

STUDY ON WATER BODIES & VARIOUS PARAMETERS AND THEIR
ENVIRONMENTAL IMPACT ON THE CENTRAL REGION OF CHHATTISGARH STATE,
INDIA

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ABSTRACT

Due to continuous increase in the human population, we have seen growth in urbanization and industrialization. Since water is one of the most important commodities for both urbanization and industrialization as well as for agriculture, It has been also exploited more than any other resources. The uncontrolled discharge of waste whether it is domestic or industrial, various water bodies have been affected in various parameters such as TDS, pH, heavy metal contamination, turbidity, phosphorus and nitrogen content, dissolved oxygen and fluoride. We have been observed various environmental impact and ecological disturbance caused by the recent fluctuation by the data of above parameter. The harmful impact of these fluctuation have been seen as a threat for human health. The presented review is the study and analysis of the water bodies and its quality standards along with its environmental impact in central region of Chhattisgarh

INTRODUCTION:

Water pollution occurs when a body of water becomes contaminated, usually by chemicals or micro-organisms. This contamination can cause water to become toxic to human and environment. This review article explain the cause of water pollution, how it can affect human health and what people can do to help prevent it. Water is sometime referred to as the universal solvent, as it dissolve more substance than any other liquid. However, this ability means that water is easily prone to pollution. Scientific findings suggest that loss of bio-diversity due to change in the landscape especially conversion of rural habitat to urban habitat is directly responsible for reduction of important eco-system functions such as productivity and material cycling. Ground water is one of the important component of the irrigation sources for agriculture. The ground water resources in the state of Chhattisgarh is quite sufficient, however the development is very much limited. Rainfall is a principal source of recharge to the ground water body, besides rainfall, canals, stream, ponds etc. also plays an important role in improving

ground water level. A number of sources including unrestrained industrial growth, lack of waste water collection infrastructure, ineffective implementation of environmental and sanitation laws and practices led to have adverse impact on aquatic sources of central Chhattisgarh. The urban solid waste were used to dispose as landfills in outer areas of the cities. This solid waste create thick leachate with waste water, which not only affect the soil but affect the ground water too. The ground water quality depends on the quality of recharged water, atmospheric precipitation, inland surface water and sub surface geo-chemical process. Temporal changes in the origin and constitution of the recharge water, human factor may cause periodic changes in ground water quality. Mining and metal processing activities led to distribution of metals in the surface environment. Iron ore and mines are act as an important source of major metals such as Fe and Mn contributes for traces of metals into the environment.

STUDY AREA:

The presented study focuses the central region in Chhattisgarh covering the Raipur, Bilai and the bank of Kharun River. This region has been seen a rapid urbanization and industrialization which led to the exploitation of the water bodies in this region are Kharun River industrial reservoir, local ponds, ground water and canals.



Hydrological Map of Chittagong Region (2018)



WATER QUALITY INDEX:

A water quality index provides a single number that expresses overall water quality at a certain location and time based on several water quality parameters. The objective of an index is to turn complex water quality data into information understandable and useable by the public. This type of index is similar to the index developed for air quality that shows if it is a red or blue air quality day. A single number cannot tell the whole story of water quality, there are many other water quality parameters that are not included in the index.

Table 3 Physicochemical parameters of surface water samples (mg l ⁻¹) except pH values									
Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9
pH	6.5	6.8	6.4	6.9	6.4	6.3	6.6	6.4	6.5
Alkalinity	178	194	167	187	174	148	159	156	179
Hardness	328	412	615	712	614	523	459	618	478
EC (μ S/cm)	807.6	918.6	977.2	1164.6	890.6	989.6	903.2	894.6	915.6
TDS	452.3	542.2	654.6	745.2	614.5	568.7	546.2	505.7	618.3
Calcium	38.4	62.3	27.2	40	100	36	44.4	43.2	50
Magnesium	14.2	34.1	11	14.3	39	12	14.5	14	12.1
Chloride	96	58	101	77	109	97	71	66	112
Sulphate	40.4	35.6	22	37.6	32.2	26.7	25.2	36.4	27.2
DO	5.14	5.57	6.14	5.35	5.06	4.78	6.47	6.91	5.47
Nitrate	0.26	0.34	0.37	0.48	0.52	0.37	0.41	0.28	0.34
WQI	(WQI)1	(WQI)2	(WQI)3	(WQI)4	(WQI)5	(WQI)6	(WQI)7	(WQI)8	(WQI)9
	=80	=79.8	=86.8	=83.9	=84.2	=94.2	=76.4	=75.4	=81.8

RESULT AND DISCUSSION:

FLUORIDE:

Fluoride is one of the chemical pollutants available in water that comes into water by dissolution of fluoride containing rocks by their weathering and leaching or discharge by agricultural and industrial activities during manufacturing glass, electronics, steel, aluminum, bricks, tiles, ceramic, pesticides and fertilizers. The concentration of the fluoride in the public water supply that provides the greatest protection against dental caries with the least clinically observable dental fluorosis considered optimal. However, depending on the climatic conditions and fluoride ingestions from other sources. An appropriate fluoride level of 0.5-1 ppm in drinking water is recommended.

pH:

pH valued is an important factor in maintaining the carbonate and bicarbonate levels in water. The slight alkalinity may be due to the presence of bicarbonates ions. Which are produced by the free combinations of CO₂ with water to form carbonic acid, which affects the pH of the water.

ELECTRICAL CONDUCTIVITY:

The specific conductivity of water or a solution in its capacity to conduct electric current and depends on the nature and concentration of ionized salts. Electrical conductivity is the most important parameter to demarcate salinity hazard and suitability of water for irrigation purpose.

TDS:

Total dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, phosphates and nitrates of calcium, magnesium, sodium, potassium, manganese, organic matter salt and other particles. The TDS is mainly attributed to anthropogenic activities and agro chemical process in the region.

HEAVY METAL CONTAMINATION:

Concentration of all the heavy metals tested for the water samples collected from these surface water bodies and ground water samples falls well within the permissible limits of water quality standards, except Cd and Pb being marginally higher in surface water and iron exceeding the limits in ground water sample.

Table 5. Concentration of heavy metals in Kharun river water (ppm)

Sample	Fe	Ni	Cd	Mn	Zn	Ca	Cu
Before 100 m dumping	0.21	BDL	0.001	0.031	BDL	55	BDL
After 100 m dumping	0.28	BDL	0.001	0.041	BDL	58	0.02

Table 5 Heavy metals concentration in water samples (mg/L)

Dam	Ni	Cd	Cr	Cu	Pb	Fe	Mn	Zn	Co
1 Boridih Dam	ND ±0.004	0.037 ±0.002	0.017 ±0.001	ND	ND	0.083 ±0.004	0.019 ±0.001	ND	0.008 ±0.001
2 Jharam Dam	0.025 ±0.003	0.068 ±0.003	0.029 ±0.002	0.003 ±0.001	0.070 ±0.003	0.436 ±0.07	0.012 ±0.001	1.894 ±0.05	0.012 ±0.002
3 Tandula tank	0.024 ±0.002	0.013 ±0.006	ND	ND	0.077 ±0.002	0.0651 ±0.002	0.023 ±0.003	0.013 ±0.03	0.010 ±0.001
Ground water									
1 Nalkasa	0.033 ±0.003	0.046 ±0.002	0.016 ±0.003	0.012 ±0.001	0.149 ±0.1	1.974 ±0.1	0.0821±0.02	1.798 ±0.15	0.024 ±0.002
2 Barsatola	0.019 ±0.11	0.068 ±0.002	0.025 ±0.005	ND	0.055 ±0.001	0.244 ±0.12	0.076 ±0.001	0.119 ±0.12	0.012 ±0.002
3 Fugundak	0.020 ±0.001	0.062 ±0.002	0.016 ±0.003	ND	0.093 ±0.07	0.834 ±0.1	0.036 ±0.001	0.107 ±0.05	0.003 ±0.001
4 Mucher	0.026 ±0.001	0.063 ±0.003	0.025 ±0.002	ND	0.070 ±0.001	0.097 ±0.003	ND	1.158 ±0.18	0.003 ±0.001
5 Bhanitola	0.025 ±0.002	0.067 ±0.007	0.034 ±0.004	ND	0.068 ±0.002	0.844 ±0.02	0.085 ±0.001	0.065 ±0.001	0.015 ±0.001

TURBIDITY:

The suspension of particles in water interfering with passage of light is called turbidity. Turbidity is varies from 3.1 to 30.2. The visual analysis shows that higher turbidity was observed due to green moss.

CHLORIDE:

The high concentration of chloride is considered to be an indication of pollution due to high organic waste of animal origin. Chloride is almost low range from 7.9 to 49.9 mg/L.

COD:

Chemical oxygen demand test determined the oxygen required for chemical oxygen for organic matter. In the samples the values were varied between 0.3 to 1.55 mg/L.

NITROGEN AND PHOSPHORUS:

Nitrogen and Phosphorus are essential nutritional elements for life processes in water bodies. However in excessive quantities, they may represents a significant source of aquatic pollution. Eutrophication has become a widespread issue rising from a chemical nutrient imbalance and is largely attributed to anthropogenic activities. Nitrate concentration in ground water and surface water is normally low but can reach high levels as a result of agricultural runoff, refuse dump runoffs, or contamination with human or animal waste. It varies in sample from 0.4 to 5.1 mg/L.

CONCLUSION:

It was observed that most of the water pollution is caused by human induced sources. The water quality indices were in the range of 80 to 94.2, indicating very poor water qualities around some industrial areas. The bio-toxic effects might potentially be life threatening when unduly exposed to them, so they cannot be ignored as these heavy metals are invaluable in many aspects, but precautions and proper industrial hygiene should be taken in handling them. The values obtain for elemental and organic carbon are higher whereas heavy metal contents are also within permissible limit, so it can be used for extensive agricultural process. The BOD level is relatively low compared to the standard, which has direct impact on biological decomposition of dissolved organic matter to occur under aerobic condition. Phosphorus and nitrogen concentration is also high in majority of water sources showing continuous flow of detergents or fertilizers. Long term

maintaining of the water quality and trophic level of water bodies is of utmost importance to adopt comprehensive rejuvenation and conservation strategy.

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