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IMPACT OF WATER POLLUTION ON THE GANGA RIVER

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Abstract

It is possible to define water pollution as the presence of one or more contaminants, or combinations of contaminants, in the water in such quantities and for such lengths of time that they tend to be harmful to human, animal, or plant life, or property, or that unreasonably interfere with the comfortable enjoyment of life or property. Aquatic life is considered to be part of the definition of life. To put it in simpler terms, it is the process of polluting bodies of water such as lakes, rivers, ponds, seas, oceans, and even groundwater. This is because environmental toxins and effluents are being dumped directly into bodies of water without being treated beforehand. Pollution in the water affects not only the individual species but also the natural biological communities in which they live. This has an effect on the entire biosphere. It brings to the demise of a significant portion of the aquatic life that was previously present in the body of polluted water. If such water is drank without first being treated, it can cause a number of illnesses, including cholera, dysentery, diarrhea, malaria, dengue fever, chickungunya, and so on, and in rare instances it can even be fatal.

keywords: *Water, Pollution, Ganga, River*

INTRODUCTION

India's Ganga river has a long and illustrious history. Ganga is the lifeblood of an ecosystem that is home to 500 million people as well as myriad of species of aquatic and woodland life. It has a total length of 2,525 kilometers, which makes it the longest river in the world. The Ganges River originates in the vast Himalayan mountains, travels through the state of Uttarakhand in India, then flows south and east across the Gangatic plains of northern India into Bangladesh before emptying into the Bay of Bengal. However, because there is not enough environmental planning and awareness, the continuous disposal of waste in an unregulated way leads to an increase in the level of pollution. Kanpur, Varanasi, and Allahabad are three of the most important cities located along its banks, and they are mostly responsible for the river's pollution.

As a result, it is our responsibility to bring Ganga the honor that she rightfully deserves, given that in Hindu mythology, Ganga is considered to be a mother. The Ganga River Basin is India's largest river basin and comprises 26% of the country's total geographical area. It is also home to 43% of the country's population. This population, which is quite dense, poses a major risk to Ganga since all of the human waste and industrial waste is discharged straight into the river. In order to counteract this risk, all of this population has to be aware that they are progressively losing their own life stream. In the year 1986, the government of India initiated the "Ganga Action Plan" with the intention of monitoring the river and taking the necessary steps to ensure its safety.

The Pollutant

The over 400 million people who live in close proximity to the Ganges river are to blame for the river's extremely high levels of pollution. Large amounts of pollutants are added to the river as it travels through places that are heavily inhabited because it carries sewage from many of the cities that are located along its path, rubbish from industries, and religious gifts wrapped in non-biodegradable plastics. The fact that many less fortunate people depend on the river on a regular basis for activities like as bathing, washing their clothes, and cooking contributes to the severity of the situation. According to estimates provided by the World Bank, the losses to India's health caused by water pollution equal three percent of the country's total GDP. It has also been hypothesized that water-borne infections are responsible for one third of all fatalities that occur in India and eighty percent of all illnesses that occur in that country. The increasing population density, different human activities such as bathing, washing clothing, and the bathing of animals, as well as the dumping of various toxic industrial waste into the rivers, are the primary factors contributing to the pollution of the Ganga river's water. Other factors contributing to the pollution of the river's water include the actions of humans.

Human waste

The river travels through around 48 settlements in addition to 30 cities with populations of over 100,000 people, 23 cities with populations between 50,000 and 100,000 people, and the whole length of 23 more cities.[12] Through their use of household water sources, this population is responsible for a significant percentage of the sewage water in the Ganga, which contains a greater organic load.

Industrial waste

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Numerous tanneries, chemical plants, textile mills, distilleries, slaughterhouses, and hospitals prosper and grow along this and contribute to the pollution of the Ganga by dumping untreated waste into it. This is because a large number of industrial cities have been established on the bank of the Ganga, such as Kanpur, Prayagraj, Varanasi, and Patna. Other cities that contribute to the pollution of the Ganga include Prayagraj and Patna. One power station that runs on coal burns 600,000 tons of coal every year and creates 210,000 tons of fly ash. This facility is located close to the city of Kanpur on the banks of the Pandu River, which is a tributary of the Ganges. The ash is thrown into ponds, and from those ponds, a slurry is created. This slurry is then filtered, combined with wastewater from homes, and discharged into the Pandu River. Heavy metals that are hazardous to humans, such as lead and copper, are found in fly ash.

The quantity of copper that is discharged in the Pandu River before it ever reaches the Ganga is one thousand times more than the amount of copper that is found in water that has not been poisoned. Roughly twelve percent of the entire amount of wastewater that flows into the Ganga comes from industrial sources. Even though they make up a very small percentage, the fact that they are frequently poisonous and do not biodegrade makes them a key source of worry.

Religious traditions

Over seventy million people take a dip in the Ganga during the times leading up to major celebrations in order to cleanse themselves of their past mistakes. The pollution of the Ganga is caused by the fact that some objects, such as food, rubbish, and leaves, are abandoned in the river. Traditional beliefs maintain that the sins of the deceased can be atoned for and that they will be carried directly to salvation if they are burned on the banks of the Ganga and then allowed to float down the river. On an annual basis, the city of Varanasi cremates an estimated forty thousand bodies, many of which are only partially consumed by the flames.

Water shortage

Water scarcity is growing substantially worse, and pollution levels are only getting worse as time goes on. There are stretches of the river that have already lost all of their water. There was a time when the river's average depth in Varanasi was around 60 meters (200 feet), but currently it is just 10 meters (33 feet) deep in some areas. India makes use of electric groundwater pumps, diesel-powered tankers, and power plants that are fueled by coal in order to mitigate the effects of its ongoing water crisis. If the nation continues to rely on these kind of energy-intensive stopgap measures for the foreseeable future, the climate of the entire globe will suffer as a result. There is a lot of pressure on India to expand its economic potential while simultaneously safeguarding its environment, which is something that very few countries, if any, have managed to do successfully. What India does with its water will serve as a litmus test to see whether or not that combination is feasible.

Mining

Illegal mining in the Ganges river bed for stones and sand for construction work has been an issue in the Haridwar district of Uttarakhand for a very long time. This is the first place where the Ganges river enters the plains. Kumbh Mela is held here. This is despite the fact that quarrying has been prohibited in the Mela area zone in Haridwar, which covers a total area of 140 km2.

Materials and Methods

In accordance with the established protocols, samples were gathered. Several aspects were investigated with the use of established methodologies, and the outcomes were compared to the criteria established by the WHO and the ISI. Each and every one of the reagents that were used was made with AR grade ingredients. Throughout the entirety of the investigation, glass distillate water was utilized. The Electrical Conductivity was measured using a Systronics – Conduct meter, and the pH was measured with a Digital Systronics pH – meter. Both meters

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were manufactured by Systronics. During the course of the investigation, other factors such as ions of calcium and magnesium, alkalinity, total dissolved solids, and total hardness were investigated and evaluated.

Calculation of Water Quality Index

Through the use of WQI, the intricate scientific knowledge may be reduced to a single number. It is a dimensionless number that may be arrived at by examining various aspects that impact water quality into a single number in order to simplify the process of determining the quality of water for the average person. The WQI is computed based on a number of different physicochemical characteristics, which are then multiplied by a weighting factor, and the final aggregate is derived by taking the arithmetic mean of all of the values. The Water Quality Index (WQI) technique has been utilized effectively by a great number of writers as a way to express the quality of water for various water bodies. The method used to compute the WQI in this research is the same one that was used in a previous one, thus the computation of the WQI should be straightforward.

Calculation of Quality rating (Qi):

Quality rating for each parameter was calculated by using the following equation

$$Qi = \frac{(V_{actual} - V_{ideal})}{(V_{standard} - V_{ideal})} \quad X\ 100$$

Where

Qi = Quality rating of ith parameter for a total of n water quality parameters.

Vactual = Actual value of the water quality parameter obtained from laboratory analysis

Videal = ideal value of that quality parameter can be obtained from the standard tables.

Videal for pH = 7 and for other parameters it is equating to zero and

DO Videal = 14.6 mg / L

Vstandard = Recommended WHO standard of the water quality parameter.

Calculation of Unit weight (Wi): Using the following formula, we were able to determine the unit weight based on a value that was inversely proportional to the suggested standard (Si) for the respective parameter.

$$Wi = \frac{K}{Si}$$

Where,

Wi = Unit weight for nth parameter,

Si = Standard permissible value for nth parameter

K = proportionality constant, For the sake of simplicity, K is assumed as 1, The overall WQI was calculated by aggregating the quality rating with unit weight linearly using the following equation

$$WQI = \frac{\sum WiQi}{\sum Wi}$$

Where

Qi = quality rating,

Wi = Unit weight

Results and Discussion

a) Temperature

Because it is responsible for increasing the solubility of a wide variety of minerals, salts, and gases, temperature is an essential parameter. The temperature was determined to be 200 degrees for both samples. (See Table I).

b) pH

The hydrogen ion concentration is used to calculate pH, which is then expressed as a negative logarithm. It is recommended that potable water have a pH between 7 and 8. The existence of dissolved gases, salts, bases, and acids are only few of the numerous things that can have an effect on the pH level of water. According to the criteria established by the ISI and the WHO, a pH of 7.88 for sample S1 and 8.0 for sample S2 is considered to be in the elevated range. (Figure 1 and Table I).

c) Alkalinity

The ability of water to prevent the formation of acid is referred to as its alkalinity. The alkalinity of the water is brought about by the presence of substances like bicarbonates, carbonates, and hydroxides. These salts in the water are the result of the dissolving of minerals from rocks and soils, as well as the activities of plants and microorganisms, as well as the discharge of waste from industrial processes. The alkalinity levels that were recorded in this study were likewise found to be rather high, coming in at 125 mg/L in Sample 1 and 130 mg/L in Sample 2, respectively.(Figure 1 and Table I).

d) Electrical Conductivity

The ability of water to carry an electric current is referred to as its electrical conductivity. The presence of dissolved salts and minerals is to blame for this phenomenon. The conductivity was measured to be 90 microseconds per centimeter for both the S1 and S2 samples. (Figure 1 and Table I).

e) Total hardness

The level of hardness in the water is an essential quality since it prevents water from becoming foamy when mixed with soap solution and, if the level is allowed to rise over the acceptable range, can cause significant sickness. When untreated water is utilized in manufacturing, it results in significant harm to both the finished goods and the machinery. The presence of bicarbonates, chlorides, and sulphates of calcium and magnesium are the primary factors responsible for the hardness of water. According to the standards used by WHO, the total hardness was recorded as being excessive, coming in at 133 mg/L for sample S1 and 138 mg/L for sample S2, however the standards used by ISI were considered to be average.(Figure 1 and Table I).

f) Total Dissolved Solids

The term "total dissolved solids" refers to the sum of all the different solids that are dissolved in the water. The amount of Total Dissolved Solids that was reported as 80 mg/L for both the S1 and S2 samples is not a cause for worry because it is within the acceptable limits for consumption of the product. (Figure 1 and Table I).

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Parameter	Methods	WHO Standars	ISI Standards	S1	S2
Temperature	Thermometric	……..	…….	200	200
pH	pH metry	7.0-8.0	6.5-8.5	7.8	8.0
Alkalinity	Titration	120	200	125	130
Electrica Conductivity	Conductometry	1400	……	90	90
Total Dissolve Solid	Filtration method	1000	500	80	80
Total Hardness	EDTA titration	100	300	133	138

Table 2: Water Qaulity Index (Wqi) Status of Water Quality

Water Quality Index Level	Water Quality Status
0-25	Excellent water quality
25-50	Good water quality
50-75	Poor water quality

75-100	Very poor water quality
>100	Unsuitable for drinking

Conclusion

The preceding research is eye-opening since it reveals that the quality of the water in Rishikesh, which is often regarded as having the lowest levels of pollution, is actually rather bad (Table IV). In the sample S1 (Table II), the WQI was found to be 78.0, and in the sample S2 (Table III), it was found to be 81.5. Without first putting the water through a purification process, it is impossible to state that it is safe for drinking or any other home use. According to the findings of the research, it is a deplorable state of affairs that water at practically its source is not suitable for consumption by humans, and as the water makes its way through other big cities, it is extremely possible that the water will become severely contaminated, reaching levels that are hazardous. Assessments of the water's quality in several different sites may be the topic of additional research.

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