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Impact of Sand Mining on Water Quality of Tungabhadra River in Harihara, Davangere, Karnataka, India

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KEY WORDS: River water quality, Sand mining, Environmental damage.

ABSTRACT

Water is a primary mover for all activities and essential feature for all modern development. Water as a solvent it's have a capable to observe many compounds of organic and inorganic matter. Most of the Indian rivers are polluted and the water from these rivers is unfit for drinking. Hence assessing the quality of river water is needed day to day life. The People of Harihara are largely dependent on Tungabhadra River flowing very near to the town. Sand mining in Harihara town most of the time water was untreated. The pollution in the river sediments was delineated by mineral mining. This is causing pollution in the river stretch there by affecting the quality of water in the river. The present situation deals with a study of water quality analysis physico-chemical parameter such as PH, DO, BOD, EC, COD, total hardness, chloride, TDS, etc were analyzed adopting the standard procedures. Five sampling locations are observed and study was conducted from summer month. Sampling was done in summer

Introduction

Water is a primary mover for all activities and essential feature for all modern development. Water as a solvent it's have a capable to observe many compounds of organic and inorganic matters. Rapid urbanization in Harihara taluk were increased the demand for sand in all activities on civil works. The different methods are used to extracting sand

The pollution of water is increased due to human population, industrialization, the use of fertilizers in agriculture and man-made activity. Parameters such as temperature, turbidity, nutrients, hardness, alkalinity, dissolved oxygen, etc. are some of the important factors that determines the growth of living organisms in the water body [5]. Hence, water quality assessment involves the analysis of physico-chemical, biological and microbiological parameters that reflect the biotic and abiotic status of the ecosystem [6].

Huge overwhelming loads of materials were utilized for the critical impact of water contamination and effect on biodiversity, water table levels, just as financial, political, atmosphere and social effects and so forth. Huge scope mining of stream bed sand and rock higher than characteristic recharges, hopeless harms to land, water, biotic and social/practical conditions related such a large number of world's waterway frameworks.

Tremendous degree mining of stream bed sand and rock higher than trademark energizes miserable damages to land, water, biotic and social/useful conditions related such countless worlds' conduit structures. It's by and by commonly got that, dismissing the no longer term benefits, the erratic stream bed sand mining are unfriendly of these life proceeding with structures, in the long way.

The present study manages investigation of water quality or physico-concoction qualities of Tungabhadra river water by impact of sand mining in Harihara situated on the north edge of Davangere city.

Materials and Methods

Study area

The present sand mining has been digging or excavated through open mining, which includes illegal sand mining, mechanical removal and etc. Due to this there is a large amount of degradation in natural resources like land, water, forest, and the various kinds of flora and fauna.

Location: stretched about 30km from Rajanahalli to Sarathi village of Harihara.

Latitude: 14°507'N

Longitude: 75°8'E

Area covered: 7.8 km^2

Urban Population: 91,251 thousand (2020)

Selection of Water sample sites

The water samples were collected from six different points or stations of the r (Figure 1).

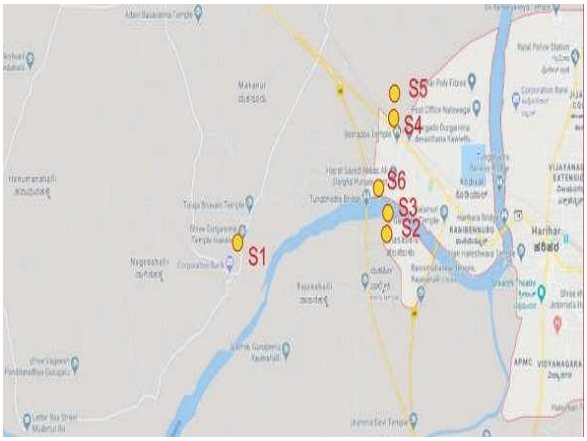


Figure 1: Satellite image of Tungabhadra River, Harihara in Davangere showing sampling sites denoted by dot.

1. Station I – Point of Tungabhadra River flow at Rajanahalli
2. Station II – Point near of road side in downstream-1
3. Station III- Point near of road side in downstream-2
4. Station IV- Point near of old bridge behind of Raghavendra Swamy math-1
5. Station V - Point near of old bridge behind of Raghavendra Swamy math-2
6. Station VI – Point below the rail way bridge construction

Collection of samples

The water samples were collected in polyethylene bottles. Initially, the prewashed bottles were rinsed with sample water. The closed bottle was dipped in the lake at the depth of 0.5 m, and then a bottle was opened inside and was closed again to bring it out at the surface. The samples collected in three replicates from six different points were mixed together to prepare an integrated sample.

Physico-chemical parameters

To study the physico-chemical properties of the river water content, water samples were collected from the sand mining area in a clean polythin container for the period of two months. Samples were collected during morning hours in between 8.00 to 10.00 a.m. using of one litter container. The physical and chemical parameters were analyzed in the seasons of summer respectively. Parameters including temperature, pH, electrical conductivity, turbidity, total dissolved solid, total alkalinity, total hardness, calcium, magnesium, dissolved oxygen, biochemical oxygen demand and chloride were analyzed. We adopted standard guidelines of water sampling and physico-chemical parameters evaluation. Parameters such as temperature, pH, electrical conductivity, dissolved oxygen and turbidity, were directly evaluated in the study area whereas other parameters were analyzed in laboratory.

Results and Discussions

The physico-chemical parameters such as temperature, pH, electric conductivity, turbidity, alkalinity, dissolved oxygen, total dissolved solid, calcium, magnesium, sodium, chloride, biological oxygen demand, nitrate and total hardness of water were analyses in the water samples taken from Tungabhadra River water, Harihara, Davangere, Karnataka, India. These parameters were taken at the six points of the lake. All parameters were reported

Temperature

The temperature plays an important role for controlling the physico-chemical and biological parameters of water and considered as one among the most important factors in the aquatic environment particularly for freshwater. The highest temperature in summer was recorded 29°C and can be due to high solar radiation.

Electrical conductivity

Water capability to transmit electric current is known as electrical conductivity and served as a tool to assess the purity of water. The highest electrical conductivity was reported during summer was 390.00 mg/l. During summer, a high level of conductivity indicates the pollution status as well as trophic levels of the aquatic body.

Turbidity

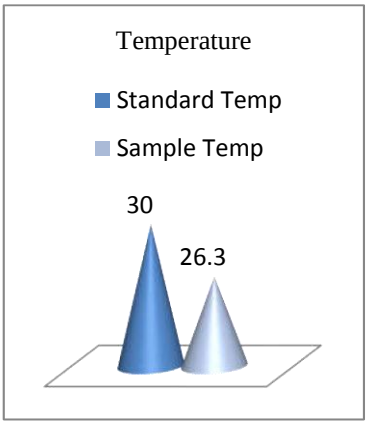
The turbidity of water can be related to the expression of optical property and reflects the intensity of light scattered by the particles present in the water. The high turbidity value reported in summer was 25.30 NTU due to sand mining area largely pollution of land

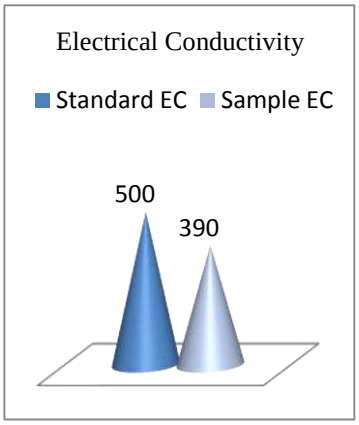
Total dissolved solids (TDS)

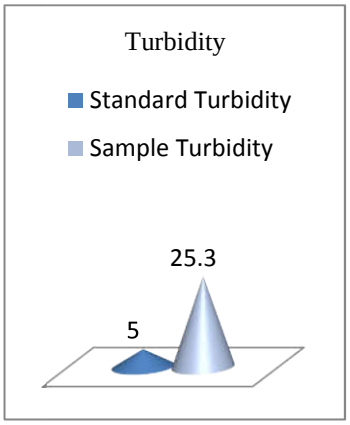
The highest total dissolved solids (TDS) in summer was observed as 964 mg/L due to the addition of sand mining and dead organic substances contributed by the decomposition of aquatic plants and animals which may be related to the water dilution caused by evaporation at high temperature during summer. The maximum limit for TDS as suggested by W.H.O is 500 mg/l which indicated that the recorded TDS signifies the polluted river water. The contamination of domestic waste water, garbage and other related wastes in the surface water body can be one among the reasons for increase in TDS measure. Our on- field observations were also similar in this case.

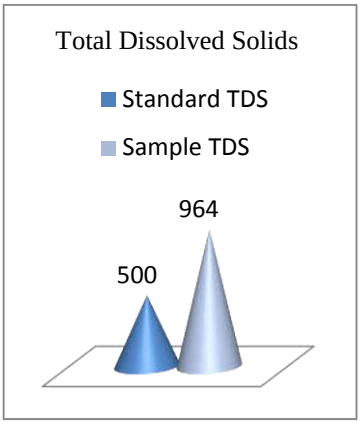
Physico-chemical parameters of Tungabhadra river water quality (2020)			
S. No.	Parameters	Summer	W.H.O. standards for Drinking water (annual max.)
1	Temperature (°C)	26.30	30-32
2	Electrical conductivity (Ω/cm)	390.00	500
3	Turbidity (NTU)	25.30	5
4	Total Dissolved Solid (mg/L)	964.00	259-500
5	pH	8.71	6.5-8.5
6	Alkalinity (mg/L)	344.00	100
7	Total hardness (mg/L)	175.00	200
8	Calcium (mg/L)	117.40	75
9	Magnesium (mg/L)	80.20	150
10	Dissolved oxygen (mg/L)	9.20	7.5
11	Chloride (mg/L)	63.40	200
12	Biochemical oxygen demand (mg/L)	4.90	6.9
13	Chemical oxygen demand (mg/L)	13.30	60

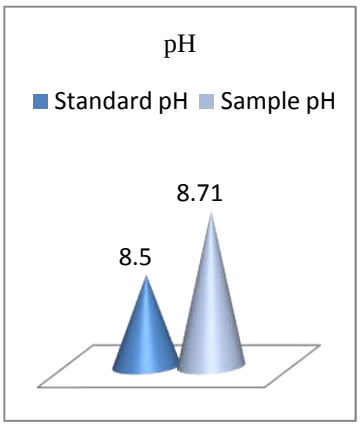
Table 1: **physico-chemical parameters of Tungabhadra River water quality (2020)**

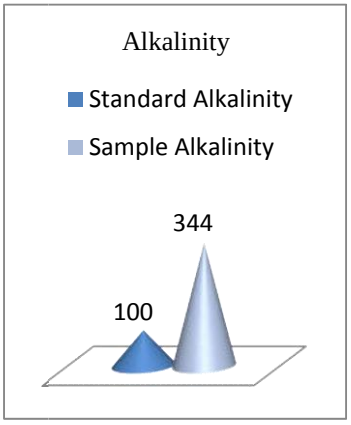


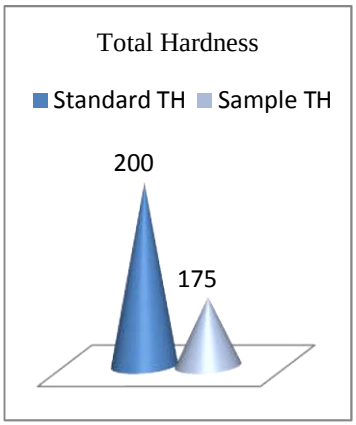


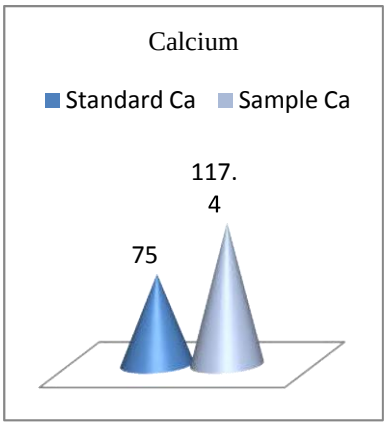


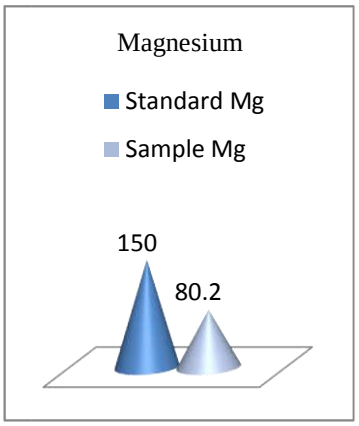

Total Dissolved Solids
Standard TDS
Sample TDS
964
500

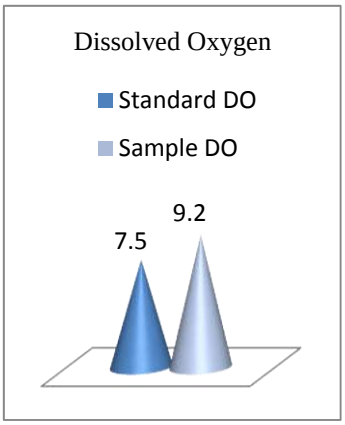

pH
Standard pH
Sample pH
8.71
8.5

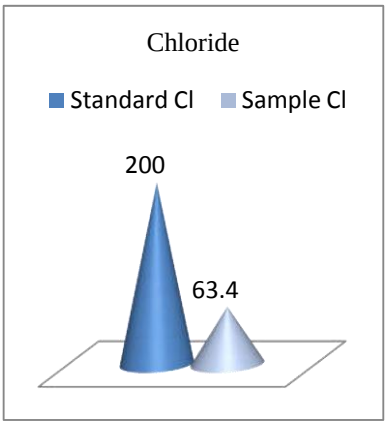

Alkalinity
Standard Alkalinity
Sample Alkalinity
344
100

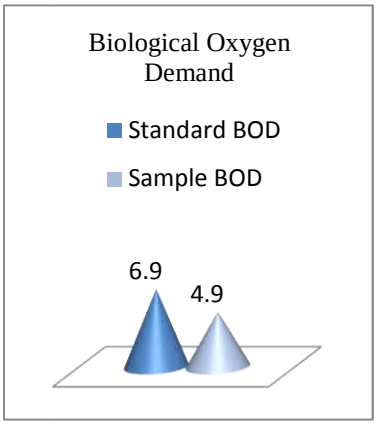

Total Hardness
Standard TH
Sample TH
200
175

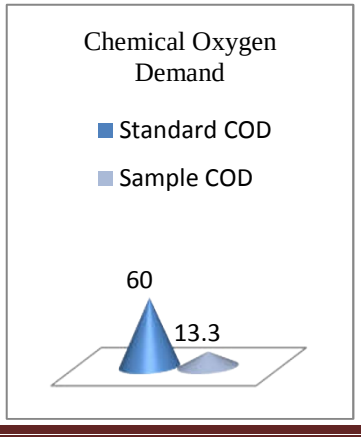

Calcium
Standard Ca
Sample Ca
117.
4
75


Magnesium
Standard Mg
Sample Mg
150
80.2


Dissolved Oxygen
Standard DO
Sample DO
9.2
7.5


Chloride
Standard Cl
Sample Cl
200
63.4


Biological Oxygen Demand
Standard BOD
Sample BOD
6.9
4.9


Chemical Oxygen Demand
Standard COD
Sample COD
60
13.3

pH

We recorded a high pH of river water associated with the high decomposition activities of biotic and abiotic.

Alkalinity

The highest value of alkalinity was reported during summer was 344 mg/L due to the accumulation of organic matters produced by decay and decomposition of vegetation and in turn, added carbonate and bicarbonate concentrations in the river water content.

Total hardness

The lowest amount of total hardness was recorded during summer season as 175 mg/L because of low volume of water and high rate of vegetation in the river area.

Calcium

The highest amount of calcium content in water was recorded during summer season as 117.40 mg/L by the addition of sewage waste which may be responsible for the increase in amount of calcium.

Magnesium

The highest amount of magnesium was 80.2 mg/L recorded during the summer season as the amount of magnesium is essential for chlorophyll bearing plant for photosynthesis and act as a limiting factor for the growth of phytoplankton

Dissolved oxygen

The highest amount of dissolved oxygen recorded during the summer season was 9.2 mg/L because of the increased solubility of oxygen at lower temperature.

Chloride

The highest chloride concentration of 63.4 mg/L was reported in summer due to frequent run-off loaded with contaminated water from the surrounding slum area and evaporation of water. The high chloride concentrations indicate the presence of organic matter, presumably of animal origin.

Biochemical oxygen demand (BOD)

The highest biochemical oxygen demand was recorded during summer season as 4.9 mg/L which can be attributed to the high bacterial activity and heavy input of organic matter in the lake water.

Chemical Oxygen Demand (COD)

The highest chemical oxygen demand recorded during summer season as 13.3 mg/L Concentration of the COD is high in water that indicates the pollution in water. The estimation of physic- chemical parameters as per the W.H.O guidelines may guide the civic authorities to modify the sustainable techniques to enhance the water quality.

Conclusion

The obtained from the physic-chemical analysis of the water quality in the Tungabhadra river, Harihara taluk Davangere district Karnataka clearly indicates that most of the important quantities such as turbidity, total dissolved solids, pH, hardness and alkalinity contents in the river water are above the upper threshold of the W.H.O guidelines. This present situation may drastically affect the aquatic, minerals and terrestrial organism growth in the water repository and significant pollutants emerge from domestic sections pose an additional threat to the water quality in the near future. To sustain the ecology and aquatic life in river, certain measures and planning must be taken by the civic body to combat the pollution rate in the river water.

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