

# Water Quality of Pashan Lake and Manas Lake Interconnected by Ramnadi River – A Case study

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**Abstract** Water pollution has been one of the major topics in the environmental issue of urban India. Pashan Lake and Manas Lake is an important lake in Pune city which attracts migratory birds. Deforestation on nearby hills has caused heavy siltation resulting in decreasing the depth of the lake. The surface water quality of Pashan Lake is severely degraded due to the pollution from surrounding areas directly entering the water. Eight surface sampling points are selected to evaluate the water quality. The study presents the physicochemical characteristics of the lake water and suggests the means to improve the water quality through eco remediation measures for restoration. Water analysis are done for the parameters like pH, Dissolved oxygen (DO), Biochemical oxygen Demand (BOD), Chemical oxygen Demand (COD), Alkalinity, Electrical Conductivity for testing the suitability for drinking, agricultural purposes.

**Keywords** - Water Pollution, Lake Water Quality, Industrial Waste, Physico-Chemical Characteristic, Sampling, Mean Sea Level.

## I. INTRODUCTION

Pune situated in Indian state of Maharashtra is the second largest city after Mumbai. Pune has emerged as a major educational hub in recent decades. Also the city is known for its manufacturing and automobile industries, research institutes of Information Technology (IT), education, management and training, etc. which attracts students and professionals from various areas. The growth rate of Pune city from last 40 years is observed to be 40% and it has been estimated that it will be much more in future. With a growing population there is an increasing demand for water from agriculture, industry and domestic use. The increase in demand for water will cause shortage of water. Water is an important natural resource for entire living community, hence its quantity and quality are of prime importance. Due to rapidly increasing population, rising standards of living and exponential growth of industrialization and urbanization have exposed the water resources to various forms of degradation thus leading to water pollution. Therefore, many water bodies including Manas Lake, Pashan Lake and Ramnadi have become unfit to use.

2. Water is essential to human life and health of environment. The water quality is mainly defined by its physical, chemical and biological characteristics. A healthy environment includes the water quality which protects public health. The water resources are affected by community uses such as agriculture, urban and industrial use. Thus, the water quality is deteriorated due to such human interferences. Also due to increasing water demand

there is scarcity of water. A time may come where we would need to use this contaminated water which may lead to serious health effects so it is necessary to save and maintain the quality of water. Realizing that the water resources are in a serious stage of degradation a step can be taken towards preserving and purifying the water flowing through rivers and lakes. Water is essential to human life and health of environment. The water quality is mainly defined by its physical, chemical and biological characteristics. A healthy environment includes the water quality which protects public health. The water resources are affected by community uses such as agriculture, urban and industrial use. Thus, the water quality is deteriorated due to such human interferences. Also due to increasing water demand there is scarcity of water. A time may come where we would need to use this contaminated water which may lead to serious health effects so it is necessary to save and maintain the quality of water. Realizing that the water resources are in a serious stage of degradation a step can be taken towards preserving and purifying the water flowing through rivers and lakes.

## II. NEED OF STUDY

Water is essential to human life and health of environment. The water quality is mainly defined by its physical, chemical and biological characteristics. A healthy environment includes the water quality which protects public health. The water resources are affected by community uses such as agriculture, urban and industrial use. In agricultural fields the farmers spray pesticides on

crops to protect the plants and crops from weeds, fungi or insects. These pesticides sprayed on crops gets mixed with flowing water. If excess water is present in agricultural fields then this excess water is allowed to flow into water bodies further. Also sometimes these pesticides seeps into ground and gets mixed with the ground water. In both the cases the water quality gets deteriorated. In urban areas, water quality is mainly affected due to disposal of kitchen wastes, bathing, washing, defecating, etc. Due to industrial activities the effluents generated during manufacturing processes are led into the water bodies without treatment, thus leading to water pollution. Thus, the water quality is deteriorated due to such human interferences. Also due to increasing water demand there is scarcity of water. A time may come where we would need to use this contaminated water which may lead to serious health effects so it is necessary to save and maintain the quality of water. Realizing that the water resources are in a serious stage of degradation a step can be taken towards preserving and purifying the water flowing through rivers and lakes.

### III. LITERATURE REVIEW

i) Asheesh Shrivastava, Shalini A Tandon, and Rakesh Kumar: “*Water Quality Management Plan for Patalganga River for Drinking Purpose and Human Health Safety*”: This paper concludes that the Collection of water samples were done. Near about 14 samples were collected and then these samples were tested based on Temperature Turbidity, Dissolved oxygen (DO)<sup>[4]</sup>.

ii) Hussain, Sayyed and Quadeer, Shaik: “*Water Pollution Assessment of Ganga River*”: This paper concludes that Physical and chemical properties were studied. Authors organized cleaning problem and also stated it will be inspiring and would reward to nation for cleaning of river<sup>[6]</sup>.

iii) Sreenivasa Salla and Suparna Ghosh : “*Assessment Of Water Quality Parameters Of Lower Lake, Bhopal*” : It is suggested to provide organic fertilizers to farmers, arrange the proper drainage facility and avoid the dumping of waste in lake as it deteriorate the water the quality<sup>[7]</sup>.

iv) Joshua Nizel Holder: “*Water pollution and its impact on human health*”: This paper concludes the pollution situation of Turag River in Bangladesh. Objective was to show variations in different parameters along the flow. Result determined water quality of Turag River<sup>[11]</sup>.

### IV. STUDY AREA

#### • MANAS LAKE:

Manas Lake (Bhugaon) is an artificial lake. This lake located on north Pune- Paud road, on east village bhugaon-1.5 km from lake, on south-NDA, on west-village Bhugaon-1.5 km from lake. Manas Lake (Bhugaon) was contracted on 1977 for irrigation of agriculture land near the lake and to provide drinking water for villages near that

as Bhugaon and Bavdhan area in Pune city<sup>[6]</sup>. Total area that using the water from the lake 630 ha and irrigable land is 510.40 ha<sup>[9]</sup>.

#### • PASHAN LAKE:

Pashan lake area is around 144 Acers. Depth is 25-30 ft. after desiltation. The source for the lake is water from Ram River .The Lake does not seem to have received care and attention during last few years as a result, the lake as well as its catchment is facing serious threats from encroachment and pollution.<sup>[8]</sup>

#### • RAMNADI:

Ramnadi is river in Pune District and a tributary of Mula. It originates in the Sahyadries near Kathpewadi north-west of Pune city. The river flows through the Pashan, Baner and Aundh areas of Pune city. Some local people say that the basin of Ramnadi was shrieke in Pashan and Baner areas during illegal constructions. However, these constructions are yet to be removed. However, it has been turned into a sewage canal due to over dumping of garbage.

### V. IMPACT ON ENVIRONMENT

#### i) DUE TO CLIMATIC CHANGES:

- Potential impacts on surface water bodies, such as rivers And lakes, their nutrient status, mobilization of such toxic substance have been increased. Also, with increased storm events, especially in summer, there could be more frequent incidences of combined sewer overflows discharging highly polluted waters into receiving water bodies.
- Due to changes in temperature the ice that starts melting resulting in disturbance of water in lakes and river which affects the inflow and outflow of rivers.
- Sudden variations resulting in acidic rain directly or indirectly harms the water quality of lakes, river. However this leads to passage of acids into water resulting degradation of the water quality
- This changes may also affect the aquatic life and resulting in an indirect affect for the human world too.

#### ii) DUE TO HUMAN ACTIVITIES:

- The first and the most important point that is the sewer lines which are directly allowed to flow in rivers and lakes leading to various severe future consequences
- Due to rapid increase of air pollution depleting the fresh amount of oxygen, as a solution for this problem by human are creating more severe problems resulting to much more severe scenario of future environment depletion.
- Dumping of wastes in lakes and rivers is also a major issue nowadays which are leading to conversion of fresh and pure water completely to waste water which is harmful to use.

### VI. THREATS TO WATER BODIES

For over thousands of years, human settlements and civilizations have originated, concentrated and thrived

around different types of water bodies. It is known that waterbodies have played a crucial role in growth and development of human society. It is paradoxical that they have undergone degradation in modern times due to various anthropogenic activities [2]. These are pollution, encroachment, eutrophication, illegal mining activities, ungoverned tourist activities and cultural misuse.

#### **i) POLLUTION**

All urban water bodies in India are suffering because of water pollution. There are some compounds like cyanides, thiocyanates, phenolic compounds, fluorides,

Radioactive substances, etc. which are harmful for humans as well as animals [2]. In India, water pollution due to industrial wastes and sewage has been assuming menacing proportions pollution. Large lakes and large stretches of most of the rivers in India have water which is unsafe for drinking purpose.

#### **ii) ENCROACHMENT**

Encroachment is another major threat to water bodies particularly in urban areas. As more people are migrating to cities the availability of land is getting scarce. Hence, these urban water bodies are no more acknowledged for their ecosystem services. Ouster Lake in Puducherry and Deepor beel in Guwahati are well-known examples of encroachment [2].

#### **iii) ILL-LEGAL MINING ACTIVITIES**

Ill-Legal mining for building material such as sand and Stones both on the catchment and on the bed of the lake Also have extremely damaging impact on the water body And one the reasons behind the destruction of many water bodies in India [2].

#### **iv) UNPLANNED TOURISM ACTIVITIES**

Unplanned tourism activities without systematic planning and regulation proved to be another major threat to urban water bodies. Dal Lake in Srinagar, Tso Morari and Pong Lakes in Ladakh are examples where the unplanned and unregulated tourism has posed long-term negative impacts both on biodiversity of the area as well as on the local environment [2].

All the above threats and parameters helps us to determine the water quality of various water bodies. All the above discussed points have a direct and indirect effect on water quality.

### **VII. PARAMETERS TO BE ANALYZED**

To find reasons for water turning to wastewater following Parameters were analyzed:

- pH
- Temperature
- Alkalinity
- Conductivity
- Dissolved Oxygen(DO)

- Biochemical Oxygen Demand(BOD)
- Chemical Oxygen Demand(COD)
- Most Probable Number(MPN)

#### **pH:**

It is generally use to measure how acidic, basic or neutral the solution is. Apparatus used is pH meter. Pure water is said to be neutral. pH of water below 7.0 is considered acidic while pH of water greater than 7.0 is considered basic or alkaline.

#### **TEMPERATURE:**

There is relation between the atmospheric temperature and water temperature. Air temperature is one of the most important ecological factors which control the physiological behaviour of the aquatic system [1].

#### **ALKALINITY:**

It is the ability to neutralize acids. Titration method is performed. Methyl orange and phenolphthalein indicators frequently used in titration because of its clear and distinct colour variance.

#### **CONDUCTIVITY:**

It is capacity of water to allow or carry electric current. This depends upon presence of ions. Apparatus used is Conductivity Meter. Potassium chloride being a strong electrolyte is generally used for the calibration.

#### **DISSOLVED OXYGEN:**

It is the total amount of oxygen dissolved in water. It is important for the decomposition of organic matter it DO is less it would cause aquatic life in stress and if high it would lead to death of aquatic life. On site DO-fixation is done to stabilize the amount of oxygen and the further procedure is carried out in laboratory [5].

#### **BIOLOGICAL OXYGEN DEMAND:**

Amount of dissolved oxygen required by the microorganisms to break down organic material present in a given water sample at certain temperature over a specific time period. [5] Higher the BOD faster the DO depletes. Chlorine can also result in depleting of BOD measurement by killing the microorganism. Sources of BOD may be Leaves, Dead Animals, and effluents from wastewater treatment plant.

#### **CHEMICAL OXYGEN DEMAND:**

It determines the quantity of oxygen required to decompose the organic matter in a waste sample, under specific conditions of oxidizing agent. Test generally performed using COD digester which includes nestle tubes. The chemical oxygen demand test procedure is based on the chemical decomposition of organic and inorganic contaminants, dissolved or suspended in water.

### MOST PROBABLE NUMBER:

It is generally performed to detect the presence of coliforms. MPN is most commonly applied for the quality testing of water that is to ensure whether the water is safe or not in terms of bacteria present in it. If coliforms present may result in severe disease such as typhoid, cholera. The colour of sample on agar agar jelly turns slight greenish which indicates the presence of coliforms.

### VIII. CONCLUSION

We have concluded that the water quality is been deteriorated day by day. From the above study we have come to the conclusion that the level of water pollution have reached to the alarming stage. The quality of water in most part of the world has degraded, though the situation in India is more severe. It is time to move towards sustainable development. We should think of even those generations which have still to appear on this earth.

### X. APPLICATION

After studying or analyzing the physio-chemical properties of water samples from lake and river gives an idea of the severity of water quality. By this we should understand the necessity by treating the wastewater so that it can be used by proper means and in proper manner.

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