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Water Quality Index (WQI) of the Wainganga River, Balaghat Madhya Pradesh, India

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Abstract:

This study investigates and ranks the quality of the water of the River Wainganga, a tributary of the Godavari System. During the course of this inquiry, a technique called the Water Quality Index (WQI) will be used. Using a method supplied by the Bureau of Indian Standards, the Union Health Ministry, the Government of India, and the Indian Council of Medical Research, the River Wainganga's surface water quality index was calculated. Additional samples were taken from a sub-drainage of the River Wainganga to bring the total number of samples collected in this location to eighteen. Whether or whether it is safe to drink the water flowing from a body of water depends on a number of factors, including the water's quality and the body of water's potential to sustain a variety of ecosystems. The eight indices of water quality—iron, colour, pH, electrical conductivity (EC), turbidity, alkalinity, total dissolved solids, and total hardness—were measured at two sites along the river between September 2010 and May 2011. The purpose of collecting this data was to create a water quality index. All of these readings were compiled and analysed to create an index that may be used to rate the quality of the water. These findings are part of an ongoing study designed to establish an index for assessing the water's overall quality. The iron concentration of this sample was 169.2 mg/l, which is the highest value ever recorded for this unit of measurement. In all of history, this was its highest documented value. One of the most important findings was that the iron concentration of the samples was much greater than predicted. Have a look at this [excellent example:] [Check out this fantastic example:] Congestion of the nasal mucosa and throat, mental fogginess, and issues with the digestive system, the muscles, reproduction, the nervous system, and the genes have all been connected to iron deficiency. Iron deficiency has also been linked to anaemia, which further contributes to the condition. Additionally, an iron deficiency is linked to congestion of the nasal mucosa and the throat. Congestion, Parkinson's disease, cancer, edoema of the eyelids, and tumours have all been linked to insufficient iron levels. Iron deficiency has also been linked to edoema of the eyelids. To get an accurate reading of the WQI throughout the whole river, we used the Brown WQI technique. Each and every point along the water's path was evaluated using this procedure. This strategy is more all-encompassing in its approach to the issue. While conducting this study, a novel method for determining if water is fit for human consumption will be developed. The strategy will be put into action. This method, from now on referred to as the Water Quality Index (WQI), will be put into action. The highest WQI value that could be measured was 30246.51%, however the values recorded at the several sample sites ranged from 8741.1% to that maximum.

Keywords: Assam Public Health Engineering Department (APHED), Bureau of Indian Standards (BIS), Indian Council of Medical Research (ICMR), Water Quality Index (WQI), Water Quality Status (WQS)

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INTRODUCTION

Since water constitutes the majority of the planet's surface, Earth is often referred to as the "blue planet." There are about 1.35 x 109 cubic kilometres worth of water covering the earth. Saltwater, which is what constitutes the seas, still accounts for about 97.1% of the entire volume of the oceans. It is now believed that the annual loss of glaciers and ice sheets is less than 2%, which is a significant reduction in comparison to previous years. Even though it only makes up 2% of the total water supply on the planet, fresh water is very necessary for human survival. In order to find the remaining 0.6% of the drug, it is necessary to first change it into a form that is undetectable by human senses. The ever-increasing amounts of pollution may be the result of a wide variety of acts taken by humans. As a direct consequence of this, preventing pollution of our various water sources is one of our highest priorities. It is of the highest significance to do research on the available water supply and to maintain a level of command over it. In principle, maintaining a constant vigilance over the state of the water's purity might be beneficial in this respect. Since the 1990s, the population of the world has been rapidly increasing, and as a direct consequence, industries such as agriculture and food processing have increased the amount of water that they require. This is a direct contributor to the global water issue, which is becoming worse for people every day. To ensure their continued operation, more than seventy percent of the state's rural water distribution systems are dependent on groundwater sources. Because rivers supply water to more than half of the state's agricultural land [23, 24], it is absolutely necessary for professionals to keep a careful check on the quality and quantity of the water that is flowing through the river. This is the only way to ensure that the state will continue to grow and prosper. This is because the river plays a significant role in the development and prosperity of the state as a whole. In April of 2002, the Government of India established the National Water Policy in order to improve the management of water as a significant natural resource, a fundamental human need, and a treasured national asset; and to protect its wholesomeness via planning, development, and pollution control. These goals were accomplished through the implementation of the National Water Policy. These goals were accomplished at the same time. The policy was put into action in the capital city of New Delhi by the Ministry of Water Resources of the Indian government. The water strategy was developed with the intention of improving water management in light of the significance of

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water as a limited resource, a fundamental human need, and a valuable national asset. The document covered a wide variety of subjects, such as the "Need for a National Water Policy," the "Information System," the "Water Resources Planning," the "Institutional Mechanism," the "Water Allocation Priorities," the "Project Planning," the "Ground Water Development," the "Drinking Water," the "Irrigation," the "Resettlement and Rehabilitation," the "Financial and Physical Sustainability," and the "Participatory Approach to Water." All of these topics were discussed in Flood management, preventing land loss due to flooding or river erosion, drought-prone area construction, project oversight, interstate water allocation, maintenance and modernization, structural safety, science and technology, education and training, and a great number of other fields all benefit from the involvement and contributions to improved performance made by the private sector. Construction in regions that are prone to drought, flood management, and the prevention of the loss of land as a result of floods or river erosion are a few examples. The management of floods, the prevention of land loss due to flooding or river erosion, and the building of communities that are resilient to drought are all examples of strategies that come under this category.

In July of 2003, the government of Madhya Pradesh made public its intention to implement both the National Water Policy from 2002 and the recommendations made by the Madhya Pradesh Water and Irrigation Commission. This was signalled by the government of Madhya Pradesh's announcement of the Madhya Pradesh State Water Policy. This was done in accordance with the National Water Policy of 2002 and the recommendations made by the Madhya Pradesh Water and Irrigation Commission. Both of these documents were taken into consideration while carrying out these actions. This was done in order to facilitate the incorporation of the results into the formulation of state water policy in the state. This far-reaching strategy will, by the end of the next twenty years, have accomplished its goal of ensuring that water is transported, produced, and managed in compliance with all relevant regulations. In order to maintain the government's permission, it is necessary to do regular tests on the quality of both surface water and ground water. There is a lack of law in India that appropriately tackles the problem of water pollution, and this lack of legislation comes from both the central government and the different states. Unless an overall plan to prevent water pollution is put into place, the actions of the government to tackle water pollution will lack the required focus and oomph to be successful. The ecological restoration of degraded

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water bodies and the implementation of preventative measures against pollution are both essential components of this approach.

The economic activity that is now taking place in the Balaghat region poses significant risks to the quality of the surface water in the places that are nearby. Rice mills, oil refineries, steel and alloy foundries, and firms that specialise in the creation of handcrafted brass cookware are just some of the businesses that call the Balaghat Tahsil their home. The Balaghat Tahsil is also home to a broad range of other types of industries. Rice mills, oil refineries, steel and alloy foundries, and factories are all examples of businesses that fall within the umbrella of the manufacturing sector. Both surface water and groundwater may get contaminated when businesses discharge their waste into the surrounding environment [20-21-22-23-24-25]. Changes in the quality of water caused by human activity can differ in kind, scope, and duration depending on a number of factors. These factors include the geochemical, physical, and biological processes that are occurring at ground level as well as the hydrogeological conditions that existed before them. All of these components work together to help define these characteristics. There is a possibility that the amount of water that is confined inside the system may be affected by factors such as external circumstances, landform, and hydraulic conductivity [21-22-23-24-25]. Residents of the Balaghat District hold the Wainganga River in high esteem, and their way of life is inextricably linked to the river in many ways. The neighbouring villages are home to around 250 people, while the six riverfront cities are together home to approximately 870 individuals. These cities are responsible for the contamination of rivers at a rate that is equivalent to one million gallons per day, on average. The river is continually impacted by the pollutants as a result. [25].

Heavy metal intake has been linked to a variety of diseases, including those affecting the digestive tract, muscles, reproductive system, neurological system, and genes [1-4, 6-8, 14-26, 29-30]. Additionally, this may cause congestion in the nasal passages and the pharynx. As a result of this, monitoring of ferrous metals is essential for determining the extent of any potential damage to the environment. The current study evaluated the water quality index in the Balaghat Tahsil part of the Wainganga for drinkable purposes in accordance with the standards set forth by the Union Health Ministry, the Government of India, as well as the APHED, BIS, and ICMR [32]. This was done in consideration of the geographical and sequential fluctuations in iron metal concentration. As stipulated by the, this activity was carried out in order to ascertain whether or not the water quality index of the river was

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appropriate for ingestion by humans.

STUDY AREA

Balaghat is the name of a city and district in what was then known as British India; now, it is part of what is called the Central Provinces. The word "bal," meaning "fort," is whence Balaghat got its name. To be more specific, the Seoni sub-district of the district is where you're most likely to find Balaghat. This has been the situation in the district for some time. Providing services to both the city government and the district government at once, this facility serves as the administrative nerve centre for both. The city government's main offices are also located there. It's possible that the settlement is situated around the confluence of the aforementioned river with the Wainganga. On the other side of the Wainganga River from the settlement is the Seoni railway station near Balaghat Road. This station has a chance of being located closest to the residential area of the community as a whole. Certainly, this is not impossible. A railway station may be found around 4 kilometres (2.5 miles) in the direction you are looking right now. There is a gap between them of which the distance is presently undetermined. To reach your target, you must follow this path. The area receives an average of 10,300 millimetres of precipitation each year, which adds to the pleasant climate and helps keep the temperature stable. Total rainfall is measured in millimetres. The total quantity of precipitation one is subjected to when travelling across the United States from west to east increases as one moves further and farther eastward. The elevated humidity is to blame for this phenomenon. It's not impossible that this pattern will spread throughout a sizable chunk of the United States. As the month of June nears its midpoint, the southwest monsoon will have established itself as the dominant wind pattern. The start of the wet season has arrived. While June through September get the greatest rain annually, this only accounts for around 90% of the total annual rainfall. Despite the fact that the majority of annual precipitation occurs between June and September, Rainfall is most in July and August, with July being the greatest monthly total. The heaviest rain is often recorded in July. July typically has the highest monthly rainfall total for the year. Something may be said to be relatively consistent if its value, like the average annual rainfall, fluctuates only little from one year to the next. Precipitation levels are an indicator of this kind of activity, since they occur annually on average. A section of the Howrah-Mumbai Railway, which links the two cities, runs through the area (Howrah and Mumbai). In addition, Seoni serves as the western terminus

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of National High Road No. 6, which circles the whole area clockwise before returning to Seoni. The remainder of India may be reached by travelling to one of these two routes and then taking either of them to this region. The location of the study area and the drainage patterns in the region are shown in Figure 1 elow. The location of the map is shown in the figure's legend. This map is included in the downloadable extras. If you go to the article's figure legend, you may examine the complete map. This map may have been included in the previous chapter.

Figure 1: Showing the Location Map of Balaghat District of Madhya Pradesh State after Pandey [36]

Water Quality Index

A number of indices have been developed in order to summarise data about the quality of the water in a format that is not only straightforward to explain but also straightforward to understand. The Work Quality Index (WQI), which was first developed by Horton in the early 1970s, is essentially a mathematical test result [13]. This index was initially conceived of by Horton. After Horton's work, a number of researchers from a wide range of universities located in different parts of the world came together to develop WQI-based ratings for a variety of water quality parameters. The primary goal of a water quality index, also known as a WQI, is to provide a method for producing a cumulatively determined numerical expression that identifies a certain level of water quality [17]. This is the WQI's main aim. A water quality index may be used to produce a single number that provides an indication of the overall quality of the water at a specific location and point in time. This number is generated based on a range of distinct water quality criteria. The information that is offered by the water quality index, which tries to simplify otherwise difficult-to-grasp data about water quality, should be understandable to the general people, and they should be able to put this knowledge to good use. The story of the quality of the water may be told in more detail than can be shown by a single statistic. The index does not take into consideration each and every one of the characteristics that are provided.

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There are a significant number of them. On the other hand, the Water Quality Index (WQI), which takes into account a variety of fundamental components, has the potential to operate as a clear indicator of water quality. A number of indices have been developed in order to summarise data on water quality in a format that is not only easy to express but also easy to understand. This goal has motivated the development of these indices. The Work Quality Index (WQI), which was first developed by Horton in the early 1970s, is essentially a mathematical test result [13]. This index was initially conceived of by Horton. After Horton's work, a number of researchers from a wide range of universities located in different parts of the world came together to develop WQI-based ratings for a variety of water quality parameters. The primary goal of a water quality index, also known as a WQI, is to provide a method for producing a cumulatively determined numerical expression that identifies a certain level of water quality [17]. This is the WQI's main aim. A water quality index may be used to produce a single number that provides an indication of the overall quality of the water at a specific location and point in time. This number is generated based on a range of distinct water quality criteria. The information that is offered by the water quality index, which tries to simplify otherwise difficult-to-grasp data about water quality, should be understandable to the general people, and they should be able to put this knowledge to good use. The story of the quality of the water may be told in more detail than can be shown by a single statistic. The index does not take into consideration each and every one of the characteristics that are provided. There are a significant number of them. On the other hand, the Water Quality Index (WQI), which takes into account a variety of fundamental components, has the potential to operate as a clear indicator of water quality.

Materials and Method

A journey was conducted to the Balaghat Tahsil in the Seoni District in the Indian state of Madhya Pradesh to collect a sample of the local water source. Following collection, the sample underwent rigorous investigation to reveal the substance's physicochemical properties (APHA 2005; [2-3]). In this study, we calculated the WQI by considering and applying the eight parameters that will be addressed in further depth below. The eight most crucial characteristics are pH, turbidity, colour, electrical conductivity, and general hardness. Number 10 on the list is the total quantity of solids that have dissolved. One of these characteristics is also regarded to be iron-like (Fe). As a means of establishing a standard by which to evaluate the precision with which drinking water quality is assessed, the Bureau of Indian Standards put out a proposal. The Water

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Quality Index (WQI), developed using this standard, bears its name. This allowed for the development of a credible depiction of the water's overall quality. This allowed for a level of precision in the results that beyond any reasonable expectations (BIS). The weighted arithmetic index method [5,] was developed to do the calculation needed to compute WQI. Therefore, the computation could be made. Getting a reliable WQI reading necessitated doing these steps. Using the equation described below, denoted by the letter qn in the following sentence, we were able to get an overall rating for the water's quality. To demonstrate this idea, consider the following statement:

$$q_n = 100\,[v_n - v_{io}] / [s_n - v_{io}]$$

where q_n = Quality rating for the nth parameter at given sampling station.

v_n = Estimated value of nth parameter at given sampling station.

S_n = Standard permissible value of the n^{th} parameters.
V_{io} = Ideal value of the n^{th} parameters in pure water.

The unit weight was calculated by a value inversely proportional to the recommended standard value (S_n) of the corresponding parameter.

$$W_n = k/S_n$$

Where W_n = Unit weight of the parameters.

S_n = Standard permissible value of the n^{th} parameters.

k = Constant for proportionality.

The overall WQI was calculated by aggregating the quality rating (**qn**) with the unit weight linearly.

$$WQI = \Sigma\, q_n w_n / \Sigma\, w_n$$

where w_n = Unit weight of the parameters &

q_n = Quality rating for the **n**th parameter at given sampling station.

The total dissolved solids (TDS), alkalinity (pH), electrical conductivity (EC), total hardness (TDS), and turbidity are the eight components that are used in the calculation of the Water Quality Index (WQI) (T). In addition, iron (Fe) is a component of (TDS). Iron is among the most significant of the components that need to be taken into account. These aspects are necessary to guarantee that the river will, in the years to come, be able to support a diversity and number of living organisms that are satisfactory. The results of

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numerous different water quality tests are described in Table 1, which offers an overview of the many available options. These techniques are discussed in decreasing order of how important they are. Because a property may only have a deleterious influence on the water quality of a river when it is present in very high quantities, limitations that are more flexible are indicative of a reduced risk. It may be said that the significance of a parameter is inversely proportional to the possible value range that is within the realm of its practicability to make effective use of. This is due to the fact that the relevance of a parameter is directly proportional to the efficiency with which it may be used.

Table 1: showing the organisation that is responsible for recommending standards for drinking water and the unit weight (Wn) expressed in mg/l.

Sr. No.	Parameters	standards	Agency	Unit weight (w_n)
1	IRON (Fe)	0.3	BIS/ICMR	0.90959
2	COLOUR	5	BIS/ICMR	0.05457
3	pH	6.5-8.5	BIS/ICMR	0.03898
4	EC	300	BIS/ICMR	0.00091
5	TDS	500	BIS/ICMR	0.00054
6	ALKALINITY	120	BIS/ICMR	0.00136
7	TURBIDITY	5	BIS/ICMR	0.05457
8	TOTAL HARDNESS	300	BIS/ICMR	0.00091

On the basis of the WQI, the quality of the water is categorized from excellent to unsuitable excellent QI ranges [7], as shown in the Table 2.

Table 2: Showing WQI & Status of Water Quality

Water Quality Index Level	Water Quality Status
0 – 25	Excellent Water Quality
26-50	Good Water Quality
51 – 75	Poor Water Quality
76 – 100	Very Poor Water Quality
Above 100	Unsuitable for Drinking

RESULTS & DISCUSSIONS

There are a number of waterborne illnesses that may be acquired through drinking water that has been tainted with chemicals. Preventive measures, starting with those taken in one's own house, may protect against certain conditions. The quantity of water stored and the quality of the water close to the surface have both declined as a result of the increasing demand and accompanying supply. Hydrochemical data from 18 surface water samples collected from throughout the area have been analysed and evaluated. Figure 1 shows that samples are collected both upstream and downstream from the collection location. The

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most typical parameters for the river water quality index include iron, turbidity, total dissolved solids, colour, electrical conductivity, alkalinity, and total hardness. However, the quality of the water for human consumption may differ from what is indicated by these indicators. Information from the blotted areas is included in Tables 3 and 5, and it reflects both hydrochemical changes and changes in land use. Tables showing typical values for iron, total dissolved solids, colour, electrical conductivity, alkalinity, and hardness in River Wainganga water. In this investigation, iron concentrations in rivers were utilised as a proxy for the degree of water pollution in the Balaghat Tahsil. Figure 1 shows that the average concentration of iron (Fe) at site I is 30.18 mg/l, whereas at site II it is 105.72 mg/l. For both BIS and ICMR, the Fe content was over the acceptable range. The physicochemical characteristics of samples collected both upstream and downstream of the Wainganga River show that the area was not significantly impacted by the discharge. If these numbers were measured for the river at this time of year, they would be unprecedented. During times of heavy discharge, samples were obtained from the river itself. Because of the discharge, the physicochemical conditions inside the Wainganga River have changed, as seen above. As can be seen in Tables 3 and 5, the river water had reached dangerously high levels of pollution and iron. The most alarming of these infractions was the total Iron content, which was roughly 186 times higher than the permissible limit according to BIS/ICMR and Water Quality Standards established by the Union Health Ministry, Government of India, and followed by APHED [32] for river waters at the time of sampling. APHED adhered to these criteria. We devote a lot of care to the concentration of this particular pollutant since Iron form has a relatively high concentration and presents a considerable harm to aquatic species. Tables 4 and 6 and Figures 2 and 3 provide the WQI for the study area. The WQI values in the examined samples varied from a low of 8741.11 to a high of 30246.51 points.

The values of WQI very much depend upon the value of Iron in water. On the basis of the WQI, the quality of the water is categorized unsuitable at site I and II respectively for potable usage. The WQI of water samples at Site I and II are shown in Table 4 and 6.

Table 3: Showing Results of (Site I) Sunflag Iron Industry, Warathi, Balaghat

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Month of sampling	Heavy Meta	General Tests						
	Iron (Fe) (mg/l)	Color (Hazen Unit)	pH	Electrical Conductivity (µmhos/cm)	TDS (mg/l)	Alkalinity (mg CaCO3/l)	Turbidity (NTU)	Total Hardness (mg CaCO3/l)
Sept. 10	55.85	4	8.1	363	224	148	210	140
Oct. 10	50.87	4	8.4	372	265	165	187	157
Nov. 10	57.98	4	7.3	356	209	136	165	198
Dec. 10	45	3	7.9	324	217	190	143	154
Jan. 11	23.98	4	8.3	398	365	168	129	243
Feb.11	19.7		7.1	465	275	154	94	287
Mar. 11	12.8	3	7.6	653	367	209	63	297
Apr.11	1.7	2	7.8	647	402	208	5	220
May.11	3.8	2	8.1	476	436	243	5	198
Average	30.18	3.11	7.84	450.44	306.66	180.11	111.22	210.44

Table 4: Showing Calculation of Water Quality Index

S.NO.	PARAMETERS	OBSERVED AV. VALUES	STANDARD VALUES (Sn)	UNIT WEIGHT (W_n)	QUALITY RATING (q_n)	W_n x q_n
1	IRON (Fe)	30.18	0.3	0.90959	10060	9150.475
2	COLOUR	3.333	5	0.05457	66.66	3.637636
3	pH	7.84	6.5-8.5	0.03898	56	2.18288
4	EC	450	300	0.00091	150	0.1365
5	TDS	306.66	500	0.00054	61.332	0.033119
6	ALKALINITY	180.11	120	0.00136	150.09166	0.204125
7	TURBIDITY	111.22	5	0.05457	2224.4	121.3855
8	TOTAL HARDNESS	210.44	300	0.00091	70.146666	0.063833
				Σw_n = 1.0614	Σq_n =128383.63	$\Sigma w_n q_n$ =9278.119
WATER QUALITY INDEX (WQI) = $\Sigma q_n w_n / \Sigma w_n$ = 8741.150148						

Table 5: Showing Results of (Site II) Near Sunflag, Pandhrabodi Nala, Warthi, Balaghat

Month of sampling	Heavy Metal	General tests						
	Iron (Fe) (mg/l)	Color (Hazen Unit)	pH	Electrical Conductivity (µmhos/cm)	TDS (mg/l)	Alkalinity (mg CaCO3/l)	Turbidity (NTU)	Total Hardness (mg CaCO3/l)
Sept. 10	167.5	3	8.4	442	276	188	45	144
Oct. 10	159.23	3	8.6	465	324	199	57	176
Nov. 10	169.2	3	8.3	487	329	210	53	165
Dec. 10	155.2	4	8.4	426	357	243	43	198
Jan. 11	128.3	2	7.9	547	398	214	47	254
Feb.11	111.98	2	7.3	543	435	266	37	244
Mar. 11	54.87	3	8.8	643	476	213	32	265
Apr.11	2.7	1	8.1	787	496	280	26	276
May.11	2.5	1	8.1	675	466	298	25	287
Average	105.72	2.44	8.21	557.22	395.22	234.55	40.55	223.22

Table 6: Showing Calculation of Water Quality Index

S.NO.	PARAMETERS	OBSERVED AV. VALUES	STANDARD VALUES (Sn)	UNIT WEIGHT (W_n)	QUALITY RATING (q_n)	W_n x q_n
1	IRON (Fe)	105.72	0.3	0.90959	35240	32053.95
2	COLOUR	2.44	5	0.05457	48.8	2.663016
3	pH	8.21	6.5-8.5	0.03898	80.66	3.144127
4	EC	557.22	300	0.00091	185.74	0.169023
5	TDS	395.22	500	0.00054	79.044	0.042684
6	ALKALINITY	234.55	120	0.00136	195.458	0.265823
7	TURBIDITY	40.55	5	0.05457	811	44.25627
8	TOTAL HARDNESS	223.32	300	0.00091	74.4066	0.06771
				Σw_n = 1.0614	Σq_n =36715.1	$\Sigma w_n q_n$ =32104.56
WATER QUALITY INDEX (WQI) = $\Sigma q_n w_n / \Sigma w_n$ = 30246.5167						

Figure 2: Showing Water Quality Index Pandhrabodi Nala, Warthi, Balaghat

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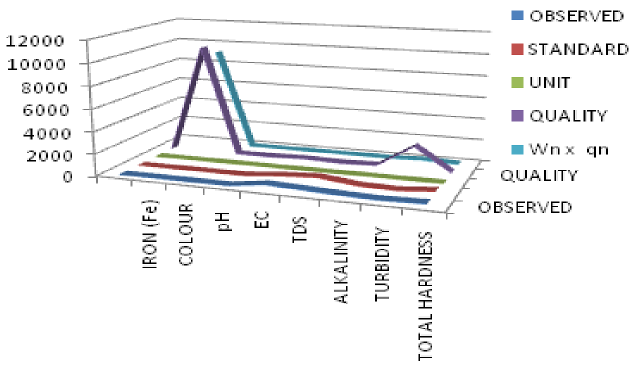
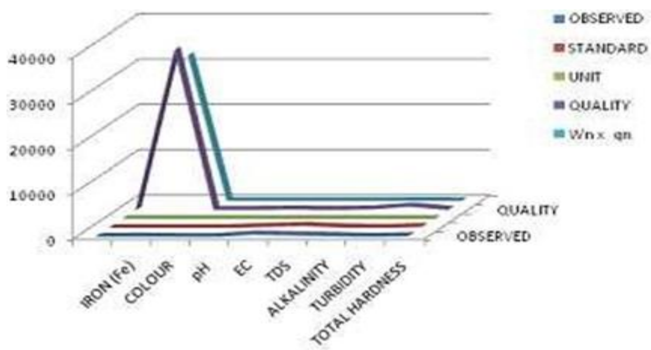


Figure 3: Showing Water Quality Index Sunflag Iron Industry, Warathi, Balaghat



As a direct result of human activity, there is now a much larger concentration of a variety of toxic metals and metalloids. [Citation needed] [Citation needed] Because of their ability to create disruptions in core metabolic processes, they provide a significant danger to the health of both humans and aquatic organisms. [15-16- 18-19] Particulate particles and vaporised metals found in soils, sediments, and water are common transporters of these elements. Plants and animals may take them in via their skin, their digestive systems, or their lungs. They can even inhale them.

Consuming trace metals, such as those containing the element iron (Fe ions), is essential to maintaining normal physiological function, which includes the production of metallo-proteins. On the other hand, conditions in which there is an excessive consumption of trace metal ions have been connected to the development of pathological events, such as the formation of iron oxides in Parkinson's disease [6]. There is evidence relating these redox active metal ions to the production of neurodeposits as well as an increase in oxidative damage. Both of these factors play essential roles in the development of chronic inflammatory illnesses [43] and may serve as a trigger for cancer [8-26]. One of the several

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ways in which metal ions are becoming an increasingly serious threat is through causing inflammation [10], which is a defining characteristic of a wide variety of diseases and conditions and a major contributor to the development of premature ageing.

Because unintentional contact with hazardous metal ions has the potential to have adverse consequences on one's health, several preventative safeguards have been developed as a means of assisting persons in avoiding such contact as much as possible. Metal poisoning is taken extremely seriously in Europe, and the continent as a whole makes significant steps to protect its population [11, 12, 27, 28]. In this process, important steps include screening source materials for impurities and monitoring the levels of metal ions produced by the body. In the field of medicine, a great amount of time and effort is being invested in the study and development of efficient methods for removing metal ions from the body. This is being done in an effort to combat the negative health effects of metal toxicity. Researchers are now putting their efforts into removing neurodegenerative deposits as opposed to lowering oxidative stress levels as their primary emphasis. In the case of the latter, the metal ion chelator generates an anti-oxidant enzyme mimic in order to combat the redox activity of the metal ion. Catechins, a kind of polyphenol, have been shown to have potential as a prodrug chelator for free radicals [1-4].

CONCLUSIONS

The Water Quality Index (WQI) is a tool that provides a picture of the condition of the water supply at a particular point in time and location by compiling data from a broad variety of sources. This snapshot may be seen at any given moment. It was found that the tests included levels of pollutants that were far greater than the minimal minimum that is authorised by Indian law. The WQI values ranged from 8741.16 to 30246.51 in the samples that were obtained from a variety of locations; the findings indicate that untreated water should not be drunk by people since it poses a health risk to them. The higher concentration of iron that was discovered in the River Wainganga in the region that was under examination may be the result of surface leaching of slag or waste water discharge from the steel industry. Both of these scenarios are feasible.

As a direct result of this, it is strongly suggested that wastewater be purified before it is discharged into the natural environment. By making use of the Water Quality Index, it is possible to disseminate easily understandable data on water quality to both the general

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public and those responsible for shaping public policy. This is accomplished via the use of a standardised rating system. Nevertheless, it is of the utmost importance that the correct precautions be taken in order to ensure that the water in the Wainganga River remains drinkable and to protect the authenticity of this one-of-a-kind treasure for the sake of future generations. Before it is safe to drink, the water that comes from the Wainganga River has to go through additional purification steps.

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