

# **Water quality of lakes**

## **1.1 Introduction:**

The problem of pollution of surface water bodies due to anthropogenic activities is so severe that EPA, Punjab planned to evaluate the quality of surface water sources in a systematic way with the objective of combat their respective pollution problem(s) therefore Environment Protection Department Government of Punjab decided to monitor the quality of River Chenab under its ADP Project “Monitoring of Surface Water Bodies in Punjab”. In this context all the five rivers of Punjab along with the lakes given below are monitored:

- i. Rawal Lake District Rawalpindi
- ii. Kallar Kahar Lake District Chakwal
- iii. Ucchali Lake Khushab
- iv. Khabiki Lake Khushab
- v. Jhalar Lake Khushab
- vi. Namal Lake Mianwali
- vii. Malkana Lake/ Wet Land Near Trimmu Head Works, Jhang
- viii. Kohar Wala Lake/Wet Land Near Trimmu Head Works  
Jhang
- ix. Mangla Lake, District Jhelum

These canals are located in different districts. Brief descriptions of these lakes are given. Rawal Lake in Pakistan is an artificial reservoir that provides the water needs for the cities of Rawalpindi and Islamabad. Korang River along with some other small streams coming from Margalla Hills have been set to form

this artificial lake which covers an area of 8.8 km<sup>2</sup>. Korang River is the outlet stream of Rawal Dam. Rawal Lake is located within an isolated section of the Margalla Hills National Park.



Khabikki Lake is a salt water lake in the southern Salt Range area in Pakistan. The lake is one kilometre wide and two kilometres long. Khabikki is also the name of a neighbouring village. Sakaser is the highest mountain in the Salt Range area in Pothohar in Pakistan. It is 1522 meter/4946 feet high. It is situated in Khushab District but it can be seen from adjoining districts of Mianwali and Chakwal.

Ochali or Uchhali Lake is just below the Sakaser mountain, it is a salt water lake in the southern Salt Range area in Pakistan. Sakaser (1522 metre / 4946 feet), the highest mountain in the Salt Range, looms over the lake. Due to its brackish water the lake is lifeless.

Namal Lake is located in one corner of the Namal valley in Mianwali, Punjab, Pakistan. It was formed following the construction of Namal Dam in 1913. Namal Dam is situated some 32 km from



Mianwali city. The lake has a surface area of 5.5 km<sup>2</sup>. There are mountains on its western and southern sides. On the other two sides are agricultural areas.

Kallar Kahar lake is situated in a beautiful valley in the southern mountainous area of Potohar plateau in the salt range. It is located at an altitude of about 1500 ft from sea level. It is a natural lake which is fed by a natural fresh water spring at the base of hills. This spring water fills the lake up to a level and then overflows and makes a stream towards the north.



The lake is not deep, so a lot of natural vegetation can be seen all around it and even in the middle. It is a natural breeding sanctuary for many birds, so it is an ideal place for bird watching. Some migratory birds can also be seen in particular season. Wild peacocks can be seen wandering around the area. Now and then their particular sound can be heard clearly.

The Mangla Dam is located on the Jhelum River in Mirpur District, part of disputed Kashmir under the control of Pakistan. It is the sixteenth largest dam in the world. It was built from 1961 to 1967 with funding from the World Bank. Mangla lake is an

artificial reservoir that provides the water needs for the cities of Mirpur District.



## **1.2 Methodology:**

### **i) Sampling**

Sulfuric acid and Nitric acid were used as preservatives in sampling bottles for trace elements and nitrate determination respectively. All samples were brought to the lab and kept in refrigeration at a temperature of 4°C till analysis.

### **ii) Analysis**

Analysis of the wastewater samples was carried out in EPA Laboratory, Lahore. Samples were analyzed according to the standard procedure as described in “**Standard Methods for Examination of Water and Wastewater**” by WPCF, AWWF & APHA 18<sup>th</sup> edition was followed, to obtain base line information on industrial effluent along with pollution load study.

**Table 1.1: Analysis results of lakes**

No	Description	Temp. °C	pH	DO mg/l	BOD mg/l	COD mg/l	TDS mg/l	TSS mg/l	Cl mg/l	Sulphate mg/l	Sulfide mg/l	Remarks
<b>NEQS</b>			<b>6-9</b>	<b>-</b>	<b>80</b>	<b>150</b>	<b>3500</b>	<b>200</b>	<b>1000</b>	<b>600</b>	<b>1.0</b>	
01	Rawal Lake District Rawalpindi.	25.0	8.0	8.0	3.3	8.8	150	50	30	144	04	The value Sulfide exceeds the NEQS limits.
2	Kallar Kahar Lake District Chakwal.	32.1	9.3	3.0	810	2044	6860	60	2302	1617	12	The values of BOD, COD, TDS, Chloride, Sulphate and Sulfide exceed the NEQS limits.
3	Uchali Lake Khushab.	24.1	9.0	8.0	1860	4200	61260	260	22525	11468	16	The values of BOD, COD, TDS, TSS, Chloride, Sulphate and sulfide exceed the NEQS limits.
4	Khabiki Lake khushab.	24.8	8.4	7.2	45	90	3410	40	651	1123	8	The value Sulphate and Sulfide exceed the NEQS limits.
5	Jhalar Lake Khushab.	25.0	9.0	8.2	112	381	6840	180	1502	1214	12	The values of BOD, COD, TDS, Chloride, Sulphate and Sulfide exceed the NEQS limits.
6	Namal Lake Mianwali.	24.3	8.9	8.7	40	90	3780	10	751	2056	12	The values of TDS, Sulphate and Sulfide exceed the NEQS limits.
7	Malkana Lake / Wet Land Near Trimmu Head Works Tehsil And District Jhang.	35.8	7.3	1.8	12.6	28.8	1520	50	295	671	4	The values of Sulphate and Sulfide exceed the NEQS limits.
8	Kohar Wala Lake / Wet Land Near Trimmu Head Works Jhang.	24	8.2	4.0	90	264	2240	20	920	448	04	The values of BOD, COD and Sulfide exceed the NEQS limits.
9	Mangla Lake, District Jhelum	13.6	7.2	8.2	2.4	8.4	100	60	145	22		The parameters analyzed are within the NEQS limits.

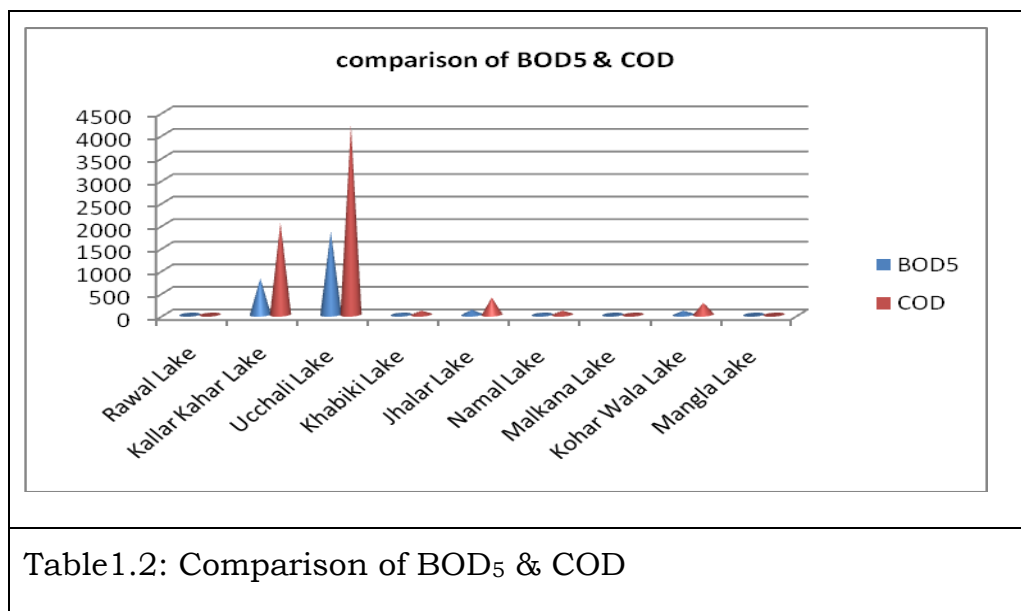
### 1.3 Findings:

Analysis of samples clearly predicts the picture of pollution level in the nine lakes. Kallar Kahar Lake District Chakwal, Ucchali Lake Khushab, Jhalar Lake Khushab are the most polluted lakes of all having BOD, COD, TDS, Chloride, Sulphate and Sulfide exceeding the NEQS limits table 1.1.

Samples taken from Malkana Lake / Wet Land near Trimmu head works Tehsil and District Jhang shows that the values of Sulphate and Sulfide exceeds the NEQS limits, samples from Kohar Wala Lake / Wet Land near Trimmu Head Works Jhang indicates exceeding vales of BOD, COD and Sulfide.

Namal lake water has TDS, Sulphate and Sulfide in abundance. However the other few lakes e.g. Mangla and Rawal lakes are combatively cleaner.

Below is the chart shows the comparative value of BOD<sub>5</sub> and COD (table 1.2), and table 1.3 indicates the comparison of TDS & TSS in the lakes.



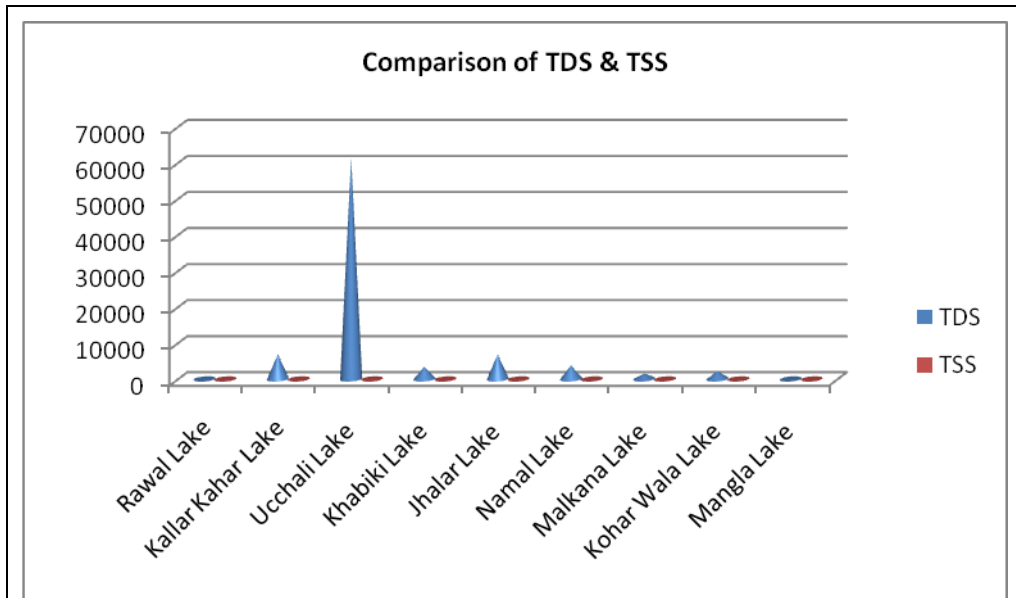


Table 1.3: Comparison of TSS & TDS

Table 1.4 below shows the comparison between the values of ions i.e. Chloride, Sulphate and Sulfide detected in the lake waters.

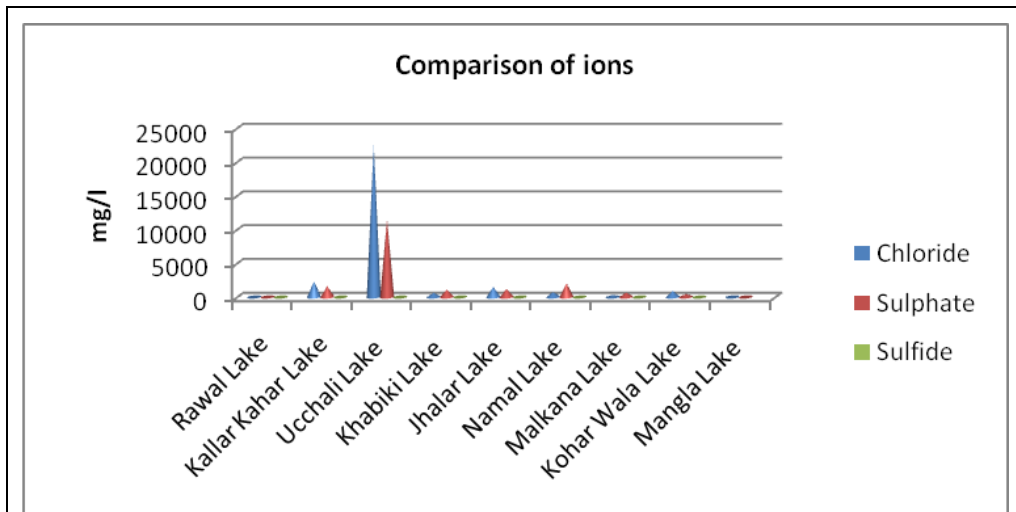


Table 1.4: Comparison of Chloride, Sulphate and Sulfide

BOD indicates the amount of putrescible organic matter present in water. Therefore, a low BOD is an indicator of good

quality water, while a high BOD indicates polluted water. Dissolved oxygen (DO) is consumed by bacteria when large amounts of organic matter from sewage or other discharges are present in the water. While presence of sulfide cause ecological damage to aquatic and riparian ecosystems through fish kills, increased fish disease outbreaks, dominance of acid-tolerant species, precipitation of iron, etc. effects on estuarine fisheries and aquaculture projects (increased disease, loss of spawning area, etc) and reduction in agricultural productivity through metal contamination of soils.

TDS & TSS effect on clarity and taste of water rendering it harmful for drinking for not only humans but also for the animals. Presence of sulfide cause ecological damage to aquatic and riparian ecosystems through fish kills, increased fish disease outbreaks, dominance of acid-tolerant species, precipitation of iron, etc. effects on estuarine fisheries and aquaculture projects (increased disease, loss of spawning area, etc) and reduction in agricultural productivity through metal contamination of soils.

#### **1.4 Conclusion:**

Water quality monitoring is an essential tool used to gage the quality of surface water and to make management decisions for improving or protecting the intended use.

Comparison of data collected about all the lakes shows that some lakes need immediate action for their rehabilitation like Kallar Kahar Lake Chakwal, Uchali & Jhalar Lake Khushab. Sources of pollution in these lakes are yet to be discovered.

The main reasons of failure to conserve water resources include:



- Confusion of social, environmental, commercial, and political aims
- Poor management structures operating without clear policy guidelines
- High capital investment needs with low or no rate of return
- Resistance to achieving full or even partial cost recovery
- Decentralized water agencies with service responsibility but few resources
- Political interference at most levels of operation
- Non-existent of regulator
- Lack of proper legal framework
- Lack of platforms for contribution by concerned citizens

### **1.5 Recommendations:**

- Public awareness for conservative use of domestic water
- Installation of sewage treatment plants must be planned to properly dispose-off swage water and to avoid agricultural soil contamination
- Government of concerned Districts of River Indus must take immediate measures measures to control /reduce upstream pollution control measures for Kallar Kahar Lake District Chakwal, Ucchali Lake Khushab, Jhalar Lake.
- Irrigation Department of concerned districts may be requested to direct the industries to dispose off their effluents after proper treatment.
- Industries should also be restricted to conduct third part audits occasionally and submit their report to EPA Punjab for examination.