

# Effect of Industrial Wastewater on Quality of Lake Water in India

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**Abstract**— A lake could also be outlined as an internal body of water (usually freshwater) wholly enclosed by land and with no direct access to the ocean. Lakes square measure someday subjected to waste product discharges originating from completely different sources. Chemicals such as nitrogen, phosphorus and carbon in certain concentration might distort and disrupt aquatic ecosystem. Eutrophication of upcountry water bodies has become synonymous with the deterioration of water quality that interferes with most of its helpful uses. Currently a day's several human activities creates the pollution in and round the water body, owing to that natural standing of lakes might are available the zone of pollution. The standard of water typically is indiscriminate in line with its physical, chemical and biological characteristics. Rapid industrialization and indiscriminate use of chemical fertilizers and pesticides in agriculture are inflicting serious and varied pollution in aquatic surroundings resulting in deterioration of water quality and depletion of aquatic aggregation. Owing to the utilization of contaminated water, human population suffers from water borne diseases. It is therefore necessary to check the water quality at regular intervals of time. It's thus necessary to visualize the water quality at regular intervals of your time. This review paper offers a short summary concerning lake, its classification and therefore the varied factors touching its water quality. What is more drawback of eutrophication is additionally mentioned well. Varied parameters needed for analyzing water quality beside water quality index also are mentioned.

**Key words:** Industrial waste, Water pollution, Water quality parameters

## I. INTRODUCTION

A lake may be a massive water body enclosed by land and haunted by varied aquatic life forms. Lakes are subjected to various natural processes taking place in the environment, such as the hydrological cycle. The degradation of lake has occurred not only due to waste water effluent inflow but also by saltation, domestic sewage, immersion of idols and other activities around the lakes (Kataria, 2012). The water of lakes is used for drinking and agricultural purposes, but not all lakes are supporting for the same use because by virtue of some particular property and value, every lake performs particular function. The function depends upon location, size, various ecosystem characteristics of lake and in contrast the degree of human interference in the matter of water pollution (Pawar, 2012). In India, lake pollution is very severe and critical problem due to huge amount of pollutants discharged by urban activities. Thus, water pollution needs serious immediate action and continuous monitoring of pollution level in order to prevent the water because of its importance in maintaining the human health, plants and agriculture (Ghosh, 2014). Lake is a reflection of its watershed. Like watershed landscape, the topography, soil, geology and vegetation determines the kinds of

materials entering into the lake that in turn reflect on its water quality. Nutrient enrichment of lakes is one of the major environmental problems in many countries (Mushatq et al., 2013). Water is essential for life and the well-being of all people.

Natural water systems provide fisheries, flood plains, agriculture, natural services and product like formation renewal, water quality improvement and biodiversity (Richard, 2011). Owing to increase in population, industrialization and urbanization, massive quantities of waste and industrial waste product square measure discharged into lake that has considerably contributed to the lake pollution. Studies on water quality assessment of Lake Water have been conducted from time to time for the last twenty years by many agencies (Gorde and Jadhav, 2013). The standard of lake water varies from time to time owing to interaction of native factors. Thus, the water that is considered the soul of nature, its pollution can primarily have an effect on entire grouping. Many analysis studies are examined and reported concerning chemical science parameters in several regions of the planet. Smart quality of water in lakes is crucial for maintaining recreation and fisheries and for the supply of municipal drinkable. These uses square measure clearly in conflict with the degradation of water elicited by agricultural use and by industrial and municipal waste disposal practices. The management of lake water quality is typically directed to the resolution of those conflicts. Obscurity within the world has lake management been a completely self-made activity. However, abundant progress has been made specifically with relevancy governable beginning discharge of wastes. The additional pervasive impacts of diffuse sources of pollution inside the watershed and from the atmosphere square measure less manageable and square measure still the topic of intensive investigations in several elements of the planet (UNESCO, 1996).

### A. Lakes

Lakes are outlined as bodies of standing water occupying a basin. They will vary from ponds of but 0.4 hectares to massive water bodies of a part of thousands of kilometers. They originate as a product of geologic processes and terminate by the various issue as a results of the loss of the,

- 1) Ponding mechanism,
- 2) Evaporation caused by changes within the hydrological balance,
- 3) Filling caused by Alluviation,
- 4) Stingy human intervention/encroachment.

The mechanisms of origin square measure various and square measure reviewed by Anne Hutchinson, (1957), World Health Organization differentiated eleven major lake sorts and sub-divided them into seventy six sub-types. several organisms rely upon fresh for survival and humans oftentimes rely upon lakes for 'goods and services' like drinkable, waste assimilation, fisheries, agricultural irrigation, industrial activity, boosting of natural

groundwater table, habituating large choice of flora and fauna and recreation. Being is vital members of the aquatic organic phenomenon. The being includes flora or alga (microscopic plants) and fauna (tiny shrimplike animals that eat algae). The flora is primary producers that convert light-weight energy to energy from the Sun to plant part through the method of chemical action. Tiny microscopic shrimp-like crustaceans known as fauna eat the flora. In turn, the zooplanktons square measure very vital food for fish. The plant life area unit organized taxonomically for the most part by color. Vital phyla (groups) include: true bacteria (blue-green algae), division Chlorophyta (green algae), Cryophyte (yellow-brown algae) and Bacillariophyta (diatoms). The cyanobacteria are of particular interest to limnologists and lake users because members of this group are those who often form nuisance blooms and their dominance in lakes may indicate poor water conditions

## II. CLASSIFICATION (UNESCO/WHO/UNEP, 1996)

### A. Based on Origin

In geological terms, lakes are ephemeral. They originate as a product of geological processes and terminate as a result of the loss of the ponding mechanism, by evaporation caused by changes in the hydrological balance or by in filling caused by sedimentation. Glacial lakes: Lakes on or in ice, ponded by ice or occurring in ice-scraped rock basins. The latter origin (glacial scour lakes) contains the most lakes. Lakes formed by moraines of all types and kettle lakes occurring in glacial drift also come under this category. Lakes of glacial origin are by far the most numerous, occurring in all mountain regions, in the subarctic regions. All of the cold temperate and many warm temperate lakes of the world fall in this category. Tectonic lakes: Lakes formed by large scale crustal movements separating water bodies from the sea, e.g. the Aral and Caspian Seas. Lakes formed in rift valleys by earth faulting, folding or tilting, such as the African Rift lakes and Lake Baikal, Russia. Lakes in this category may be exceptionally old. For example, the present day Lake Baikal, Russia originated 25 million years ago. Fluvial lakes: Lakes created by river meanders in flood plains such as oxbow and levee lakes and lakes formed by fluvial damming due to sediment deposition by tributaries, e.g. delta lakes and meres. Bounds lakes: Lakes bring to an end from the ocean by the creation of spits caused by sediment accretion as a result of long-shore sediment movement, like for the coastal lakes of Egypt. Dammed lakes: Lakes created behind rock slides, mud flows and screeds. Volcanic lakes: Lakes occurring in craters and calderas and that embrace dammed lakes ensuing from volcanic activity. These area common in such countries like Japan, Philippines, Indonesia and elements of Central America and Western Europe. Resolution lakes: Lakes occurring in cavities created by percolating water in soluble rocks like sedimentary rock, mineral or common salt.

### B. Supported the Organic Process Level

They represent never-ending vary of nutrient concentration and associated biomass production. The names given to the classifications represent by trial and error outlined intervals starting from terribly low to terribly high productivity (Thomas et al., 1996). Oligotrophic lakes: Lakes of low primary productivity and low biomass related to low

concentration of nutrients (N and P). In temperate regions, the fish fauna is dominated by species like lake trout and white fish. These lakes tend to be saturated with chemical element throughout the water column. Mesotrophic lakes: These lakes area unit less well outlined than either oligotrophic or eutrophic lakes or area unit typically thought to be lakes in transition between the two conditions. In temperate regions, the dominant fish is also whitefish and perch. In temperate regions, the fish communities area unit dominated by perch, roach and bream. Such lakes may additionally show several of the consequences that begin to impair water use.

### C. Issue Moving Lake Water Quality

The quality of water resources is deteriorating dramatically in several places on a commonplace, being one amongst the foremost issues round-faced by man. These area unit each natural (e.g. changes in precipitation, erosion, weathering of crustal materials) and phylogenesis (e.g. urban, industrial and agricultural activities, excessive human exploitation of water resources) reasons for this continued degradation of water on our planet (Gray, 1999). Lakes have low surface speed and a long-water retention time as a result, lakes act as a sink for influent water and therefore the materials (including pollutants). Urban lakes will expertise notably serious pollution stresses as a results of phylogenesis activities in their watershed. The impacts of urban lakes on coastal wetlands are often divided into 2 broad classes, (i) Home ground alteration or destruction and (ii) Water quality degradation (e.g. hyperbolic nutrient, sediment and / or waste product loading. One of the foremost pressing threats to coastal lakes is degraded water quality as results of urban growth and land use changes that increase the resistant surface areas. Non-point sources in residential development areas will typically have larger negative water quality impacts than urban purpose sources.

Agricultural activities area unit accountable for nutrient and sediment hundreds that impair water quality nationwide. These sources of pollution area unit typically related to health, environmental impacts and area unit particularly accountable for eutrophication and degradation of water stream quality. Land use/land cowl management, notably high-input agriculture and placental operations is taken into account to be a very important supply of chemical element, phosphorus and sediments export from catchments and often has been known as a serious contributor of surface pollution. Since fresh bodies area unit phosphorus restricted, loading of phosphorus is of specific environmental and economic considerations for managing potable quality. Nutrient transport is extremely addicted to the runoff volume that successively depends on many factors like downfall, temperature and antecedent soil wet content. Chichester, (1977) according that the best chemical element concentration in runoff occurred throughout the late spring and summer seasons once downfall intensity was highest. Chemical element is frequently side to lakes, streams and rivers through mineralization of dissolved and suspended soil organic matter and thru the applying of chemical fertilizers and animal manures for crop production. In general, soil and water ecosystems area unit the prime recipients of excess nutrient and sediment loading. Low dissolved chemical element concentration and overall

changes in plant and aquatic community composition happens naturally, however it become damaging once the organic process state is altered by human activities related to intensive placental operations or excess manure applications to cropland. It sometimes involves hyperbolic nutrient and sediment transport to surface waters. Since lakes area unit the ultimate recipients of pollutants, changes in surface water quality related to nutrients and sediments discharged from agricultural operations have accumulative impact on degradation of terrestrial ecosystems (Hoorman et al., 2008) Eutrophication may be a world development related to nutrient enrichment of aquatic scheme. In natural course, its slow method of lake aging ultimately ends up in succession. Lakes have a additional complicated and fragile scheme as they are doing not have a self-cleaning ability and so promptly accumulate pollutants.

The increasing phylogeny influence in recent years in aquatic systems and their geographic area have contributed to an oversized extent to deterioration of water quality and dwindling of water bodies resulting in their accelerated eutrophication. Eutrophication means that the method of enriching water in alimentary substances (called additionally nutrients, biogenesis and bioelements). This method causes the rise in biological production and unfavorable organic pollution leading to a series of unfavorable changes in water ecosystems creating it not possible to properly exploit the reservoir. the most components inflicting eutrophication are: chemical element, chemical element and carbon. Currently, eutrophication has the phylogeny character caused by an excellent quantity of biogenesis gift in surface waters returning chiefly from fields and municipal and industrial waste. However, assessing the impacts on eutrophication isn't undemanding as eutrophication happens as a results of the complicated interaction between nutrient availableness, lightweight conditions, temperature, continuance and flow conditions. However, it's attainable to assess the impacts of global climate change on individual elements contributive to eutrophication via field or modeling experiments.

### III. PARAMETERS FOR ANALYZING OF LAKE WATER QUALITY

#### A. Physico- Chemical Parameters

It is terribly essential and necessary to check the water before it's used for drinking and domestic functions. Choice of parameters for testing of water alone depends upon for what purpose we tend to getting to use that water and what extent we'd like its quality and purity. Some physical check ought to be performed for testing of its physical look like temperature, color, odour, pH, turbidity, TDS etc, whereas chemical tests ought to be perform for its soma, COD, dissolved chemical element, alkalinity, hardness and alternative characteristics. Indian commonplace dictate for analyzing lake water quality.

#### B. PH

The hydrogen ion concentration indicates the intensity of acidity and pH and live gas ions in water. Water that has hydrogen ion concentration worth of over 9 or but 4.5 becomes unsuitable to be used (Ghosh, 2014). Hydrogen ion concentration is most vital in decisive the corrosive nature of water. Lower the hydrogen ion concentration worth

higher is that the corrosive nature of water. Hydrogen ion concentration was completely correlate with electrical phenomenon and total pH. Varied factors motivate changes in hydrogen ion concentration of water. The upper hydrogen ion concentration values ascertained suggests that CO<sub>2</sub>, carbonate and bicarbonate equilibrium is affected additional thanks to modification in chemical science condition. Hydrogen ion concentration balance in healthy aquatic system is maintained at intervals the vary of 0.5 to 8.5, hydrogen ion concentration vary of half dozen to 8.5 is traditional in keeping with the U.S. Public Health Association.

#### C. Temperature

Temperature is one in every of the necessary factors in aquatic surroundings since it regulates the varied physico-chemical in addition as biological activities. The temperature of surface waters is additionally influenced by latitude, altitude, season, air circulation, flow and depth of water body.

#### D. Turbidity

Turbidity is associate degree expression of sunshine scattering and lightweight riveting property of water and is caused by the presence of suspended particles like clay, silt, mixture organic particles, plankton, soil particles, discharged effluents, rotten organic matter and total dissolved solids in addition because the microscopic organisms (muddiness may be a mensuration of the cloudiness of water, measured by passing a beam of sunshine through the water and measurement photometrically. Cloudiness is caused by material suspended in water. Clay, silt, organic matter, organism and alternative microscopic organisms cause muddiness in natural water. This has been recognized as a valuable limiting consider the biological productivity of the water bodies.

#### E. Alkalinity

Alkalinity is measure of solution's capability to react with a robust acid (H<sub>2</sub>SO<sub>4</sub>) to a planned hydrogen ion concentration. PH of water is thanks to the presence of hydroxides, carbonates and bicarbonates. PH may be a perform of hydrogen carbonate and carbonates. These salts get hydrolyzed in resolution and turn out anion. It's additionally used as a live of productivity of water. Natural water bodies in tropics sometimes show big selection of fluctuations in their total pH worth relying upon the geographics and season.

#### F. Dissolve oxygen (DO)

Dissolved chemical element associate degree analysis live the quantity of foamy chemical element (O<sub>2</sub>) dissolved in a solution. A tiny low quantity of chemical element, up to concerning 10 molecule of chemical element per million of water, is generally dissolved in water. Dissolve chemical element is that the dissolved foamy variety of chemical element. It's essential for respiration of fish and alternative aquatic organisms. Adequate dissolve chemical element is important for the lifetime of fish and alternative aquatic organism. The D.O concentration can also be related to corrosiveness of water and chemical process activity. The decomposition of organic matter may be a very important considers consumption of DO, as additional vigorous

deposition may be seemingly throughout heat weather that additionally witnessed accumulated flow of tourists within the region. The re-oxygenation of water throughout monsoon may be occurring thanks to circulation and intermixture by flow when monsoon rains a decent water quality ought to have solubility of chemical element. Chemical element content is vital for direct want of the many organisms and has an effect on the solubility of the many nutrients and thus the cyclicity of aquatic system (Azmi et al., 2015). Its correlation with water body provides direct and indirect data e.g. microorganism activity, chemical action, availableness of nutrients, stratification etc.

#### G. Biochemical oxygen demand (BOD)

BOD is dissolved element needed by organism for aerobic decomposition of organic matter gift in water. The number of element needed to hold out biological decomposition solids in biodegradable pollution underneath aerobic condition at degree Celsius is thought as B.O.D. Surface water (river, lake) containing soma values ten mg/l square measure take into account being moderately and over twenty mg/L on be extremely impure water. The bigger the complex matter gift, bigger the element demands and bigger the soma values.

#### H. Total Hardness

Hardness is caused by bivalent gold ions that square measure capable of reacting with sops to create precipitates and with bound anions gift within the water to create scale. Hardness of water is as a result of presence of major cations like atomic number 20 and atomic number 12 that square measure conveyance hardness alongside anions like salt, chloride, bicarbonates and carbonates, cause temporary hardness, whereas sulphates and chlorides cause permanent hardness. The water are often categorised consistent with degree of hardness as soft (0-75 mg/l) moderately (75-150 mg/l) hard, (150-300 mg/l) and on top of 300 mg/l.

#### I. Phosphorus

Element in water happens principally in salt, condensed phosphate and organically certain phosphate. The microbic degradation of organic matter releases the element in phosphate type. The importance of element lies in its ability to cause eutrophication of water in presence of different nutrients, particularly gas. The standard criterion of element in water is merely to see the unwanted protoctist growth.

#### J. Nitrate

The buildup of nitrate in reservoirs and water bodies as a result of intensive human activities has become a standard development that alters ecological method in several components of the globe. The kinds of nitrate that have an effect on aquatic ecosystems embrace inorganic dissolved forms, ammonia (NH<sub>4</sub>), radical (NO<sub>2</sub>), nitrate (NO<sub>3</sub>) and a spread of dissolved organic compounds like amino acids, carbamide and composite dissolved organic gas and particulate gas.

### IV. BACTERIOLOGICAL ANALYSIS OF LAKE WATER

The most common and widespread danger related to drinkable is contamination, either directly or indirectly, by sewage, different wastes or human and animal excretory product (WHO, 1984). regarding 25 years agone,

authoritative estimates indicated that every year some 500 million folks square measure tormented by water-borne or water associated illness and as several as 10 million of those die. In a very recent estimate supported United Nations agency reports suggests that eightieth of all human sicknesses within the developing world square measure caused by biological contamination. Feculent pollution of drinkable could introduce a spread of enteric pathogens.

#### A. Water Quality Index

A water quality index provides one range that expresses the general water quality at a precise location and time supported many water quality parameters. Water quality index numerically summarizes the data from multiple water quality parameters into one price. Initially, water quality index was developed by Horton (1965) in us by choosing ten most typically used water quality variables like dissolved element (DO), pH, coli forms, specific electrical phenomenon, pH scale and chloride etc. Water quality may be a term accustomed describes the chemical, physical and biological characteristics of water, typically in relation to its quality for a specific purpose. supported the separate parameters we tend to may be confused regarding the assessment of the temporal and abstraction dynamic trend of water quality, the sectionalisation and classification of water quality, the comparison of water quality within the rivers and also the interpretation of water quality to the community on top of disadvantages are often overcome by victimisation Water Quality Index.

### V. CONCLUSION

Water may be valuable natural resources that are facing depletion and pollution as a result of increase in consumption by ever growing population and industrial activities. Lake pollution is extremely severe and important drawback as a result of large quantity of pollutants discharged by urban activities. Thus, pollution wants serious immediate action and continuous observance of pollution level so as to stop its viability. This involves active would like for water management which needs water quality analysis because the initial step. The analyzed knowledge obtained from lakes may be used as baseline and point of reference once assessing any changes caused by natural or evolution sources. The study of physico chemical parameters is extremely necessary to induce precise plan regarding the standard of water. Extremely impure water has varied hurtful effects on masses it will neither be used for domestic purpose nor for industrial use. There's associate imperative ought to offer awareness to the folks for safeguarding the water reservoirs from pollution. Strict proceeding ought to be taken against those that square measure accountable for contamination.

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