.833604	78.737812
8	Centre of lake	23.834051	78.739386

Figure Showing Sampling of water at one of the ghaat

2.4Selection of determinants:

The selection of determinants was done on the basis of the main parameters which were tested & not tested by PCMC but standards laid for the same by CPCB.

Parameters for investigation:

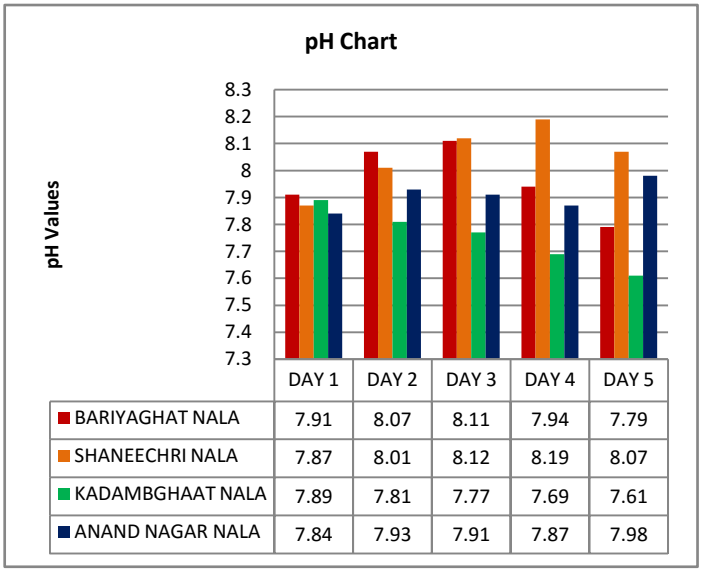
- pH
- Colour
- Temperature
- Total solids.
- TSS
- Suspended solids
- Dissolve oxygen (DO)
- BOD
- COD
- Nitrogen (Nitrite)
- Total coliform
- Conductivity
- Sulphate

Results & Discussion:

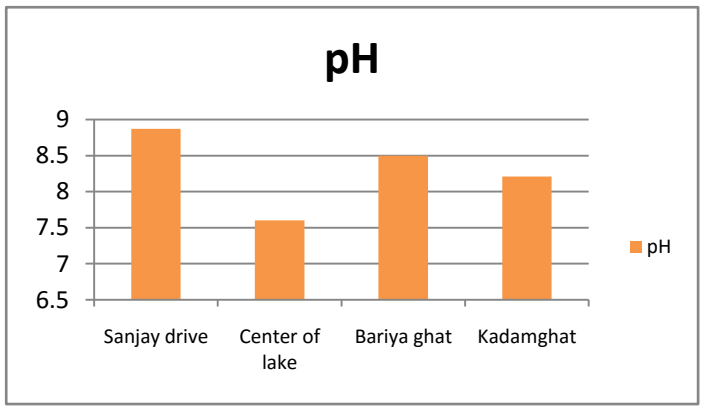
2.5 pH method:

The pH for samples was measured using digital pH meter (Eutech instruments pH510 Ph/mV/°C meter) which was calibrated by using standard buffer solution of 4.02, 7.01 and 1.

A photograph of the pH meter is shown.



pHTESTS RESULT OF ALL DRAINS



pHTESTS RESULT OF ALL LAKES

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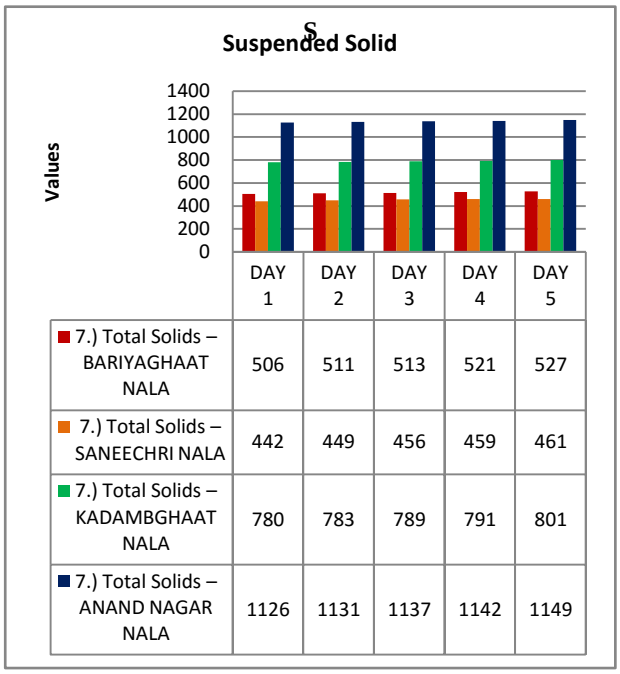
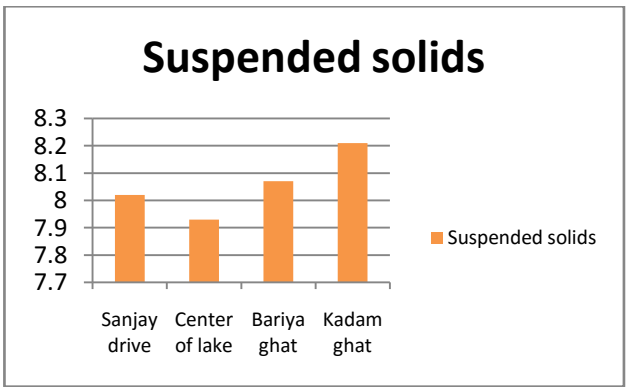
2.6 Total Dissolved Solid (TDS):

Initial weights of beaker (clean and dry) were taken as W1. 100ml of sample were taken in the beaker. In an oven the beakers were kept at 1000C for 24 hours till becomes dry. After 24 hours,finalweight of the beaker was recorded asW2. Total dissolved solids were calculated in terms of mg/L.

Total solids testing sample



SUSPENDED SOLID TESTS RESULT OF ALL DRAINS

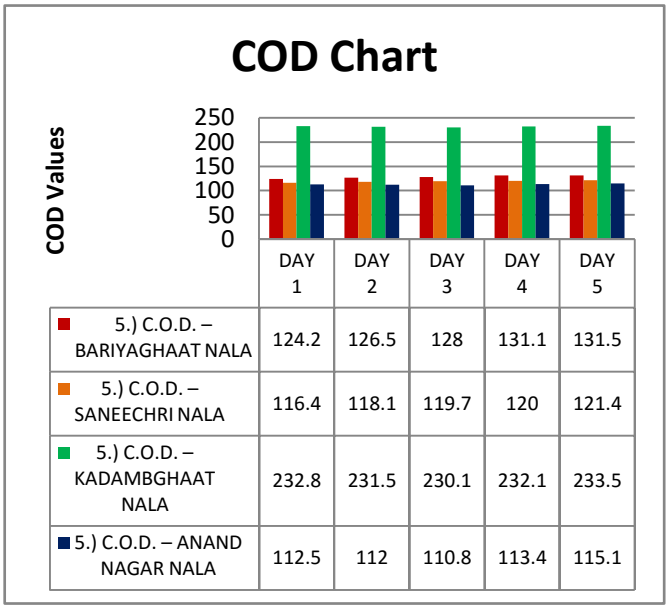


SUSPENDED SOLID TESTS RESULT OF ALL LAKES

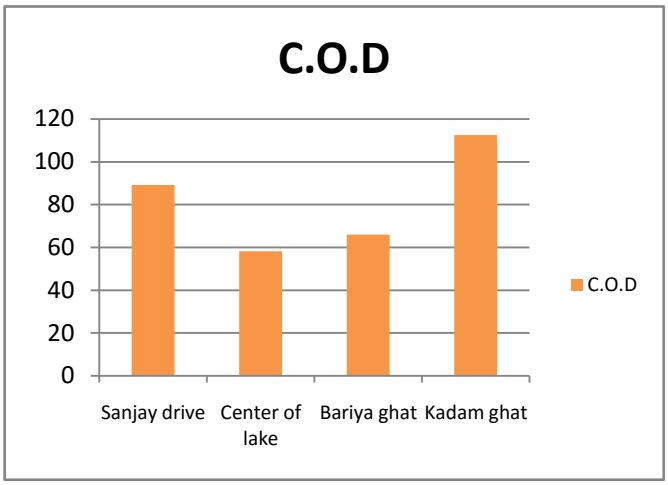
Chemical Oxygen Demand (COD)

It is the commonly used test for the prediction The chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers) or wastewater, making COD a useful measure of water quality. It is expressed in milligrams per litre (mg/L), which indicates the mass of oxygen consumed per litre of solution. APHA is the standard COD method used for the parameter determination.

In the testing process 20 ml sample was taken in a COD condenser flask with pinch of mercuric sulphate (HgSO4) and silver sulphate (Ag2SO4), mixing it with 10 ml of potassium dichromate (K2Cr2O7, 0.25N). 30 ml of conc. Sulphuric acid (H2SO4) was added to it. Then the flasks containing the digestion reagents and samples were refluxed at 2500C for 2 hours (KJeloplus-KJL/2LWC Pelican Equipments Inc. After digestion the samples were kept for cooling at room temperature, and titrated with 0.1 N solution of Ferrous Ammonium Sulphate (FAS) using ferrous indicator. Sharp colour changed from orange to green to wine red colour. The appearance of wine red colour marked the end point of titration.



COD TESTS RESULT OF ALL DRAINS



COD TESTS RESULT OF ALL LAKES

CONDUCTIVITY:

About 200ml of the sample was placed in a beaker and allowed to settle at room temperature (23° to 27°C), while the cell of the conductivity meter was washed thoroughly with the sample water before the measurement was taken. The cell was then dipped into

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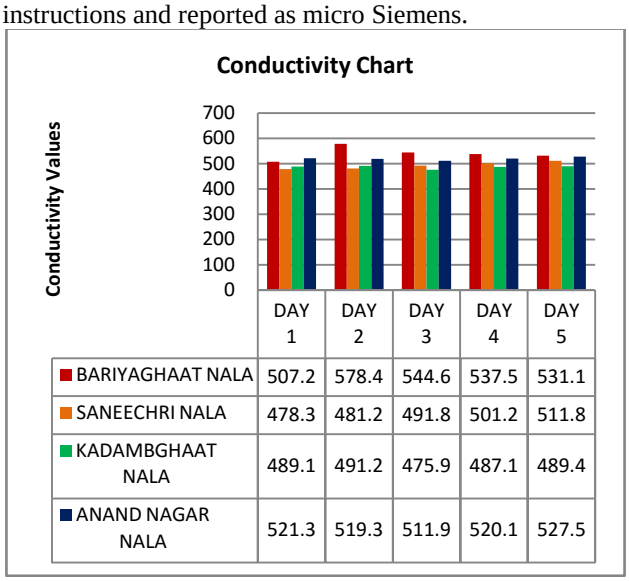
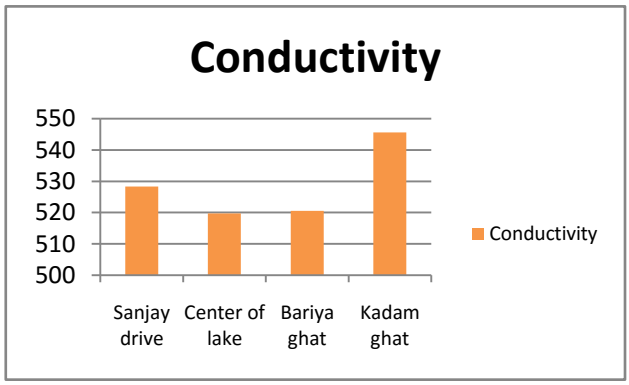
the beaker containing the sample, and electrical conductivity was measured in accordance with the instructions and reported as micro Siemens.



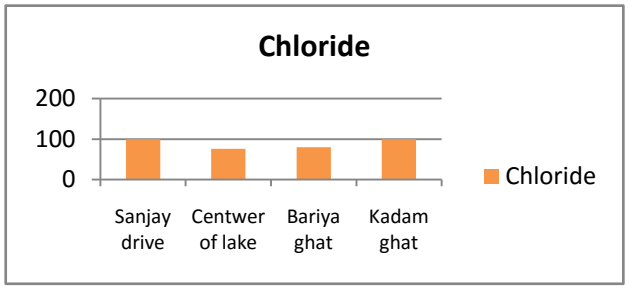
CONDUCTIVITY TESTS RESULT OF ALL DRAINS



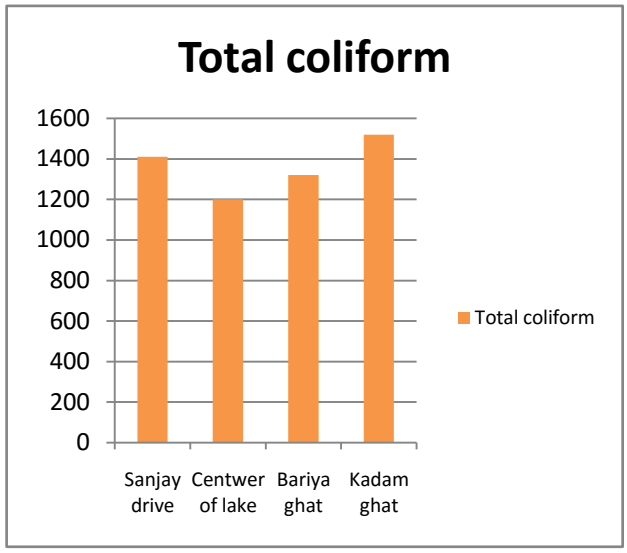
CONDUCTIVITY TESTS RESULT OF ALL LAKES

Chloride:

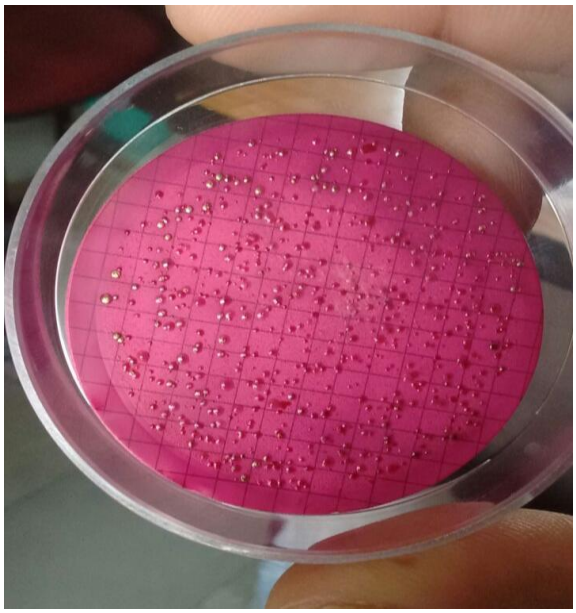
While performing the chloride test 100ml of the water sample was measured and 1ml of potassium dichromate (K2Cr2O7) was added as an indicator. The solution was then titrated against 0.01N Silver Nitrate (AgNO3) solution until the yellow colour changed to brown at the end point, and the result was expressed in mg/l.



SULPHATE TESTS RESULT OF ALL LAKES



RESULT AFTER TESTING PROCESS



Sulphate:

In the Sulphate test 250ml of the sample was measured and its pH was adjusted with 1N HCl to about 5, using a pH meter. It was brought to the boil while slowly adding barium chloride solution and stirring gently until precipitation appeared to be complete.

The precipitate was digested at about 80°C to 90°C for 2 hours. The precipitate was filtered with filter paper, washed with distilled water and placed in a crucible along with the filter paper, and then heated in a muffle furnace at 800°C for 1 hour.

It was allowed to cool in a desiccator, and the barium sulphate precipitate weighted. The result was expressed in mg/l.

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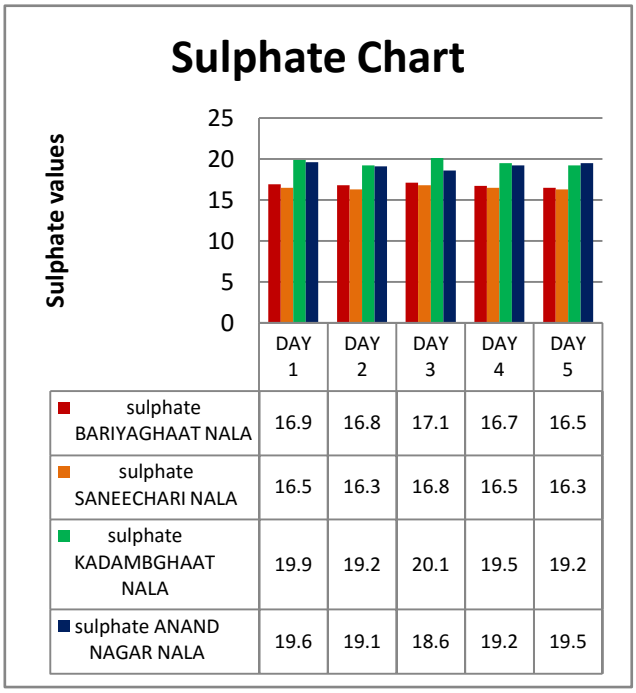
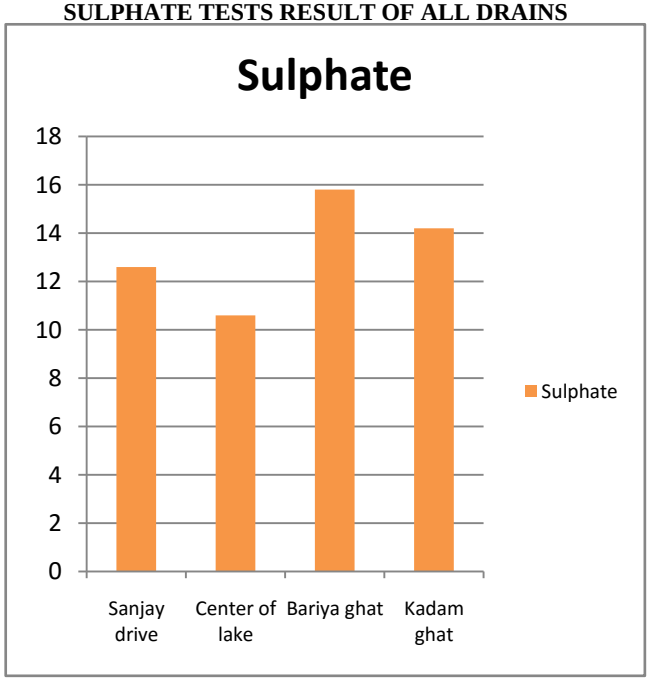


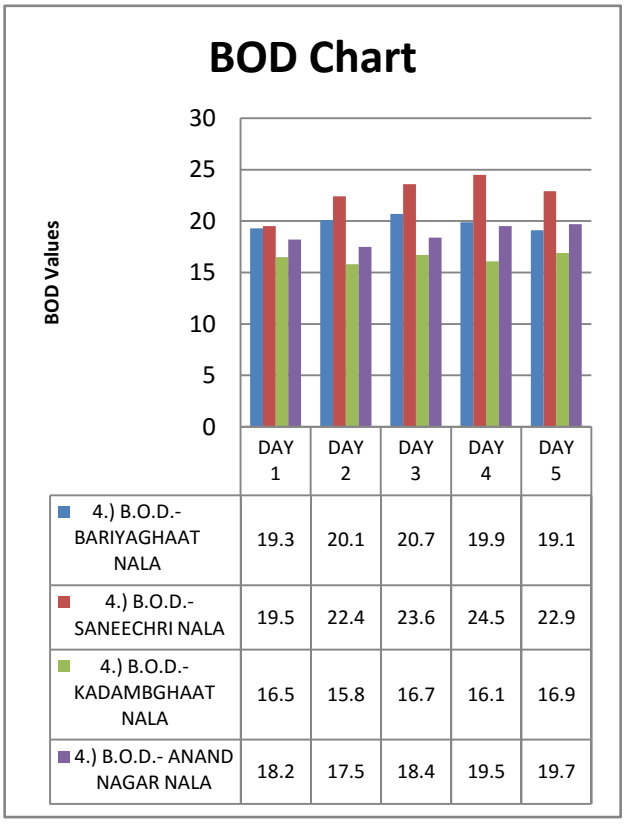
	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
sulphate BARIYAGHAAT NALA	16.9	16.8	17.1	16.7	16.5
sulphate SANEECHARI NALA	16.5	16.3	16.8	16.5	16.3
sulphate KADAMBGHAAT NALA	19.9	19.2	20.1	19.5	19.2
sulphate ANAND NAGAR NALA	19.6	19.1	18.6	19.2	19.5

SULPHATE TESTS RESULT OF ALL DRAINS



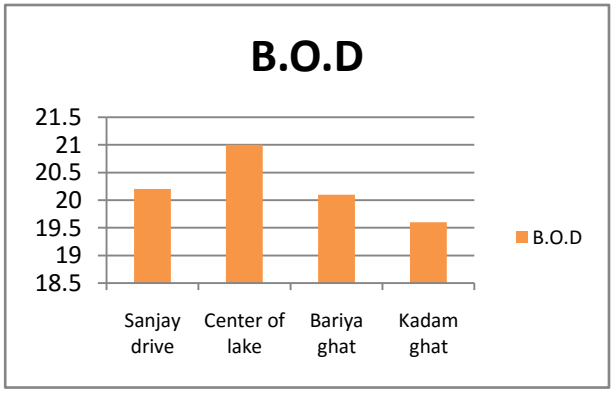
SULPHATE TESTS RESULT OF ALL LAKES

BOD Incubator equipment used for the experiment



	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
4.) B.O.D.- BARIYAGHAAT NALA	19.3	20.1	20.7	19.9	19.1
4.) B.O.D.- SANEECHRI NALA	19.5	22.4	23.6	24.5	22.9
4.) B.O.D.- KADAMBGHAAT NALA	16.5	15.8	16.7	16.1	16.9
4.) B.O.D.- ANAND NAGAR NALA	18.2	17.5	18.4	19.5	19.7

BOD TESTS RESULT OF ALL DRAINS



BOD TESTS RESULT OF ALL LAKES

Biological Oxygen Demand (BOD)

The biochemical oxygen demand (BOD) is used to determine the relative oxygen requirements of waste water, effluents and polluted water that are useful in evaluating the BOD removal efficiency of such treatment systems. It measures the molecular oxygen utilized during specified incubation duration for the biochemical degradation of inorganic and organic substance.

The biochemical oxygen demand (BOD) was measured following APHA 5210B (2005). The BOD was calculated in units of mg/l after 3 days of incubation period at 27 ^{0}C. Represent the amount of dissolve oxygen consumed by bacteria and other microorganisms while they are decompose organic matter under aerobic situations at a specified temperature.

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	PARAMETERS	LIST OF SAMPLING SITE IN LAKHA BANJARA LAKE SAGAR								
		SD	AN	KG	KN	SN	BN	BG	CL	W.H.O specification
PhysicoChemical	pH	8.87	7.98	8.21	7.89	8.19	8.11	8.5	7.6	6.5-8.5
	Chloride	99.87	--	99.82	--	--	--	79.86	76.23	--
	Total Solids	410	1149	558	801	461	527	410	378	500
	TSS	362	1128	356	594	401	456	364	330	500
	Suspended solids	8.02	--	8.21	--	--	--	8.07	7.93	--
	Dissolve oxygen (DO)	6.5	9.7	8.24	3.3	5.1	9.7	7.62	8.6	5
	BOD	20.2	19.7	19.6	16.9	24.5	20.7	20.1	21	5
	COD	89.2	115.1	112.5	233.5	121.4	131.5	66	58.2	10
	Nitrogen (Nitrite)	0.075	0.31	0.16	0.28	0.19	0.25	0.15	0.08	50
	Total coliform	1410	--	1520	--	--	--	1320	1200	Below 50 MPN/100ml
	Conductivity	528.3	527.5	545.6	489.4	511.8	578.4	520.6	519.7	250
	Sulphate	12.6	19.6	14.2	20.1	16.8	17.1	15.8	10.6	250mg/l

Table of Physico Chemical Parameter Table

5. CONCLUSION:

Result of the study indicated that LakhaBanjara lake water is contaminated and not totally safe for consuming purpose. We found total coli form in high amount .In all drain b.o.d and c.o.d also find high from there permissible limit .That is necessary to do continuous inspection and environmental awareness scheme to reduced effluents. It is suggested to arrange the proper drainage facility and avoid the dumping of waste in lake as it deteriorates the water quality .We should give ideas and workshop to citizens regarding to protect the Lake water from pollution .Legal action should be taken against those who are responsible for the pollution of lake water. LakhaBanjara Lake water can be reused if proper treatment plant established and prevent the contamination source surrounding the water body.

1.kadambghaat and bariyaghaat are highly polluted by direct mixing of sewage.

2. Govt. should be established there 4 to 5 high fountain for aeration for saving aquatic life.

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