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Short Review Paper

Assessment of present water quality of Sirpur Lake at Indore, MP, India - a review

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Abstract

Water is said to be one of the most important and useful natural resource present in the universe. As we all know that water is necessary for the existence of life on the earth for each and every living organism. Water should be safe, potable and free from any type of contamination before making the use of it. Water should be used for drinking, domestic, industrial and irrigation purposes etc. Therefore water quality should be checked before consumption for any purpose mentioned above. There are different guidelines available to check the water quality for different purposes and if found more or less than the prescribed limit an action should be taken to make it potable and safe. There are various national and international agencies which describes the quality of water in terms of water quality parameter. Water Quality Index generally describes the quality of water for each and every parameter and thus it also helpful in making the policies related to the safety of water. Water Quality Index therefore provides sufficient and meaningful information about water quality to general public and policy maker. Present work deals with the water quality of Sipur Lake at Indore district. The results obtain were then compared with relevant Standards. The results would be helpful in getting information about the lake water and necessary steps regarding the safety of water for future use in drinking domestic, industrial and irrigation purposes. These results would directly helpful in improving the quality of lake water and thus also helpful for the aquatic life present in the lake water and we also come to know that water of lake would be useful for any other purposes or not.

Keywords: Water Quality, Physico-Chemical and Bacteriological parameters, heavy metals, WHO and BIS guidelines.

Introduction

Water is necessary for the development of the entire living organism on the earth. It helps in the growth of the entire organism containing life on earth. Of all the matter present in the earth water is said to be above all because it gives life and without this we would not be able to survive even for a second[1]. It is said that "Water is more precious than gold and more explosive than dynamite". As we all know that water should be checked before its consumption because consumption of water containing impurities will cause various water borne diseases. Therefore all the parameters should be compared with the guidelines prescribed by Bureau of Indian Standards and World Health Organization before consuming it as a drinking, domestic, industrial, recreation and irrigation purposes etc[2].

Water Quality Index present integrated effect of various parameters considering due to weight age to concentration of parameters and its significance by a single number for particular use of water. This will provide necessary and useful information about water quality to generate public and policy makers also. It is a well known fact that most of the diseases in human beings have their roots in the quality of water they consume. Therefore water should be safe and potable. The reason behind the contamination of water is that we should need to check the quality of water and water supply sources at regular intervals but this doesn't happens in most of the countries and therefore we found most of the peoples and animals dies by consuming non potable water or water containing harmful wastes. All the action which should be taken to ensure that drinking water is potable is called water treatment[3].

About sirpur lake: The present study deals with the Sipur Lake (Figure-1) in Indore district situated in south west corner of Indore district. Sipur Lake is said to be the gift of Holkar family to the city more than a hundred years ago which covers 600 acres in Indore Dhar highway, which was the natural habitat for birds till the 80's and from where its decline began. The rain fed lake which comes under the Indore Municipal Corporation. Sipur Lake is a fully secured water body and a safe bird habitat where migratory birds continue to come on their seasonal visits every year. Large birds like Greater Flamingo and Seniors Crane both visit Sipur Lake. The flora & fauna of lake and tranquility of the place was just like manna from heaven to the visitors. But because of huge industrialization since from last few decades in the nearby area of lake will contributes much towards the contamination of water because of the harmful wastes coming from these industries containing so many toxic wastes along with them which directly or indirectly makes an impact on human health and also to the bird sanctuary lives in

the vicinity of lake. Because of such industrialization it causes massive killing of fish since from last few decades and birds continue to decline from this lake. Therefore we need to protect the quality of lake water so that it can be used for different purposes like drinking, domestic, irrigation, industrial and recreational purposes.

Figure-1: Sirpur Lake Indore.

Literature Review

Pathak et al carried out their research work on estimation of physical and chemical parameters of water in and around Sangam in Allahabad. Allahabad is one of the main holy cities of our country. Due to continuous increase in population and human activities like washing or bathing clothes near the banks of river and by dumping of harmful wastes in the river helps in degrading the drinking quality of river water. The results obtain would be helpful for the management of river water in future[4].

Somasundaram et al studied on the 6 sampling sites were selected to check the quality of river water. Thus the physical and chemical parameters below the prescribed limit of World Health Organization in the Vaigai river water. Hence it concludes that the Vaigai river water is not suitable for the drinking purpose and the water will be treated well before consumption[5].

Nighojkar et al studied all the parameters were also compared with Class C standards, The Canadian Water quality Index results had shown that WQI of the Khan River is poor, indicating the urgent need for prevention of polluting sources and formulation of conservation strategies[6].

Pranab and Mishra studied different water samples from different locations such as dug wells, bore wells, hand pumps and ponds were collected. The samples were then analyzed for various water quality parameters such as chloride, sulphate, nitrate, sodium, potassium, calcium, magnesium, iron, copper, cadmium, chromium, lead and zinc using standard methods. The results obtain were found that most of the samples have values above or below the prescribed limit given by the Bureau of Indian Standards for drinking purpose as the water from the different locations will be used as a drinking purpose[7].

Laishram studies ground water quality at Imphal west district. In this studies ground water samples was collected during pre monsoon season and analyzed for determination of pH, solids, electrical conductivity, total hardness, calcium, magnesium, sodium, potassium and chloride. The results obtain would tell us that the samples represented by S_1 to S_5 are fit for drinking purpose from physico chemical point of view while remaining other samples from S_6 to S_{10} are unfit for drinking purpose. Apart from this further investigation will also be done to check whether heavy, metals are present beyond desirable limit[8].

Bindhu studied ground water quality of Kanyakumari district Tamil Nadu. In this study various physico chemical and bacteriological characteristics of ground water samples collected in Dharmapuram village, Kanyakumari district was assessed. For this analysis 30 samples were collected from different locations. The results obtain revealed that all analyzed parameters were within maximum desirable limit with an exception of 2 samples. Despite this it was evident from the analysis that in tested ground water samples the bacteriological quality was not under acceptable level and 50% to the samples were antammiated wilt coliforms. Along with this other microbial genera were also showed their existence in 30% samples. Therefore it clearly indicates that the natural and extend of microbial antamination in the ground water samples of the selected villages of Kanyakumari district[9].

Tiwari et al studied on Bichhiya River and Govindgarh Lake in Rewa to assess its physical parameters. As we all know that all life on earth depends on water. In this study various physical parameters such as pH, temperature, transparency and current speed were analyzed in Bichhiya River and Govindgarh lake of Rewa district. The present study aims at acquiring the first hand knowledge of the water quality of Bichhiya River and Govindgarh lake in order to assess its production potential. The study provides sufficient data and also helps to understand water characteristics and indicate that water of Bichhiya river and Govindgarh lake can serve as a good habitat. All the parameters are quite suitable for the growth fish[10].

Tripathi et al studied on surface water quality around Amarkantak Thermal Power Plant in Chachai Madhya Pradesh having an impact on seasonal variations. This research is an outcome of physico chemical observation and analysis of seasonal surface water samples collected from adjacent locations of Chachai (M.P.). The surface water quality of this

region generally relates to geo morphological and environmental conditions which can be called as the key source to assess the alteration in surface water quality of surroundings. In this research surface water quality was assess to make the use of water in terms of domestic and agricultural purposes. Hence 5 no. of surface water samples from 5 identified locations were collected and analyzed for summer, winter and monsoon season. As the samples were analyzed for different seasons there would be significant change in the physical and chemical parameters. In this research with the seasonal variations seasonal changes also effects the silica concentration of water samples. After the analysis of surface water samples values of seasonal alteration compared with the guidelines prescribed by Bureau of Indian Standards[11].

Vaishnav S. et al studied the water quality status of river shivnath and the result shows that most of the parameters were not under permitted limits of BIS and WHO. Fecal coliforms exceeded the BIS limits, which makes the water unsuitable for use. This shows that water quality of Shivnath River is below the standards limits as it is unsuitable for domestic and drinking purpose[12].

Objectives of study area: To study some physical, chemical and bacteriological characteristics of lake water for pre monsoon and monsoon season and estimate the water quality index through formulation of appropriate used methods and its comparison with the guidelines from Bureau of Indian Standards.

Experimental technique-how to do

The physical, chemical and bacteriological characteristics of Sipur lake water studied in the month of April 2017 - August 2017 (pre monsoon and monsoon season) for a period of eight month. The results obtain will help us to know the quality of lake water and for which purpose it would be suitable for us.

In this study Spot sampling technique was selected as the base and the study was done at specific depths of lake. After collecting the samples from different sites, it was bought to the laboratory and preserved it. On the following day all the experiments were performed.

Water quality assessment of Sirpur Lake

As we all know that water from different sources seems to be polluted because of the unfair activities done by human beings. Therefore it is necessary and important to check the quality of water before using is as a drinking, domestic, irrigation and industrial purposes. Water quality of lake would be analyzed for various physico, chemical and bacteriological parameters. Apart from all these water quality will also be analyzed for heavy metals present in the lake as they are harmful for the aquatic life present in the lake water. These heavy metals generally contribute in the declination of aquatic life present in the lake water. Selection of parameters is mainly depends upon the type of water going to be used and up to which extent quality and quantity of water we needed. In this study water from Sipur lake contains so many dissolved, suspended and bacteriological and floating impurities. Along with them it should also be checked for various physical parameters like pH, temperature, colour, odor, turbidity etc. and chemical parameters like BOD, COD, DO, alkalinity, chlorides, hardness etc. will also be analyzed. Physical Chemical characteristics of lake water along with undesirable effects outside the acceptable limits which shown below[13].

Table-1: Physical Chemical Parameters.

Parameters	Acceptable limit	Unit	Undesirable effect outside the acceptable limit
Colour	5	Hazen	Above 5 consumer acceptance decreases
Turbidity	1	NTU	Above 5 consumer acceptance decreases
pH	6.5-8.5	-	Beyond this range the water will affect the mucous Membrane and/or water supply system.
Dissolved Solid	500	Mg/L	Beyond this palatability decreases and may cause Gastrointestinal irritation.
Sulphate (SO_4^{2-})	200	Mg/L	Beyond this causes gastro intestinal irritation when magnesium or sodium is present
Fluoride (F^-)	1	Mg/L	Fluoride may be kept as low as possible. High fluoride may cause fluorosis.
Chloride (Cl^-)	250	Mg/L	Beyond this limit taste corrosion and palatability are affected.
Total Alkalinity ($CaCO_3$)	200	Mg/L	Beyond this limit taste becomes unpleasant.
Total Hardness ($CaCO_3$)	300	Mg/L	Encrustation in water supply structure and adverse effects on domestic use.
Nitrate (NO_3^-)	45	Mg/L	Beyond this Mathaemoglovinemia takes place / may be indicative of pollution
DO	Not Mention		
BOD			
COD			

Apart from all these some tests are also performed to check the bacteriological parameters such as E. Coli and Total Coli form Bacteria. Heavy metals will also be analyzed for aquatic point of view. Once all these parameters will analyze we should come to know the level of contamination in the lake water and up to which extent and for various purposes we can make the use of it.

As we all know that Indore is said to be the hub of industries in Madhya Pradesh. Most of the industries are located in mid city or outside the city and hence these industries contributing much towards the contamination of water because of the harmful wastes comes from these industries and without any proper treatment all these wastes are directly being dumped in the water streams which directly or indirectly affects the quality of water sources. In Indore city limited water sources are present to fulfill the demands of daily needs and if this continuously goes on then that day is not so far when peoples will have to suffer from safe and fresh water scarcity. These wastes generally increase the quantity of physico, chemical and bacteriological parameters more than the prescribed limit. The water containing these wastes if consumed cause so many water borne diseases ad directly makes an impact on human or say all living beings health. There have been several formulations of water quality indices. Basically there are two different types of Water Quality Index[14].

Additive Water Quality Index: $WQI_a = \sum_{i=1}^{n} w_i q_i$ (1)
Where: q_i= quality rating for the parameter, n= Number of parameters, w_i= weight to the i^{th} parameter,

Such that, $\sum_{i=1}^{n} w_i = 1$ (2)
Multiplicative water quality index: $WQI_m = \sum_{i=1}^{n} q_i^{w_i}$ (3)

Conclusion

This paper deals with the various physico, chemical and bacteriological characteristics of Sipur Lake in Indore district during premonsoon and monsoon season in the year 2017. These results were then compared with relevant Standards and World Health Organization. Quality of lake should also be checked for drinking purposes by the guidelines from IS 10500-2012. These results would be helpful in getting information about the type of contamination in lake water and thus the type of protection needed. All these data would be helpful in improving the quality of lake water and to make the lake water safe and potable for various purposes.

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