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TREND ANALYSIS OF WATER QUALITY OF KOPILI RIVER, ASSAM

(Dharamtul and Kampur Sites)

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Trend analysis of water quality of Kopili river, Assam Dharamtul and Kampur

Introduction:

River water is an important surface water resource for households, agriculture (e.g. irrigation, animal husbandry) and industry (e.g. processing water and energy production). So river water quality is of key concern for maintaining the ecological balance. Surface water is more prone to be affected by both anthropogenic activities and natural processes. Natural processes influencing water quality include precipitation rate, weathering processes and sediment transport, whereas anthropogenic activities include urban development and expansion, and industrial and agricultural practices. These activities often result in the degradation of water quality, physical habitat, and biological integrity of the ecosystem. In view of the limited stock of freshwater worldwide and the role that anthropogenic activities play in the deterioration of water quality, the protection of these water resources has been given topmost priority in the 21st century. There is a great range of water quality parameters that can be used to characterise waters. Largely the water quality measurement objectives and the previous history of the water body will determine selection of parameters. It is true, however, that some parameters are of special importance and deserve frequent attention.

Study Area

The Kopili River is the largest south bank tributary of Brahmaputra river basin Assam. Kopili River basin has a total geographical area of about 1,355,000 hectares. It is located between 91-93^0 E longitude and 25-27^0 N latitude. Kopili River is an interstate river which originates in the Meghalaya plateau and flows through Central Assam and the hill districts of Assam before its confluence with the Brahmaputra. The river mouth where Kopili River meets the Brahmaputra River is Kajalmukh Assam. In Assam it drains through the districts of Karbi Anglong, Dima Hasao, Kamrup and Nagaon. The river flows for a total length of 290 kilometres and has a catchment area of 20997 square kilometres. The basin has a sub-humid climate with annual rainfall of the study area ranging from 1200 to 1700 mm. The Kopili Flow Irrigation Scheme, completed in 1975, in Kamrup district irrigates 1,300 hectares (3,200 acres) of land across 14 revenue villages and facilitates paddy cultivation. The Kopili Hydro Electric Project, located across the districts of Dima Hasao in Assam and Jaintia Hills in Meghalaya and run by the North Eastern Electric Power Corporation, consists of the Khandong and Umrongso dams and their reservoirs and three power houses that have a total installed capacity of 275 MW.

The Kampur is one of the site of the river Kopili and is located in Nagaon district of Assam. Kampur lies between longitude 92^{0}39'12.99''E and Latitude 26^{0}09'10.06''N. The water width of Kampur is 120metres and bank to bank width is 170 meters and has a catchment area of 11500 sq. km. This site is Gauge and Flood Forecasting site and is a base station. The site has been opened in May 1974. Telemetry has also been installed at this station on 23rd May 2014.

The Dharamtul is also one of the site of the river Kopili which is located in Morigaon District of Assam. Dharamtul lies between longitude 92^{0}21'19.59''E and Latitude 26^{0}09'58.37''N. The water width of Dharamtul is 50 metres and bank to bank width is 80 meters and has a catchment area of 14100 sq. km. This site is also a Gauge and Flood Forecasting site and is a base station. The site has been opened in September 1974. Telemetry is also been installed on 12th June 2014 at this site.

Kampur site is located upstream to Dharamtul site of the Kopili river. Further upstream there lies the base station Khironighat site and further downstream lies the trend station J.B. Gaon site. The distance between Kampur and Dharamtul sites is 35km (approx.). Dharamtul and Kampur are both baseline station and is Gauge and Flood Forecasting station.

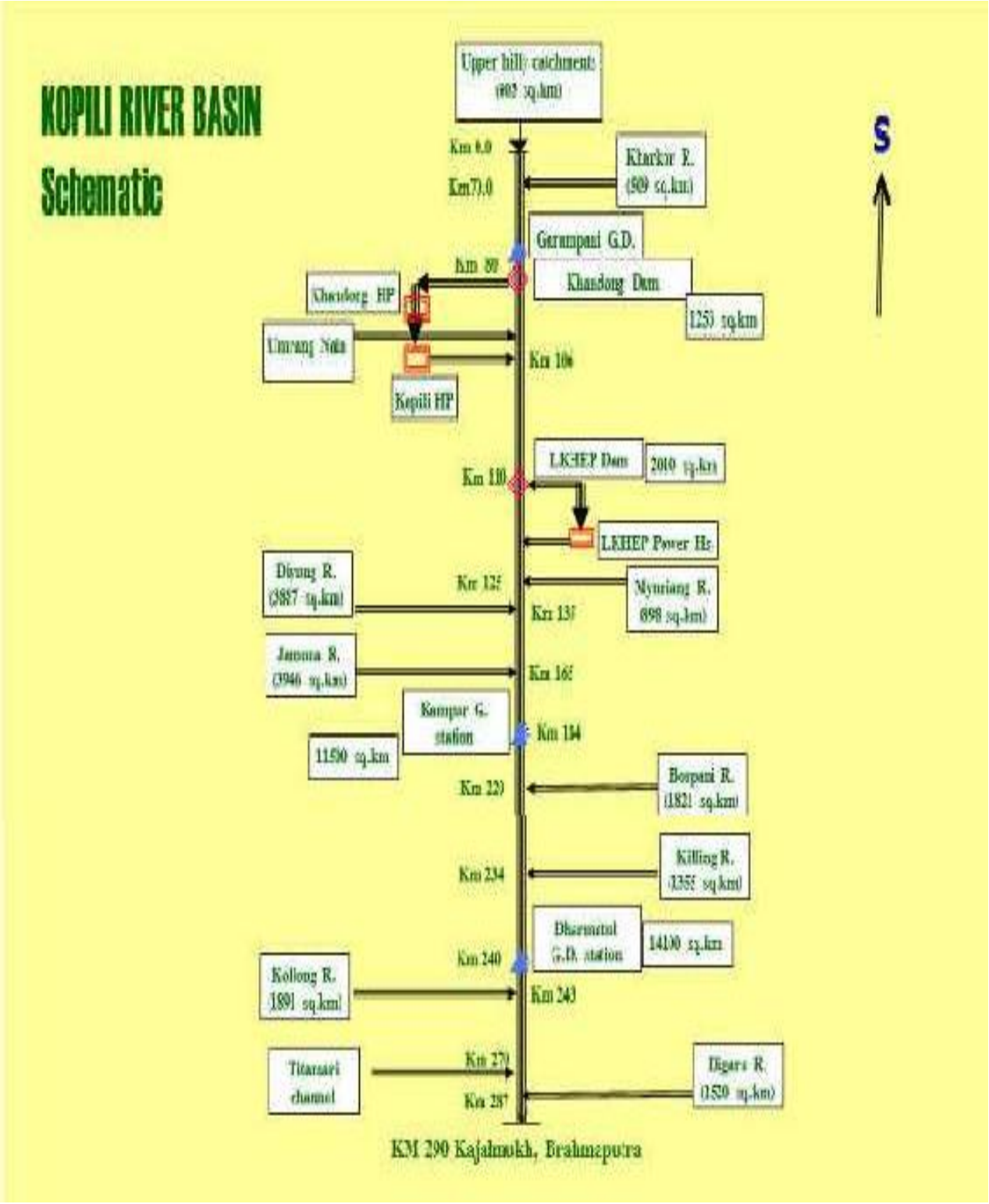

Fig. 1: Kopili River Basin Schematic

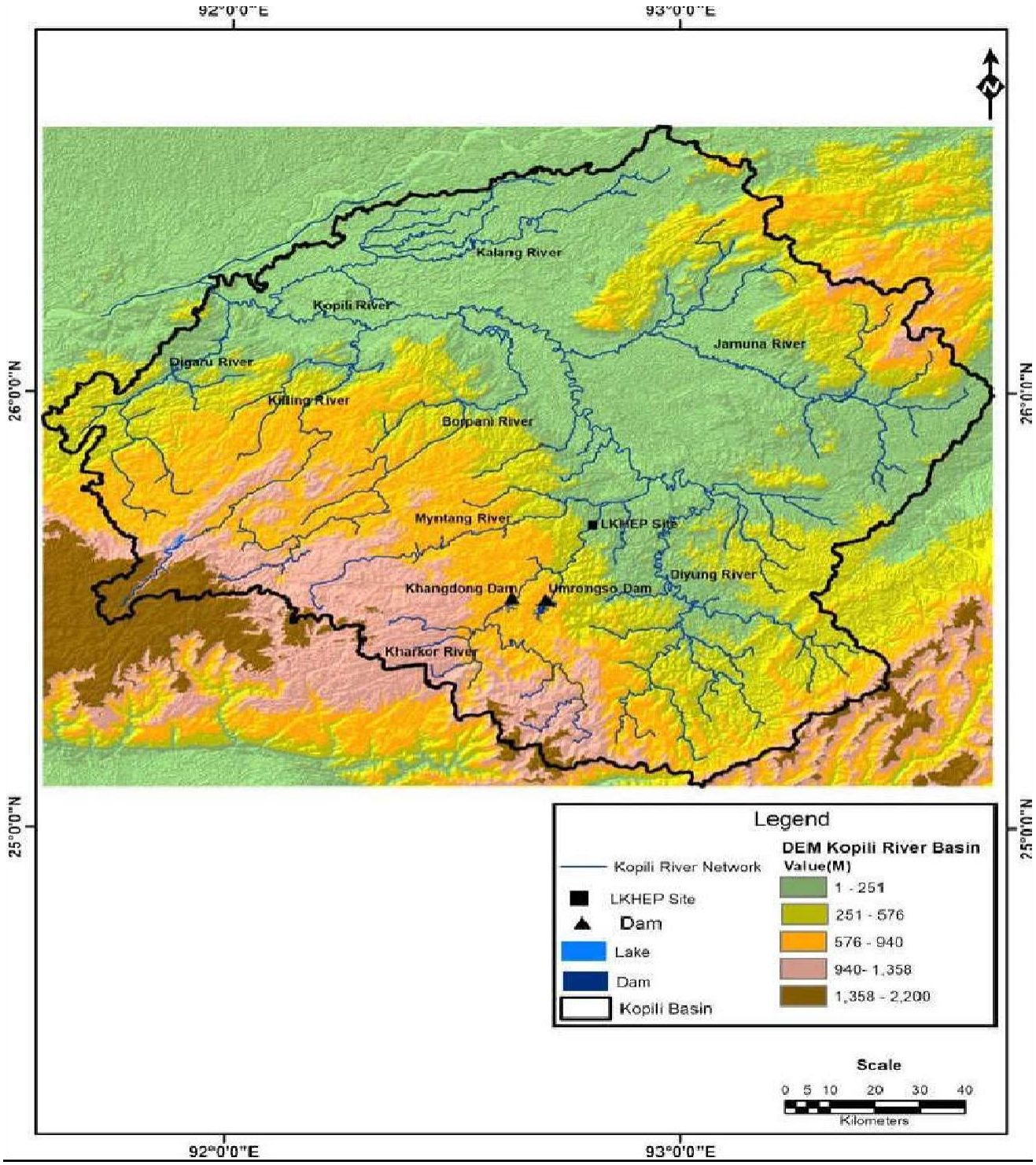

Fig. 2: Map of Kopili River Basin

Analysis of sample: The collected water samples were analysed for physical, chemical parameters using standard analytical procedure and/or instrumental methods (APHA 1998). The quantitative estimation for the chemical parameters is determined by titrimetric, spectrophotometeric, flame photometric method etc.

Results and Discussions:

The water samples were analyzed for physicochemical characteristics. The values of physicochemical parameters namely Temperature, pH, EC, TS, TDS, TSS, Total Hardness, DO, COD, BOD5, Chloride, PO4 and SO4 of Kampur and Dharamtul site are obtained. These values are compared with standard values of parameters prescribed for Classification of Inland Surface Waters (BIS 2296-1982) given in Table-2. The results are as discussed below:

p^H:- The hydrogen ion concentration in water is expressed in terms of pH. It is defined as the logarithm of inverse of hydrogen ion concentration in moles/L. The pH value of natural waters mostly depends on free carbon dioxide, bicarbonates and carbonate ions. Low pH values indicate acidic water having corrosive properties. The higher values of pH represent that there is high chloride, bicarbonate, carbonate etc. that means the water is alkaline. The pH value in between 6.5-8.5 is considered acceptable. However, no health-based guideline value has been proposed for pH.

The yearly average value of pH in Kampur site of River Kopili is varying between 6.5 to 9.2 in monsoon season and 6.6 to 7.75 in non monsoon season from 2005 to 2019. And that of Dharamtul site is seen to have pH varying in between 6.6 to 8.05 during monsoon and 6.8 to 7.9 during non-monsoon seasons. The slightly acidic behaviour of the river might be due to contamination of Kopili river with acid mine discharge from open cast coal mines and rat hole mining in Meghalaya. The trend analysis graph of both the sites shows both increasing and decreasing trend and is shown in the **figure (3 & 4)**. However as per the Classification of Inland surface waters (IS: 2296-1982), it is suitable for A and B class of water.

Conductivity(EC) :- Conductivity or electrical conductivity (EC) of natural water is due to the presence of salts, which dissociate into cations and anions. It is the ability of a solution to conduct current. The units of EC are µmhos/cm or µS/cm and is expressed at 25^0 C. Electrical conductivity is an estimate of total dissolved salts in water and water with EC values between 2500 and 10000 µmho/cm is not recommended for human consumption and normally not suitable for irrigation (S.M. Kueli, 2009)

The yearly average value of conductivity of water of Kopili River is varying between 71.5 µmho/cm to 139 µmho/cm in monsoon and 89.1 µmho/cm to 157.55 µmho/cm in non-monsoon from 2005 to 2019 in Kampur site. And the yearly average of Dharamtul site is varying between 71.5 µmho/cm to 121.5 µmho/cm in monsoon and 81.7 µmho/cm to 148.35 µmho/cm in non-monsoon from 2005 to 2019. The trend analysis of both the sites shows the increasing trend in monsoon and non monsoon season **figure (5 & 6)**. The electrical conductivity in both the monsoon and non monsoon season is less than 2250 µmhos/cm and is suitable for use as irrigation water that is Class 'E'.

TOTAL DISSOLVED SOLID (TDS):- Total dissolved solids (TDS) is the measure of the dissolved combined content of all organic and inorganic substances present in a liquid in molecular, ionized, or micro-granular suspended form. Total dissolved solids information is used to determine the overall ionic effect in a water source. Certain physiological effects on plants and animals are often affected by the number of available ions in the water. Elevated dissolved solids can cause "mineral tastes" in drinking water. Corrosion or encrustation of metallic surfaces by waters high in dissolved solids causes problems with industrial equipment and boilers as well as domestic plumbing. The TDS value for river waters depends largely on the ratio of the contribution of the overland flow to the subsoil flow. It may vary from less than 50 mg/L to a few thousand mg/L.

The yearly average value of TDS for Kampur site of the Kopili River is varying between 41.8 to 82.77 mg/L in monsoon and 47.5 to 98.1 mg/L during non-monsoon. And that of Dharamtul site is found to be varying between 43.98 to 70.89 mg/L and 47.55 to 82 mg/L during monsoon and non-monsoon. The trend analysis of both the sites shows an exponential increase in monsoon and non-monsoon season **(figure 7 & 8)**. The TDS in both monsoon and non-monsoon season is less than 500 mg/L, which is the permissible value for A Class water as per Water Quality Standards in India (Source IS 2296:1992).

TURBIDITY:- Turbidity, which is a related parameter, is interference to the passage of light or scattering of light by suspended particles in a column of water. It is measured in nephelometric turbidity units (NTU). It may range from 1 to 1000 NTU.

The yearly average value of turbidity for Kampur site of Kopili river is varying between 1.85 NTU to 76.5 NTU in monsoon and 0.385 NTU to 41.95 NTU in non-monsoon from 2006 to 2019. And that of the Dharamtul site of Kopili river is found to be varying between 1.59 NTU to 139.5 NTU in monsoon and 0.43 NTU to 56.65 NTU in non-monsoon from 2006 to 2019. The trend analysis of both the sites shows the exponentially increasing trend in monsoon and non monsoon season (**figure 9 & 10**).

Only these above physical parameters are observed for the Kampur and Dharamtul sites of Kopili River.

Major Ions:

CHLORIDE: Chlorides are salts resulting from the combination of the gas chlorine with a metal. Some common chlorides include sodium chloride (NaCl) and magnesium chloride ($MgCl_2$). Chlorine alone as Cl_2 is highly toxic and it is often used as a disinfectant. In combination with a metal such as sodium it becomes essential for life. Small amounts of chlorides are required for normal cell functions in plant and animal life. Chlorides can contaminate fresh water streams and lakes. Fish and aquatic communities cannot survive in high levels of chlorides.

The yearly average of Chloride ions for the site Kampur of Kopili river is varying between 1 to 14.91 mg/L in monsoon and 2 to 21.5 mg/L in non-monsoon from 2007 to 2019. And also the yearly average of Dharamtul site of Kopili river is varying between 2 to 18.1 mg/L in monsoon and 0.9 to 17.2 mg/L in non-monsoon from 2007 to 2019. The trend analysis of both the sites shows a decreasing trend in monsoon and non-monsoon season (**figure 11 & 12**).

Public Drinking Water Standards (Source IS 2296:1992) require chloride levels not to exceed 250 mg/L. Criteria for protection of aquatic life require levels of less than 600 mg/L for chronic (long-term) exposure and 1200 mg/L for short-term exposure.

TOTAL HARDNESS:- Hardness is due to the presence of multivalent metal ions which come from minerals dissolved in the water. Hardness is based on the ability of these ions to react with soap to form a precipitate or soap scum. In fresh water the primary ions are calcium and magnesium; however iron and manganese may also contribute. Carbonate hardness is equal to alkalinity but a non-carbonate fraction may include nitrates and chlorides. Generally, the harder the water, the lower is the toxicity of other metals to aquatic life. In hard water some of the metal ions form insoluble precipitates and drop out of solution and are not available to be taken in by the organisms. If a stream or river is a drinking water source, hardness can present problems in the water treatment process. Hardness must also be removed before certain industries can use the water. For this reason, the hardness test is one of the most frequent analyses done by facilities that use water.

The yearly average for Total hardness of Kampur site of Kopili River is varying between 27 to 70 mg/L in monsoon and 29 to 67 mg/L in non-monsoon from 2007 to 2019. And that of Dharampur site of Kopili River is found to be varying between 25 to 70 mg/L in monsoon and 20 to 85 mg/L in non-monsoon from 2007 to 2019. The trend analysis of both the site shows a decreasing trend in monsoon and non-monsoon (**figure 13 &14**). The Water Quality Standards in India (Source IS 2296:1992) designated the use of water whose value for total hardness is not exceeding 200 mg/L as A Class water.

CALCIUM:- Calcium salts and calcium ions are among the most commonly occurring in nature. Calcium is usually one of the most important contributors to hardness. Even though the human body requires approximately 0.7 to 2.0 grams of calcium per day as a food element, excessive amounts can lead to the formation of kidney or gallbladder stones. High concentrations of calcium can also be detrimental to some industrial processes. Thus, both domestic and industrial water users have to consider calcium concentrations. Calcium also serves an important role in the health of bodies of water. In natural water it is known to reduce the toxicity of many chemical compounds on fish and other aquatic life.

The yearly average for Calcium of Kampur site of Kopili river is varying between 7.6 to 24 mg/L in monsoon and 7.2 to 24.4 mg/L in non-monsoon from 2007 to 2019. And in Dharamtul site of Kopili river it is varying between 6 to 18 mg/L in monsoon and 6 to 24 mg/L in non-monsoon from 2007 to 2019. The trend analysis of both the site shows a decreasing trend in monsoon and non-monsoon (**figure 15 & 16**).

According to the Water Quality Standards in India (Source IS 2296:1992) water whose value for Calcium is not exceeding 200 mg/L is designated as A Class water. The high value of calcium in surface water i.e. river may result from the leaching of soil and other natural sources or may come from man-made sources such as sewage and some industrial wastes. This type of high value has not been observed in both the sites of the Kopili River.

MAGNESIUM:- Magnesium is widely distributed in ores and minerals. It is also very chemically active; therefore it is not found in the elemental state in nature. With the exception of magnesium hydroxide, which has a high pH value, its salts are very soluble. Magnesium ions are of particular importance in water pollution. They may contribute to water hardness. Concentrations of magnesium and calcium in water may also be a factor in the distribution of certain crustaceans, fish and other organisms in streams.

The yearly average of Magnesium for Kampur site of Kopili river is varying between 2 to 9.3 mg/L in monsoon and 1.4 to 6 mg/L in non-monsoon from 2007 to 2019. And in Dharamtul site of the Kopili river it is varying between 1.4 to 8.5mg/L in monsoon and 1.2 to 6 in non-monsoon from 2007 to 2019. The trend analysis of both the site shows a decreasing trend in monsoon and non-monsoon (**figure 17 & 18**). According to the Water Quality Standards in India (Source IS 2296:1992) water whose value for Magnesium is not exceeding 200 mg/L is designated as A Class water

CONCLUSION:

From the above results and discussions, the trend analysis for the Kampur and Dharamtul site of Kopili River basin has been carried out approximately from 2005 to 2019 for monsoon and non monsoon period. The value of these parameters pH, EC, TDS, Turbidity, Chloride, Total Hardness, Calcium and Magnesium were analysed and compared with the standard values mentioned for classification of Inland Surface Waters (IS:2296-1982). It is observed that the annual average values of pH is showing both increasing and decreasing trend, the EC is showing an increasing trend, the TDS and the turbidity is also showing an increasing trend for both the sites. And the annual average value of Chloride, total hardness, calcium and magnesium is showing a decreasing trend for both the sites.

The data for the other parameters namely, Carbonate, Bicarbonate, Sodium, Potassium, Sulphate, Iron etc. are not uniformly available in data cell to observe the trend of these parameters. And to know the health, i.e., the river water quality, it is necessary to observe mainly the Dissolved Oxygen (DO), Biochemical oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Total and Fecal coliforms. The data of DO, BOD, COD for Kampur and Dharamtul sites of Kopili River is not uniformly available. As both the site is Baseline station the DO is not observed at these sites.

The Designated Best Use Classification of Inland Surface Water - CPCB (IS:2296-1982)

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfections	**A**	1. Total Coliforms Organisms MPN/100 ml shall be 50 or less. 2. pH between 6.5 and 8.5 3. Dissolved oxygen 6 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20^0C 2mg/l or less.
Outdoor bathing (Organized)	**B**	1. Total Coliforms Organisms MPN/100 ml shall be 500 or less. 2. pH between 6.5 and 8.5 3. Dissolved oxygen 5 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20^0C 3 mg/l or less.
Drinking Water Source after conventional treatment and disinfection	**C**	1. Total Coliforms Organisms MPN/100 ml shall be 5000 or less. 2. pH between 6 and 9 3. Dissolved oxygen 4 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20^0C 3 mg/l or less.
Propagation of Wild life and Fisheries	**D**	1. pH between 6.5 and 8.5 2. Dissolved oxygen 4 mg/l or more. 3. Free ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste Disposal	**E**	1. pH between 6.5 and 8.5 2. Electrical conductivity at 25^0C micromhos/cm Max. 2250 3. Sodium absorption ratio Max. 26 4. Boron Max 2mg/l.
	Below **E**	Not meeting **A**, **B**, **C**, **D** and **E** criteria.

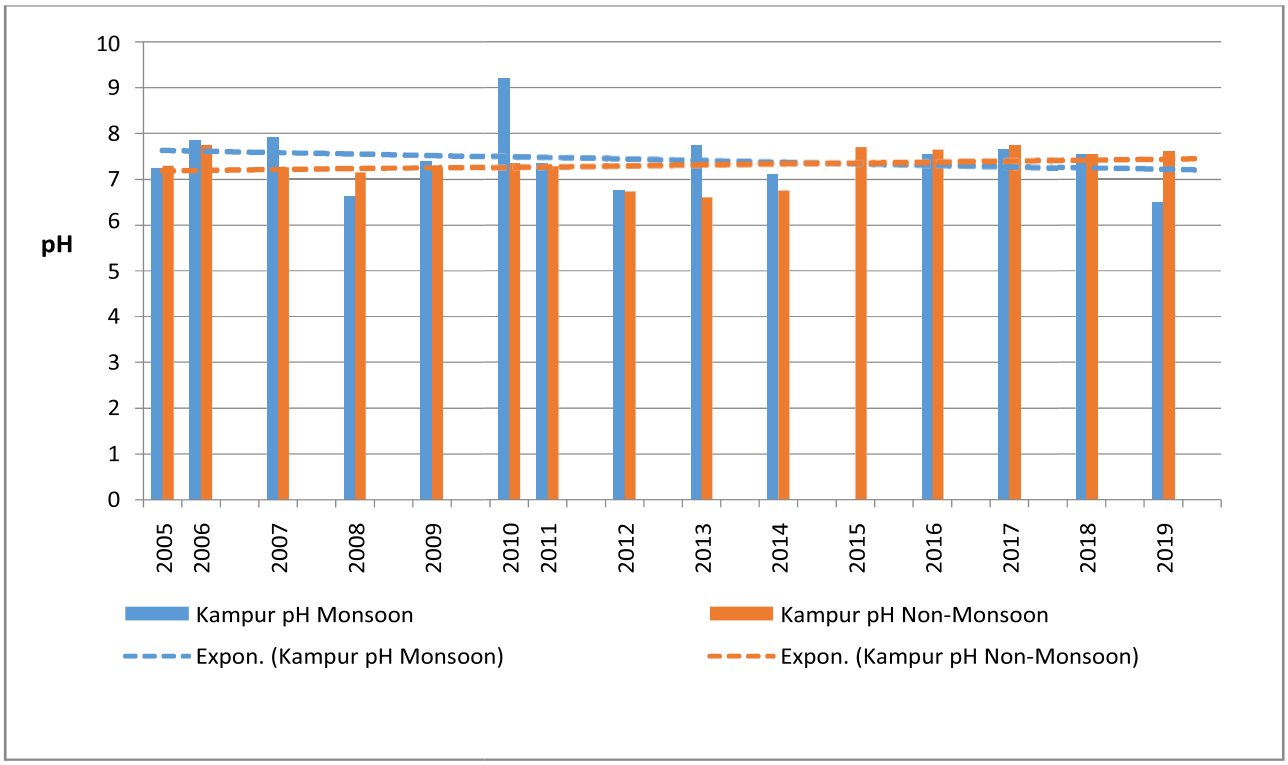

Fig. 3: Trend in pH of Kopili River of Kampur site(Assam)

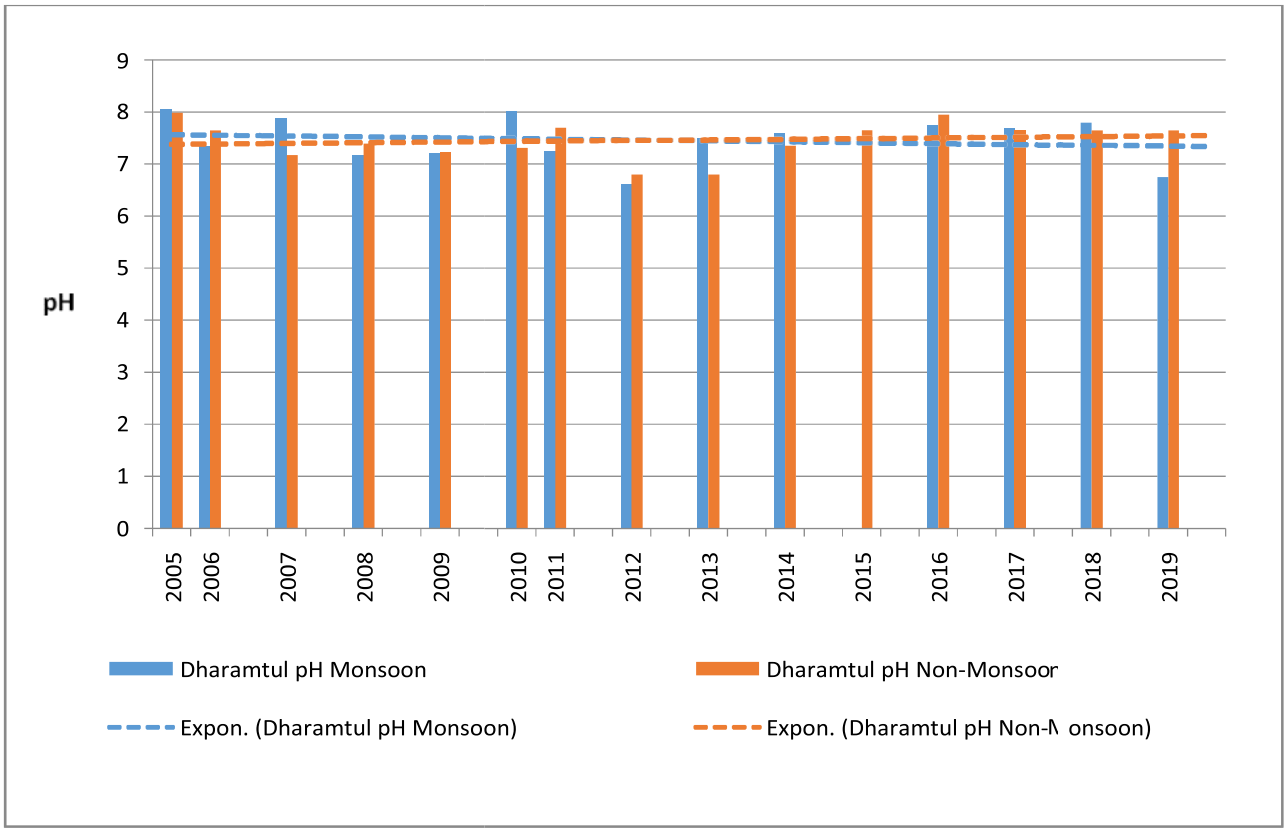

Fig. 4: Trend in pH of Kopili River of Dharamtul site(Assam)

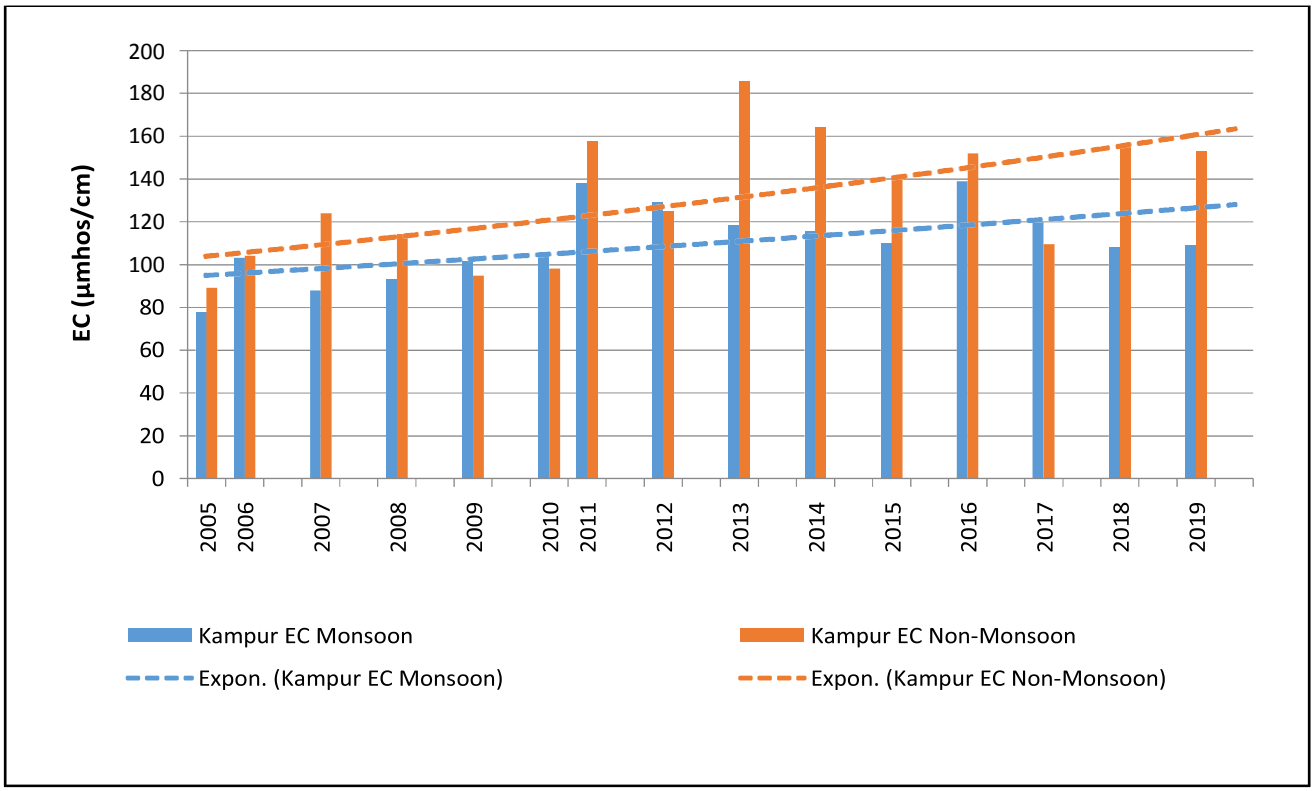

Fig. 5: Trend in Electrical Conductivity (EC) of Kopili River of Kampur site (Assam)

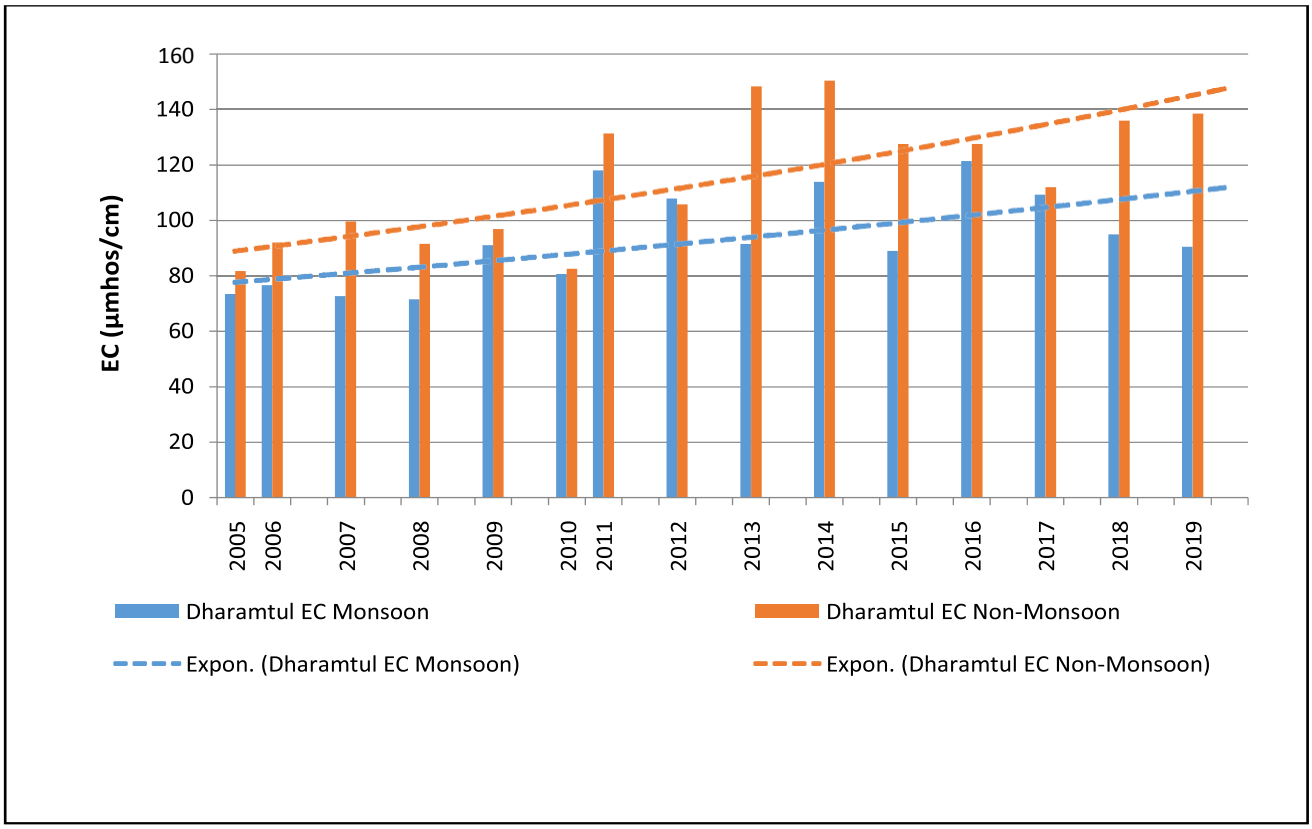

Fig. 6: Trend in Electrical Conductivity (EC) of Kopili River of Dharamtul site(Assam)

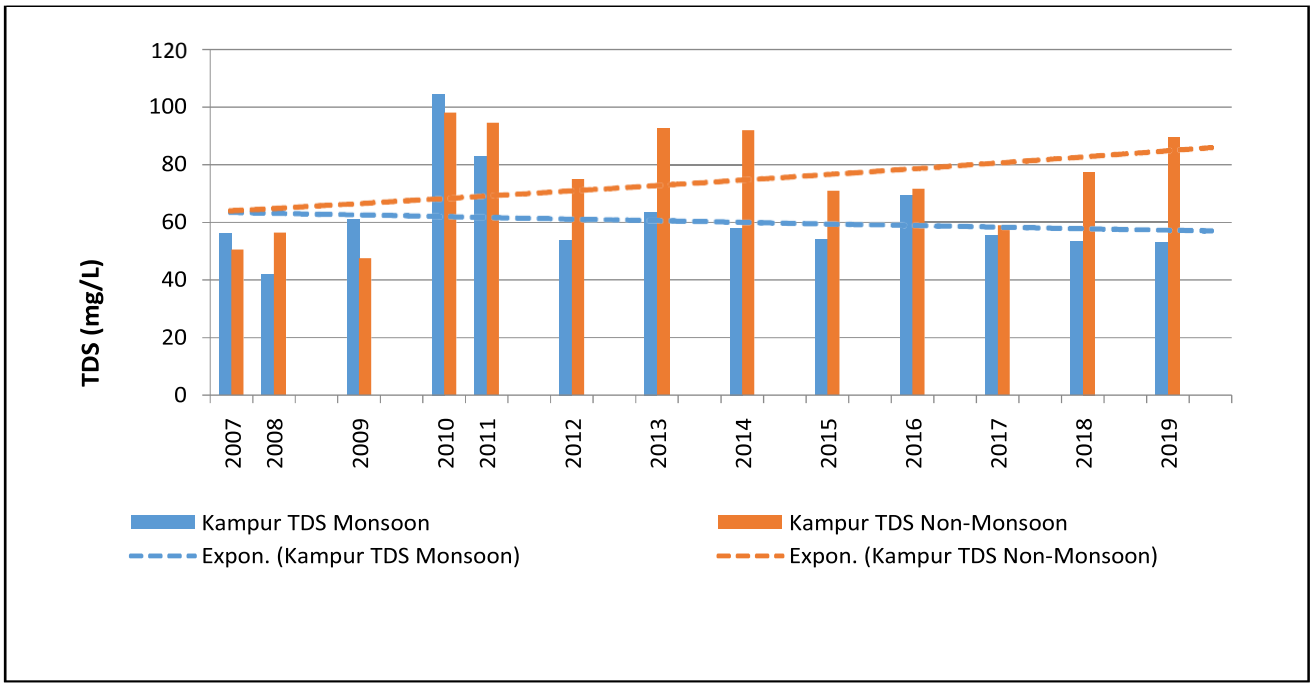

Fig. 7: Trend in Total Dissolved Solids (TDS) of Kopili River of Kampur site(Assam)

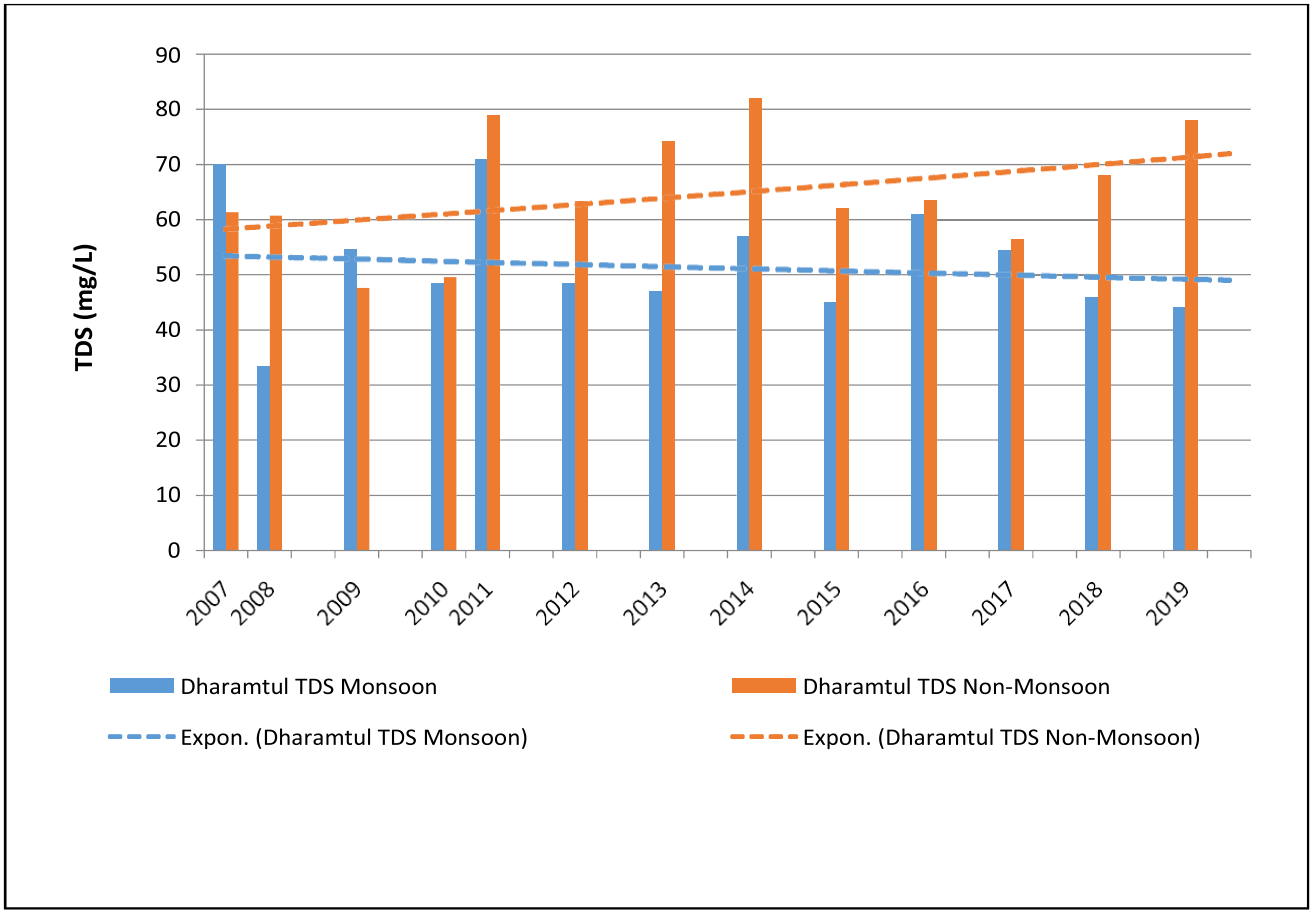

Fig. 8: Trend in Total Dissolved Solids (TDS) of Kopili River of Dharamtul site(Assam)

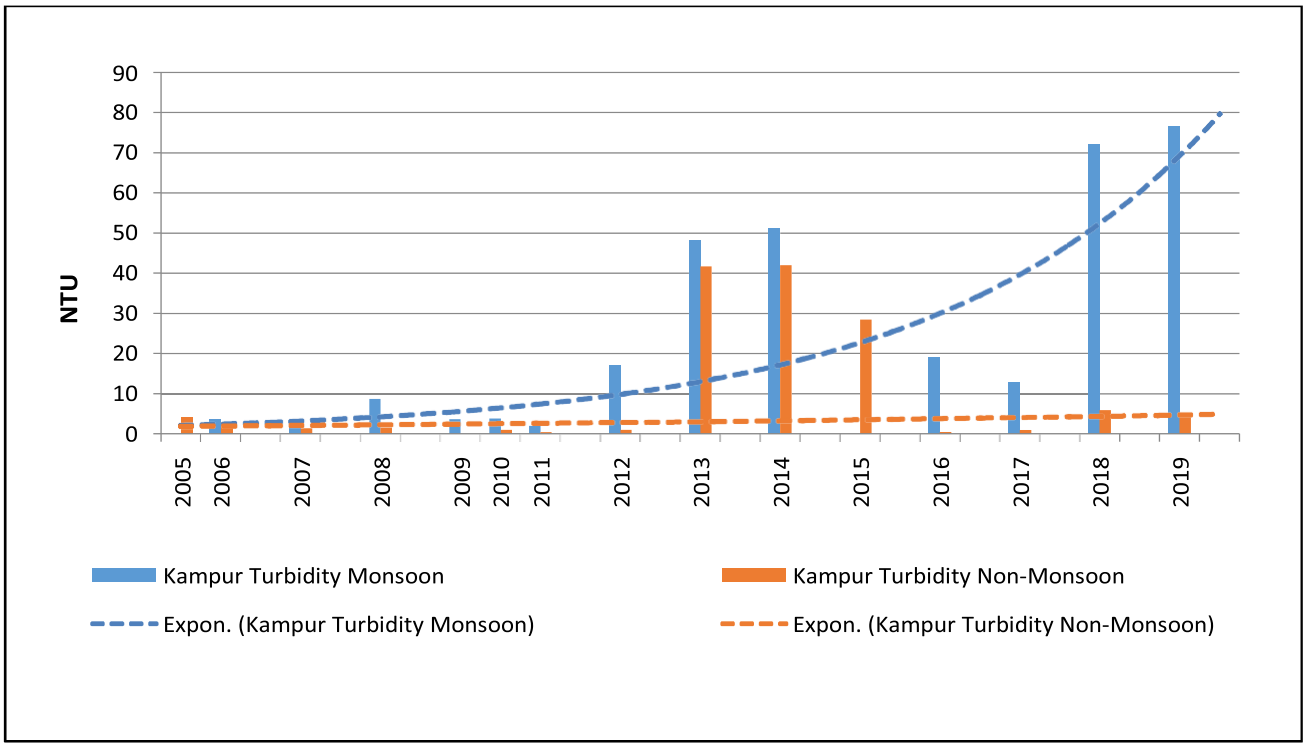

Fig. 9: Trend in Turbidity of Kopili River of Kampur site(Assam)

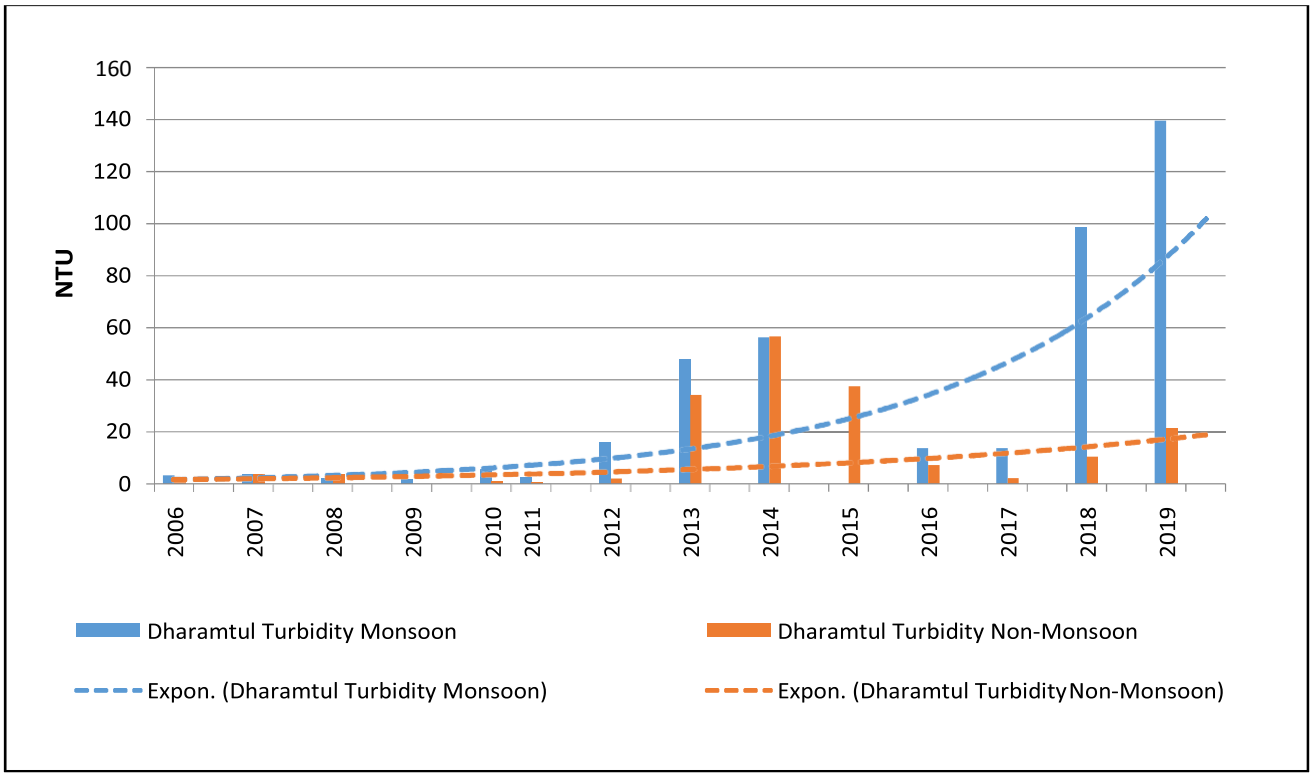

Fig. 10: Trend in Turbidity of Kopili River of Dharamtul site(Assam)

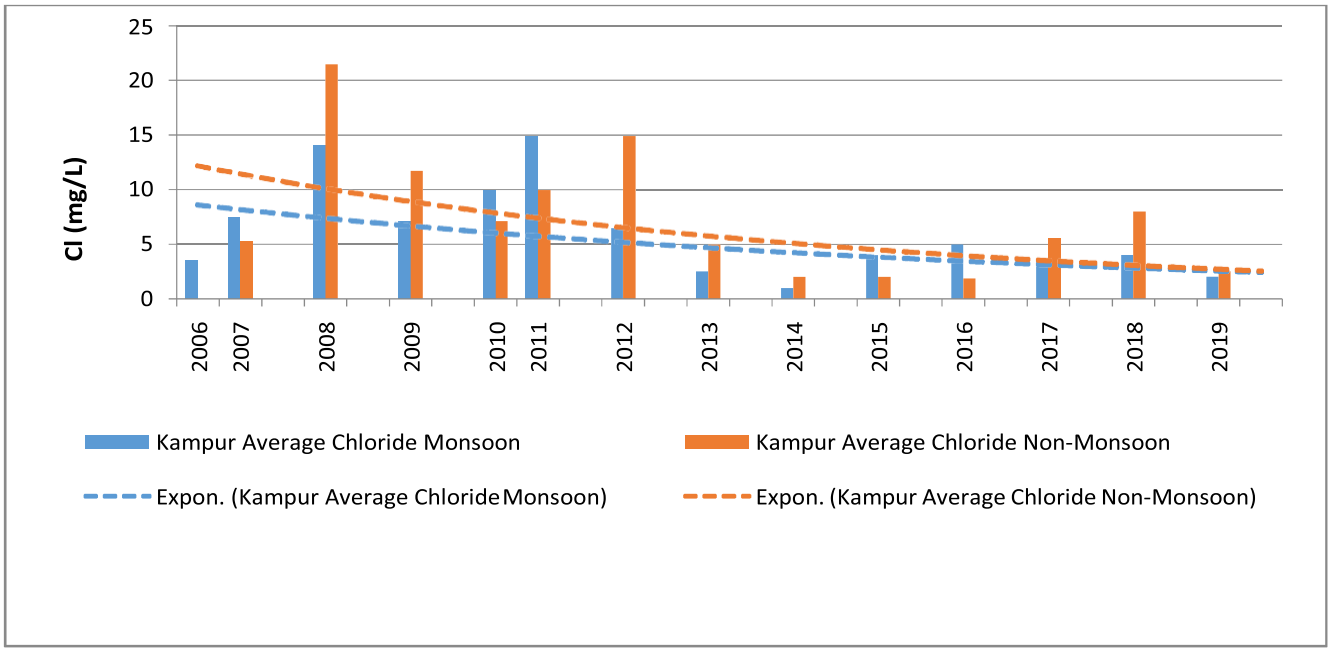

Fig. 11: Trend in Chloride of Kopili River of Kampur site(Assam)

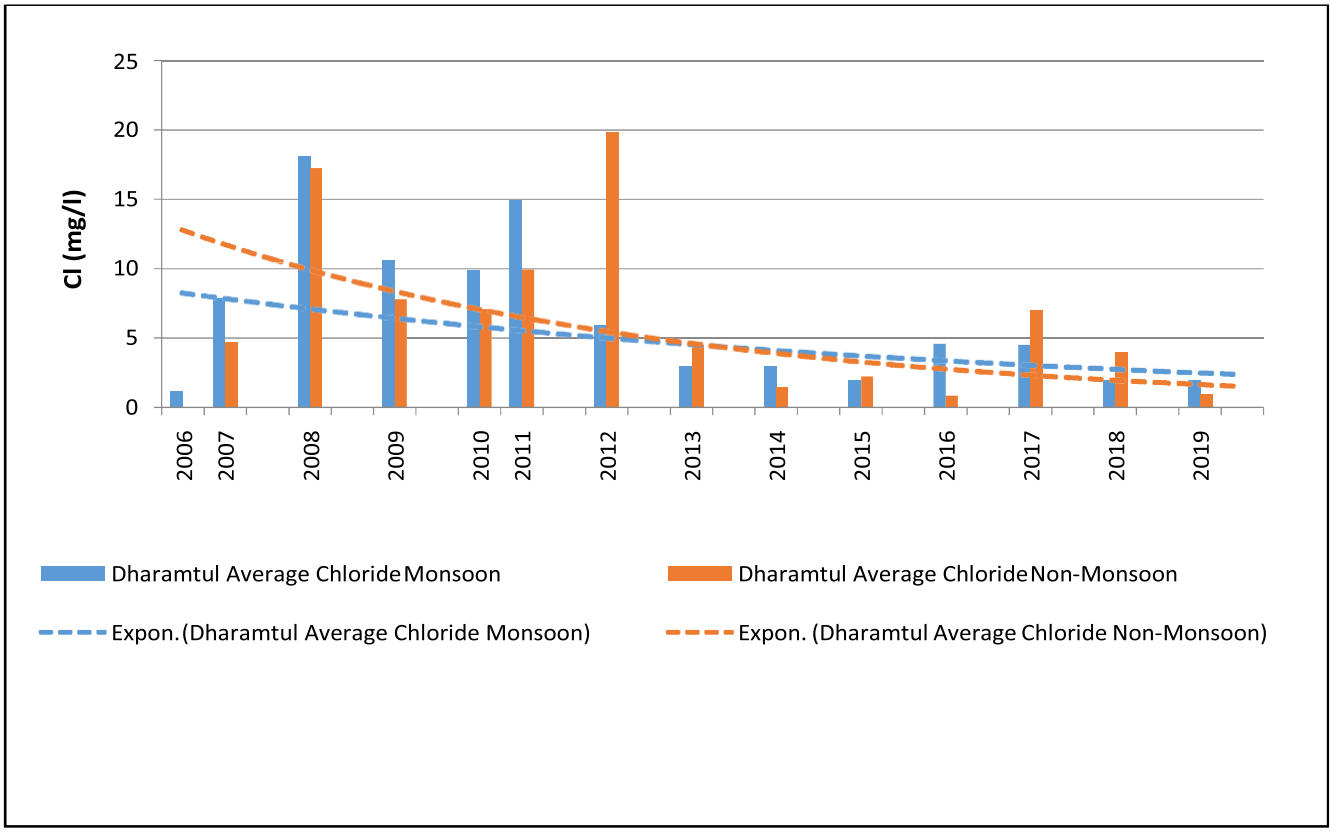

Fig. 12: Trend in Chloride of Kopili River of Dharamtul site(Assam)

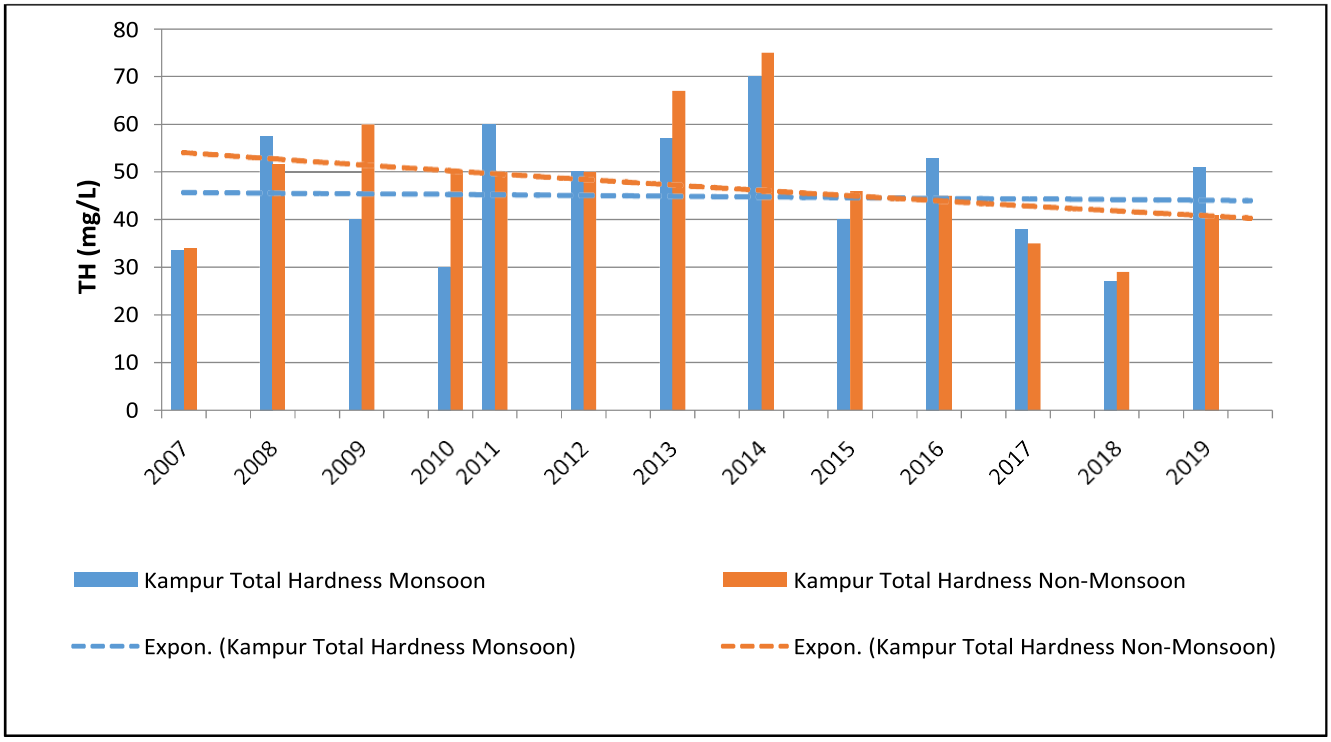

Fig. 13: Trend in Total Hardness of Kopili River of Kampur site(Assam)

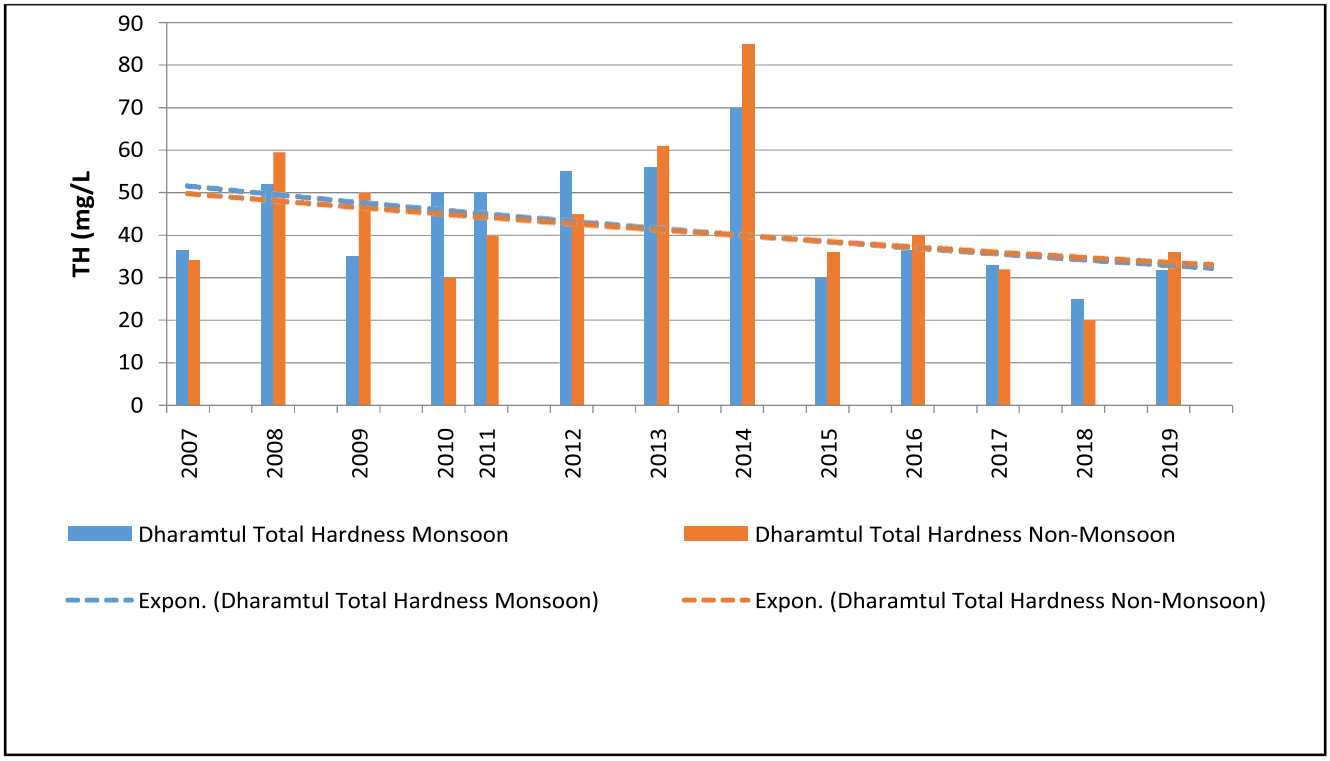

Fig. 14: Trend in Total Hardness of Kopili River of Dharamtul site(Assam)

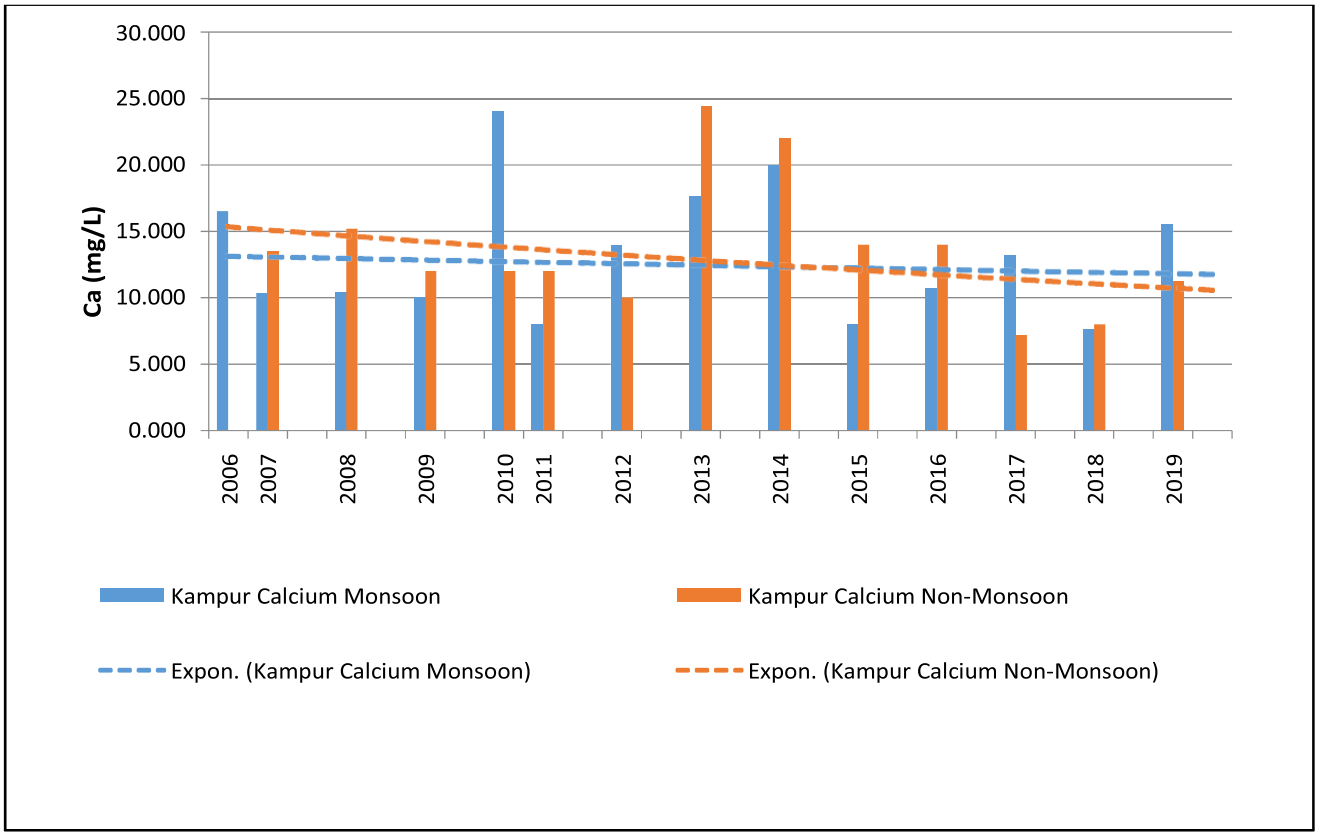

Fig. 15: Trend in Calcium of Kopili River of Kampur site(Assam)

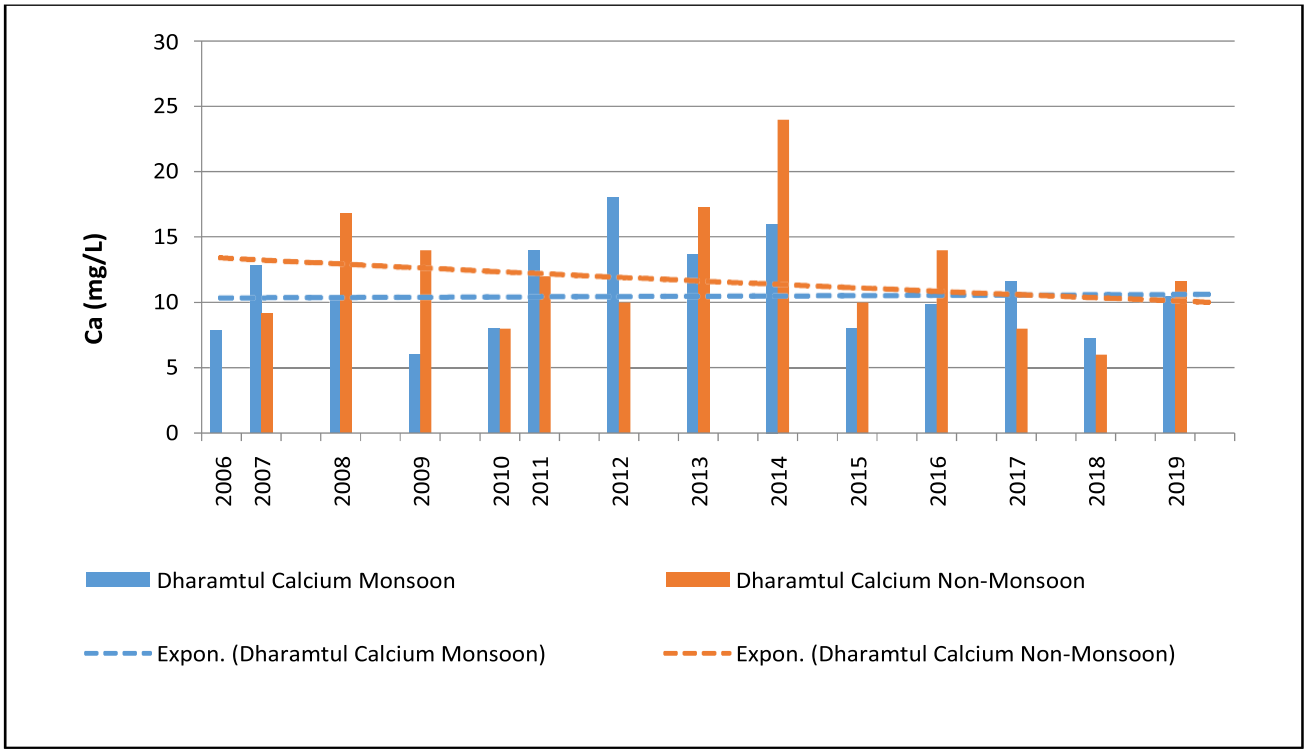

Fig. 16: Trend in Calcium of Kopili River of Dharamtul site(Assam)

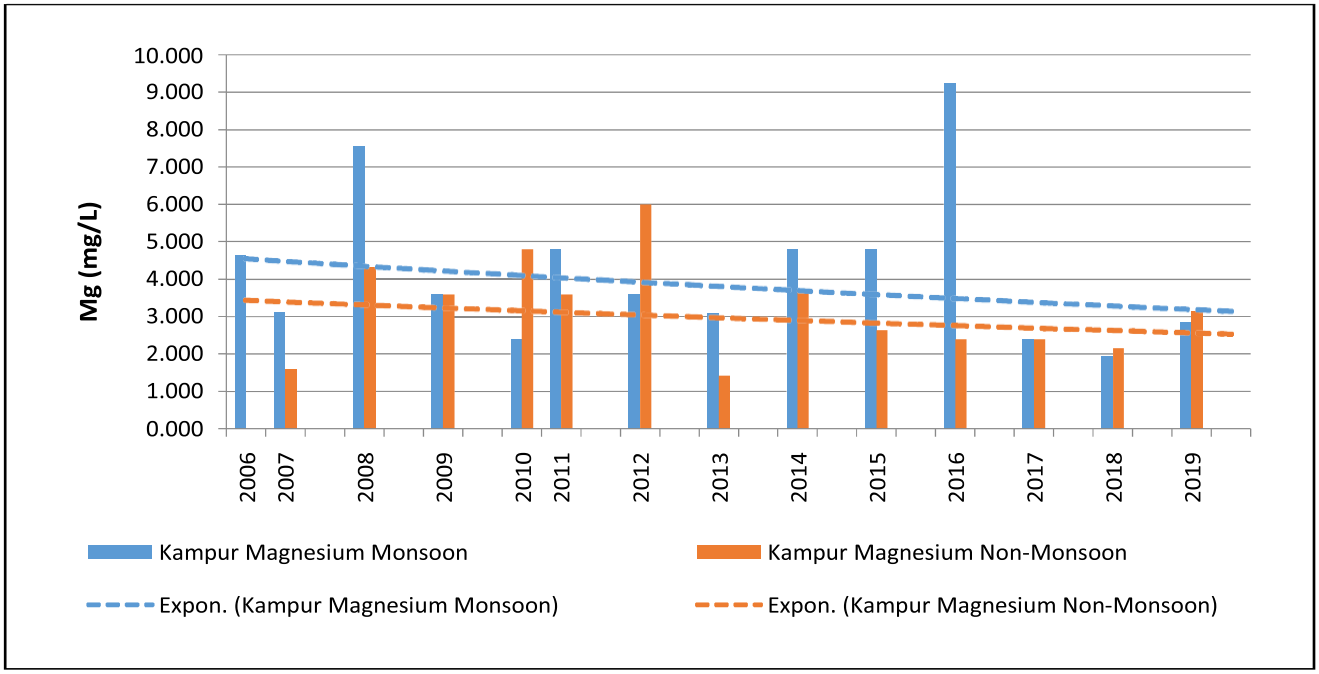

Fig. 17: Trend in Magnesium of Kopili River of Kampur site(Assam)

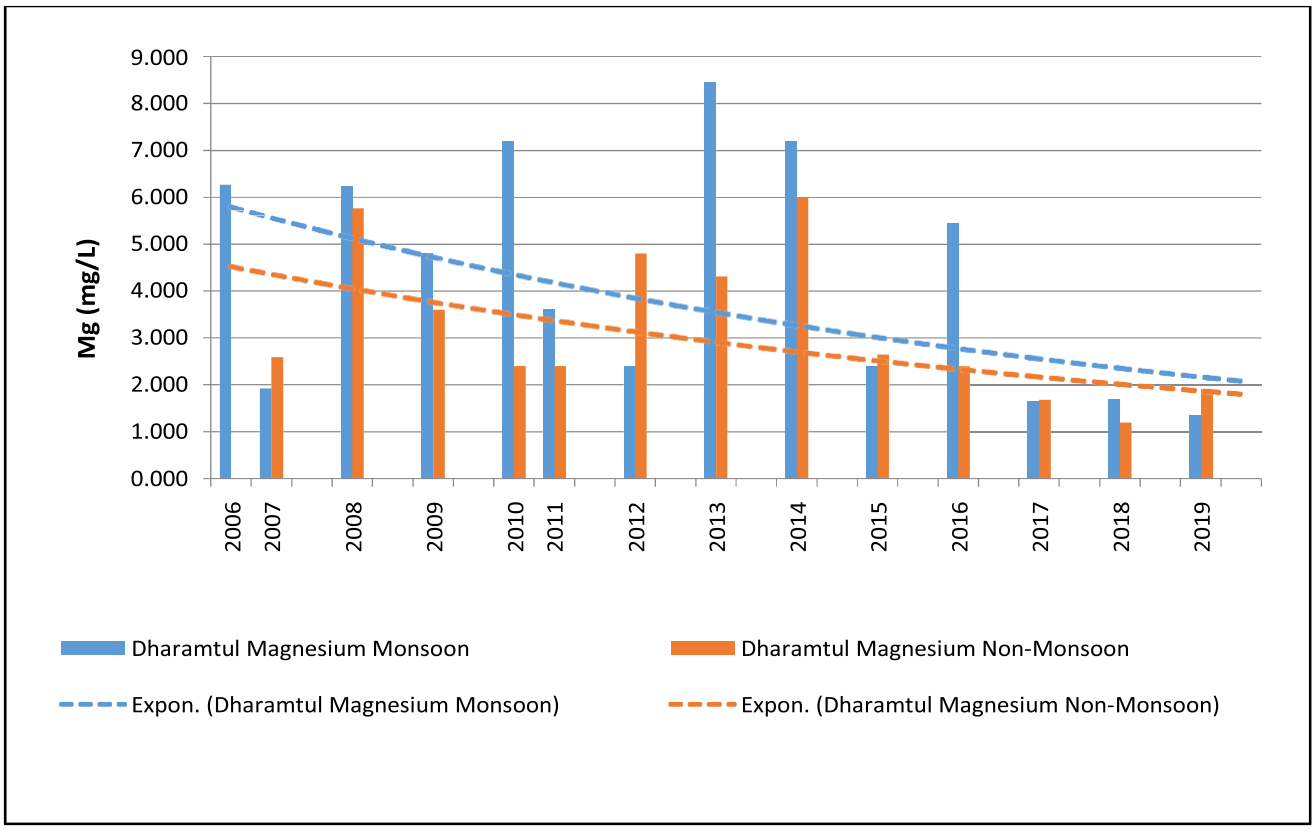

Fig. 18: Trend in Magnesium of Kopili River of Dharamtul site(Assam)

REPORT ON WATER QUALITY OF KULSI SITE ON RIVER KULSI & DUDHNAI SITE ON RIVER DUDHNAI FOR TEMPERATURE, pH, ELECTRICAL CONDUCTIVITY, TDS AND TURBIDITY

For the period 2008 to 2019

SUBMITTED BY

S. LYNDEM,
ARO, DL, MBD,
CWC, GUWAHATI

INTRODUCTION:-

Water is one of the most vital natural resources for the survival of life. The demand for water increases in an alarming rate with the pace of increasing population as well all- around development of the country. On an average, India receives annual precipitation of about 4000 km^3.Out of this 4000 km^3 water, 1869 km^3 is the average annual potential flow in rivers available as water resource.

The river Kulsi drains out a total area of 3770 sq km. within the Kamrup and Goalpara district of Assam as well as West Khasi hills and East Garo hills district of Meghalaya. Out of the total catchment, 685 sq. km is plain catchment in Assam and 3805 sq. km is hill catchment in Meghalaya and Assam. The hill range is covered with evergreen forests and gets high rainfall during monsoon. The total length of Kulsi from its source outfall is about 220 km. Out of which 100 km is Meghalaya and rest 120 km is in Assam.

ABOUT THE BASIN :-

Kulsi river, a south bank tributary of the Brahmaputra river system, is composed of three rivers, namely Khri, Krishniya and Umsiri all of which originate from west Khasi hill range and flows north. The river is known as Khri in the upper catchment after being joined by two other tributaries namely Krishniya and Umsiri within the Khasi hills in Meghalaya it flows north-west and enters Assam at Ukium and after that it flows north upto Kulsi village through the plains of Kamrup district of Assam. Finally it outflows into the Brahmaputra near Nagarbera.

It is interesting to note that all these three rivers originate from more or less the same altitude. All the three rivers are joined by innumerable number of small hilly streams and rivulets till they join together and flow down as Kulsi. The river Khri and Krishniya join together after flowing for distance of about 85 km and 47 km respectively. After joining the combined river flows with the name of Khri for a distance of about 15 km it is joined by the Umsiri which flows for a distance of about 32 km before meeting at Ukium. After this the river flows almost straight north for a distance of about 20 km with the name Kulsi near the village Kulsi where it bifurcates into two branches. One branch flows by the western side of Kulsi reserve forest and the other by the eastern side of it both are known as Kulsi, one as eastern Kulsi and the other as central Kulsi. The central Kulsi again bifurcates into two rivers near village Hatigarh and the left arm is known as Kharkhari and the right arm flows as original Kulsi. After this bifurcation the river Kulsi enters into the alluvial plain (flood plain of the Kulsi and Brahmaputra) and comparatively shallow having meandering plan form. The eastern most channel (Kulsi) is joined by two small channels

from its right before crossing the N.H. 37 near Kukurmara. This flow further parallel to river Brahmaputra and then meets other branch of the Kulsi i.e Kharkhari near the village Chamariya and flow west parallel to Brahmaputra with the name of Jaljali till it joins the Brahmaputra near Mornoi. Before meeting the Brahmaputra, it is joined by three important rivers from Khasi and Garo hill namely Boko, Singra and Deosila. During this course the river flows through the course approximately parallel to the Brahmaputra maintaining distance of 3 to 2 km.

RAINFALL:-

There are 7 rain gauge stations established by Brahmaputra Board for determination of data on rainfall in the catchment. However, data of Borjhar area at near Gopinath Bordoloi International airport site maintained by IMD has been used as it is closest to the common area and has a long duration record, According to the data available, the average annual rainfall of Kulsi command is 1747.54 mm based on the available records of daily rainfall data for the period from January 1982 to August 2012.

The seasonal distributions of rainfall in Kulsi command are as below:-

Season	Rainfall in(mm)
Pre-monsoon(March to May)	500.5
Monsoon(June to September)	1073.7
Post Monsoon(October to November	73.0
Winter(December to February)	35.5

Winter: The winter season sets in December and ends in February. This is the coldest season. The weather changes due to passage of western disturbance over the region. Winter rainfall is quite low in this area.

Summer: The summer season begins in March and continues up to May. In this season, occasionally marked instability develops in atmosphere and severe thunderstorms occur, sometimes precede by dust squalls. Hailstorms occur sometime in season especially in hills during the month of March and April.

Monsoon: The monsoon sets in the last week of May or in early June. It generally occurs due to depression in the Bay of Bengal. Subsequently, a series of such depression forming at the head of the Bay of Bengal moves inland. It gives spells of continuous and moderate to heavy

rain over the sub-basin. The monsoon withdraws in the last week of September or first week of October.

Autumn or Post Monsoon: (*October to December*). This season begins in October and ends in December. There is almost no rain except for first fortnight of October. During this period the climate is neither very cold nor hot. However, in the high altitude upper reach of the sub basin, the climate becomes quite cold towards December end.

TEMPERATURE:-

There is no weather station situated within the command area. The nearest operational weather station available is at Gopinath Bordoloi International Airport, Borjhar which is located within 30 Km of the east end of the command area. Therefore, very accurate and long period data is available not only for maximum – minimum temperature but also for relative humidity. In general, the temperature in this basin varies from 14^{0}C to 39^{0}C during summer and from 7^{0}C to 29^{0}C during winter.

KULSI MULTIPURPOSE PROJECT:-

The project site is located about 1.5 downstream of Ukium, a border village of Assam and Meghalaya Brahmaputra Board took up the survey and investigation work of Kulsi.

The water levels are observed by direct reading on vertical wooden staff gauge located at station gauge line and 200 m U/S and 200 m D/S of station gauge line. The depths are measured by sounding with 10 to 20 kg fish weight/ Echo Sounder. Current meter is dropped for taking velocity at 0.6d using boat/ wadding, as the case may be. Discharge is computed using "Area-Velocity Method".

Sediment samples are collected with Punjab type silt sampler and one litre capacity metallic bottle at every R.D. and kept in enameled buckets. After conducting, observation samples are brought at the site laboratory where Coarse, Medium and Fine sediments are analysed.

Water quality samples were collected four times in a year, till July 2018 and monthly basis from August 2019 and now the Kulsi site is a trend station. The collection points in the river are so chosen that, flow is free from disturbances like stagnant pools, heavy growth of weeds or fungus and sampling points are generally in the maximum flow zone. Samples are collected well below 30 cm from the surface and are transferred to pre-rinsed clean polythene bottle of one litre capacity and are filled normally to the brim and sent to the Divisional Laboratory for analysis of various physical and chemical parameters.

REGARDING CLASSIFICATION OF WATERS: A, B, C, D & E

Requirement of pH value, dissolved oxygen, bio-chemical oxygen demand and total coliforms for classes A, B and C, requirements of pH value, dissolved oxygen and free ammonia for class D and requirements of pH value, electrical conductance and sodium absorption ratio for Central Board for the prevention and control of water pollution for the respective classes.

Class A: - Drinking water source without conventional treatment but after disinfections;
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Class C: - Drinking water source with conventional treatment followed by dis-infection;
Class D: - Fish culture and wild life propagation;
Class E: - Irrigation, industrial cooling and controlled waste disposal.

TOLERANCE LIMITS FOR CLASS A, B, C, D & E WATER

Sl.No.	*Characteristics/ unit*	*Class A TL*	*Class B TL*	*Class C TL*	*Class D TL*	*Class E TL*
1.	PH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	D.O mg/l	6	5	4	4	-
3.	Taste	Tasteless	-	-	-	-
4.	Odour Hazen unit	Unobjectionable	-	-	-	-
5.	T.D.S mg/l	500	-	-	-	2100
6.	Electrical conductance mhos/cm	-	--	-	$1000x10^{-6}$	$225x10^{-6}$
7.	Total Hardness mg/l	300	-	-	-	-
8.	Calcium mg/l	200	-	-	-	-
9.	Magnesium mg/l	100	-	-	-	-
10.	Iron mg/l	0.3	-	50	-	-
11.	Chloride mg/l	250	-	600	-	600
12.	Sulphate mg/l	400	-	400	-	1000
13.	Nitrate mg/l	20	-	50	-	-
14	Fluorides mg/l	1.5	1.5	1.5	-	-

T.L: - Tolerance Limit.

******* This is as per IS: 2296-1982.

******* Though Divisional Laboratory M.B.Division, C.W.C. Guwahati is analyzing 25 Nos of physical and chemical parameters, the above characteristics are available in IS: 2296-1982 for classification of water in A, B, C

INDIAN STANDARD SPECIFICATIONS FOR DRINKING WATER IS: 10500

Sl No.	Parameters	Requirement desirable limit	Remarks
1	Colour	5	May be extended up to 50 if toxic substances are suspected.
2.	Turbidity	10	May be relaxed up to 25 in the absence of alternate.
3.	pH	6.5 to 8.5	May be extended up to 9.2 in the absence of alternate.
4.	Total Hardness	300	May be extended up to 600.
5.	Calcium as Ca	75	May be extended up to 200.
6.	Magnesium as Mg	30	May be extended up to 100.
7.	Copper as Cu	0.05	May be extended up to 1.5.
8.	Iron	0.3	May be extended up to 1.
9.	Manganese	0.1	May be extended up to0.5.
10.	Chlorides	250	May be extended up to 1000.
11.	Sulphates	150	May be extended up to 400.
12.	Nitrates	45	No relaxation.
13.	Fluoride	0.6 to 1.2	If the limit is below 0.6 water should be rejected, Max. Limit is extended to 1.5.
14.	Phenols	0.001.	May be extended up to 0.002.
15.	Mercury	0.001	No relaxation.
16.	Cadmium	0.01	No relaxation.
17.	Selenium	0.01	No relaxation.
18.	Arsenic	0.05	No relaxation.
19.	Cyanide	0.05	No relaxation.
20.	Lead	0.1	No relaxation.
21.	Zinc	5.0	May be extended up to 10.0.
22	Anionic detergents (MBAS)	0.2	May be relaxed up to 1.
23	Chromium as Cr^{+6}	0.05	No relaxation.
24	Poly nuclear aromatic hydrocarbon	--	--
25	Mineral oil	0.01	May be relaxed up to 0.03.
26	Residual free Chlorine	0.2	Applicable only when water is chlorinated.

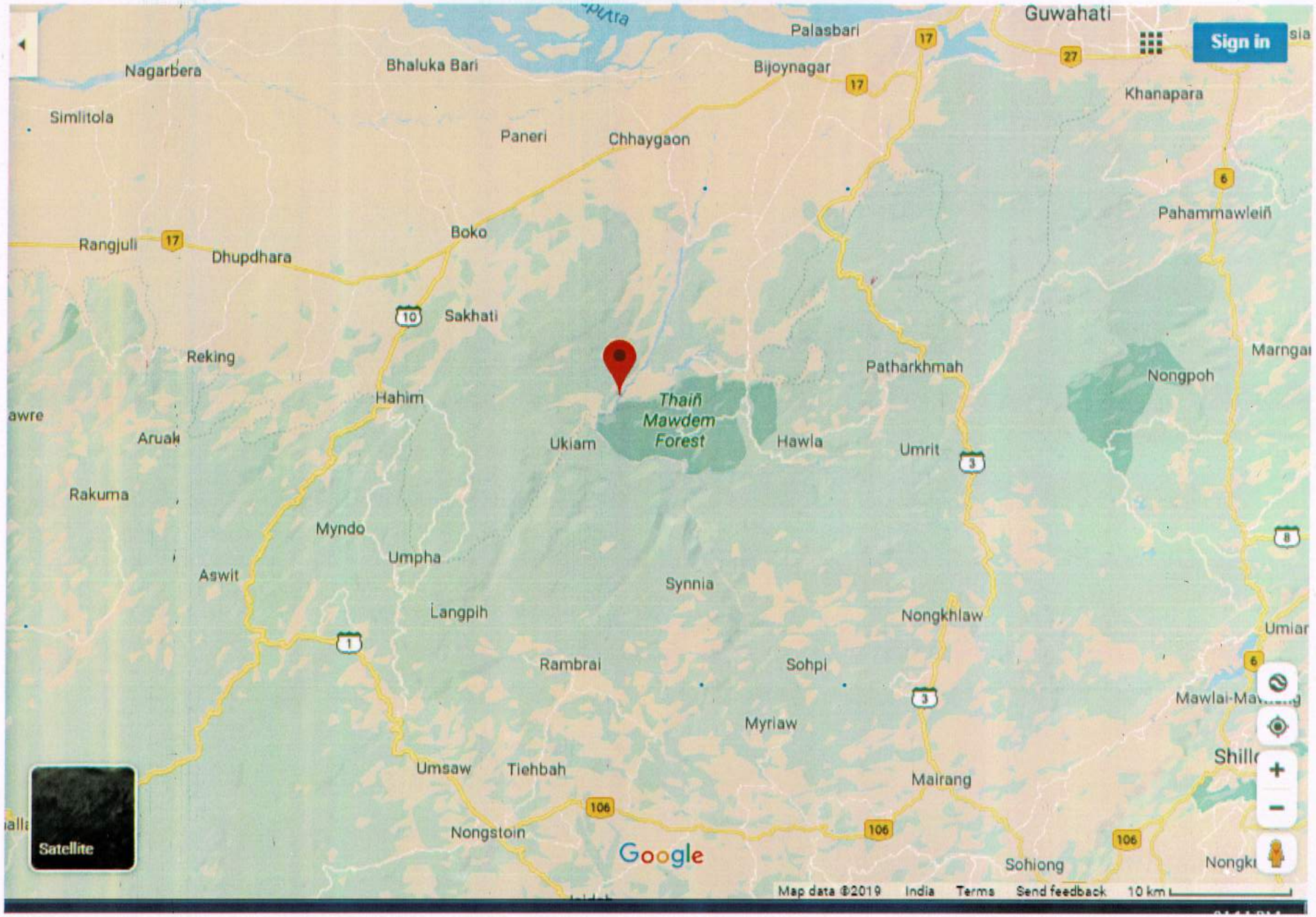
27	Pesticides	Absent	--
28	Radio active	--	--

DRINKING WATER SPECIFICATION: IS: 10500, 1992
(Reaffirmed 1993)
TOLERANCE LIMIT

Sl.No.	Parameter	IS:10500 Requirement (Desirable limit)	Undesirable effect outside the the desirable limit	IS:10500 Permissible Limit in the absence of Alternate source
Essential Characteristics				
1.	pH	6.5-8.5	Beyond this range the water will affect the mucous membrane and / or water supply system.	No relaxation.
2.	Colour(Hazen Units) Maximum	5	Above 5 consumer acceptance decreases.	25
3.	Odour	Unobjectionable	--	--
4.	Taste	Agreeable	--	--
5.	Turbidity, NTU, Max.	5	Above 5 consumer acceptance decreases.	10
Following Results are expressed in mg/l:				
6.	Total hardness as $CaCO_3$, Max	300	Encrustation in water supply structure and adverse effects on domestic use.	600.
7.	Iron as Fe, Max.	0.30	Beyond this limit taste/ appearance are affected, has adverse effect on domestic uses, and promotes iron bacteria.	1.0
8.	Chlorides as Cl, Max.	250	Beyond this limit taste/ corrosion and palatability are effected.	1000
9.	Residual free	0.20	--	--

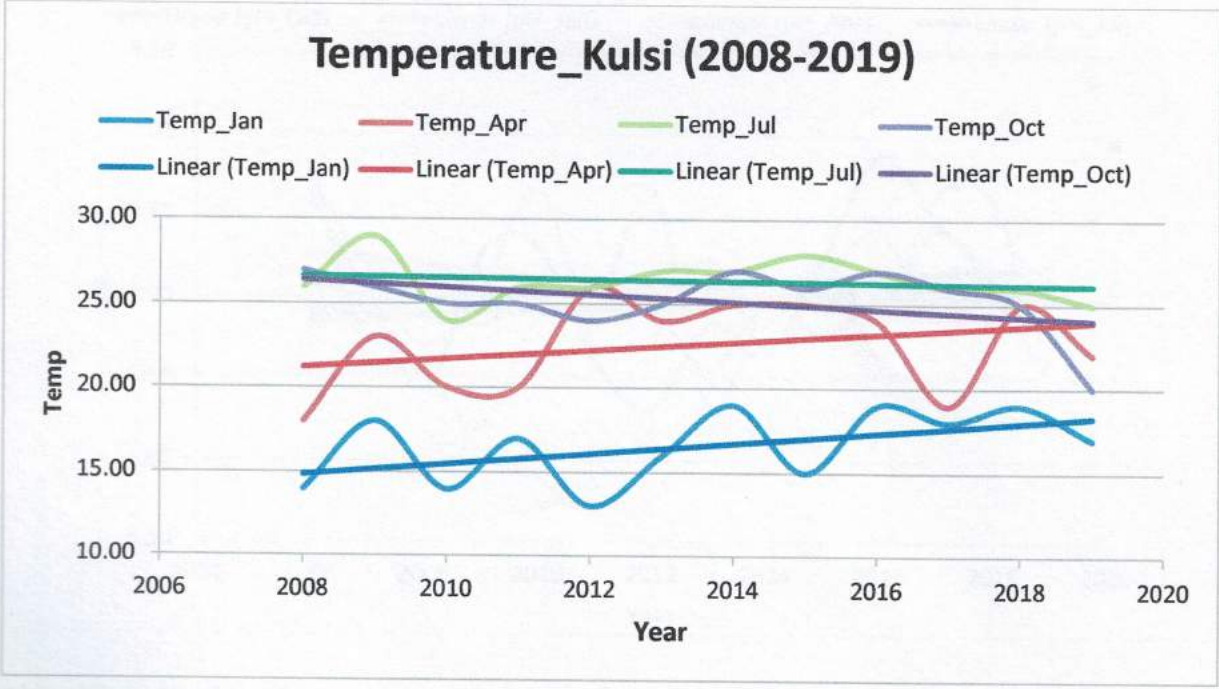
	Chlorine, Min.			
Desirable Characteristics				
10.	Dissolved solids, Max.	500	Beyond this palatability decreases and may cause gastro intentional irration.	2000
11.	Calcium as Ca, Max.	75	Encrustation in water supply structure and adverse effects on domestic use.	200
12	Magnesium as Mg Max.	30	--	100
13	Copper as Cu, Max	0.05		

MAP ON RIVER KULSI



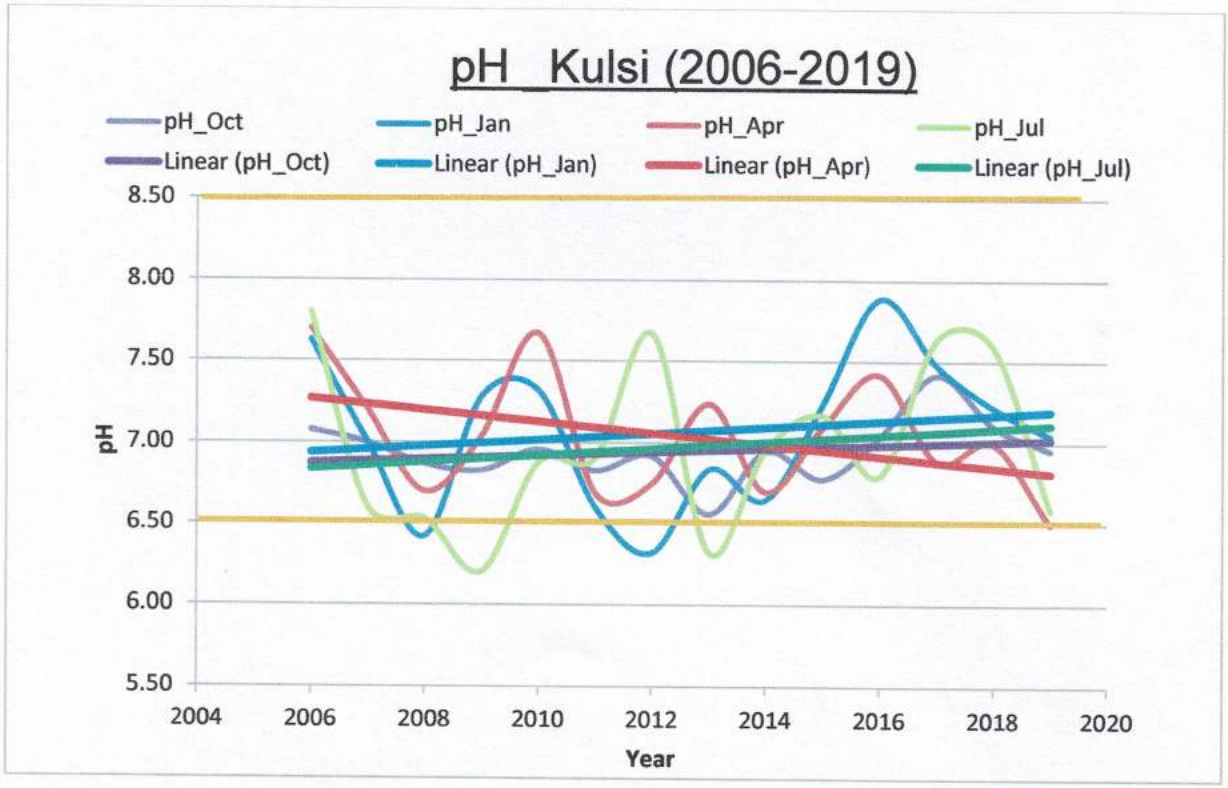
PHYSICAL CHARACTERISTICS :-

TEMPERATURE				
Year	Jan	Apr	Jul	Oct
2008	14.00	18.00	26.00	27.00
2009	18.00	23.00	29.00	26.00
2010	14.00	20.00	24.00	25.00
2011	17.00	20.00	26.00	25.00
2012	13.00	26.00	26.00	24.00
2013	16.00	24.00	27.00	25.00
2014	19.00	25.00	27.00	27.00
2015	15.00	25.00	28.00	26.00
2016	19.00	24.00	27.00	27.00
2017	18.00	19.00	26.00	26.00
2018	19.00	25.00	26.00	25.00
2019	17.00	22.00	25.00	20.00



Temperature:- Temperature for January and April (Non-monsoon) has rising trend, whereas temperature for July and October (monsoon) has falling trend. This will have consequential effect on the other parameters.

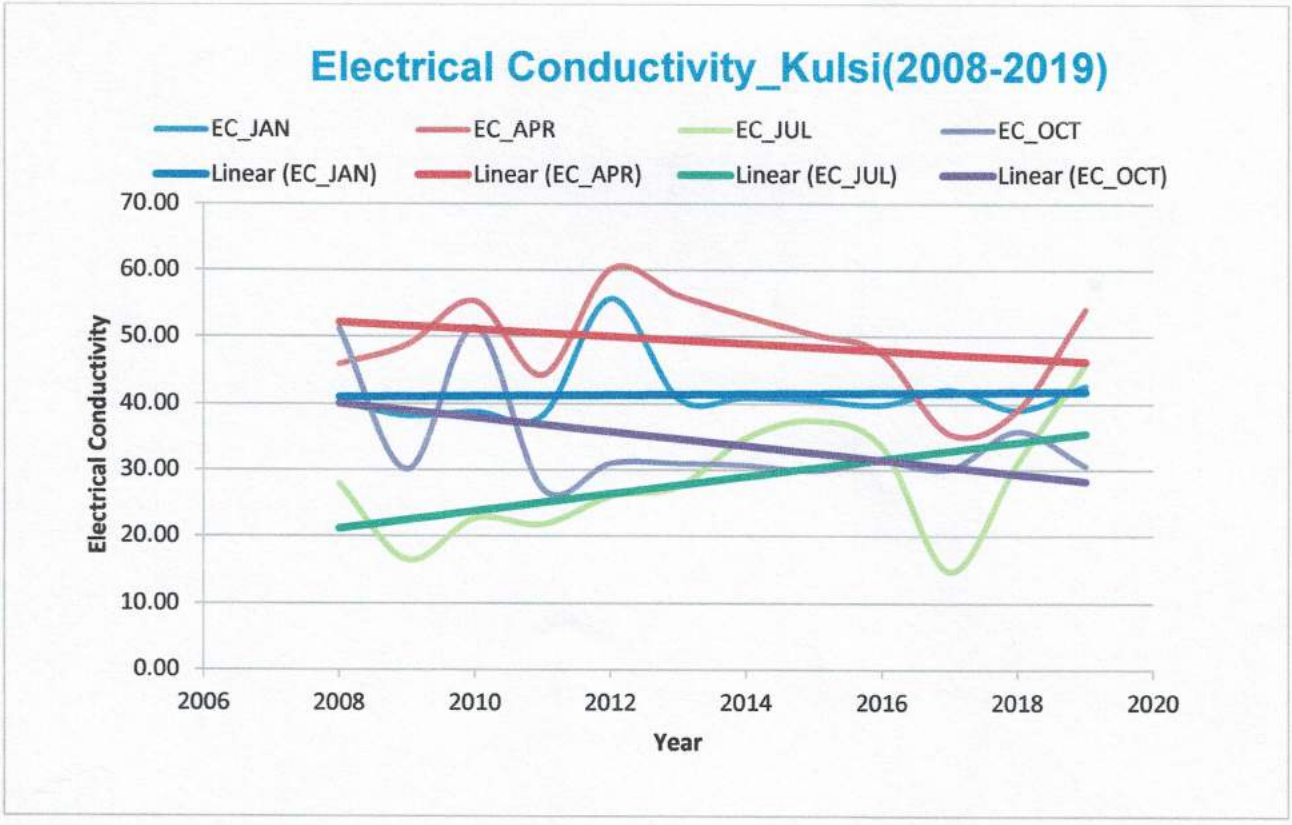
pH				
Year	Jan	Apr	Jul	Oct
2008	6.42	6.70	6.53	6.87
2009	7.28	7.04	6.20	6.83
2010	7.32	7.67	6.88	6.96
2011	6.60	6.69	6.91	6.83
2012	6.32	6.75	7.67	6.92
2013	6.84	7.24	6.32	6.56
2014	6.65	6.70	6.96	6.95
2015	7.24	7.10	7.17	6.78
2016	7.89	7.42	6.80	7.04
2017	7.48	6.89	7.64	7.42
2018	7.22	7.00	7.59	7.11
2019	7.05	6.50	6.59	6.96



pH :- The pH value of water samples collected from Kulsi site of M.B.Division varies from 6.20 to 7.89 which is broadly within safe range except few. pH value indicates increasing trend for January, July & October and decreasing trend for April. However it is within safe range. The tolerance limit of pH is 6.5 to 8.5 as per BIS for drinking purpose, irrigation purposes and pisciculture which shows that the water of Kulsi is suitable for drinking, irrigation and pisciculture

purposes. The pH is expressed in Hydrogen ion concentration. The pH distribution of Kulsi river shows that it is slightly acidic in the pre-monsoon period and slightly alkaline in the monsoon period. The decrease in pH of the water is likely due to decomposition of the inundated terrestrial vegetation of the littoral zone following increasing water levels. The pH value drops during the rainy season due to heavy rainfall and dilution effect.

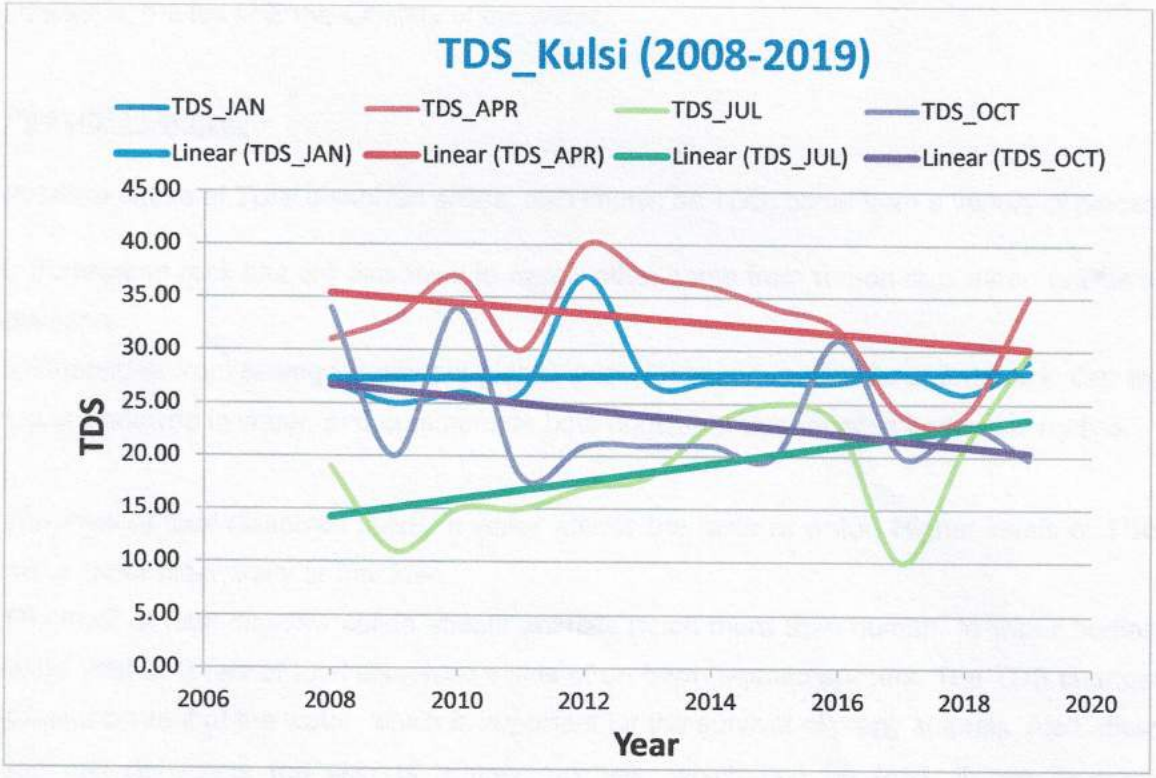
Electrical conductivity				
Year	Jan	Apr	Jul	Oct
2008	40.30	45.90	27.90	51.20
2009	38.20	48.80	16.50	30.10
2010	38.80	55.30	22.70	51.40
2011	38.30	44.30	21.80	27.10
2012	55.70	60.20	26.00	31.00
2013	40.80	56.20	27.50	31.00
2014	41.00	53.10	34.90	30.70
2015	40.60	50.30	37.50	29.90
2016	39.90	47.50	33.60	31.30
2017	42.10	35.50	14.80	30.20
2018	39.10	39.10	31.10	35.90
2019	42.70	54.10	45.90	30.60



Electrical Conductivity: - The electrical conductance is very low varying from 14.80 micromhos/cm to 60.20 micromhos/cm suitable for all purposes. The tolerance limit of electrical conductivity is 2250 micromhos/cm for irrigation purposes and 1000 micromhos/cm for pisciculture which shows that the water of Kulsi is suitable for drinking, irrigation and pisciculture

purposes. Electrical Conductivity indicates increasing trend for July & January whereas decreasing trend for April & October. However it remains within permissible range. The electrical conductivity value of the water sample of Kulsi river is very low showing that the cations and anions are present in low concentration. Most dissolved inorganic substances are in the ionized form in water and contribute to conductance.

TDS				
Year	Jan	Apr	Jul	Oct
2008	27.00	31.00	19.00	34.00
2009	25.00	33.00	11.00	20.00
2010	26.00	37.00	15.00	34.00
2011	26.00	30.00	15.00	18.00
2012	37.00	40.00	17.00	21.00
2013	27.00	37.00	18.00	21.00
2014	27.00	36.00	23.00	21.00
2015	27.00	34.00	25.00	20.00
2016	27.00	32.00	23.00	31.00
2017	28.00	24.00	10.00	20.00
2018	26.00	24.00	21.00	23.00
2019	29.00	35.10	29.80	19.80



TDS (Total Dissolved Solid)**:** - Dissolved solids are different minerals dissolved in water. They are not one specific component, but a mixture of different components. The minerals that are often dissolved are calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulphates. The TDS value of the water sample from Kulsi.

Site is well within the tolerance limit as the tolerance value is 500mg/l for drinking purposes and 2100 mg/l for irrigation purposes.

Dissolved solids are necessary for life. These are a mixture of different components. However, the mineral content of water needs to stay constant for aquatic animals to survive. So, it is also bad for the Total Dissolved Solids content in water to fluctuate.
Dissolved solids are related to a number of other compounds, which can contaminate the water as well.

First of all, "total dissolved solids are related to 'Hardness'. Hardness is a measure of the mineral content of water. So, the more dissolved solids in water, the higher will be the hardness. Another element that total dissolved solids are related to is the Turbidity of the water. Turbidity is a measure of how clear the water is. Unlike hardness, the greater the total dissolved solids content is, the lower is the turbidity of the water.

Possible Causes:-

Possible cause of Total dissolved solids, also known as TDS, come from a variety of places.

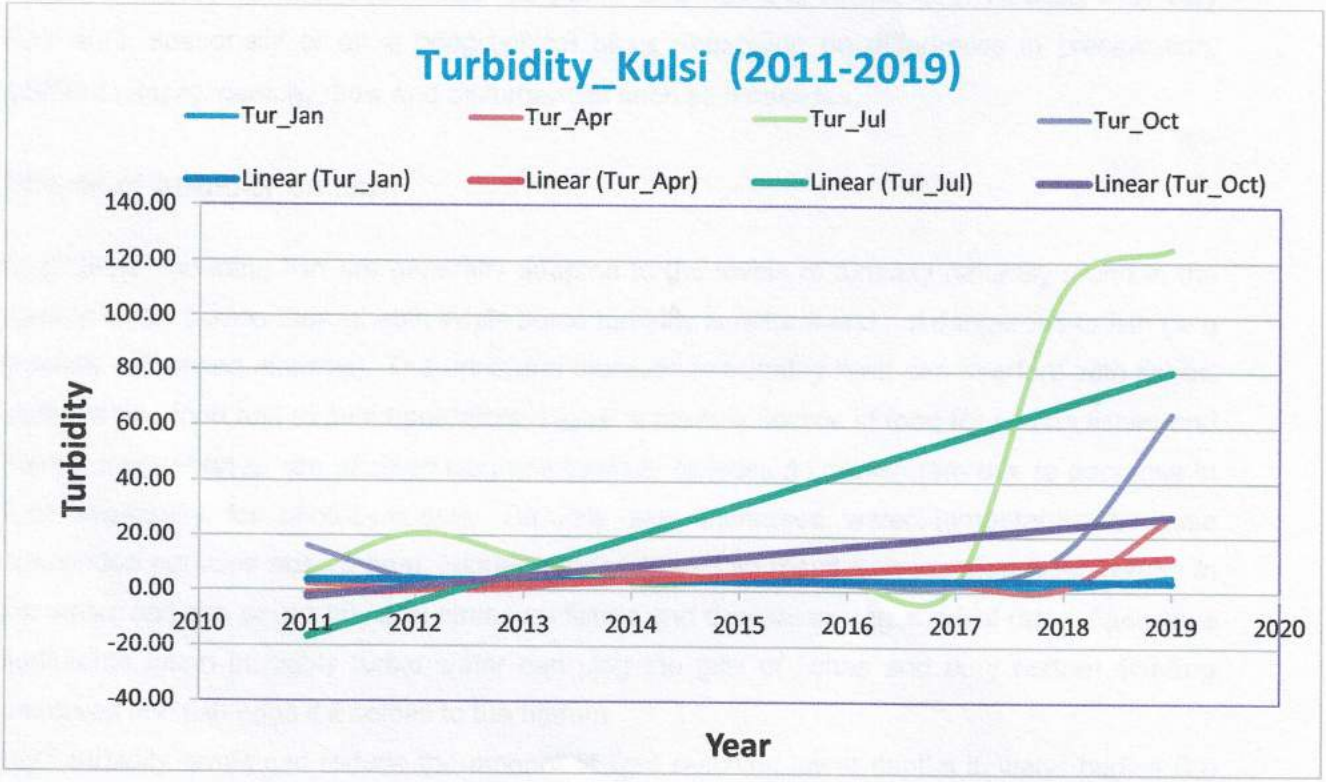
i) Sometimes rock bits are dissolved in water, other come from run-off rain water, leaves silt, or plankton.
ii) Chemicals from sewage treatment plants, pesticides, and road salts or fertilizers, can also be found dissolved in water, and contaminate both drinking water supplies and water bodies.

The level of total dissolved solids in water affects the taste of water. Higher levels of TDS can make water bitter, salty or brackish.
The level of total dissolve solids affects animals much more than human. In water bodies, like rivers, higher levels of total dissolved solids often harm aquatic species. The TDS changes the mineral content of the water, which is important for the survival of many animals. Also, dissolved salt can dehydrate the skin of aquatic animals, which can be fatal. It can increase the temperature of the water, which many animals cannot survive in.
If water contains calcium carbonate and magnesium carbonate, it might have elevated levels of hardness and the water might have a bitter taste. If water contains sodium chloride and potassium chloride it might have a salty or brackish taste and increased corrosively.

Many dissolved solids come from sewage, the plumbing salts used for de-icing, anti- skid materials, and other man-made things. One general way to reduce the levels of TDS in drinking water is to reduce the use of chemicals and inorganic salts that might eventually end up in drinking water.

Total Dissolved Solids (TDS) for July & January exhibits increasing trend whereas it shows decreasing trend for April & October. The content of TDS in the Kulsi River is drinkable. A level of 10mg/l – 40mg/l is normal for drinking water and it is safe for drinking. If the TDS value is higher it may have a bitter taste and if the TDS value is lower, then the water could have a flat taste. High TDS levels can cause the water to have a laxative effect on it and can harm aquatic life. The TDS value of the water sample from Kulsi site is well within the tolerance limit as the tolerance value is 500 mg/l for drinking purposes and 2100 mg/l for irrigation purposes.

Turbidity				
Year	Jan	Apr	Jul	Oct
2011	3.20	2.36	6.00	16.13
2012	4.55	0.55	21.00	3.77
2013	1.44	0.87	11.87	2.08
2014	6.54	6.62	2.77	4.75
2015	4.00	4.10	3.91	3.02
2016	3.15	3.42	2.97	2.62
2017	2.15	2.30	2.65	2.10
2018	1.95	1.57	110.00	14.46
2019	5.62	27.94	125.00	65.00



Turbidity: -.

Turbidity is a measure of water clarity in streams, lakes and oceans. Turbidity describes the amount of light scattered or blocked by suspended particles in water sample. Clear water has low turbidity and cloudy or murky water has higher turbidity level. Turbidity is caused by particles of soil, organic matter, metals or similar matter suspended in the water column.

Materials that cause water to become turbid include:

- Clay
- Silt
- Finely dissolved organic and inorganic material
- Microorganism such as bacteria and viruses

Watersheds may have diverse physical landscape features that can affect the amount of suspended material in the water making it cloudy or turbid. Natural sources of material include sediments from the weathering rocks (e.g, glacial outwash), dead plant material and phytoplankton. Man-made sources include substances in storm water from urban areas(e.g, roads, parking lots), upland industrial activities, construction and land clearing and activities occurring directly in water bodies such as power boat use and vehicle use. Turbidity may vary over time, seasonally or on a geographical basis depending on differences in precipitation, gradient (slope), geology, flow and disturbances such as landslides.

Effects of turbidity on fish:-

Organisms, including fish are generally adapted to the levels of turbidity naturally found in the specific water bodies they inhabit. While some turbidity is natural and not dangerous to fish (e.g glacially influenced streams). The unnatural increase in turbidity level can interfere with fishes' ability to find food and to avoid predators. Algae, a primary source of food for certain fishes and macro- invertebrates, are affected because turbidity reduces its growth rate due to decrease in light availability for photosynthesis. Turbidity also increases water temperature because suspended particles absorb heat. Higher temperatures can result in lower dissolved oxygen in the water and can cause physical stress on fishes and decreases egg survival rates. Excessive sediments found in highly turbid water can clog the gills of fishes and bury bottom dwelling creatures and fish eggs if it settles to the bottom.

High turbidity levels can reduce the amount of light reaching lower depths in water bodies like rivers, lakes and reservoirs inhibiting the growth of some forms of aquatic plants and negatively affecting the species that are dependent on them, like fish and shellfish. High turbidity levels can also affect the ability of fish gills to absorb dissolved oxygen.

Effects of turbidity on human:-

Particles in turbid water can carry disease causing pathogens or toxic pollutants. High turbidity in drinking water can shield bacteria or other organisms so that chlorine treatment in water

treatment plants cannot disinfect the water effectively. Some pathogens found in water with high turbidity can cause symptoms such as nausea, cramps and headaches. Particles can also absorb toxic pollutants that may come from urban and industrial discharges and storm water runoff. Many common contaminants that increase turbidity can also change the taste and odor of water. Water that has high turbidity may cause staining or even clog pipes over time. It may also foul laundry and interfere with the proper functioning of dishwaters, hot water heaters, showerheads, etc.

Lower Human-caused Turbidity:-

The best approach to manage turbidity is to address its source. This includes reducing storm water run – off from roads, parking lots and upland industrial activities, restoring eroding stream and lake and applying industry- specific best management practices. These are the activities that help minimize the effects of a particular activity upon the environment. Examples include use of settling ponds, re-vegetating steep slopes, maintaining a minimum of 25 feet of vegetation around streams, lakes and other water bodies and maintaining all drainage systems.

Treatment of water if high in turbidity:-

- Microfiltration
- Chlorination
- Ozone treatment
- Distillation
- Aeration
- Reverse Osmosis

Trend shows increasing in general for all seasons but at higher rate for July. The turbidity value of river Kulsi lying from 0.55 NTU to125 NTU shows that more turbidity is found in monsoon than in pre-monsoon due to high concentration of dissolve salts and suspended solids. The increase in turbidity value is due to organism like phytoplankton which contributes to turbidity in open water. Erosion and effluents from highly urbanized zones contribute to turbidity of waters in those areas. Construction, mining and agriculture, disturb the soil and can lead to raised levels of sediment which run off to water ways during storms. Storm water from paved surface like roads, bridges and parking lots also contribute to turbidity. In drinking water, the higher is the level of turbidity, the higher is the chance of developing gastrointestinal diseases from its use. Contaminants like viruses and pathogenic bacteria can attach themselves to the suspended solids. These solids then interfere with disinfection.

CONCLUSION : -

On careful study of the principal water quality of characteristics like pH, electrical conductivity, total dissolved solids and turbidity content etc. the water in the entire reach under study is found to be suitable for all purposes.

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5. Wikipedia.
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7. The USGS Water Science School.
8. Alaska Water Quality Standard.

INTRODUCTION:-

Dudhnai river, a tributary of Brahmaputra river, it is located at 25°58 '44 "latitude and 90 °47 ' 39 "longtitude.

The water levels are observed by direct reading on vertical wooden staff gauge located at station gauge line and 100 m U/S and 200 m D/S of station gauge line. The depths are measured by sounding with 10 to 20 kg fish weight/ Echo Sounder from Bridge/ Boat outfit. Current meter is dropped for taking velocity at 0.6d from Bridge/Boat outfit. Discharge is computed using "Area-Velocity Method".

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Sl.No.	*Characteristics/ unit*	*Class A TL*	*Class B TL*	*Class C TL*	*Class D TL*	*Class E TL*
1.	PH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	D.O mg/l	6	5	4	4	-
3.	Taste	Tasteless	-	-	-	-
4.	Odour Hazen unit	Unobjectionable	-	-	-	-
5.	T.D.S mg/l	500	-	-	-	2100
6.	Electrical conductance mhos/cm	-	--	-	$1000x10^{-6}$	$225x10^{-6}$
7.	Total Hardness mg/l	300	-	-	-	-
8.	Calcium mg/l	200	-	-	-	-

9.	Magnesium mg/l	100	-	-	-	-
10.	Iron mg/l	0.3	-	50	-	-
11.	Chloride mg/l	250	-	600	-	600
12.	Sulphate mg/l	400	-	400	-	1000
13.	Nitrate mg/l	20	-	50	-	-
14	Fluorides mg/l	1.5	1.5	1.5	-	-

T.L: - Tolerance Limit.

******* This is as per IS: 2296-1982.

******* Though Divisional Laboratory M.B.Division, C.W.C. Guwahati is analyzing 25 Nos of physical and chemical parameters, the above characteristics are available in IS: 2296-1982 for classification of water in A, B, C, D&E.

INDIAN STANDARD SPECIFICATIONS FOR DRINKING WATER

IS: 10500

Sl NO.	Parameters	Requirement desirable limit	Remarks
1	Colour	5	May be extended up to 50 if toxic substances are suspected.
2.	Turbidity	10	May be relaxed up to 25 in the absence of alternate.
3.	pH	6.5 to 8.5	May be extended up to 9.2 in the absence of alternate.
4.	Total Hardness	300	May be extended up to 600.
5.	Calcium as Ca	75	May be extended up to 200.
6.	Magnesium as Mg	30	May be extended up to 100.
7.	Copper as Cu	0.05	May be extended up to 1.5.
8.	Iron	0.3	May be extended up to 1.

9.	Manganese	0.1	May be extended up to0.5.
10.	Chlorides	250	May be extended up to 1000.
11.	Sulphates	150	May be extended up to 400.
12.	Nitrates	45	No relaxation.
13.	Fluoride	0.6 to 1.2	If the limit is below 0.6 water should be rejected, Max. Limit is extended to 1.5.
14.	Phenols	0.001.	May be extended up to 0.002.
15.	Mercury	0.001	No relaxation.
16.	Cadmium	0.01	No relaxation.
17.	Selenium	0.01	No relaxation.
18.	Arsenic	0.05	No relaxation.
19.	Cyanide	0.05	No relaxation.
20.	Lead	0.1	No relaxation.
21.	Zinc	5.0	May be extended up to 10.0.
22	Anionic detergents (MBAS)	0.2	May be relaxed up to 1.
23	Chromium as Cr^{+6}	0.05	No relaxation.
24	Poly nuclear aromatic hydrocarbon	--	--
25	Mineral oil	0.01	May be relaxed up to 0.03.
26	Residual free Chlorine	0.2	Applicable only when water is chlorinated.
27	Pesticides	Absent	--
28	Radio active	--	--

DRINKING WATER SPECIFICATION: IS: 10500, 1992

(Reaffirmed 1993)

TOLERANCE LIMIT

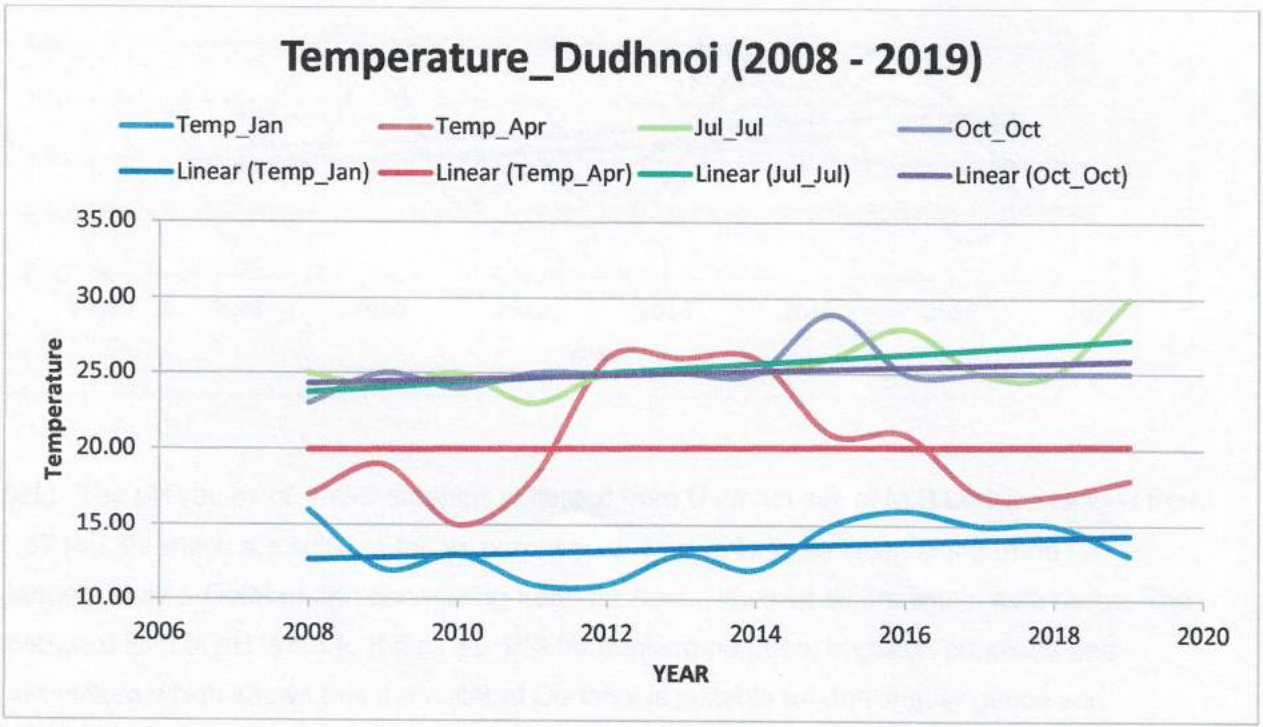
S.No.	Parameter	IS:10500 Requirement (Desirable limit)	Undesirable effect outside the desirable limit	IS:10500 Permissible Limit in the absence of Alternate source
Essential Characteristics				
1.	pH	6.5-8.5	Beyond this range the water will affect the mucous membrane and / or water supply system.	No relaxation.
2.	Colour(Hazen Units) Maximum	5	Above 5 consumer acceptance decreases.	25
3.	Odour	Unobjectionable	--	--
4.	Taste	Agreeable	--	--
5.	Turbidity, NTU, Max.	5	Above 5 consumer acceptance decreases.	10
Following Results are expressed in mg/l:				
6.	Total hardness as $CaCO_3$, Max	300	Encrustation in water supply structure and adverse effects on domestic use.	600.
7.	Iron as Fe, Max.	0.30	Beyond this limit taste/ appearance are affected, has adverse effect on domestic uses, and promotes iron bacteria.	1.0
8.	Chlorides as Cl, Max.	250	Beyond this limit taste/ corrosion and palatability are effected.	1000
9.	Residual free Chlorine, Min.	0.20	--	--

Desirable Characteristics				
10.	Dissolved solids, Max.	500	Beyond this palatability decreases and may cause gastro intentional irration.	2000
11.	Calcium as Ca, Max.	75	Encrustation in water supply structure and adverse effects on domestic use.	200
12	Magnesium as Mg, Max.	30	---	100
13	Copper as Cu, Max.	0.05		

MAP OF RIVER DUDHNOI

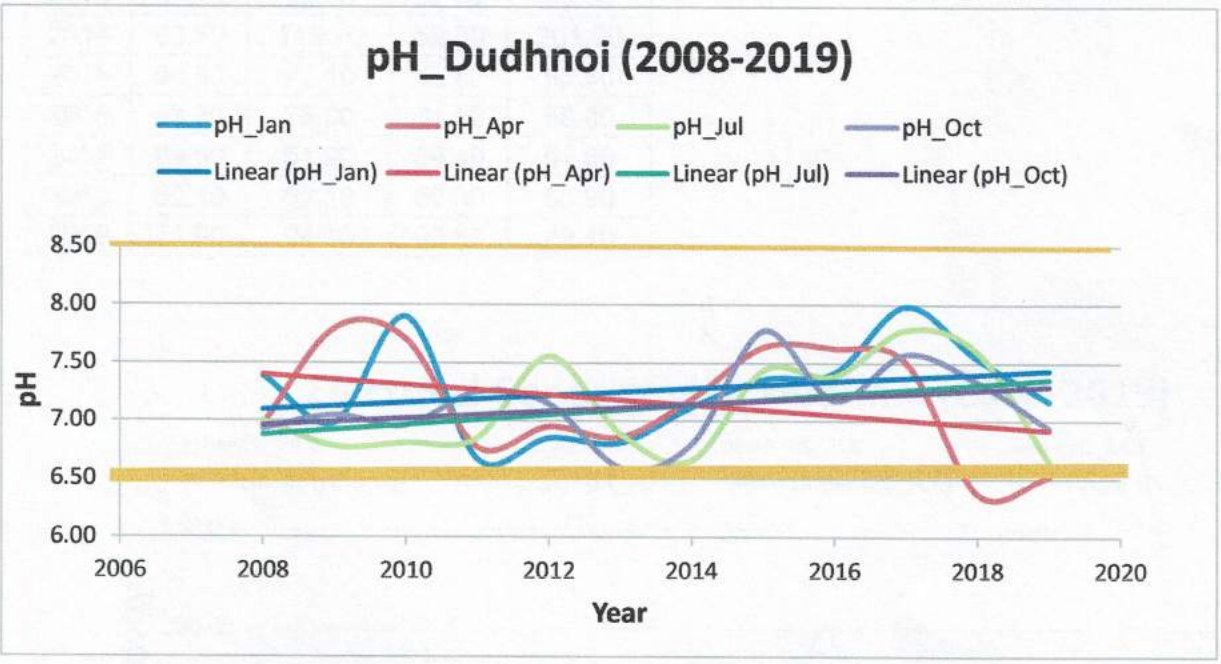
PHYSICAL CHARACTERISTICS :-

TEMPERATURE				
Year	Jan	Apr	Jul	Oct
2008	16.00	17.00	25.00	23.00
2009	12.00	19.00	24.00	25.00
2010	13.00	15.00	25.00	24.00
2011	11.00	18.00	23.00	25.00
2012	11.00	26.00	25.00	25.00
2013	13.00	26.00	25.00	25.00
2014	12.00	26.00	25.00	25.00
2015	15.00	21.00	26.00	29.00
2016	16.00	21.00	28.00	25.00
2017	15.00	17.00	25.00	25.00
2018	15.00	17.00	25.00	25.00
2019	13.00	18.00	30.00	25.00



Temperature:- Temperature for January, July and October has rising trend, whereas temperature for April shows a flat straight-line indicating that the temperature remains almost constant in that period.

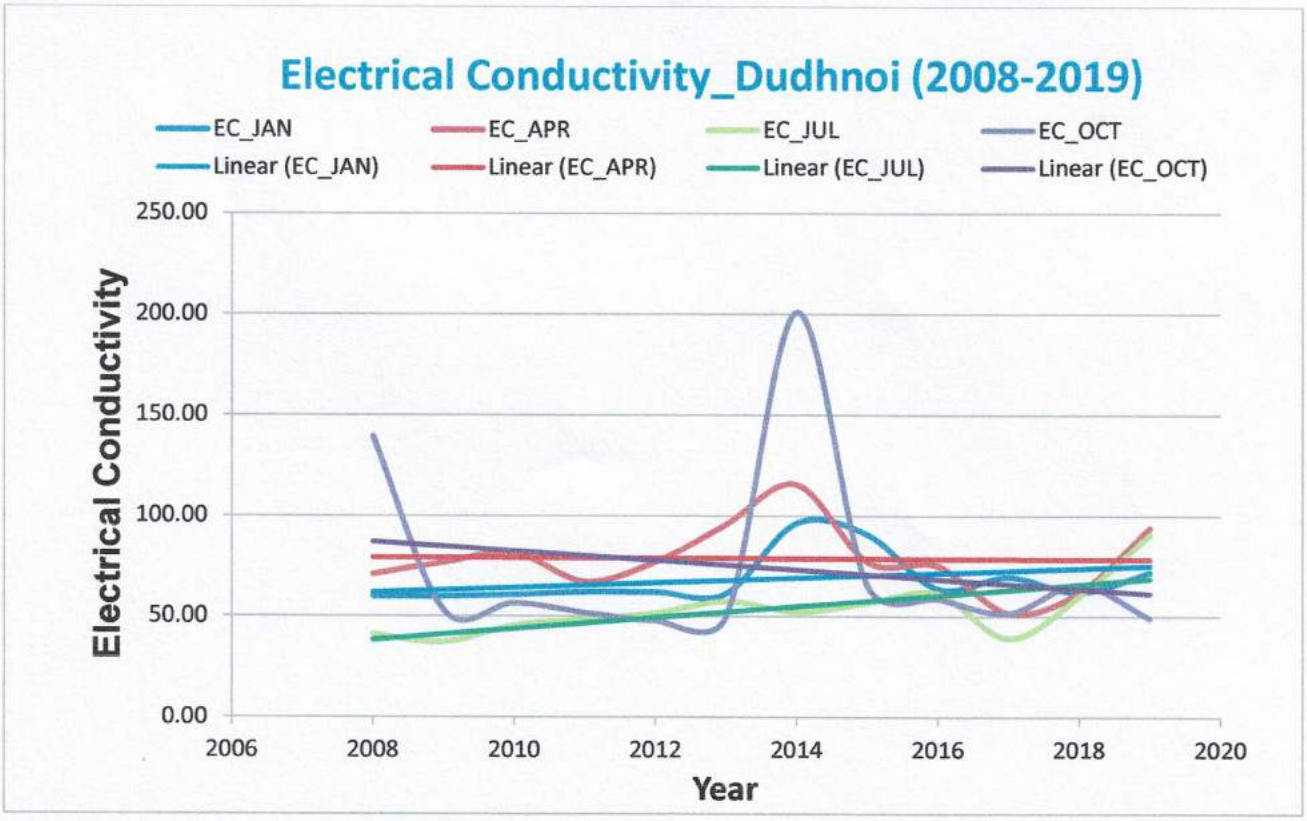
pH				
Year	Jan	Apr	Jul	Oct
2008	7.39	6.97	7.00	6.93
2009	6.98	7.80	6.78	7.05
2010	7.90	7.71	6.81	6.96
2011	6.67	6.77	6.85	7.25
2012	6.85	6.95	7.56	7.15
2013	6.81	6.86	6.89	6.60
2014	7.12	7.19	6.66	6.80
2015	7.36	7.64	7.44	7.78
2016	7.42	7.63	7.39	7.18
2017	7.99	7.51	7.79	7.58
2018	7.54	6.37	7.60	7.34
2019	7.17	6.52	6.65	6.94



pH :- The pH values of water samples collected from Dudhnai site of M.B.Division ranges from 6.37 to 7.99 which are suitable for all purposes. pH value indicates increasing trend for January, July & October and decreasing trend for April. However all are within safe range. The tolerance limit of pH is 6.5 to 8.5 as per BIS for drinking purpose, irrigation purposes and pisciculture which shows that the water of Dudhnoi is suitable for drinking, irrigation and pisciculture purposes. The pH is expressed in Hydrogen ion concentration. The pH distribution of Dudhnoi River shows that it is slightly acidic in the pre-monsoon period and slightly alkaline in the monsoon period. The decrease in pH of the water is due to decomposition of the inundated

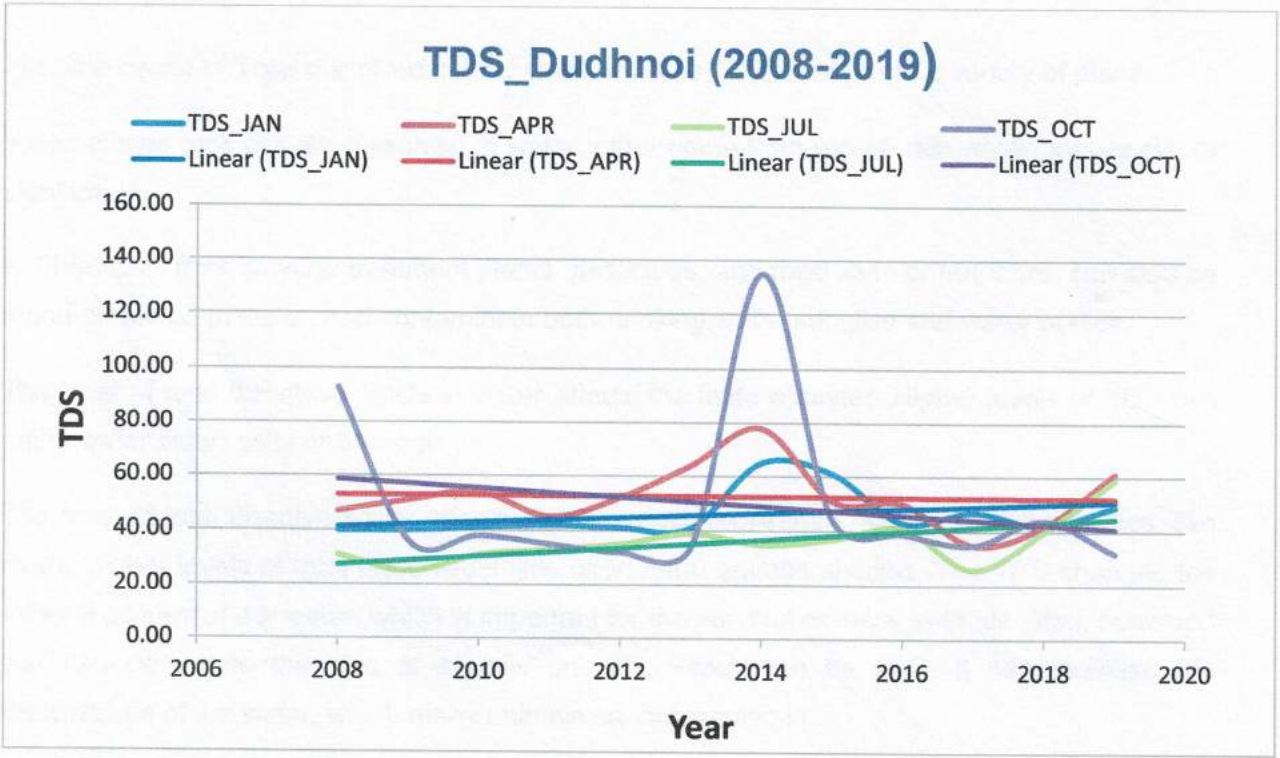
terrestrial vegetation of the littoral zone following increasing water levels. The pH values drops during the rainy season due to heavy rainfall and dilution effect.

Electrical Conductivity				
Year	Jan	Apr	Jul	Oct
2008	60.00	70.90	41.20	139.40
2009	60.00	76.60	37.50	53.00
2010	60.80	81.40	45.60	56.60
2011	62.20	67.30	48.50	51.80
2012	62.10	76.90	51.60	48.10
2013	61.40	95.90	57.60	50.00
2014	96.50	115.70	52.30	201.00
2015	90.80	77.10	56.80	65.40
2016	63.80	75.00	61.50	58.80
2017	69.60	51.90	39.40	51.80
2018	62.10	62.10	60.30	65.90
2019	71.90	94.10	90.80	49.40



Electrical Conductivity: - The electrical conductance is very low varying from 37.50 micromhos/cm to 201.00 micromhos/cm suitable for all purposes. The tolerance limit of electrical conductivity is 2250 micromhos/cm for irrigation purposes and 1000 micromhos/cm for pisciculture which shows that the water of Dudhnoi is suitable for drinking, irrigation and pisciculture purposes. Electrical Conductivity indicates increasing trend for January, April & July whereas decreasing trend for October. The electrical conductivity value of the water sample of Dudhnoi river is very low showing that the cations and anions are present in low concentration. Most dissolved inorganic substances are in the ionized form in water and contribute to conductance.

TDS				
Year	Jan	Apr	Jul	Oct
2008	40.00	47.00	31.00	93.00
2009	40.00	51.00	25.00	36.00
2010	41.00	54.00	31.00	38.00
2011	42.00	45.00	33.00	35.00
2012	41.00	52.00	35.00	32.00
2013	41.00	64.00	39.00	34.00
2014	65.00	78.00	35.00	135.00
2015	61.00	51.00	37.00	44.00
2016	43.00	50.00	41.00	39.00
2017	47.00	35.00	26.00	35.00
2018	42.00	42.00	40.00	44.00
2019	49.00	61.10	58.90	32.10



TDS (Total Dissolved Solid) : - Dissolved solids are different minerals dissolved in water. They are not one specific component, but a mixture of different components. The minerals that are often dissolved are calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulphates.

Dissolved solids are necessary for life. These are a mixture of different components. However, the mineral content of water needs to stay constant for aquatic animals to survive. So, it is also bad for the Total Dissolved Solids content in water to fluctuate.

Dissolved solids are related to a number of other compounds, which can contaminate the water as well.

First of all, "total dissolved solids are related to 'Hardness'. Hardness is a measure of the mineral content of water. So, the more dissolved solids in water, the higher will be the hardness.

Another element that total dissolved solids are related to is the Turbidity of the water. Turbidity is a measure of how clear the water is. Unlike hardness, the greater the total dissolved solids content is, the lower is the turbidity of the water.

Possible Causes:-

Possible cause of Total dissolved solids, also known as TDS, come from a variety of places.

i) Sometimes rock bits are dissolved in water, other come from run-off rain water, leaves silt, or plankton.

ii) Chemicals from sewage treatment plants, pesticides, and road salts or fertilizers, can also be found dissolved in water, and contaminate both drinking water supplies and water bodies.

The level of total dissolved solids in water affects the taste of water. Higher levels of TDS can make water bitter, salty or brackish.

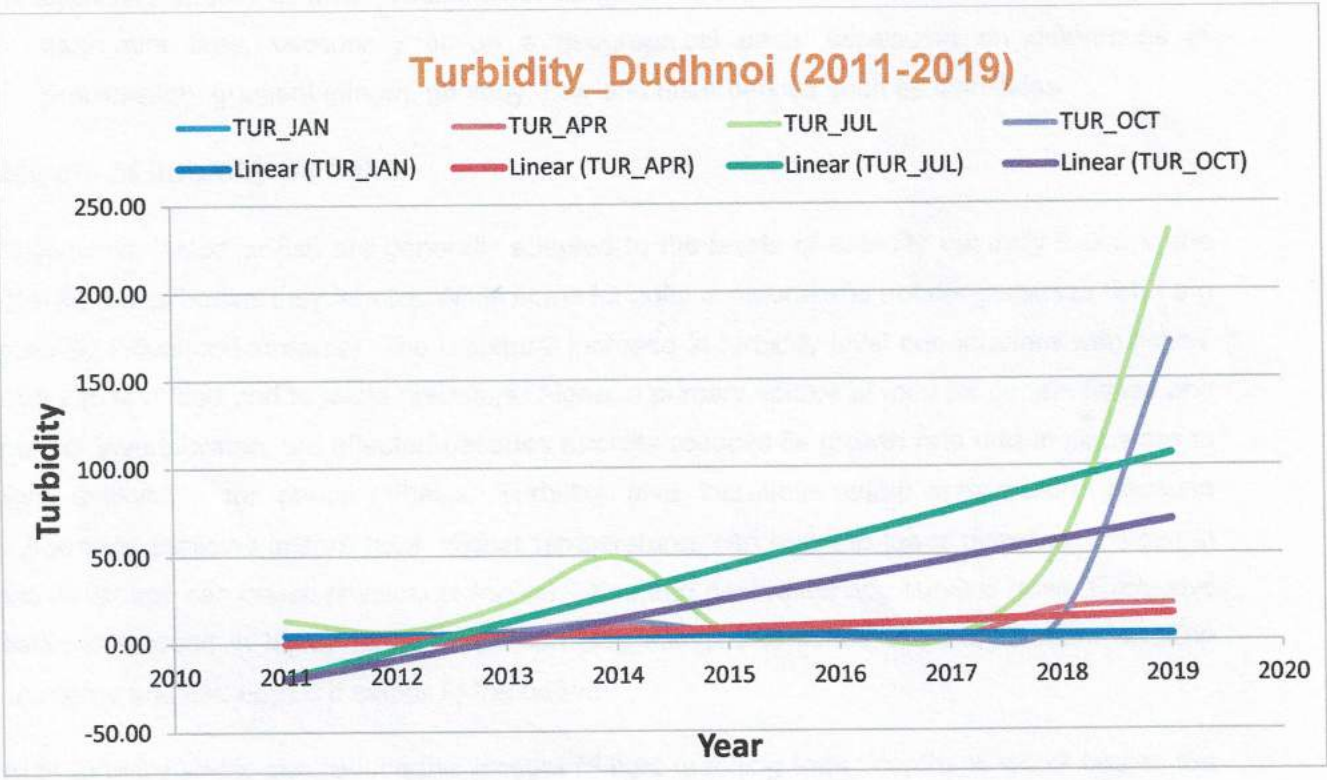
The level of total dissolve solids affects animals much more than human. In water bodies, like rivers, higher levels of total dissolved solids often harm aquatic species. The TDS changes the mineral content of the water, which is important for the survival of many animals. Also, dissolved salt can dehydrate the skin of aquatic animals, which can be fatal. It can increase the temperature of the water, which many animals cannot survive in.

If water contains calcium carbonate and magnesium carbonate, it might have elevated levels of hardness and the water might have a bitter taste. If water contains sodium chloride and potassium chloride it might have a salty or brackish taste and increased corrosively.

Many dissolved solids come from sewage, the plumbing salts used for de-icing, anti- skid materials, and other man-made things. One general way to reduce the levels of TDS in drinking water is to reduce the use of chemicals and inorganic salts that might eventually end up in drinking water.

Total Dissolved Solids (TDS) value for July & January exhibits increasing trend whereas it shows a decreasing trend for April & October. The content of TDS in the Dudhnoi river is drinkable. A level of 25 mg/l – 135.00 mg/l is normal for drinking water and it is safe to drink. If TDS value is high it may have a bitter taste and if TDS is lower than normal the water could have a flat taste. High TDS levels can cause the water to have somewhat of a laxative effect of the water and harm aquatic life.The TDS value of the water sample from Dudhnoi site is well within the tolerance limit as the tolerance value is 500 mg/l for drinking purposes and 2100 mg/l for irrigation purposes.

Turbidity				
Year	Jan	Apr	Jul	Oct
2011	3.60	5.10	13.27	3.91
2012	3.09	0.70	6.38	4.67
2013	2.54	1.21	22.00	6.71
2014	8.48	9.10	49.30	12.10
2015	7.10	6.25	5.60	5.69
2016	4.10	5.56	3.76	2.86
2017	2.16	2.25	1.90	1.60
2018	2.30	18.63	56.30	13.10
2019	3.54	21.35	234.00	171.00



Turbidity: - Turbidity is a measure of water clarity in streams, lakes and the ocean. Turbidity describes the amount of light scattered or blocked by suspended particles in water sample. Clear water has low turbidity and cloudy or murky water has higher turbidity level. Turbidity is caused by particles of soil, organic matter, metals or similar matter suspended in the water column.

Materials that cause water to become turbid include:

- Clay
- Silt
- Finely dissolved organic and inorganic material
- Microorganism such as bacteria and viruses

Watersheds may have diverse physical landscape features that can affect the amount of suspended material in the water making it cloudy or turbid. Natural sources of material include sediments from the weathering rocks (e.g, glacial outwash), dead plant material and phytoplankton. Man-made sources include substances in storm water from urban areas(e.g, roads, parking lots), upland industrial activities, construction and land clearing and activities occurring directly in water bodies such as power boat use and vehicle use. Turbidity may vary over time, seasonally or on a geographical basis depending on differences in precipitation, gradient (slope), geology, flow and disturbances such as landslides.

Effects of turbidity on fish:-

Organisms, including fish are generally adapted to the levels of turbidity naturally found in the specific water bodies they inhabit. While some turbidity is natural and not dangerous to fish (e.g glacially influenced streams). The unnatural increase in turbidity level can interfere with fishes' ability to find food and to avoid predators. Algae, a primary source of food for certain fishes and macro- invertebrates, are affected because turbidity reduces its growth rate due to decrease in light availability for photosynthesis. Turbidity also increases water temperature because suspended particles absorb heat. Higher temperatures can result in lower dissolved oxygen in the water and can cause physical stress on fishes and decreases egg survival rates. Excessive sediments found in highly turbid water can clog the gills of fishes and bury bottom dwelling creatures and fish eggs if it settles to the bottom.

High turbidity levels can reduce the amount of light reaching lower depths in water bodies like rivers, lakes and reservoirs inhibiting the growth of some forms of aquatic plants and negatively affecting the species that are dependent on them, like fish and shellfish. High turbidity levels can also affect the ability of fish gills to absorb dissolved oxygen.

Effects of turbidity on human:-

Particles in turbid water can carry disease causing pathogens or toxic pollutants. High turbidity in drinking water can shield bacteria or other organisms so that chlorine treatment in water treatment plants cannot disinfect the water effectively. Some pathogens found in water with high turbidity can cause symptoms such as nausea, cramps and headaches. Particles can also absorb toxic pollutants that may come from urban and industrial discharges and storm water runoff. Many common contaminants that increase turbidity can also change the taste and odor of water. Water that has high turbidity may cause staining or even clog pipes over time. It may also foul laundry and interfere with the proper functioning of dishwaters, hot water heaters, showerheads, etc.

Lower Human-caused Turbidity:-

The best approach to manage turbidity is to address its source. This includes reducing storm water run – off from roads, parking lots and upland industrial activities, restoring eroding stream and lake and applying industry- specific best management practices. These are the activities that help minimize the effects of a particular activity upon the environment. Examples include use of settling ponds, re-vegetating steep slopes, maintaining a minimum of 25 feet of vegetation around streams, lakes and other water bodies and maintaining all drainage systems.

Treatment of water if high in turbidity:-

- Microfiltration
- Chlorination
- Ozone treatment
- Distillation
- Aeration
- Reverse Osmosis

Trend shows increasing in general for all seasons but at higher rate for July & October.The turbidity value of river Dudhnoi lying from 0.70 NTU to 234.00 NTU shows that more turbidity is found in monsoon than in pre-monsoon due to high concentration of dissolve salts and suspended solids. The cause arise in the increasing of turbidity value is due to organism like phytoplankton can contribute to turbidity in open water. Erosion and effluent from highly urbanized zones contribute to turbidity of waters in those areas. Construction, mining and agriculture, disturb the soil and can lead to raised levels of sediment which run off to water ways

during storms. Storm water from paved surface like roads, bridges and parking lots also contribute to turbidity.

CONCLUSION

On careful study of the principal water quality of characteristics like temperature, pH, electrical conductivity, total dissolved solids and turbidity content etc. the water in the entire reach under study is found to be suitable for all purposes.

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REPORT ON WATER QUALITY OF SONAPUR ON RIVER DIGARU & BYRNIHAT ON RIVER UMTREW FOR TEMPERATURE, pH, ELECTRICAL CONDUCTIVITY, TDS AND TURBIDITY

W.E.F. 2008 TO 2019

B.K.DEKA
SR. R.A, MBD, CWC
GUWAHATI

SONAPUR GDSQ SITE ON RIVER DIGARU

INTRODUCTION:-

Digaru is a river originating in the Garo – Khasi hills of Meghalaya State in India, flowing towards the North East and then meeting the Kolong river and then merging with the Brahmaputra river. The name Digaru originated from a Kachari/ Mech word "Di" which means Water and Garo means the people living in the Garo hills. Hence Digaru literally means " water of the Garo".

The Digaru River is an alluvial river which itself is dynamic system that adjust their geometry according to differential rates of stream flow (discharge) and sediment load.

Rivers are the dynamic process which tends to change the channel morphology and hydrological characteristics by the process of erosion and deposition. Drainage basin as a whole or its sub-basins is considered one of the most fundamental geomorphic units. So the study of various properties of rivers and drainage basins is quite pertinent. Such a study is useful in ascertaining the stages of geomorphic evolution of different basins, topographic characteristics, and hydrological conditions of the concerned area which inturn will provide necessary input for catchment management strategies.

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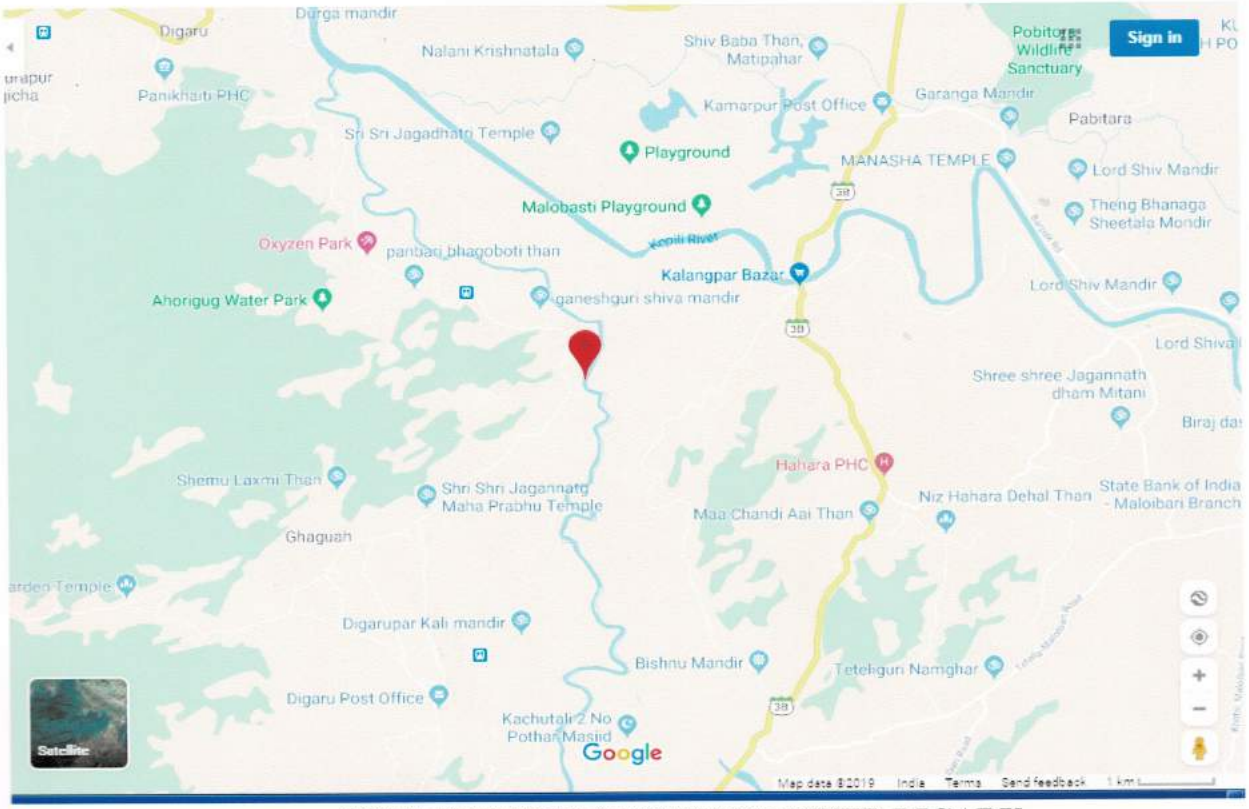
The Digaru River is an alluvial river which originates from the south-eastern slope of the Mishmi hills of Lohit district at a height of 3785m above MSL (Mean Sea Level) and flows over the unstable formation of the hilly tract with dynamic systems that is drained by numbers of intermountain river system with potential to bring about rapid changes in the landscapes. The major hazards related to this region are flood, landslides, bank-erosion and channel course shifting. Some of which are frequently recurrent and some are continuous. The cause for these may be due to the climatic conditions and more of less due to the basin physiography of the region. This river flows with high turbulent velocity during rainy season carrying sand and debris. Bank erosion and landslides are common phenomena of this region due to its meandering course and due to the loose and sandy soil types. Since the region is geologically very fragile, the runoff water comes into river with heavy silt and debris with turbulent flow, as a result river looks muddy and water level of the river bed use to raised up (mostly during monsoon) and flattened causing severe inundation to the nearby areas, having its negative impact on the socio-economic condition of the region. Due to steep gradient in the upper part the velocity of the river flow use to be very high during summer, which causes heavy erosion to the bank at various locations leading to broadening of channel, thereby threatening the very existence of the government and public properties, road communication, agricultural land, settlement areas etc. Numbers of the agricultural plots use to face loss of soil/natural fertile soil due to the erosion in the surrounding of the study area. These scenarios are very common and use to occur almost every year, posing a serious threat to the general ecology and environment of the region. In this regard we can talk about the most destructive events of the study area in a chronological manner to highlight the importance of the study.

The 1988 flood in the Digaru and its nearby areas, which was due to the continuous rain, wherein the whole region was inundated by the flood water of the Digaru and its intermountain streams causing damages to the anthropogenic factors of the region. The 2004 flash flood of Tebang Nallah, which was originally known as Sukha Nallah was a small gully, collecting rain water from the nearby catchment area of upper Loiliang village but during the flash flood of 2004, the course of Tebang Nallah (one of the tributary stream of Digaru river) has got diverted into it and thereby causing flood hazard to Danglat village. The 2012 flood, which is most recent devastating flood, reflects the continuous environmental impacts on the inhabitants of the region which was also due to the continuous rain and thereby causing the shifting of the course of the channel, posing serious threat to the ecological balance of the region The total length of the basin from its head to the point of its confluence with Lohit river is 50.8 meter. Though the Digaru basin covers a small area in context of the whole district i.e 11,402 sq.km (according to census report 2001), it is characterized by complex and intricate drainage system.

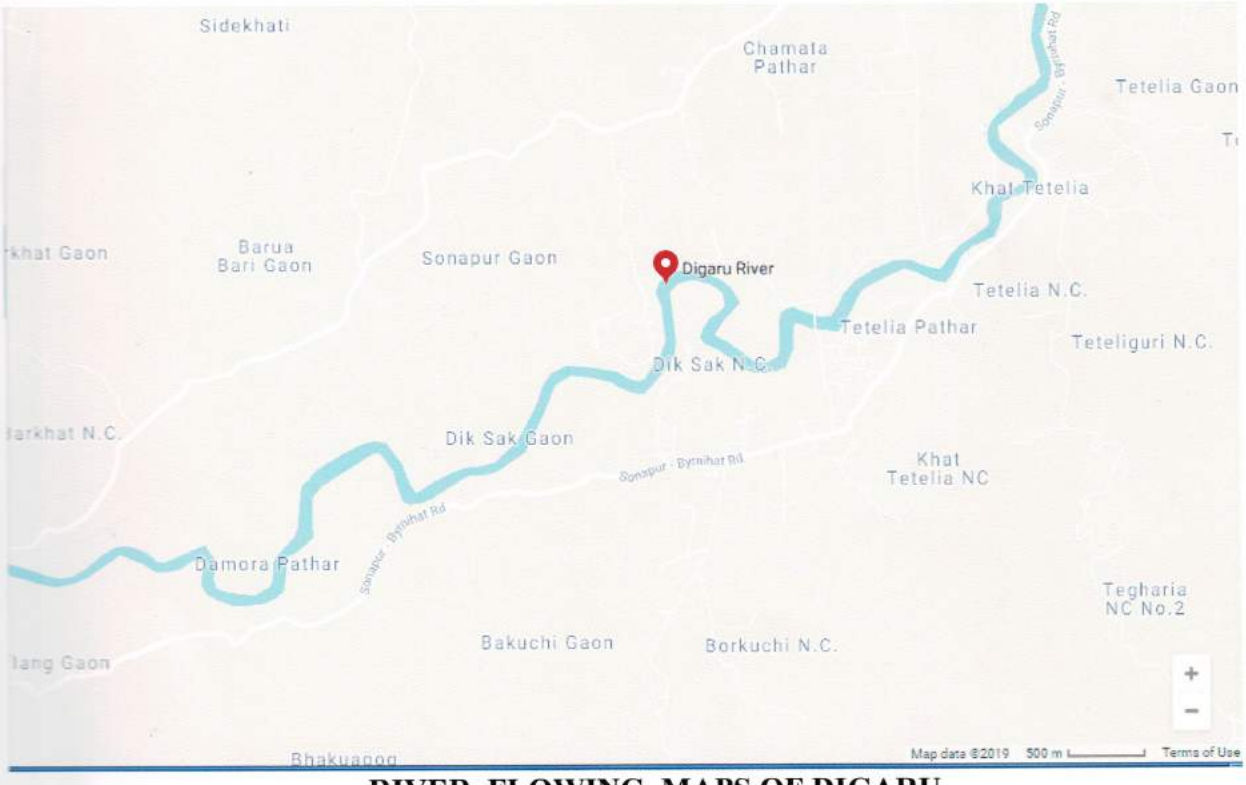
The water levels are observed by direct reading on vertical wooden staff gauge located at station gauge line and 300 m U/S and 200 m D/S of station gauge line. The depths are measured by sounding with 10 to 20 kg fish weight from Bridge. Current meter is dropped for taking velocity at 0.6d below the water surface from Bridge. Discharge is computed using "Area-Velocity Method".

Sediment samples are collected with Punjab type silt sampler and one litre capacity metallic bottle at every R.D. and kept in enamelled buckets. After conducting observation samples are brought at the site laboratory where Coarse, Medium and Fine sediment are analysed.

Water quality samples are collected four times in a year, till July 2019 and from August 2019 monthly collected and it is a trend station. The collection points in the river are so chosen that flow is free from disturbances like stagnant pools, heavy growth of weeds or fungus and sampling points are generally in the maximum flow zone. Samples are collected well 30 cm below the surface and are transferred to prerinsed clean polythene bottle of one litre capacity and are filled normally to the brim and sent to the Divisional Laboratory for analysis of various physical and chemical parameters.



SONAPUR SITE OF CWC ON RIVER DIGARU



RIVER FLOWING MAPS OF DIGARU

The co- relation between temperature and pH value of water:

Temperature plays a significant role on pH measurement. As the temperature raises, molecular vibrations increase which results in the ability of water to ionize and form more hydrogen ions. As a result, the pH will drop. The dissociationof water into hydrogen and hydroxide ion can be represented as :

$$H_2O(I) = H^+ (aq) + OH^- (aq)$$

Every solution will undergo a change in their pH value through changes in temperature. A difference in pH measurements at different temperature is not an error, The new pH level simply tells about the true pH for that solution at that specific temperature.

The value of Kw (water ionization constant) and pH with increasing temperature

T (^{o} C)	Kw ($mol^2\ dm^6$)	pH
0	0.114×10^{-14}	7.47
25	1.008×10^{-14}	7.00
50	5.476×10^{-14}	6.63
100	51.3×10^{-14}	6.14

It is clearly evident from the table that the pH pf water at 0^o C is 7.47 , but the same water at 100^o C will have a pH of 6.14

A pH value without a temperature value is meaningless .So, the pH of water sample should be tested on site at the source of the sample at that particular temperature to achieve highest accuracy of pH value.

So, as it is observed that the average temperature of water sample of Sonapur site on river Digaru varies from 20^o C to 25^o C and pH value of the water sample of Sonapur site co-relate with the temperature accordingly and within the tolerance limit of pH (6.5 to 8.5) and there is no drastic changes in the pH value w.e.f 2008 to 2018.

Water Quality : Turbidity & Conductivity:

Turbidity measures the cloudiness caused by the presence of suspended solids, such as clay and silt particles from erosion or runoff, re-suspended bottom sediments & microscopic organisms in the water. The greater the amount of total suspended solids in the water (not to be confused with total dissolved solids),the murkier water appears and the higher the measured turbidity.

Turbidity can greatly affect water quality in many ways. Some examples include reducing the amount of light available for plant growth, damaging sensitive gill structures in fish and aquatic organisms, as well as increasing their susceptibility to disease, and preventing proper egg and larval development.

Conductivity and Total Dissolved solids -Conductivity is a measure of how well water can transmit electrical current. In the Lake Roosevelt watershed, conductivity is primarily used to determine the mineralization of water (commonly called total dissolved solids).Information from the amount of total dissolved solids can be used to determine changes in water at different time of the year and can also be used to determine certain physiological effects on plants and animals.

Importance of conductivity and Total dissolved solid :

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge), Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25 degrees Celsius(25°C).

Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize(dissolved into ionic components)when washed into the water. On the other hand, streams that run through areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water. Ground water inflows canhave the same effects depending on the bedrock they flow through.

Discharges to streams can change the conductivity depending on their make-up. A failing sewage system would raise the conductivity because of the presence of chloride, phosphate, and nitrate; an oil spill would lower the conductivity.

The basic unit of measurement of conductivity is the mho or Siemens. conductivity is measured in micromhos per centimeter (μmhos/cm)or microsiemens per centimeter (μ s/cm). Distilled water has a conductivity in the range of 0.5 to 3 μmhos/cm.

Inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500μ mhos/cm. Conductivity outside this range could indicate that the water is not suitable for certain species of fish or macroinvertebrates. Industrial waters can range as high as 10,000μ mhos/cm.

So, it is seen that electrical conductivity (EC) and the Total Dissolved Solid (TDS) of Sonapur site on river Digaru are within the tolerance limit depending on each other. Hence the water can be used for various purposes as and when requred with proper treatment. As per with the BIS , it also satisfies the tolerance limit for all classes of water A,B,C,D&E. (**Class A:** -Drinking water source without conventional treatment but after disinfections; **Class B:** - Outdoors bathing: **Class C:** - Drinking water source with conventional treatment followed by dis-infection; **Class D:** - Fish culture and wild life propagation; **Class E:** - Irrigation, industrial cooling and controlled waste disposal.) Hence the water of Sonapur on river Digaru can be used all above purposes as and when required.

Effects of Turbidity & suspended solids :

Turbidity and total suspended solids refer to particles present in the water column. Turbidity and water clarity are both visual properties of water based on light scattering and attenuation. All three parameters are related to particles in the water column, whether directly or in directly.

Turbidity is determined by the amount of light scattered off of these particles. While this measurement can then be used to estimate the total dissolved solids concentration, it will not be exact. Turbidity does not include any settled solids or bedload (sediment that "rolls" along the riverbed).In addition, turbidity measurements may be affected by colored dissolved organic matter. While this dissolved matter is not included in TSS measurements, it can cause artificially low turbidity readings as it absorbs light instead of scattering it.

Total suspended solids, on the other hand, are a total quantity measurement of solid material per volume of water. This means that TSS is a specific measurement of all suspended solids, organic and inorganic , by mass.TSS includes settleable solids, and is the direct measurement of the total solids present in a water body. As such, TSS can be used to calculate sedimentation rates, while turbidity cannot.

Water clarity is strictly relative to sunlight penetration. While this is usually determined by the amount of suspended solids in water, it can also be affected by dyes, humic acid and other dissolved solids. Water clarity is the most subjective measurement of the these three parameters, as it is usually determined by human observation.

Importance of Turbidity and Total Suspended Solids:

Turbidity and TSS are the most visible indicators of water quality. These suspended particles can come from soil erosion, runoff, discharges, stirred bottom sediments or algal blooms. While it is possible for some steams to have naturally high levels of suspended solids, clear water is usually considered an indicator of healthy water. A sudden increase in turbidity in a previously clear body of water is a cause for concern. Excessive suspended sediment can impair water quality for aquatic and human life, impede navigation and increase flooding risks.

Water Chemistry:

In terms of water quality, high levels of total suspended solids will increase water temperatures and decrease dissolved oxygen(DO)levels. This is because suspended particles absorb more heat from solar radiation than water molecules will. This heat is the transferred to the surrounding water by conduction. Warmer water cannot hold as much dissolved oxygen as colder water, so DO levels will drop. In addition, the increased surface temperature can cause stratification, or layering ,of a body of water. When water stratifies, the upper and lower layers do not mix. As decomposition and respiration often occur in the lower layers, they can become too hypoxic (low dissolved oxygen levels)for organisms to survive.

Photosynthesis Production:

Turbidity can also inhibit photosynthesis by blocking sunlight .Halted or reduced photosynthesis means a decrease in plant survival and decreased dissolved oxygen output. The higher the turbidity levels, the less light that can reach the lower levels of water. This reduces plant productivity at the bottom of an ocean, lake or river. Without the needed sunlight, seaweed and bay grasses below the water's surface will not be able to continue photosynthesis and may die.

Under water vegetation die-off has two main effects. First, as photosynthetic processes decrease, less dissolved oxygen is produced, thus further reducing DO levels in a body of water. The subsequent decomposition of the organic material can drop dissolved oxygen levels even lower. Second, seaweed and underwater plants are necessary food sources for many aquatic organisms. As they die off, the amount of vegetation available for other aquatic life to feed on is reduced. This can cause population declines up the food chain.

Erosion:

An increase in turbidity can also indicate increased erosion of stream banks, which may have a long-term effect on a body of water. Erosion reduces habitat quality for fish and other organisms. In terms of water clarity, reduced light penetration due to suspended sediment can obscure aquatic organisms' vision, reducing their ability to find food. These suspended particles can also clog fish gills and affect growth rates.

Erosion can contribute to shallower, filled-in lakes and streams as some of the suspended particles settle out. These settleable solids can suffocate benthic organisms and fish eggs. In addition, the sediment may smother insect larvae and other fish food sources. When this occurs in rivers and channels, the increased sediment loads can reduce navigability for ships and boats. In cases of excessive sedimentation, settleable solids from eroson and runoff can even halt freight passage completely.

Co-relation between the Turbidity , TDS & EC:

It is seen from the data available w.e.f. 20058 to 2019 the higher value of turbidity has some direct and some indirect impact on TDS(total dissolved solid) and EC (electrical conductivity). Turbidity at Sonapur site on river Digaru raises during the monsoon period as due to high rain fall at upstream, lots of mud, silt and other particles which carries by the river Digaru river raises the value of turbidity, otherwise the value of turbidity at Sonapur site are well within the limit during the non monsoon period provided there are no high rain fall at upstream of the river Digaru and its enclosure areas prior to the Sonapur site.

So, it is seen that electrical conductivity (EC) , Total Dissolved Solid (TDS) and Tubidity of Sonapur site on river Digaru are within the tolerance limit depending on each other. Hence the water can be used for various purposes as and when requred with proper treatment. As per with the BIS , it also satisfies the tolerance limit for all classes of water A,B,C,D&E. (**Class A:** -Drinking water source without conventional treatment but after disinfections; **Class B:** - Outdoors bathing: **Class C:** - Drinking water source with conventional treatment followed by dis-infection; **Class D:** - Fish culture and wild life propagation; **Class E:** - Irrigation, industrial cooling and controlled waste disposal.) Hence the water of Sonapur on river Digaru can be used all above purposes as and when required.

REGARDING CLASSIFICATION OF WATERS: A, B, C, D&E

Requirement of pH value, dissolved oxygen, bio-chemical oxygen demand and total coliforms for classes A, B and C, requirements of pH value, dissolved oxygen and free ammonia for class D and requirements of pH value, electrical conductance and sodium absorption ratio for Central Board for the prevention and control of water pollution for the respective classes.

Class A: - Drinking water source without conventional treatment but after disinfections;

Class B: - Outdoors bathing:

Class C: - Drinking water source with conventional treatment followed by dis-infection;

Class D: - Fish culture and wild life propagation;

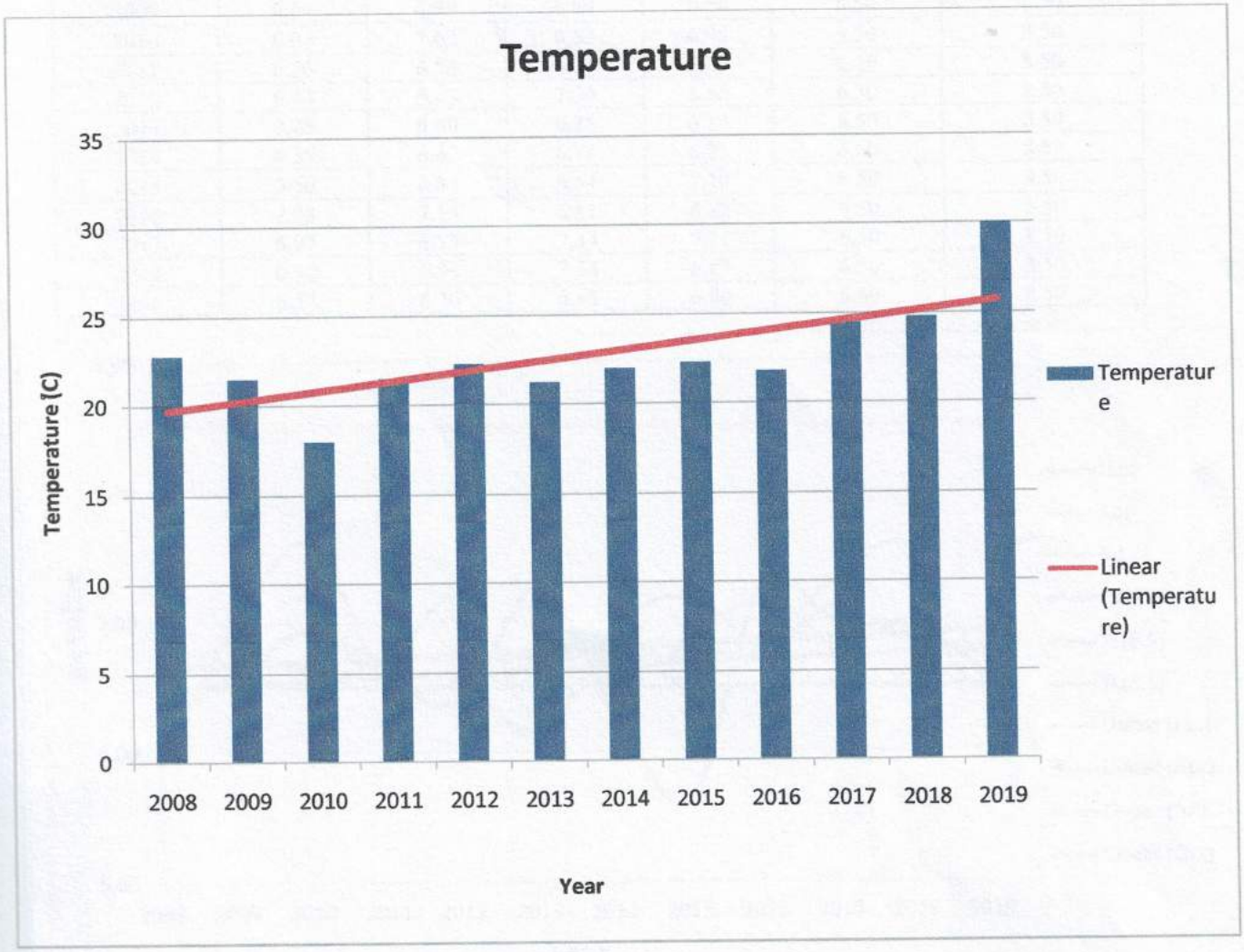
Class E: - Irrigation, industrial cooling and controlled waste disposal.

TOLERANCE LIMITS FOR CLASS A, B, C, D & E WATER

Sl.No.	*Characteristics/unit*	*Class A TL*	*Class B TL*	*Class C TL*	*Class D TL*	*Class E TL*
1.	PH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	D.O mg/l	6	5	4	4	-
3.	Taste	Tasteless	-	-	-	-
4.	Odour Hazen unit	Unobjectionable	-	-	-	-
5.	T.D.S mg/l	500	-	-	-	2100
6.	EC in mhos/cm	-	--	-	$1000x10^{-6}$	$225x10^{-6}$
7.	Total Hardness mg/l	300	-	-	-	-
8.	Calcium mg/l	200	-	-	-	-
9.	Magnesium mg/l	100	-	-	-	-
10.	Iron mg/l	0.3	-	50	-	-
11.	Chloride mg/l	250	-	600	-	600
12.	Sulphate mg/l	400	-	400	-	1000
13.	Nitrate mg/l	20	-	50	-	-
14	Fluorides mg/l	1.5	1.5	1.5	-	-

T.L: - Tolerance Limit. ******* This is as per IS: 2296-1982.

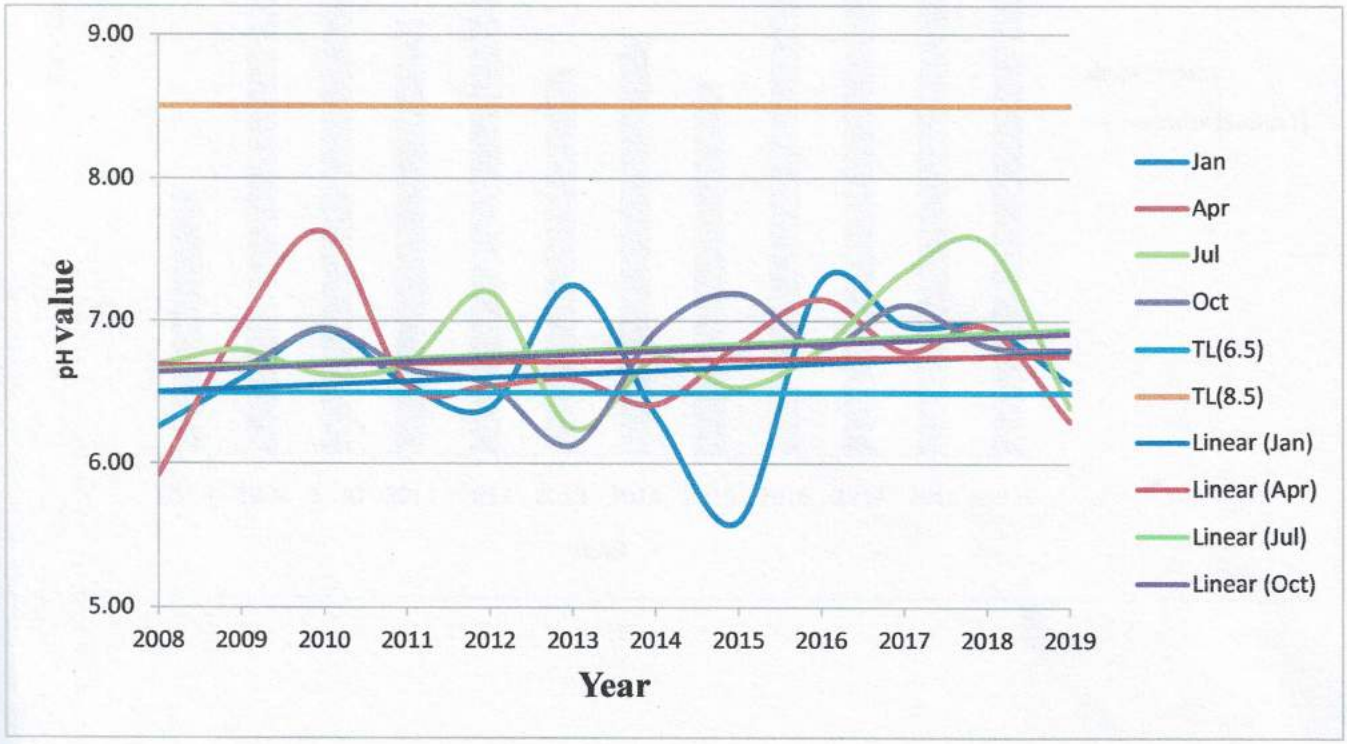
Average Temperature of Sonpur site on river Digaru w.e.f. 2008 to 2019



2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
22.8	21.5	20.8	21.5	22.3	21.3	22.0	22.3	21.8	24.5	24.8	23.9

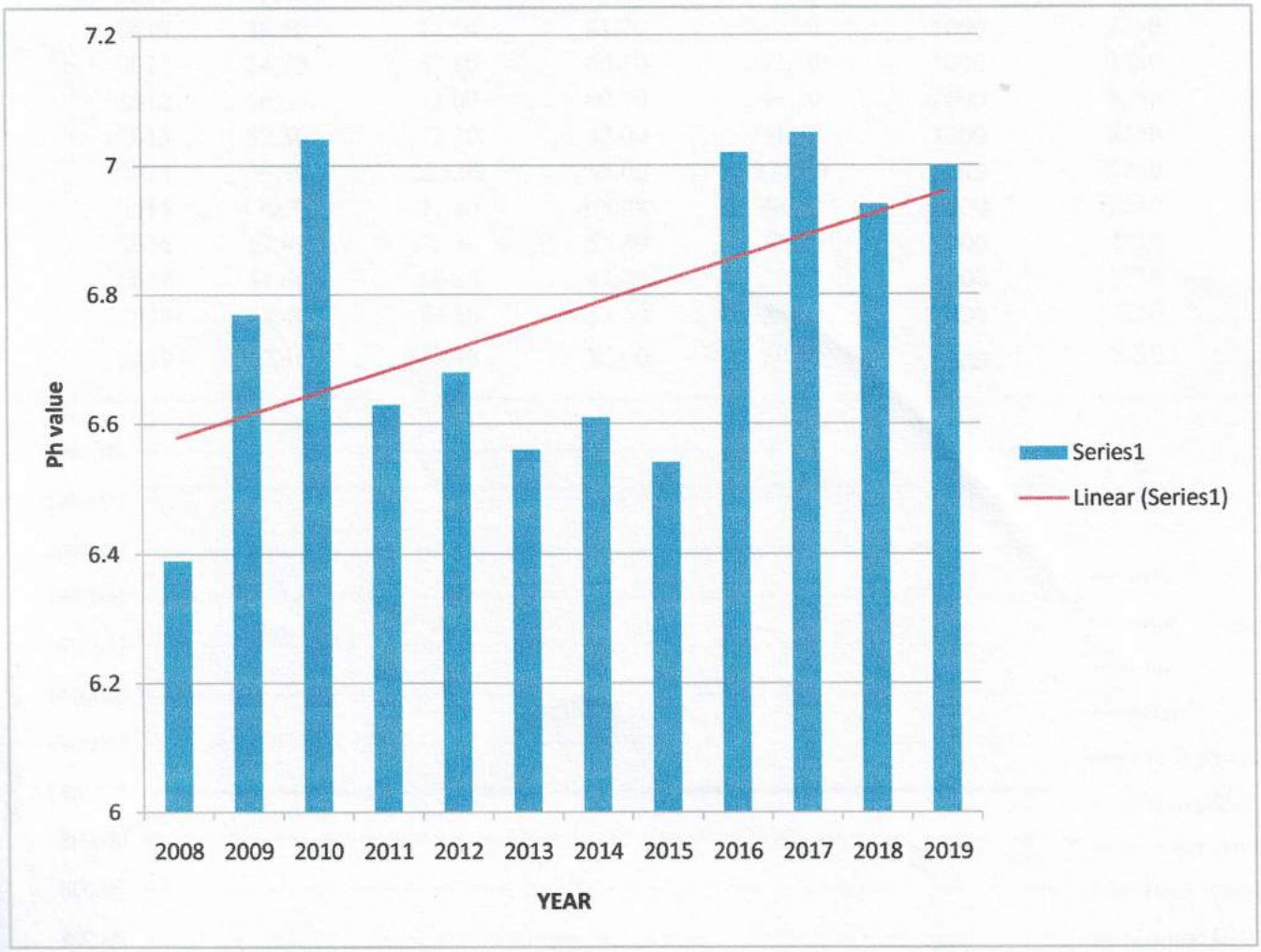
pH value of Sonapur site on river Digaru w.e.f 2008- 2019

Year	Jan	Apr	Jul	Oct	TL(6.5)	TL(8.5)
2008	6.26	5.92	6.70	6.70	6.50	8.50
2009	6.60	6.98	6.80	6.68	6.50	8.50
2010	6.94	7.62	6.63	6.95	6.50	8.50
2011	6.56	6.56	6.71	6.67	6.50	8.50
2012	6.40	6.55	7.20	6.56	6.50	8.50
2013	7.25	6.60	6.25	6.13	6.50	8.50
2014	6.35	6.42	6.74	6.93	6.50	8.50
2015	5.60	6.84	6.54	7.19	6.50	8.50
2016	7.28	7.15	6.81	6.82	6.50	8.50
2017	6.97	6.79	7.34	7.11	6.50	8.50
2018	6.96	6.96	7.54	6.83	6.50	8.50
2019	6.57	6.30	6.40	6.80	6.50	8.50



pH value of Sonapur site of M.B.Division, CWC, Guwahati, Assam on river Digaru varies from 5.60 to 7.54 w.e.f. 2008 to 2019 (12 years). The trend line of each period shows pH concentration of river Digaru at Sonapur site remains with in the pH value of 6.00 to 8.00 which shows that it comes well within the tolerance limit of 6.5 to 8.5 as per with the BIS .So, it can be assumed that if no untoward activities takes place on the upstream of the river Digaru, the trend of pH value of the river will remain within the limit as mentioned in coming years.It also satisfies the tolerance limit of pH for all classes of water A,B,C,D&E. (**Class A:** -Drinking water source without conventional treatment but after disinfections; **Class B:** - Outdoors bathing: **Class C:** - Drinking water source with conventional treatment followed by dis-infection; **Class D:** - Fish culture and wild life propagation; **Class E:** - Irrigation, industrial cooling and controlled waste disposal.) Hence the water of Sonapur on river Digaru can be used all above purposes as and when required.

Average pH value of Sonapur site on river Digaru w.e.f. 2008 – 2019

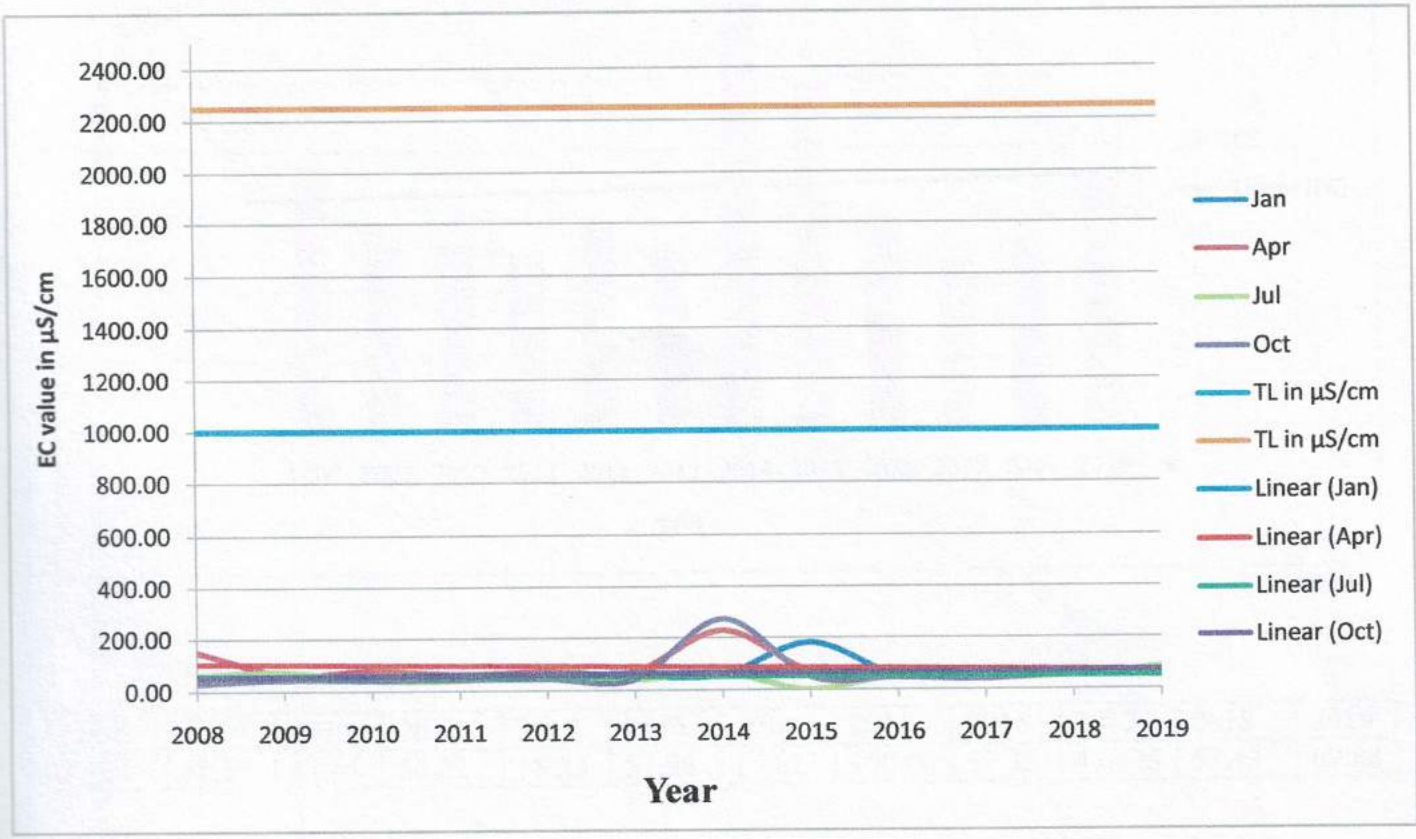


2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
6.39	6.77	7.04	6.63	6.68	6.56	6.61	6.54	7.02	7.05	6.94	7.00

The average pH value of Sonapur site on river Digaru varies from 6.39 to 7.05 which is well within the tolerance limit of ph (6.5 to 8.5) as per with BIS. It also satisfies the tolerance limit of pH for all classes of water i.e A,B,C,D & E.

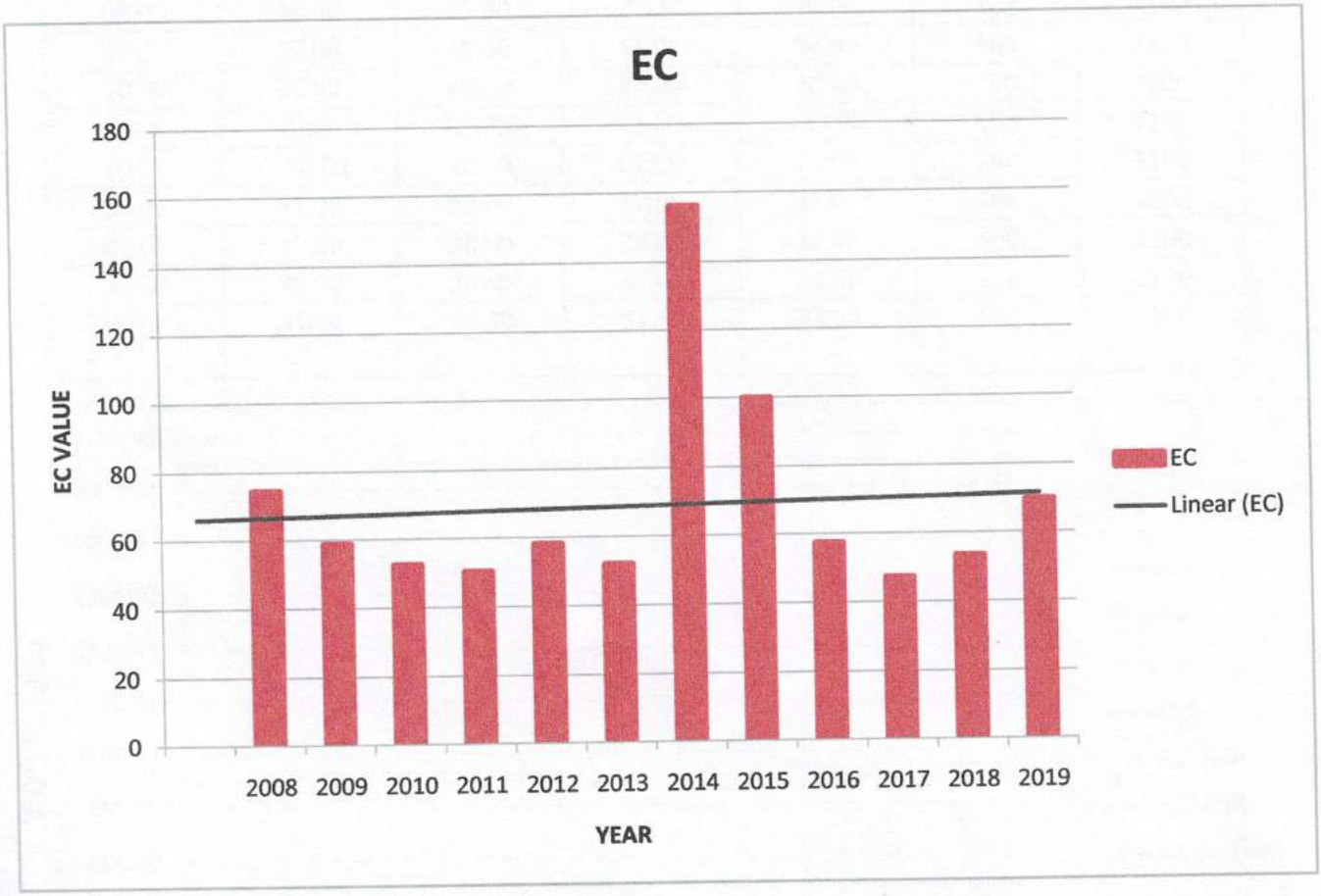
EC value of Sonapur site on river Digaru w.e.f. 2008-2019

Year	Jan	Apr	Jul	Oct	TL in µS/cm	TL in µS/cm
2008	56.10	149.80	62.30	30.30	1000	2250
2009	52.80	63.60	73.70	45.20	1000	2250
2010	48.60	77.50	41.70	42.00	1000	2250
2011	54.70	62.40	40.10	43.70	1000	2250
2012	56.00	72.00	60.70	44.20	1000	2250
2013	52.30	72.20	42.00	41.40	1000	2250
2014	59.50	228.00	65.00	272.00	1000	2250
2015	179.70	71.40	100.00	48.90	1000	2250
2016	52.90	75.30	55.40	45.80	1000	2250
2017	51.60	56.20	41.90	39.30	1000	2250
2018	54.40	54.40	52.60	56.60	1000	2250
2019	62.10	75.10	82.60	50.60	1000	2250



EC value of Sonapur site of M.B.Division, CWC, Guwahati, Assam on river Digaru varies from 30.30 to 272.00 w.e.f. 2008 to 2019 (12 years). The trend line shows EC concentration of river Digaru at Sonapur site remains with in the value of 30.00 to 280.00 µmhos/cm which shows that it comes well within the tolerance limit of 1000 to 2250 µmhos/cm as per with the BIS , it also satisfies the tolerance limit of EC for all classes of water A,B,C,D&E. (**Class A:** -Drinking water source without conventional treatment but after disinfections; **Class B:** - Outdoors bathing: **Class C:** - Drinking water source with conventional treatment followed by dis-infection; **Class D:** - Fish culture and wild life propagation; **Class E:** - Irrigation, industrial cooling and controlled waste disposal.) Hence the water of Byrnihat on river Umtrew can be used all above purposes as and when required

Average EC value of Sonpur site on river Digaru w.e.f. 2008 to 2019

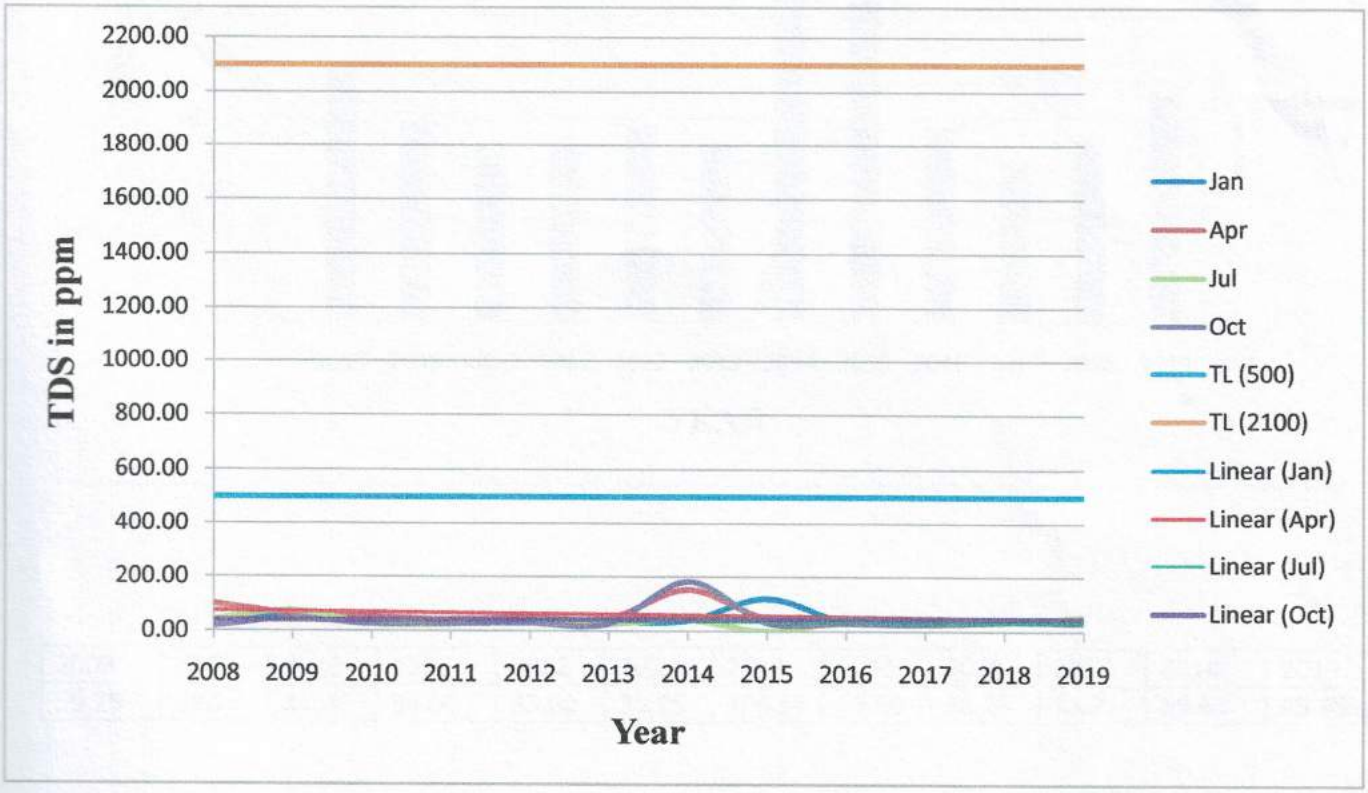


2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
74.63	58.83	52.45	50.22	58.23	51.98	156.13	100.00	57.35	470.25	53.43	69.88

The average EC value of Sonapur site on river Digaru varies from 50.22 to 470.25 which is well within the tolerance limit of EC (1000 to 2250 µmhos/cm) as per with BIS. It also satisfies the tolerance limit of pH for all classes of water i.e A,B,C,D & E.

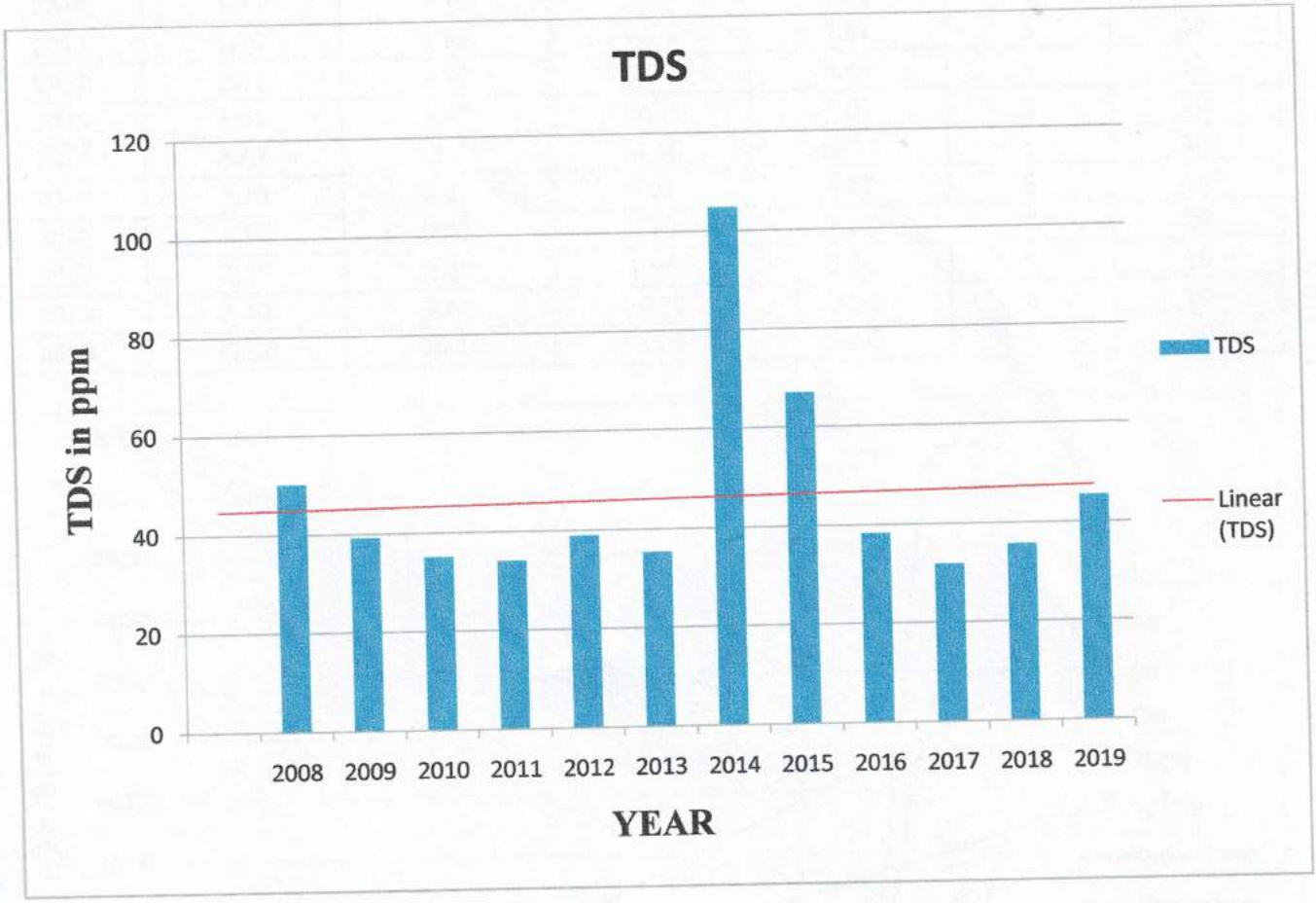
TDS value of Sonapur site on river Digaru w.e.f. 2008-2019

Year	Jan	Apr	Jul	Oct	TL (500)	TL (2100)
2008	38.00	101.00	42.00	20.00	500	2100
2009	52.80	63.60	73.70	45.20	500	2100
2010	32.00	52.00	28.00	28.00	500	2100
2011	38.00	42.00	27.00	29.00	500	2100
2012	37.00	48.00	41.00	30.00	500	2100
2013	36.00	48.00	29.00	28.00	500	2100
2014	40.00	153.00	43.00	183.00	500	2100
2015	120.00	48.00	67.00	33.00	500	2100
2016	35.00	50.00	37.00	31.00	500	2100
2017	35.00	38.00	28.00	26.00	500	2100
2018	36.00	36.00	35.00	37.00	500	2100
2019	41.00	48.80	53.60	32.80	500	2100



The TDS value of Sonapur site on river Digaru varies from 20.00 to 183.00 ppm which is well within the tolerance limit of TDS (500 to 2100 ppm) as per with BIS. It also satisfies the tolerance limit of pH for all classes of water i.e A,B,C,D & E.

Average TDS value of Sonpur site on river Digaru w.e.f. 2008 to 2019

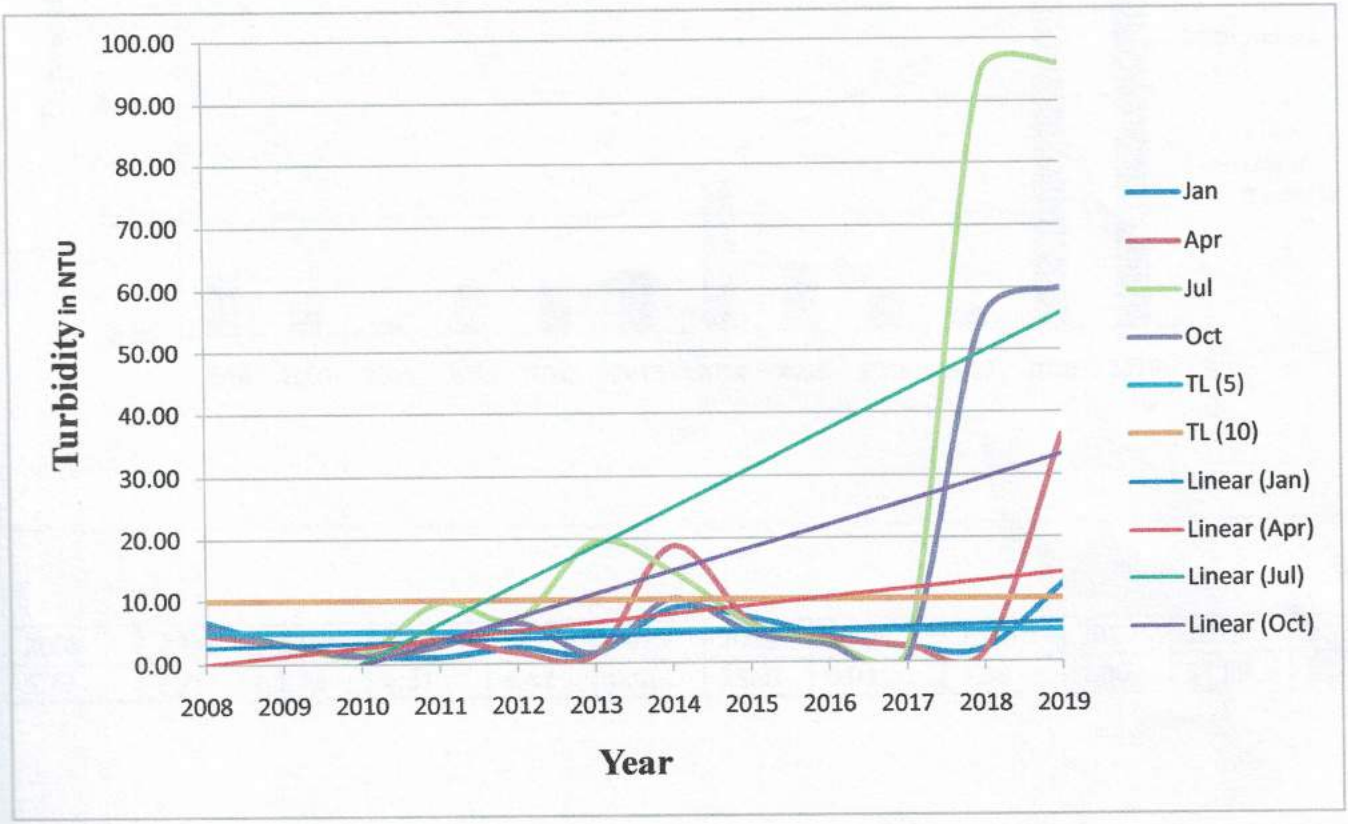


2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
50.25	39.25	35.00	34.00	39.00	35.25	104.80	67.00	38.25	31.75	35.63	45.45

The average TDS value of Sonapur site on river Digaru varies from 34.00 to 14.80 ppm which is well within the tolerance limit of TDS (500 to 2100 ppm) as per with BIS. It also satisfies the tolerance limit of pH for all classes of water i.e A,B,C,D & E.

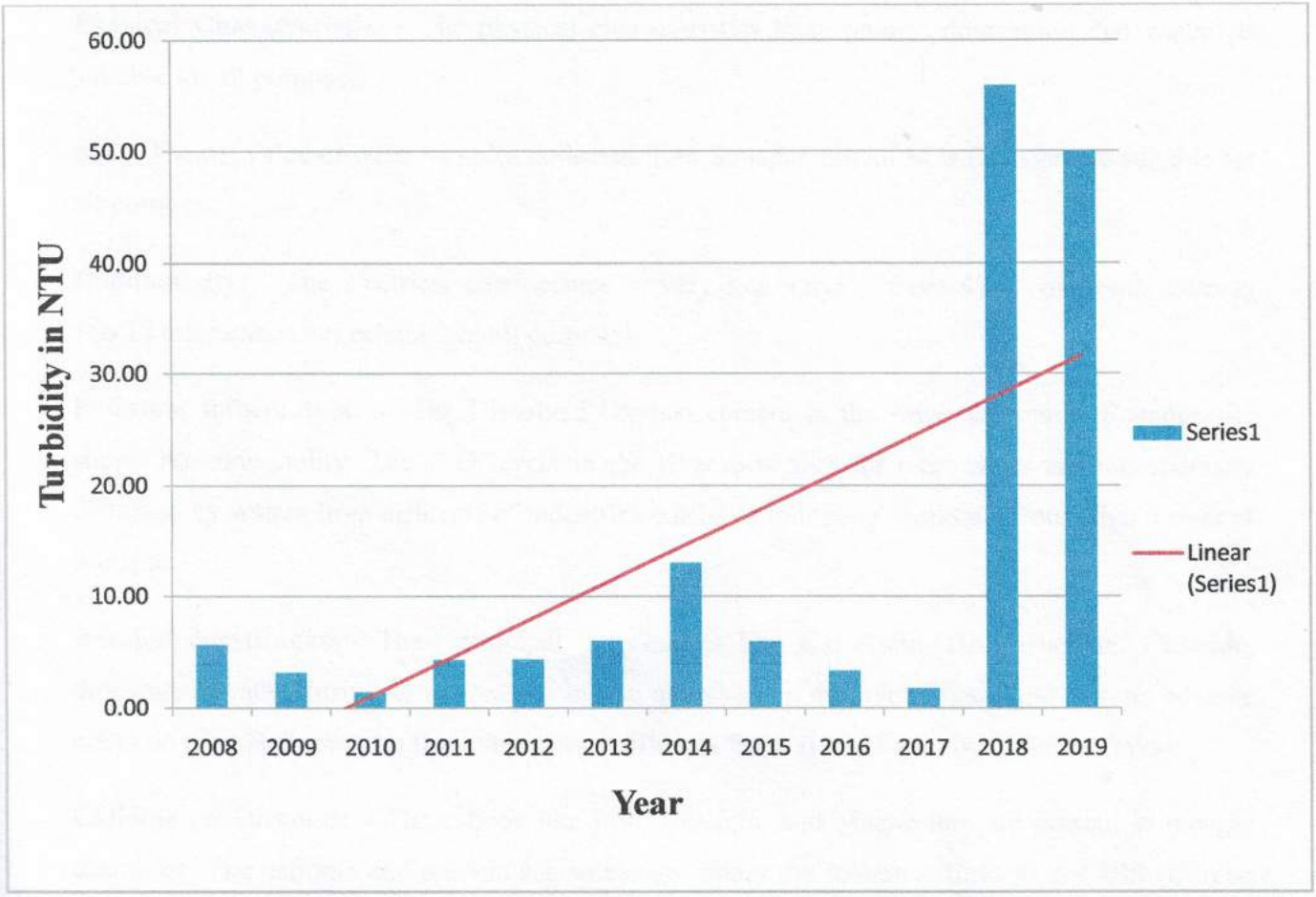
Turbidity value of Sonapur site on river Digaru w.e.f. 2008-2019

Year	Jan	Apr	Jul	Oct	TL (5)	TL (10)
2008	6.70	4.70	5.70	5.70	5	10
2009	3.21	3.21	3.21	3.21	5	10
2010	1.45	1.45	1.60	1.30	5	10
2011	1.10	3.87	9.70	2.81	5	10
2012	2.51	1.77	6.96	6.44	5	10
2013	1.60	1.47	19.51	1.65	5	10
2014	8.67	18.72	14.50	10.15	5	10
2015	7.10	6.25	6.01	4.67	5	10
2016	4.10	3.65	3.10	2.67	5	10
2017	2.35	2.45	1.95	0.50	5	10
2018	2.10	1.67	94.20	55.10	5	10
2019	12.30	36.24	96.00	60.00	5	10



The Turbidity value of Sonapur site on river Digaru varies from 0.84 to 174.00 which shows some values are within the tolerance limit of Turbidity (5 to 10 NTU) as per with BIS. But when rainfall rises at the upstream of the river, the value of turbidity exceeds the limit due to the high water velocity which brings lots of silt and mud along with its flow, but when the same water sample is filtered the water become clear and the turbidity remain within limit . which satisfies the tolerance limit of turbidity for all classes of water i.e A,B,C,D & E.

Average Turbidity value of Sonpur site on river Digaru w.e.f. 2008 to 2019



2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
5.70	3.21	1.45	4.37	4.42	6.06	13.01	6.01	3.38	1.80	55.99	50.04

The average Turbidity value of Sonapur site on river Digaru varies from 1.45 to 55.99 which shows some values within the tolerance limit of Turbidity (5 to 10 NTU) as per with BIS. But when rainfall rises at the upstream of the river the limit of turbidity exceeds the limit due to the high water velocity which brings lots of silt and mud along with its flow, but when the same water sample is filtered the water become clear and the turbidity remain within limit . Then it satisfies the tolerance limit of turbidity for all classes of water i.e A,B,C,D & E.

Water quality scenario of water of Digaru river at Sonapur site:-

Physical Characteristic: - The physical characteristics like colour, odour show that water is suitable for all purposes.

pH :- The pH value **of** water samples collected from Sonapur site of M.B.Division are suitable for all purposes.

Conductivity: - The electrical conductance is very low varying from 47.25 micromhos/cm to 156.13 micromhos/cm suitable for all purposes.

Pollution information: - The Dissolved Oxygen content in the water sample of Sonapur site shows no abnormality. The D.O levels in the river Brahmuputra river water are not seriously disturbed by waters from effluents of industries outfits or municipal disposals from Digaru river at Sonapur.

Anionic constituents:- The principal constituents like Carbonate, Bi- carbonate, Chloride, Sulphate, Nitrate, Nitrite etc are present in less quantities in the river Digaru and has no adverse effect on river Brahmuputra from the various effluents from river Digaru by different ways.

Cationic constituents: - The cations like Iron, Calcium, and Magnesium are present in meager quantities. The cationic and anionic sequences are under the tolerance limit as per BIS (Bureau Indian Standard).

Hardness No.:- The river water sample Digaru at Sonapur is soft to slightly hard and can be considered as useful for all purposes.

Alkali metals: - Sodium and Potassium are well within prescribed limits as per BIS (Bureau Indian Standard).

S.A.R:- Sodium Absorption Ratio values are low the sodium content of the river may not pose any problem.

On careful study of the principal water quality of characteristics like pH, conductivity, hardness dissolved oxygen content etc the water in the entire reach under study is found to be suitable for all purposes.

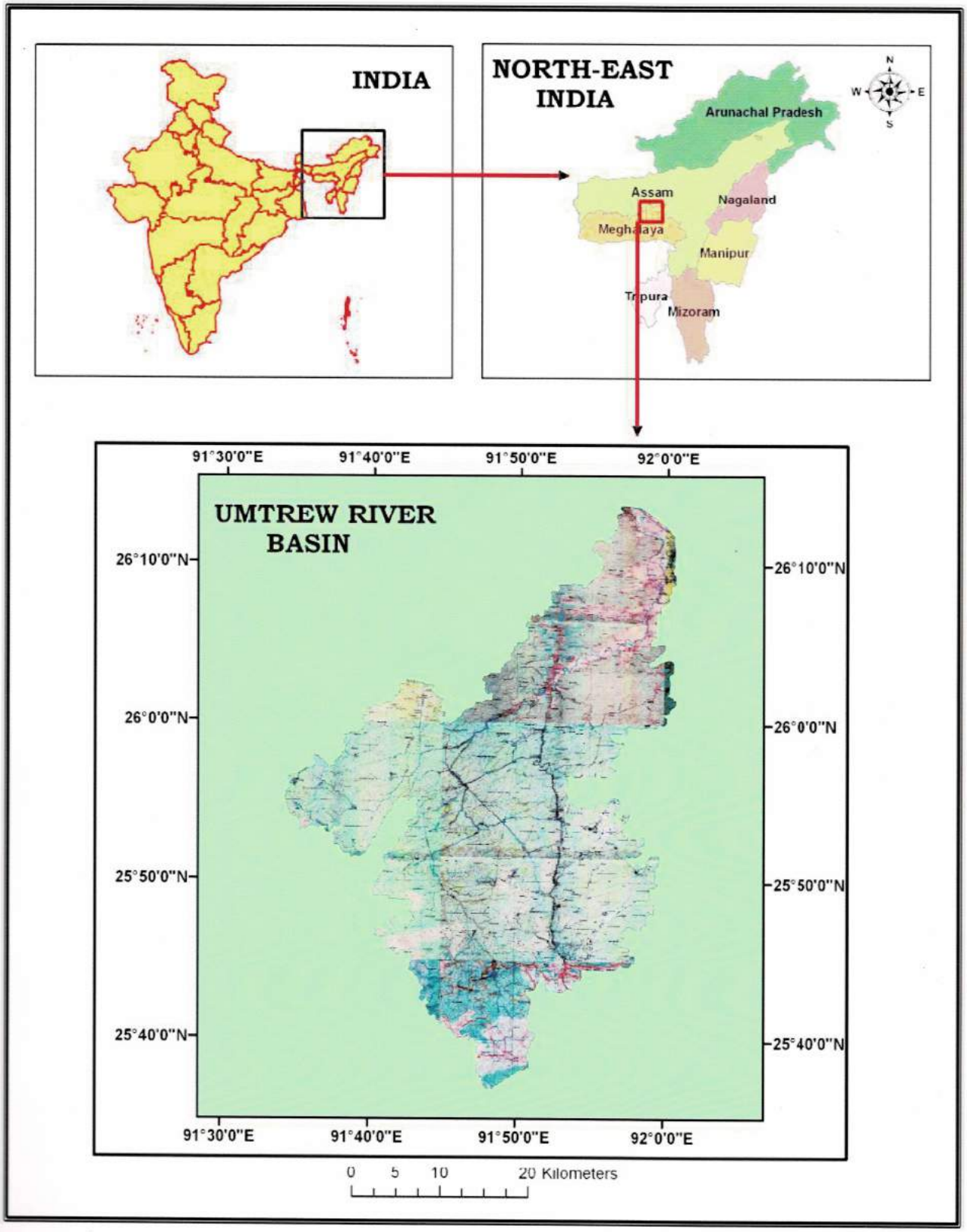
REPORT ON BYRNIHAT SITE OF RIVER UMTREW

INTRODUCTION:-

A drainage basin in a mountainous region has a direct impact on its physical, environmental and ecological setup as it is the source of human beings fundamental needs. Umtrew river basin is spreading over the Indian states of Meghalaya and Assam is located between 25°35'15'' to 26°14'18''N latitude and 91°35'17''to 92°00'15''E longitude. The river Umtrew is one of the major drainage systems in Meghalaya plateau, it originates in Meghalaya and flows down to Assam plain and merges with mighty Brahmaputra. Modern tools i.e. remote sensing and GIS techniques have been used to analyze the basin characteristics. Various thematic maps like Contour, Drainage, Road Network, Settlement, Land capability and Land Use/Land cover have been prepared to highlight the present scenario of the study site. Satellite image of 2004, 2007 and 2010 were used to understand the land use/land cover change in the basin area. Result shows that there is a decrease of 5.93% of semi evergreen forest from 2004 to 2010. This paper also attempts to identify the land use / land cover change pattern of the basin from 2004 to 2010.

River Umtrew and its tributaries has a basin area of 1369.6 km2 and most of its part falls under the northern hill ranges of Meghalaya plateau and rest is under the low lying areas of Brahmaputra plain (Figure 1). The catchment area lies between 25°40'00'' N to 26°10'00''N latitude and 91°30'00'' E to 92°00'00''E longitude (location map). The topography is undulating having elevation of 171 m in the plains of Assam and about 1799 m at highest peak of basin area. Physiographically, Umtrew basin has two regions such as (i) Hilly Southern region and (ii) Northern plains. However, the presence of Umtrew dam, a project for generation of hydro power has brought a drastic hydrological and environmental change in the lower reach of the basin area. Umtrew river basin comprises of the elongated hilly terrain of different altitudes along with inter-mountain deep gorges, small stretch of plains and marshy areas. A sub-tropical climate is dominant in the areas adjacent to Assam to a temperate climate in the upper reaches close to East Khasi hills. The rock formation includes Shillong group of rocks which comprises of Phyllites, Quartz schists, Quartzite and Intra formational conglomerates in the Meghalaya part of the basin to unconsolidated alluvium sediments in the plain land areas of Assam.

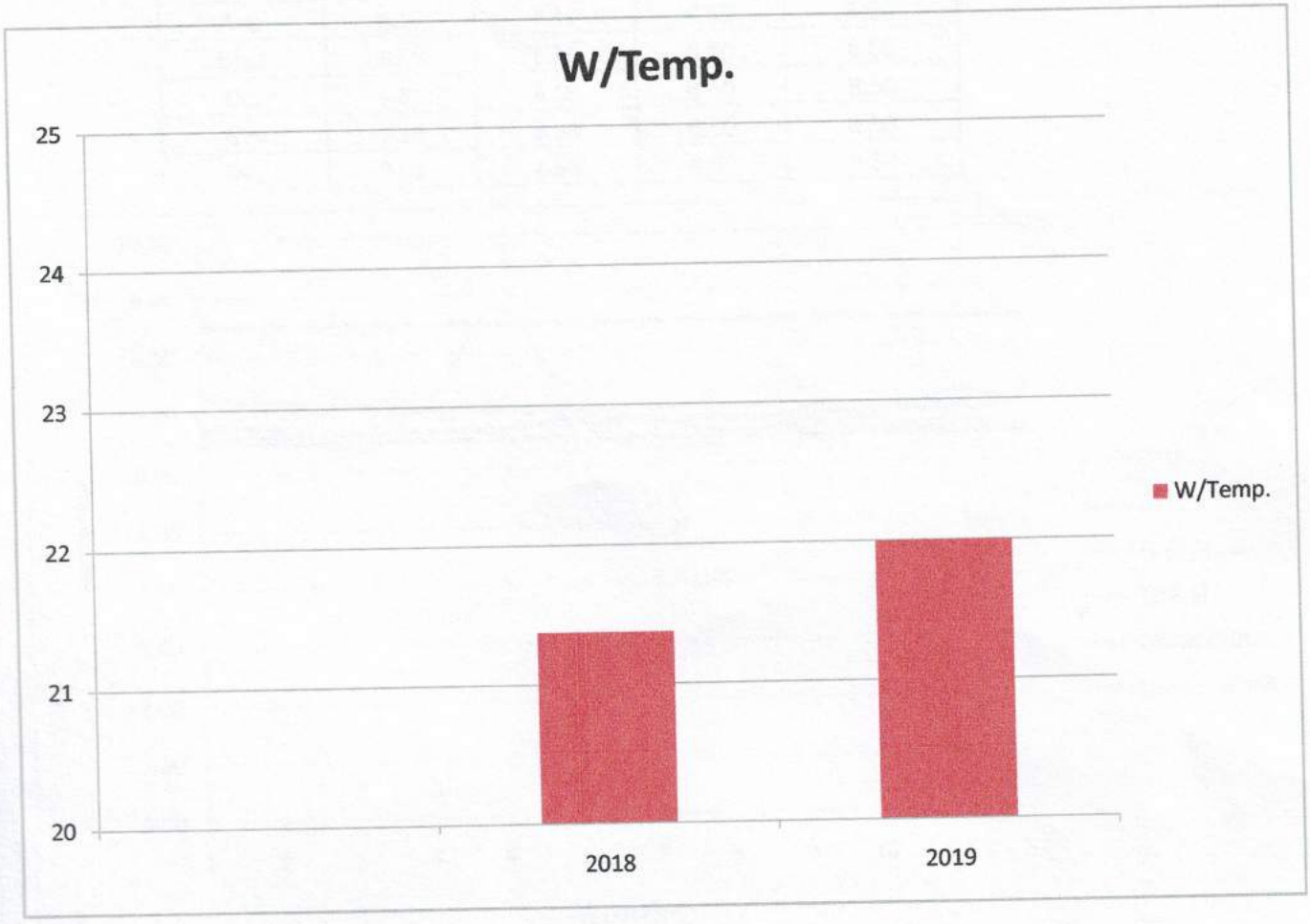
Water samples are collected on first week of the month and it is a trend station. The collection points in the river are so chosen that flow is free from disturbances like stagnant pools, heavy growth of weeds or fungus and sampling points are generally in the maximum flow zone. Samples are collected well 30 cm below the surface and are transferred to prerinsed clean polythene bottle of one litre capacity and are filled normally to the brim and sent to the Divisional Laboratory for analysis of various physical and chemical parameters.



Umtrew River Basin

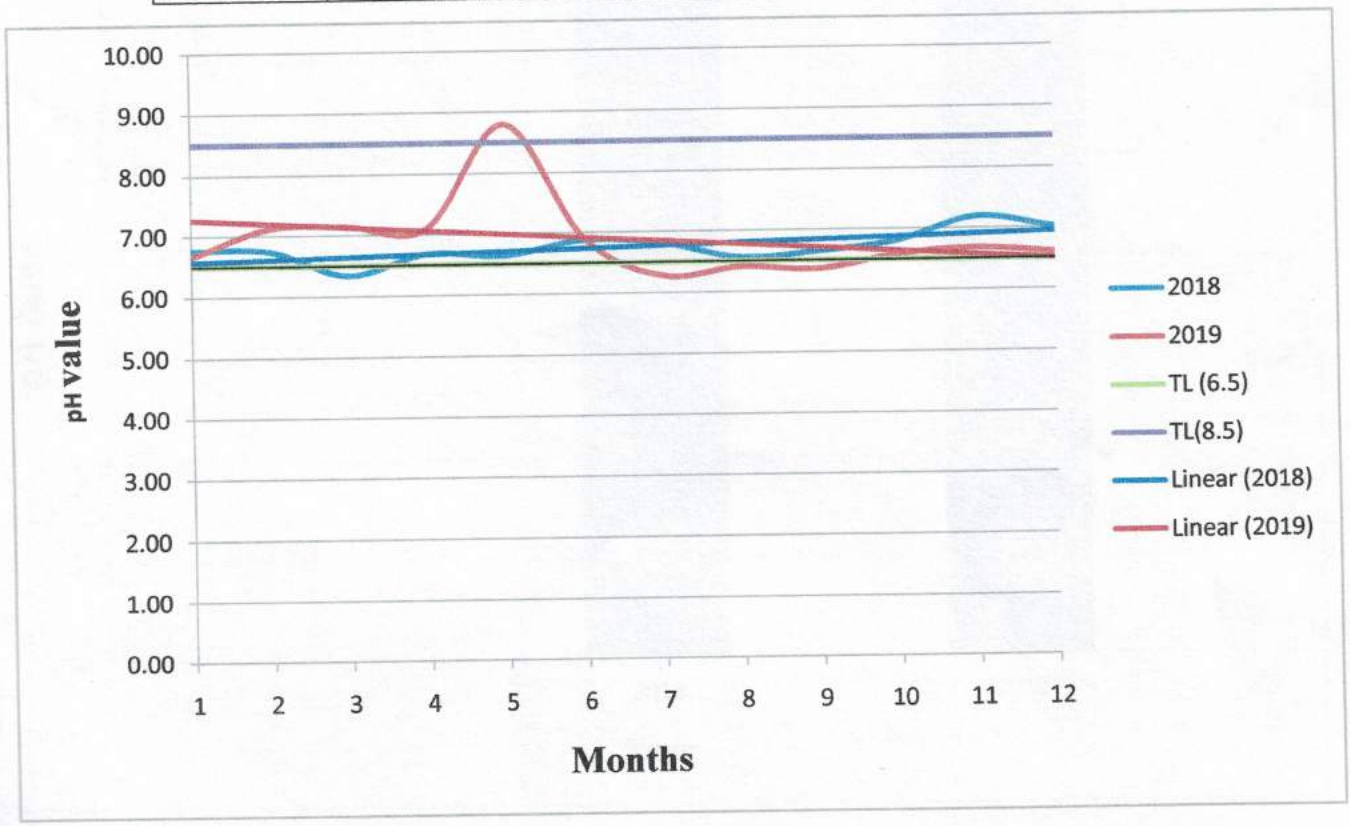
Average Temperature value of Byrnihat site on river Umtrew

Year	W/Temp.
2018	21.4
2019	22.0



pH value of Byrnihat site on river umtrew

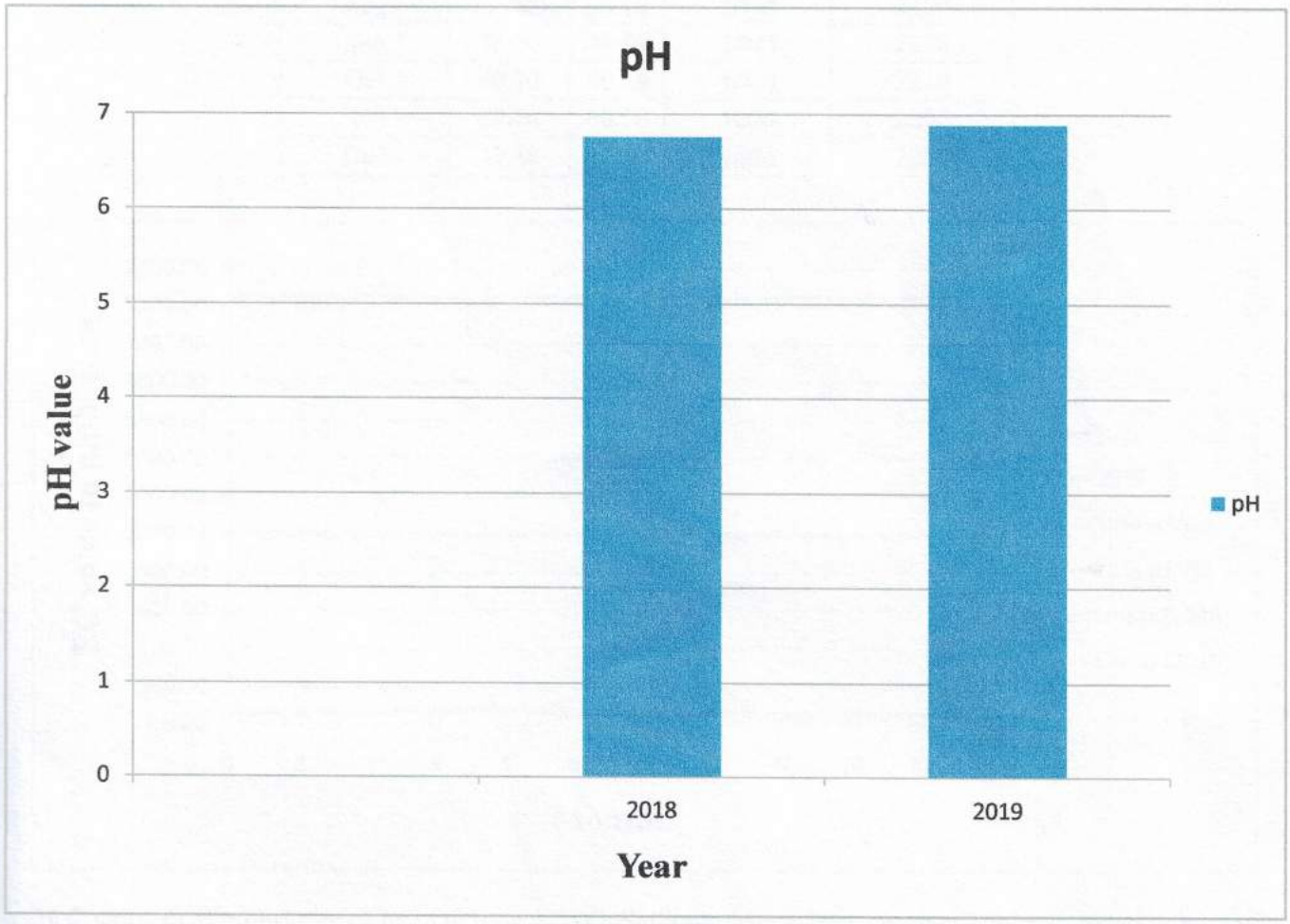
Year/Month	2018	2019	TL (6.5)	TL(8.5)
Jan	6.76	6.66	6.50	8.50
Feb	6.74	7.12	6.50	8.50
Mar	6.34	7.14	6.50	8.50
Apr	6.68	7.10	6.50	8.50
May	6.64	8.79	6.50	8.50
June	6.88	6.91	6.50	8.50
July	6.81	6.28	6.50	8.50
Aug	6.56	6.41	6.50	8.50
Sept	6.65	6.36	6.50	8.50
Oct	6.81	6.58	6.50	8.50
Nov	7.19	6.68	6.50	8.50
Dec	7.01	6.60	6.50	8.50



pH value of Byrnihat site of M.I.Division, CWC, Shillongi, Meghalaya on river Umtrew varies from 6.30 to 7.20 w.e.f. 2018 to 2019 (2 years). The trend line of each period shows pH concentration of river Umtrew at Byrnihat site remains with in the pH value of 6.50 to 8.00 which shows that it comes well within the tolerance limit of 6.5 to 8.5 as per with the BIS , it also satisfies the tolerance limit of pH for all classes of water A,B,C,D&E. (**Class A:** -Drinking water source without conventional treatment but after disinfections; **Class B:** - Outdoors bathing: **Class C:** - Drinking water source with conventional treatment followed by dis-infection; **Class D:** - Fish culture and wild life propagation; **Class E:** - Irrigation, industrial cooling and controlled waste disposal.) Hence the water of Byrnihat on river Umtrew can be used all above purposes as and when required

Average pH value of Byrnihat site on river Umtrew

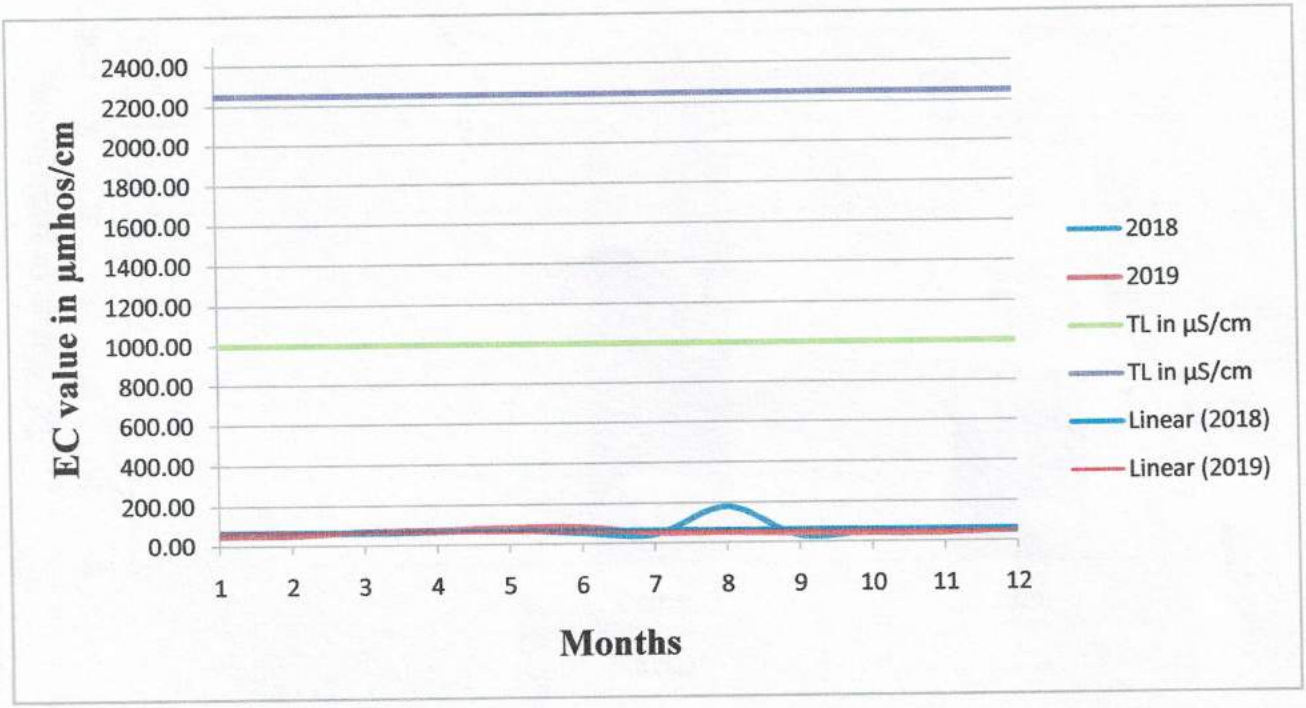
Year	pH
2018	6.76
2019	6.89



The average pH value of Byrnihat site on river Umtrew varies from 6.76 to 6.89 which is well within the tolerance limit of ph (6.5 to 8.5) as per with BIS. It also satisfies the tolerance limit of pH for all classes of water i.e A,B,C,D & E.

EC value of Byrnihat site on river Umtrew

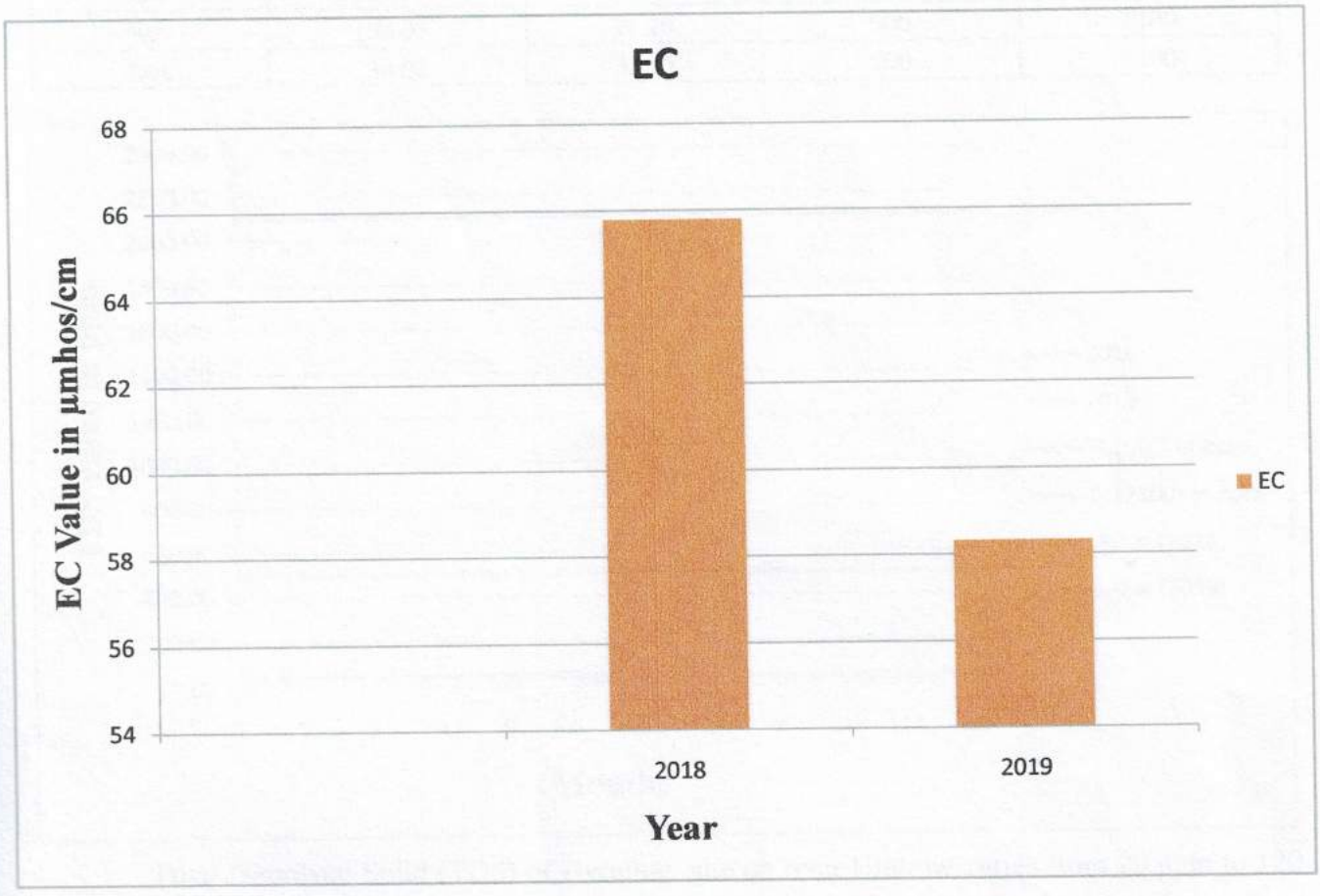
Year/Month	2018	2019	TL in µS/cm	TL in µS/cm
Jan	65.79	49.60	1000	2250
Feb	63.30	50.70	1000	2250
Mar	62.30	70.90	1000	2250
Apr	66.10	75.50	1000	2250
May	72.10	84.70	1000	2250
Jun	54.20	84.80	1000	2250
Jul	43.40	51.40	1000	2250
Aug	179.20	50.10	1000	2250
Sep	33.20	43.80	1000	2250
Oct	50.70	40.80	1000	2250
Nov	49.40	40.50	1000	2250
Dec	49.80	57.10	1000	2250



EC value of Byrnihat site of M.I.Division, CWC, Shillong, Meghalaya on river Umtrew varies from 33.20 to 179.20 w.e.f. 2018 to 2019 (2 years). The trend line shows EC concentration of river Umtrew at Byrnihat site remains with in the value of 33.00 to 180.00 µmhos/cm which shows that it comes well within the tolerance limit of 1000 to 2250 µmhos/cm as per with the BIS , it also satisfies the tolerance limit of EC for all classes of water A,B,C,D&E. (**Class A:** -Drinking water source without conventional treatment but after disinfections; **Class B:** - Outdoors bathing: **Class C:** - Drinking water source with conventional treatment followed by disinfection; **Class D:** - Fish culture and wild life propagation; **Class E:** - Irrigation, industrial cooling and controlled waste disposal.) Hence the water of Byrnihat on river Umtrew can be used all above purposes as and when required

Average EC value of Byrnihat site on river Umtrew

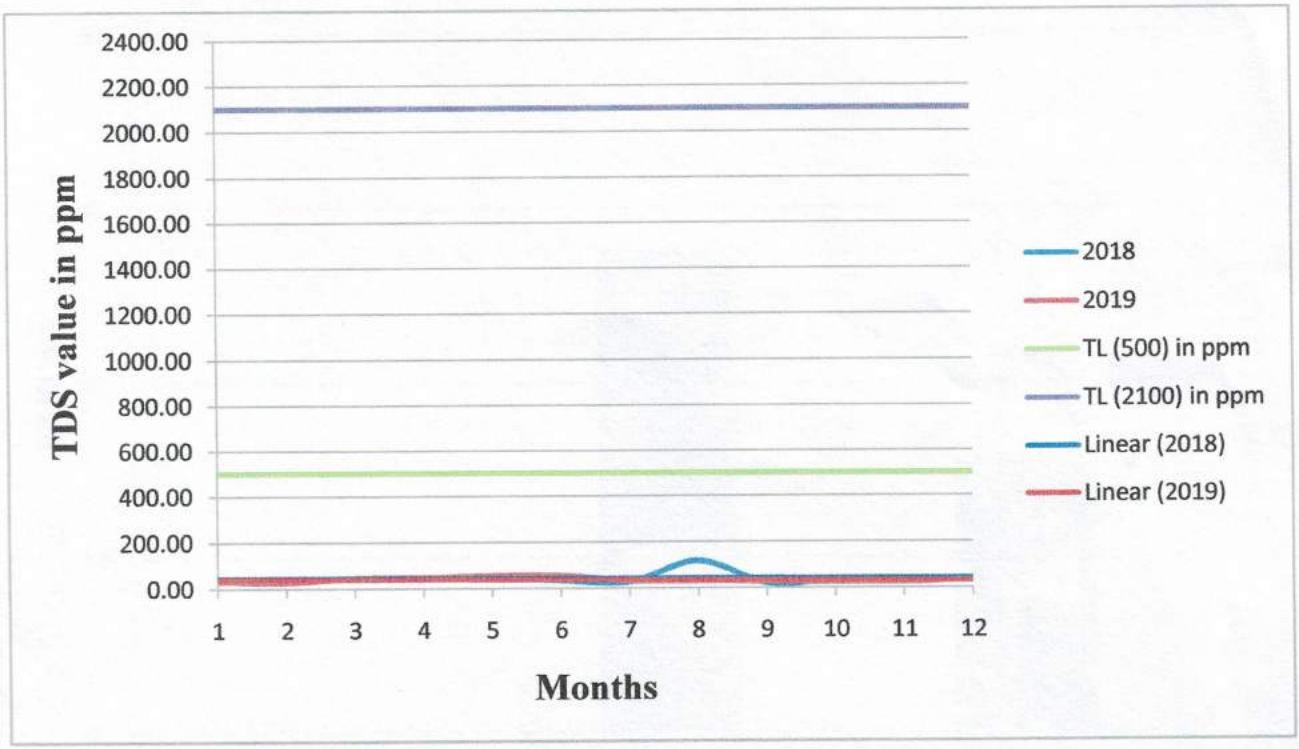
Year	EC
2018	65.79
2019	58.33



The average EC value of Byrnihat site on river Umtrew varies from 58.33 to 65.79 which is well within the tolerance limit of EC (1000 to 2250 µmhos/cm) as per with BIS. It also satisfies the tolerance limit of pH for all classes of water i.e A,B,C,D & E.

TDS value of Byrnihat site on river Digaru

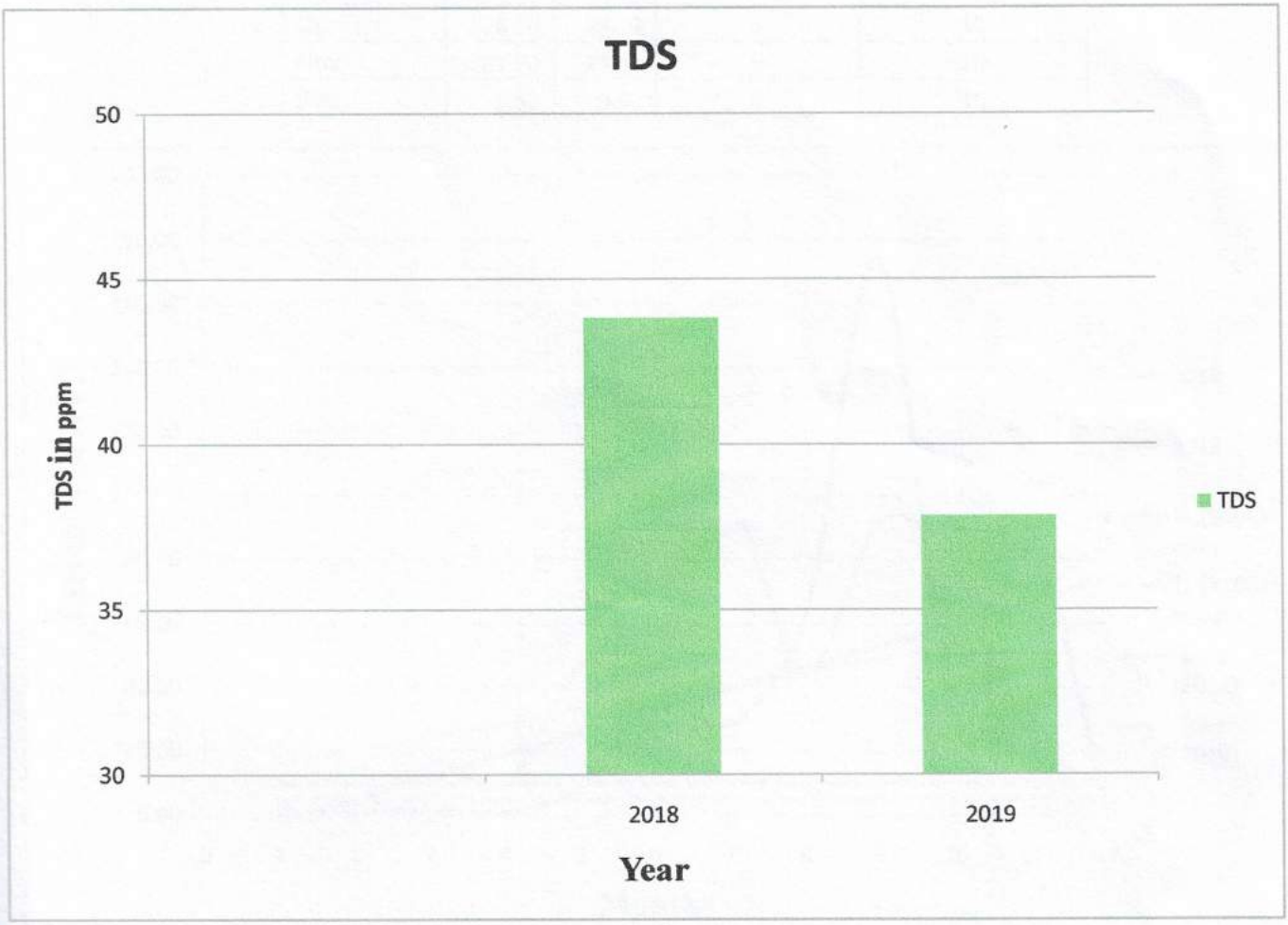
Year/Month	2018	2019	TL (500) in ppm	TL (2100) in ppm
Jan	44.00	34.00	500	2100
Feb	42.00	30.00	500	2100
Mar	42.00	47.00	500	2100
Apr	44.00	49.00	500	2100
May	48.00	55.00	500	2100
June	36.00	55.00	500	2100
July	29.00	33.30	500	2100
Aug	118.00	32.60	500	2100
Sept	22.00	28.40	500	2100
Oct	34.00	26.40	500	2100
Nov	33.00	26.20	500	2100
Dec	34.00	37.10	500	2100



Total Dissolved Solid (TDS) of Byrnihat site on river Umtrew varies from 20 ppm to 120 ppm which are within the tolerance limit of TDS. Hence the water can be used for various purposes as and when requred with proper treatment. As per with the BIS , it also satisfies the tolerance limit for all classes of water A,B,C,D&E. (**Class A:** -Drinking water source without conventional treatment but after disinfections; **Class B:** - Outdoors bathing: **Class C:** - Drinking water source with conventional treatment followed by dis-infection; **Class D:** - Fish culture and wild life propagation; **Class E:** - Irrigation, industrial cooling and controlled waste disposal.) Hence the water of Byrnihat on river Umtrew can be used all above purposes as and when required.

Average TDS value of Byrnihat site on river Umtrew

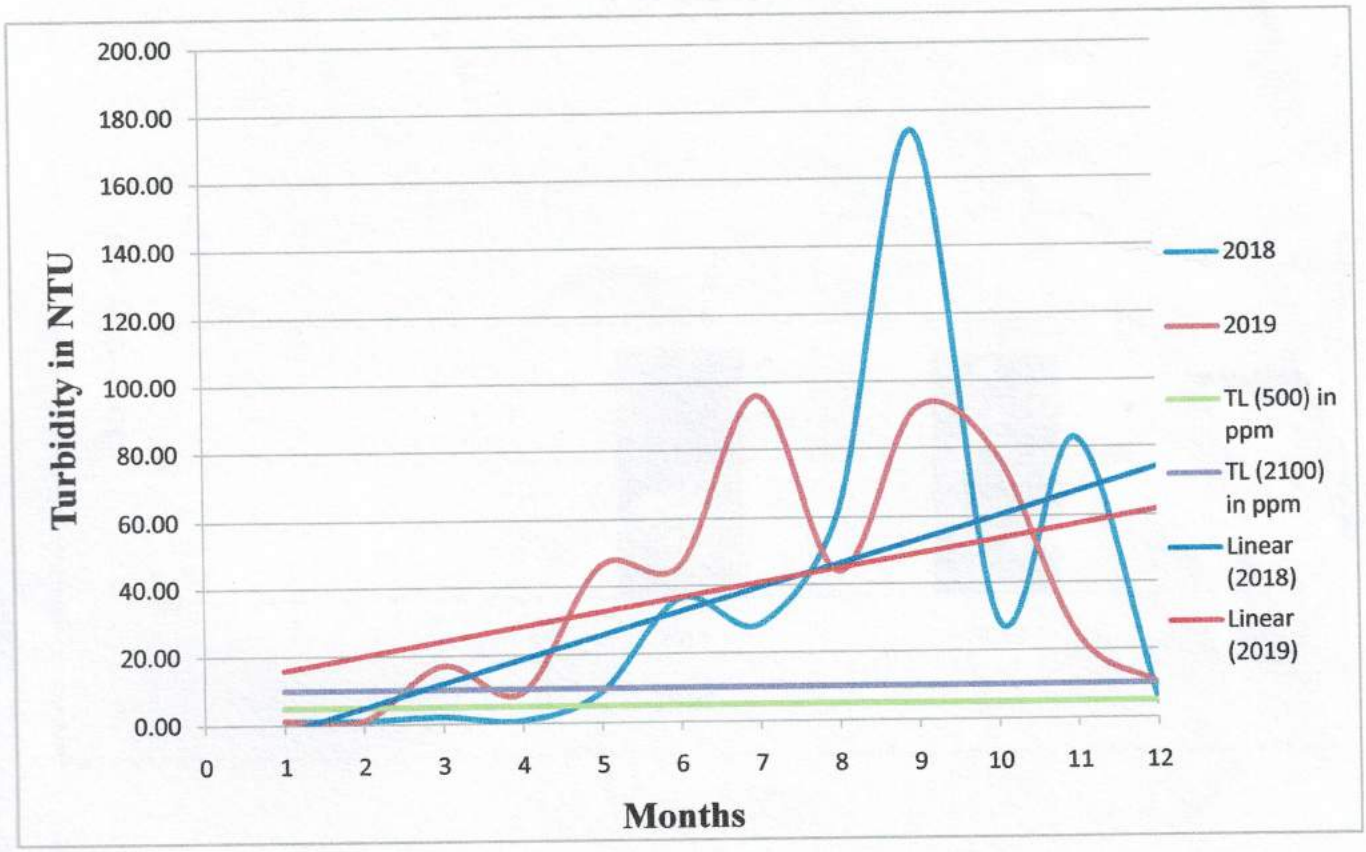
Year	TDS
2018	43.82
2019	37.83



The average TDS value of Byrnihat site on river Umtrew varies from 37.83 to 43.82 ppm which is well within the tolerance limit of TDS (500 to 2100 ppm) as per with BIS. It also satisfies the tolerance limit of pH for all classes of water i.e A,B,C,D & E.

Turbidity value of Byrnihat site on river Digaru

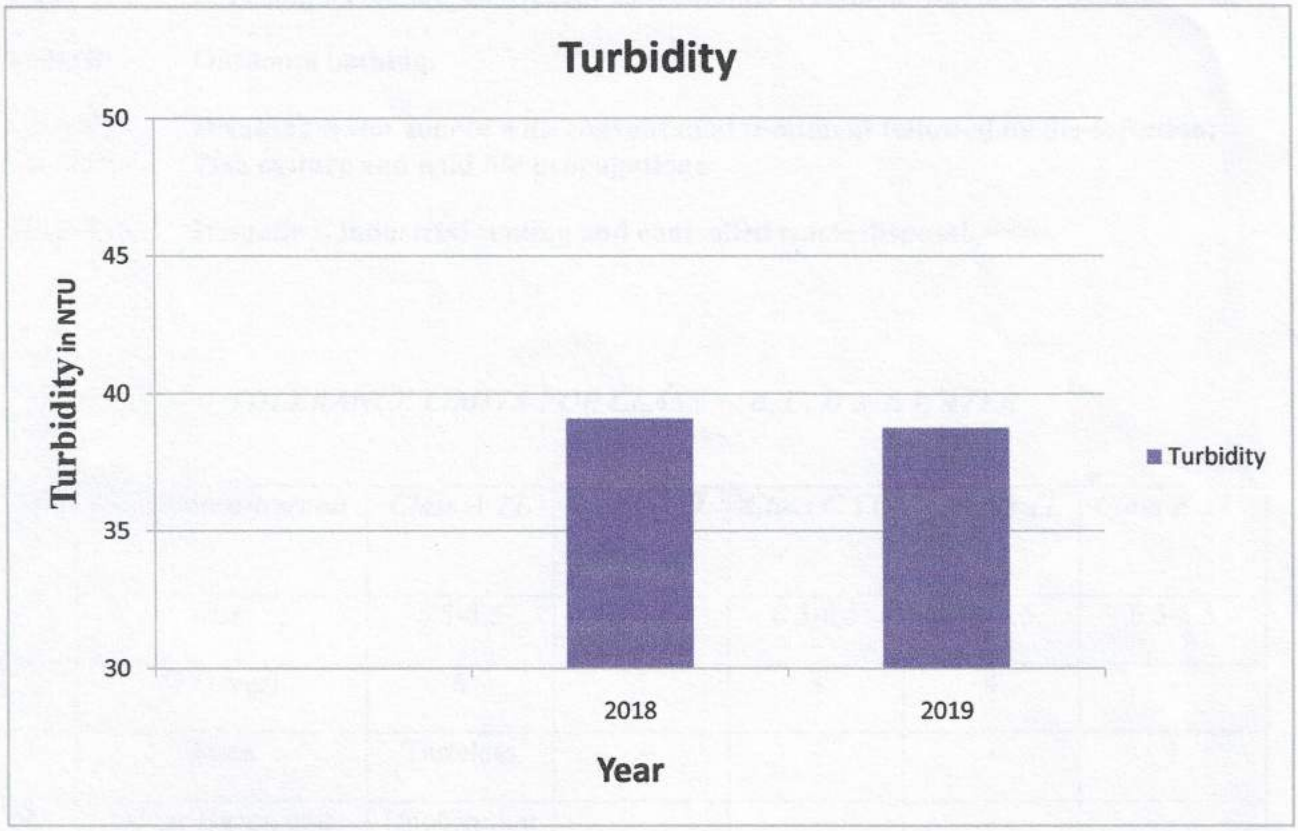
Year/Month	2018	2019	TL (500) in ppm	TL (2100) in ppm
Jan	1.20	1.19	5	10
Feb	1.10	1.20	5	10
Mar	2.11	16.98	5	10
Apr	0.84	8.93	5	10
May	9.12	46.38	5	10
June	36.40	46.30	5	10
July	28.40	96.00	5	10
Aug	62.00	44.00	5	10
Sept	174.00	92.00	5	10
Oct	28.90	78.00	5	10
Nov	82.70	24.30	5	10
Dec	4.52	9.87	5	10



The Turbidity value of Byrnihat site on river Umtrew varies from 0.84 to 174.00 which shows some values are within the tolerance limit of Turbidity (5 to 10 NTU) as per with BIS. But when rainfall rises at the upstream of the river, the value of turbidity exceeds the limit due to the high water velocity which brings lots of silt and mud along with its flow, but when the same water sample is filtered the water become clear and the turbidity remain within limit . which satisfies the tolerance limit of turbidity for all classes of water i.e A,B,C,D & E.

Average Turbidity value of Byrnihat site on river Umtrew

Year	Turbidity
2018	39.10
2019	38.76



REGARDING CLASSIFICATION OF WATERS: A, B, C, D&E

Requirement of pH value, dissolved oxygen, bio-chemical oxygen demand and total coliforms for classes A, B and C, requirements of pH value, dissolved oxygen and free ammonia for class D and requirements of pH value, electrical conductance and sodium absorption ratio for Central Board for the prevention and control of water pollution for the respective classes.

Class A: - Drinking water source without conventional treatment but after disinfections;

Class B: - Outdoors bathing:

Class C: - Drinking water source with conventional treatment followed by dis-infection;

Class D: - Fish culture and wild life propagation;

Class E: - Irrigation, industrial cooling and controlled waste disposal.

TOLERANCE LIMITS FOR CLASS A, B, C, D & E WATER

Sl. No	*Characteristics/unit*	*Class A TL*	*Class B TL*	*Class C TL*	*Class D TL*	*Class E TL*
1.	PH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	D.O mg/l	6	5	4	4	-
3.	Taste	Tasteless	-	-	-	-
4.	Odour Hazen unit	Unobjectionable	-	-	-	-
5.	T.D.S mg/l	500	-	-	-	2100
6.	Electrical conductance µmhos/cm	-	--	-	$1000x10^{-6}$	$225x10^{-6}$
7.	Total Hardness mg/l	300	-	-	-	-

8.	Calcium mg/l	200	-	-	-	-
9.	Magnesium mg/l	100	-	-	-	-
10.	Iron mg/l	0.3	-	50	-	-
11.	Chloride mg/l	250	-	600	-	600
12.	Sulphate mg/l	400	-	400	-	1000
13.	Nitrate mg/l	20	-	50	-	-
14	Fluorides mg/l	1.5	1.5	1.5	-	-

T.L: - Tolerance Limit.

******* This is as per IS: 2296-1982.

******* Though Divisional Laboratory M.B.Division, C.W.C. Guwahati is analyzing 25 Nos of physical and chemical parameters, the above characteristics are available in IS: 2296-1982 for classification of water in A, B, C, D&E.

REPORT ON " WATER QUALITY SCENARIO OF RIVERS"

ON BRAHMAPUTRA RIVER

Prepared By:

Debadutta Barman

Research Officer,MBD ,CWC GHY

Brahmaputra Basin

The **Brahmaputra** is a trans-boundary river which flows through China, India and Bangladesh. It is the ninth **largest river** in the world by discharge, and the 15th **longest.**

With its origin in the Mansorover lake region, near the Mount Kailash, located on the northern side of the **Himalayas** in Burang County of **Tibet** as the Yarlung Tsangpo River, it flows along southern **Tibet** to break through the Himalayas in great gorges (including the Yarlung Tsangpo Grand Canyon) and into **Arunachal Pradesh** (India). It flows southwest through the **Assam** Valley as Brahmaputra and south through **Bangladesh** as the **Jamuna** (not to be mistaken with **Yamuna** of India). In the vast **Ganges Delta** it merges with the **Padma** the popular name of the river **Ganges** in Bangladesh, and finally, after merging with Padma, it becomes the **Meghna** and from here, it flows as Meghna river before emptying into the Bay of Bengal.

About 2,899.9 km (1,801.9 mi) long, the Brahmaputra is an important river for **irrigation** and transportation in the region. The average depth of the river is 38 m (124 ft) and maximum depth is 120 m (380 ft). The river is prone to catastrophic flooding in the Spring when the Himalayan snow melts.

It is navigable for most of its length.The river drains the Himalayan east of the Indo-Nepal border, south-central portion of the Tibetan plateau above the **Ganga** basin, south-eastern portion of Tibet, the Patkai-Bum hills, the northern slopes of the Meghalaya hills, the Assam plains, and the northern portion of Bangladesh. The basin, especially south of Tibet, is characterized by high levels of rainfall. **Kangchenjunga** (8,586 m) is the only peak above 8,000 m, hence is the highest point within the Brahmaputra basin.

The Brahmaputra's upper course was long unknown, and its identity with the Yarlung Tsangpo was only established by exploration in 1884–86. This river is often called the Tsangpo-Brahmaputra river.

The lower reaches are sacred to **Hindus.** While most rivers on the Indian subcontinent have female names, this river has a rare male name. Brahmaputra means "son of **Brahma** " in **Sanskrit** (*putra* means "son").

The upper reaches of the Brahmaputra River, known as the Yarlung Tsangpo from the Tibetan language, originates on the Angsi Glacier, near Mount Kailash, located on the northern side of the **Himalayas** in Burang County of **Tibet**. The river is 3,848 km (2,391 mi) long, and its drainage area is 712,035 km² (274,918 sq mi) according to the new findings.

From its source, the river runs for nearly 1,100 km (680 mi) in a generally easterly direction between the main range of the Himalayas to the south and the **Kailas Range** to the north.

After passing Pi (Pe) in Tibet, the river turns suddenly to the north and northeast and cuts a course through a succession of great narrow gorges between the mountainous massifs of Gyala Peri and Namcha Barwa in a series of rapids and cascades. Thereafter, the river turns south and southwest and flows through a deep gorge (the "Yarlung Tsangpo Grand Canyon") across the eastern extremity of the Himalayas with canyon walls that extend upward for 5,000 m (16,000 ft) and more on each side. During that stretch, the river enters northern Arunachal Pradesh state through a place called Tutting in north-eastern India, where it is known as the Dihang (or Siang) River, and turns more southerly.

Assam and adjoining region

Brahmaputra basin in **India**

The Yarlung Tsangpo (Brahmaputra) enters the state of **Arunachal Pradesh** in India, where it is called Siang. It makes a very rapid descent from its original height in Tibet and finally appears in the plains. It flows for about 35 km (22 mi) southward after which, it is joined by the Dibang River and the Lohit River at the head of the Assam Valley. Below the Lohit, the river is called Brahmaputra and Burlung-Buthur by native **Bodo** tribals, it then enters the state of **Assam**, and becomes very wide—as wide as 20 km (12 mi) in parts of Assam.

The Dihang, winding out of the mountains, turns towards the southeast and descends into a low-lying basin as it enters northeastern Assam state. Just west of the town of Sadiya, the river again turns to the southwest and is joined by two mountain streams, the Lohit, and the Dibang. Below that confluence, about 1,450 km (900 mi) from the Bay of Bengal, the river becomes known conventionally as the Brahmaputra ("Son of Brahma"). In Assam, the river is mighty, even in the dry season, and during the rains, its banks are more than 8 km (5.0 mi) apart. As the river follows its braided 700 km (430 mi) course through the valley, it receives several rapidly flowing Himalayan streams, including the Subansiri, Kameng, Bhareli, Dhansiri, Manas, Champamati, Saralbhanga, and Sankosh Rivers. The main tributaries from the hills and from the plateau to the south are the Burhi Dihing, the Disang, the Dikhu, and the Kopili.

Between **Dibrugarh** and **Lakhimpur Districts**, the river divides into two channels—the northern Kherkutia channel and the southern Brahmaputra channel. The two channels join again about 100 km (62 mi) downstream, forming the Majuli island, which is the largest river island in the world. At **Guwahati**, near the ancient pilgrimage centre of Hajo, the Brahmaputra cuts through the rocks of the Shillong Plateau, and is at its narrowest at 1 km (1,100 yd) bank-to-bank.

Basin characteristics

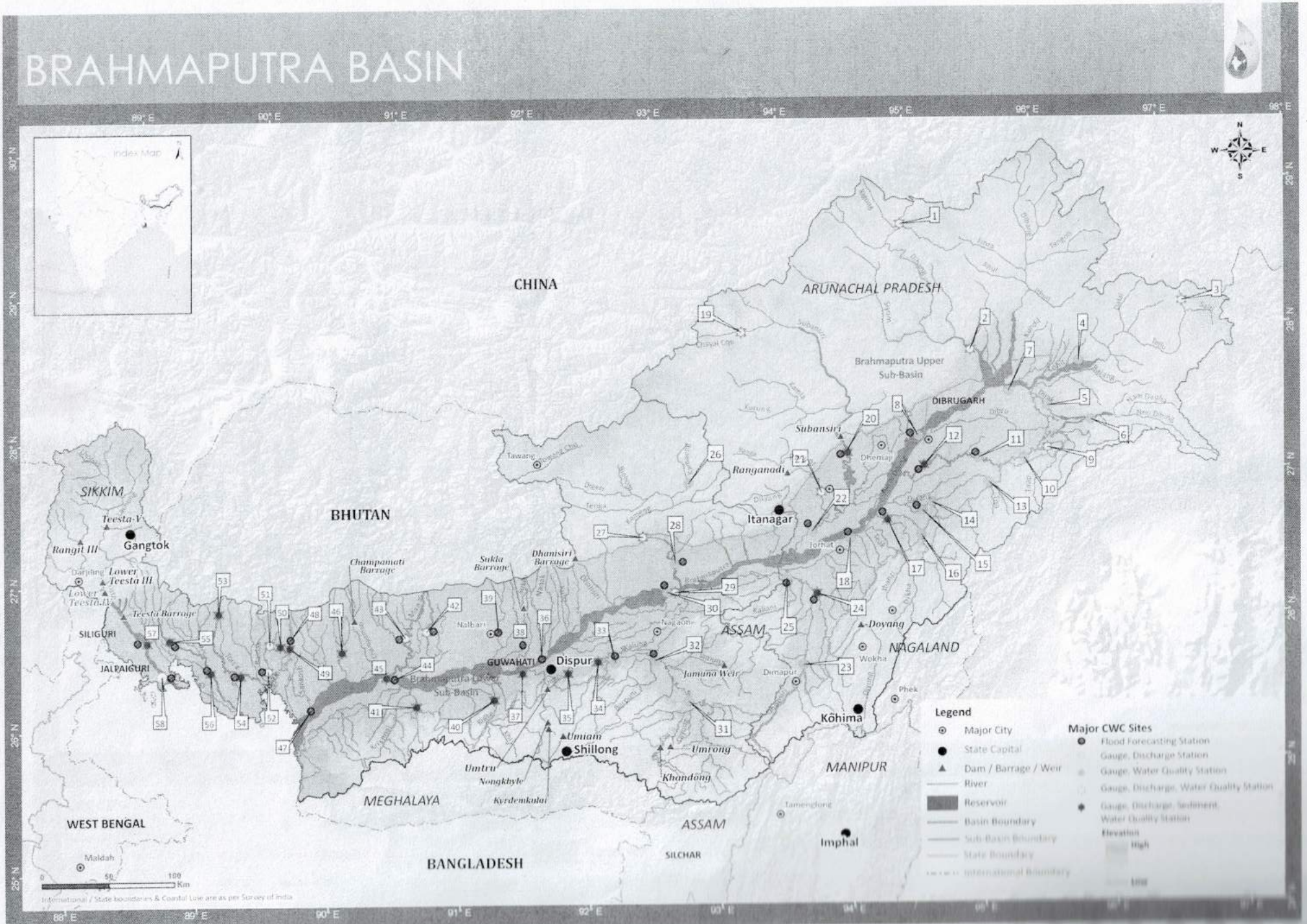
The basin of the Brahmaputra river is 651 334 km^2 and meanders quite a bit and frequently forms temporary sand bars.

Discharge

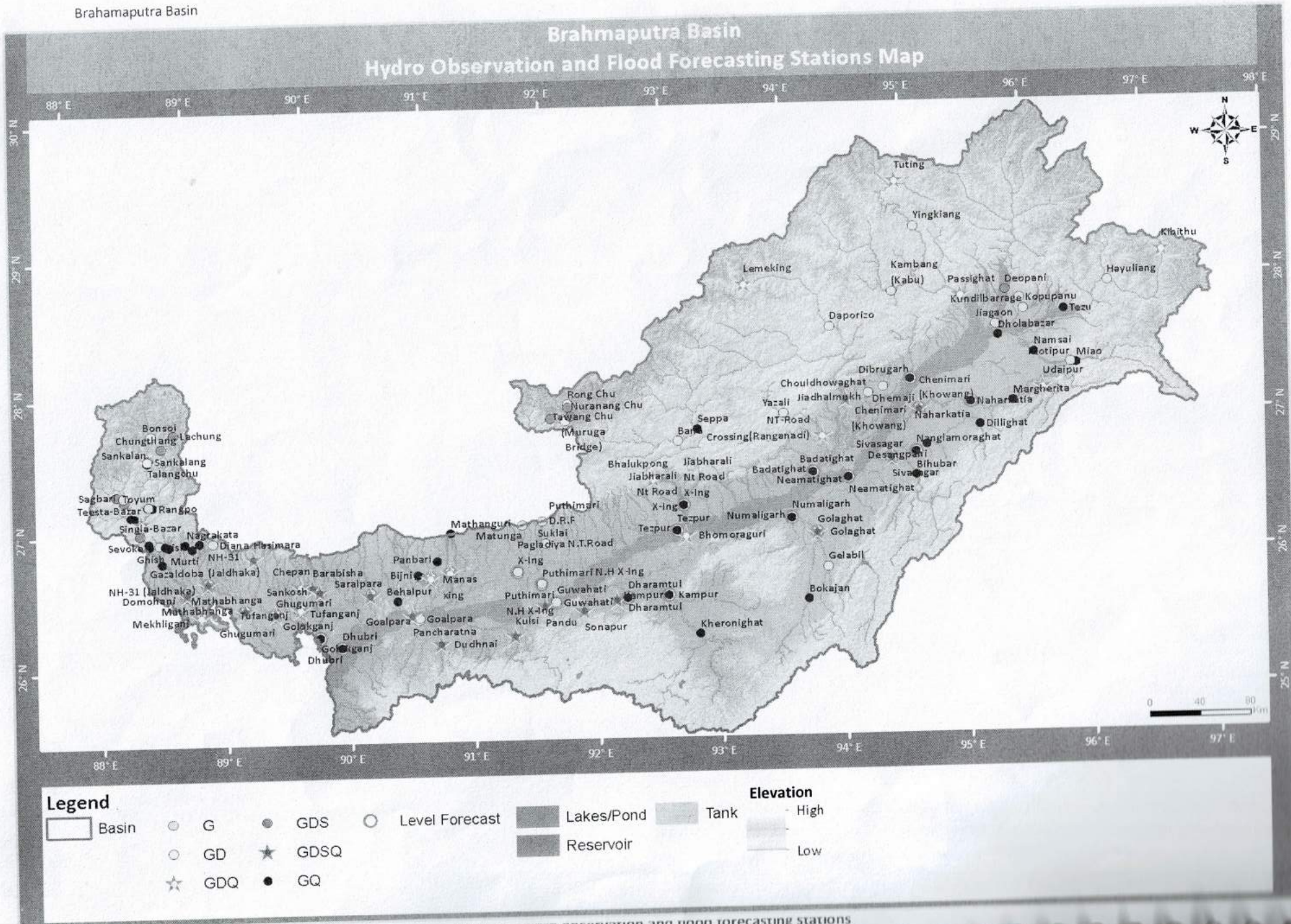
The **Ganga -Brahmaputra** system has the third-greatest average discharge of the world's rivers—roughly 30,770 m^3 (1,086,500 ft^3) per second; and the river Brahmaputra alone supplies about 19,800 m^3 (700,000 ft^3) per second of the total discharge. The rivers' combined suspended sediment load of about 1.87 billion tonnes (1.84 billion tons) per year is the world's highest.

In the past, the lower course of the Brahmaputra was different and passed through the **Jamalpur** and Mymensingh districts. In an 8.8 magnitude earthquake on 2 April 1762 however, the main channel of the Brahmaputra at Bhahadurabad point was switched southwards and opened as Jamuna due to the result of tectonic uplift of the Madhupur tract.

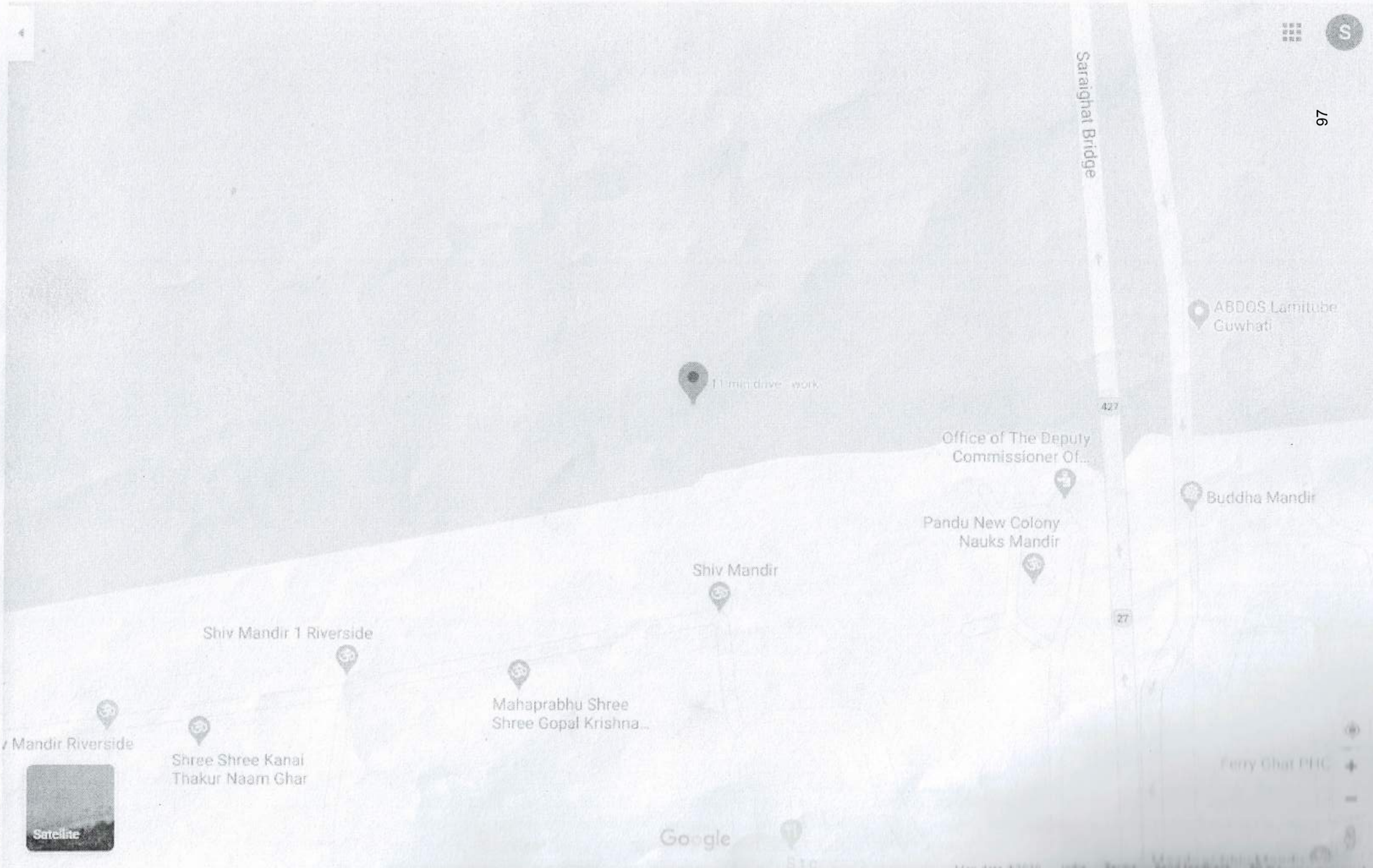
BRAHMAPUTRA BASIN



Map 2b. Brahmaputra Basin - Drainage & Sub-basin



Map 17: Hydro observation and flood forecasting stations


Saraighat Bridge
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427
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Buddha Mandir
Pandu New Colony
Nauks Mandir
Shiv Mandir
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Shiv Mandir 1 Riverside
Mahaprabhu Shree
Shree Gopal Krishna...
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Ferry Ghat PHC
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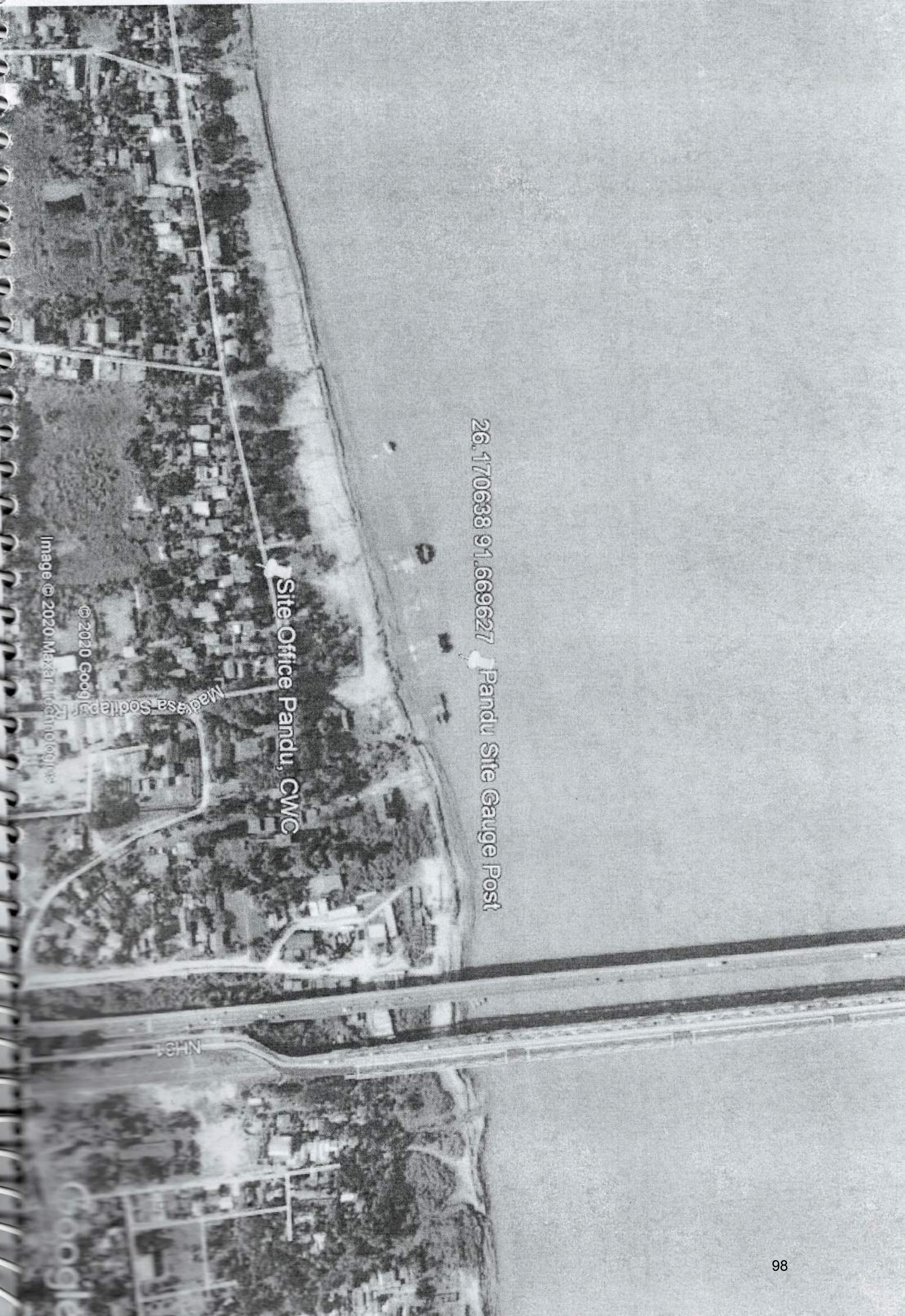
26.170638 91.669627
Pandu Site Gauge Post
Site Office Pandu, CWC
NH31
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Image © 2020 Maxar Technologies
Google

REGARDING CLASSIFICATION OF WATERS: A, B, C, D&E

Requirement of pH value, dissolved oxygen, bio-chemical oxygen demand and total coliforms for classes A, B and C, requirements of pH value, dissolved oxygen and free ammonia for class D and requirements of pH value, electrical conductance and sodium absorption ratio for Central Board for the prevention and control of water pollution for the respective classes.

Class A: - Drinking water source without conventional treatment but after disinfections;

Class B: - Outdoors bathing:

Class C: - Drinking water source with conventional treatment followed by dis-infection;

Class D: - Fish culture and wild life propagation;

Class E: - Irrigation, industrial cooling and controlled waste disposal.

TOLERANCE LIMITS FOR CLASS A, B, C, D & E WATER

Sl.No.	*Characteristics/unit*	*Class A TL*	*Class B TL*	*Class C TL*	*Class D TL*	*Class E TL*
1.	PH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	D.O mg/l	6	5	4	4	-
3.	Taste	Tasteless	-	-	-	-
4.	Odour Hazen unit	Unobjectionable	-	-	-	-
5.	T.D.S mg/l	500	-	-	-	2100
6.	EC in mhos/cm	-	--	-	$1000x10^{-6}$	$225x10^{-6}$
7.	Total Hardness mg/l	300	-	-	-	-
8.	Calcium mg/l	200	-	-	-	-
9.	Magnesium mg/l	100	-	-	-	-
10.	Iron mg/l	0.3	-	50	-	-
11.	Chloride mg/l	250	-	600	-	600
12.	Sulphate mg/l	400	-	400	-	1000
13.	Nitrate mg/l	20	-	50	-	-
14	Fluorides mg/l	1.5	1.5	1.5	-	-

T.L: - Tolerance Limit. ******* This is as per IS: 2296-1982.

Pandu GDSQ site on river Brahmaputra

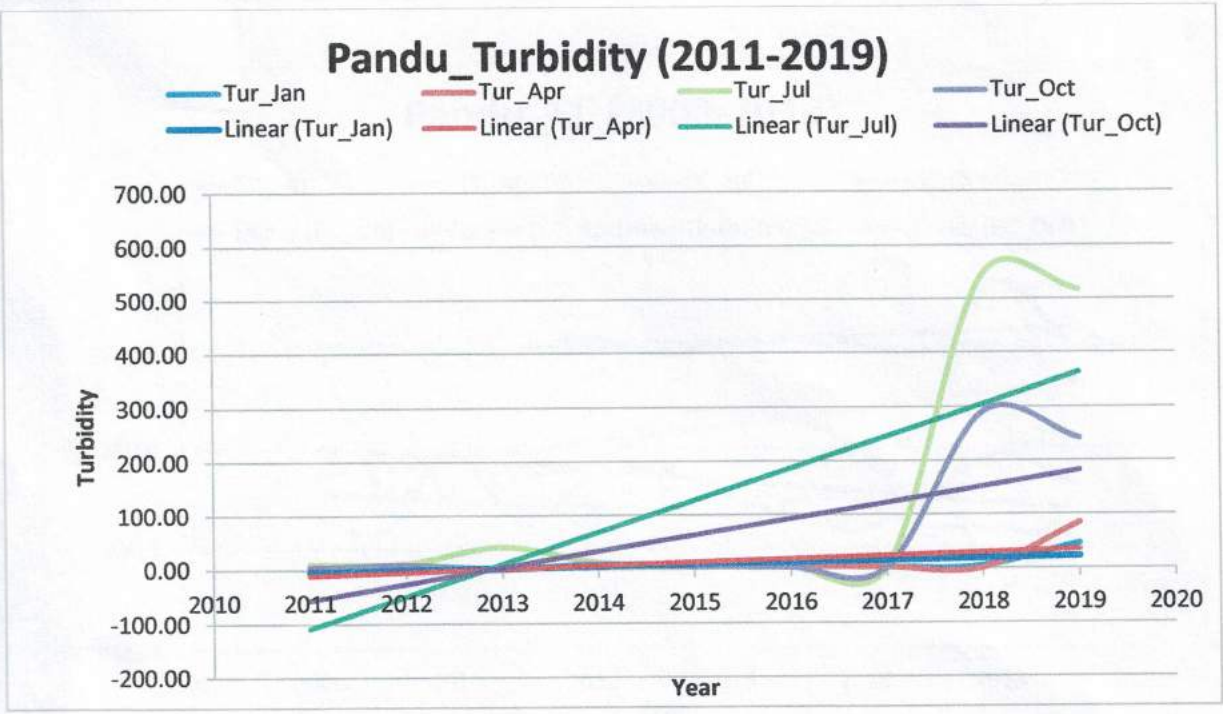
Intoduction:

Pandu GDSQ site (Code-BB00012) under MBD,CWC, GHY , Assam is situated at Latitude-23'10'06''N, Longitude-91'40'18''E on the bank of River Brahmaputra.

Salient features of Pandu GDSQ site

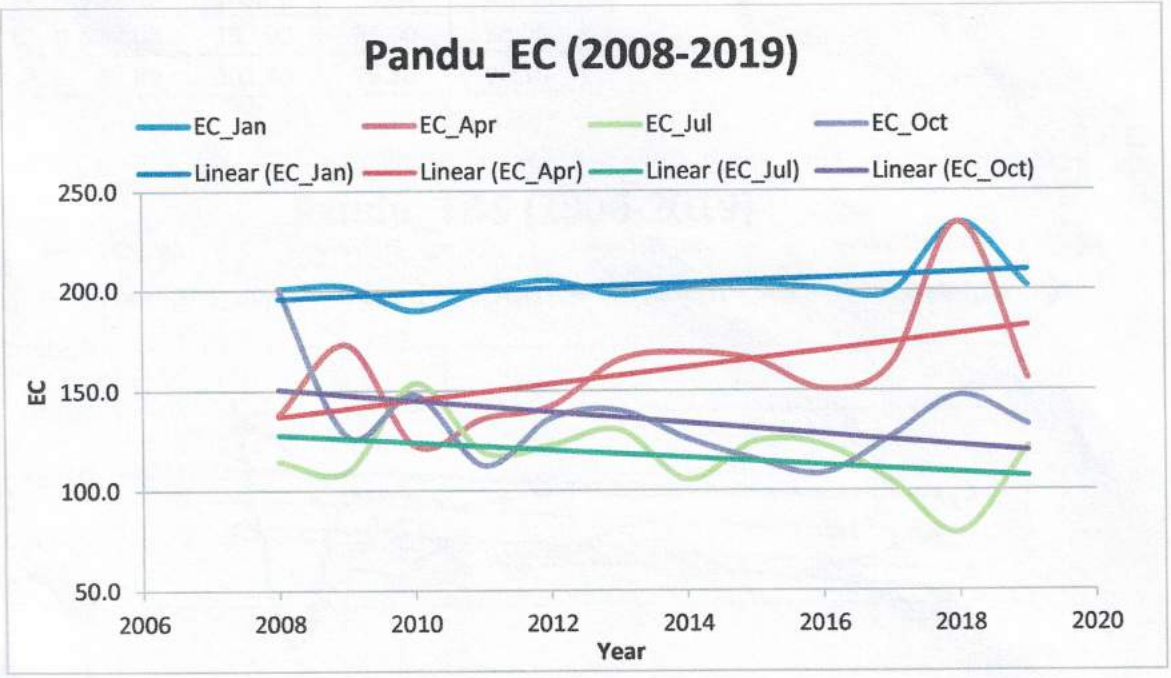
Name of Site	Pandu
Code	BB00012
State	Assam
District	Kamrup
Latitude	23'10'06"N
Longitude	91'40'18"E
River Basin	Brahmaputra
Catchment Area	417100 Sq.Km
Zero of gauge	39.00 M
Standard Bank	Left Bank
Category of site	GDS &WQ
Mode of Observation	By Catamaran/Boat with ADCP/ current meter
Date of Start of Observation	
Gauge	15/5/1972
Discharge	18/11/1998
Discharge by ADCP	24/4/2012
Sediment	27/11/2003
Water Quality	1/4/2003
Highest observed Discharge	45952m/sec on 21/7/2011

Turbidity				
Year	Jan	Apr	Jul	Oct
2011	1.00	0.74	10.60	4.57
2012	2.22	0.75	11.61	9.29
2013	0.57	2.69	41.60	1.90
2014	8.64	7.96	12.61	10.05
2015	8.10	6.35	5.71	4.87
2016	6.94	4.67	3.72	3.05
2017	2.92	3.21	3.50	2.50
2018	5.10	1.03	545.00	291.00
2019	46.60	85.00	517.00	242.00



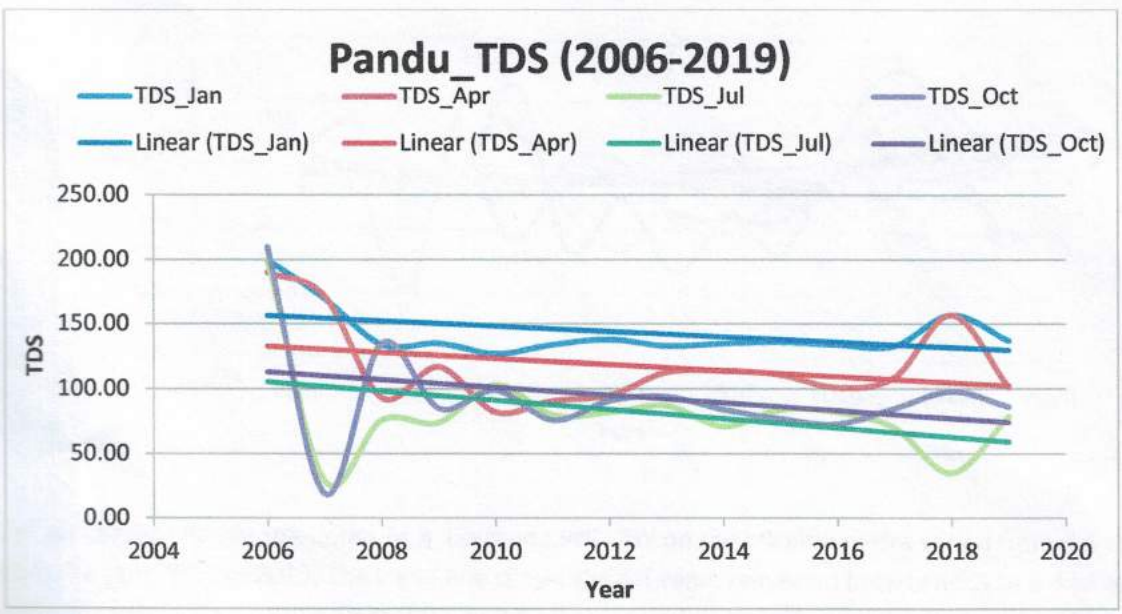
The turbidity value of Pandu site varied from 0.57 to 545 between the year 2006 to 2019.

EC				
Year	Jan	Apr	Jul	Oct
2008	201.0	138.2	114.4	201.0
2009	202.0	173.2	109.6	127.2
2010	190.1	122.3	153.9	148.2
2011	200.0	136.2	119.1	112.5
2012	205.0	142.5	122.8	136.5
2013	197.7	165.6	130.4	140.2
2014	202.0	169.3	105.2	125.8
2015	203.0	165.4	124.4	115.3
2016	201.0	151.0	122.5	108.5
2017	199.1	163.5	104.2	127.1
2018	234.0	234.0	79.0	147.5
2019	202.0	156.2	121.8	132.8



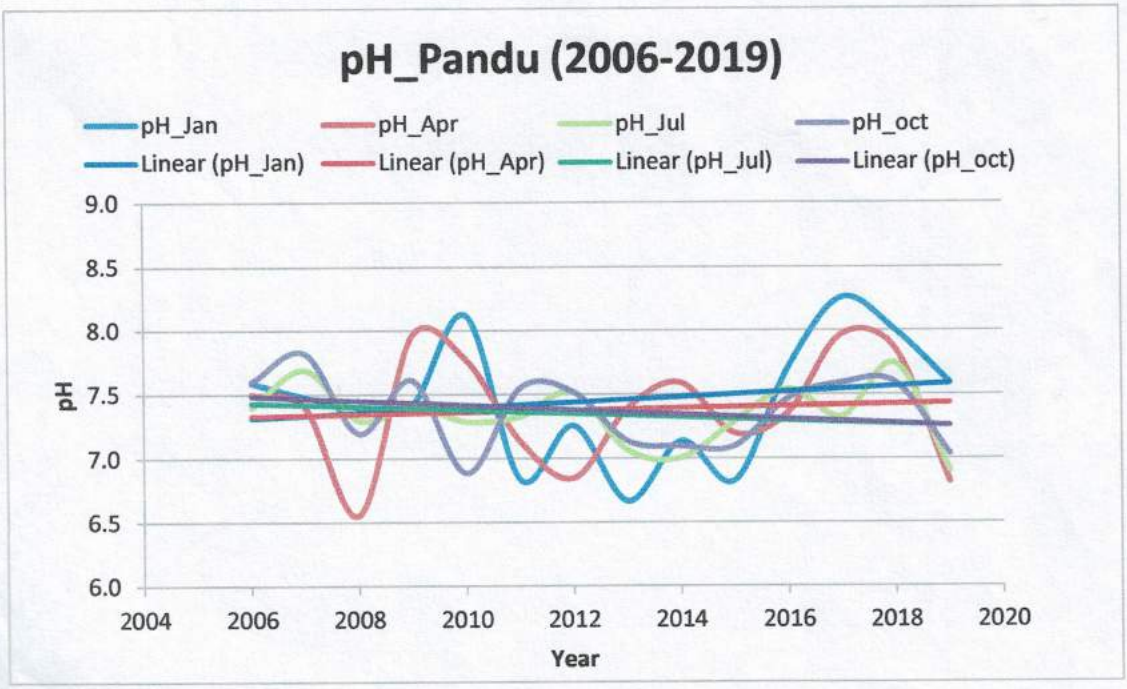
The Electrical conductivity value of pandu site under MBD , CWC GHY varied from 79 to 234 from the year 2008 to 2019. The trend line shows the EC value is within the BIS tolerance limit of 1000 and 2250 for class D and E water. (copy Enclosed)

TDS				
Year	Jan	Apr	Jul	Oct
2006	200.00	190.00	200.00	210.00
2007	170.00	172.00	29.00	19.00
2008	134.00	93.00	76.00	135.00
2009	135.00	117.00	74.00	85.00
2010	127.00	82.00	103.00	99.00
2011	134.00	91.00	80.00	76.00
2012	138.00	95.00	82.00	91.00
2013	133.00	113.00	87.00	94.00
2014	135.00	114.00	71.00	84.00
2015	136.00	111.00	84.00	77.00
2016	134.00	101.00	82.00	73.00
2017	133.00	109.00	70.00	85.00
2018	157.00	157.00	35.00	98.00
2019	137.00	101.40	79.10	86.10



The TDS value of Pandu site under MBD, CWC, GHY varied from 19 to 210 from the year 2006 to 2019. The trend line shows the TDS value of Pandu site remained below the tolerance limit of 500 and 2100 for class A and Class E . (copy enclosed)

pH				
Year	Jan	Apr	Jul	Oct
2006	7.6	7.5	7.4	7.6
2007	7.5	7.4	7.7	7.8
2008	7.4	6.6	7.3	7.2
2009	7.4	8.0	7.4	7.6
2010	8.1	7.8	7.3	6.9
2011	6.8	7.1	7.3	7.6
2012	7.3	6.9	7.5	7.5
2013	6.7	7.4	7.1	7.1
2014	7.1	7.6	7.0	7.1
2015	6.8	7.2	7.3	7.1
2016	7.7	7.4	7.5	7.5
2017	8.3	8.0	7.3	7.6
2018	8.0	7.9	7.7	7.6
2019	7.59	6.82	6.91	7.04



The pH value of Pandu site under M.B. Division CWC GHY on river Brahmaputra varied from 6.6 to 8.3 from the year 2006 to 2019. The trend line shows the pH value remained between 6.5 to 8.4 which is well within the BIS tolerance limit of 6.5 to 8.5 . It also satisfies the tolerance limit of pH for all classes of water A , B, C, D. (Copy Enclosed).

Government of India

Ministry of Jal Shakti
Department of Water Resources, River Development & Ganga Rejuvenation

Study of variation in physico-chemical parameters on Mahananda river basin

Teesta Basin Organisation

Divisional Laboratory
Lower Brahmaputra Division
Central Water Commission
Jalpaiguri

Contents

Abbreviations used:

^{0}C- Temperature in degree Celsius
K- Temperature in Kelvin
EC- Electrical Conductance
pH- Negative logarithm of Hydrogen ion concentration
Na^+- Sodium ion
K^+- Potassium ion
Mg^{2+}- Magnesium ion
Ca^{2+}- Calcium ion
Cl^- - Chloride ion
CO_3^{2-} - Carbonate ion
HCO_3^- - Bicarbonate ion
DO- Dissolved oxygen
BOD- Bio-Chemical Oxygen Demand
COD- Chemical Oxygen Demand
meq/L- Milli Equivalent/litre.
ppm- Part Per Million i.e., mg/L
LBD- Lower Brahmaputra Division
WQ- Water Quality

Introduction

The Mahananda River is one of the prime tributaries of the Ganga River in the eastern part of India. It is a trans-boundary river, mainly fed by rainwater, originated from Himalayas: Paglajhora Falls on Mahaldiram Hill near Chimli, east of Kurseong in Darjeeling district of West Bengal state. It flows through Mahananda Wildlife Sanctuary and descends to the northern part of West Bengal, Bihar in India and Panchagarh district of Bangladesh. It enters Bangladesh near Tentulia in Panchagarh District, flows for 3 kilometres after Tentulia and returns to India. After flowing through Uttar Dinajpur district in West Bengal and Kishanganj, Purnia and Katihar districts in Bihar, it enters Malda district in West Bengal. The major tributaries of the Mahananda are Balason, Mechi, Ratwa and Kankai. During summer or winter, it has very low water level but during monsoon it carries large amount of rainwater often causing floods. One of the most important places by the side of this river is Siliguri which is known as the corridor of North-Eastern states and major commercial, tourism, transportation, and educational place of Northern part in West Bengal, India. The people of Siliguri are extremely dependent on this river water to encounter their demand for drinking and other domestic activities on regular basis. As such monitoring of water quality parameters for the rivers in & around Siliguri city is a matter of concern. Therefore, the physico-chemical characteristics of Mahananda river water are very much important.

The Mahananda river flows through the West Bengal and Bihar of Indian states and Bangladesh. The Mahananda divides the district into two regions — the eastern region, consisting mainly of old alluvial and relatively infertile soil is commonly known as Barind (Borendrovomee), and the western region, which is further subdivided by the river Kalindri into two areas, the northern area is known as "Tal". It is low-lying and vulnerable to inundation during rainy season; the southern area consists of very fertile land and is thickly populated, being commonly known as "Diara". The total stretch of Mahananda river is 360 km out of which 324 km is in India and the rest is in Bangladesh. Siliguri located near the foot of southern Himalayas lies on the bank of Mahananda river. Siliguri is a metropolis, which span between two districts namely Darjeeling and Jalpaiguri in West Bengal state. The latitude of Siliguri, is 26° 42' 57" N and the longitude is 88° 25' 24" E.

Study Area:

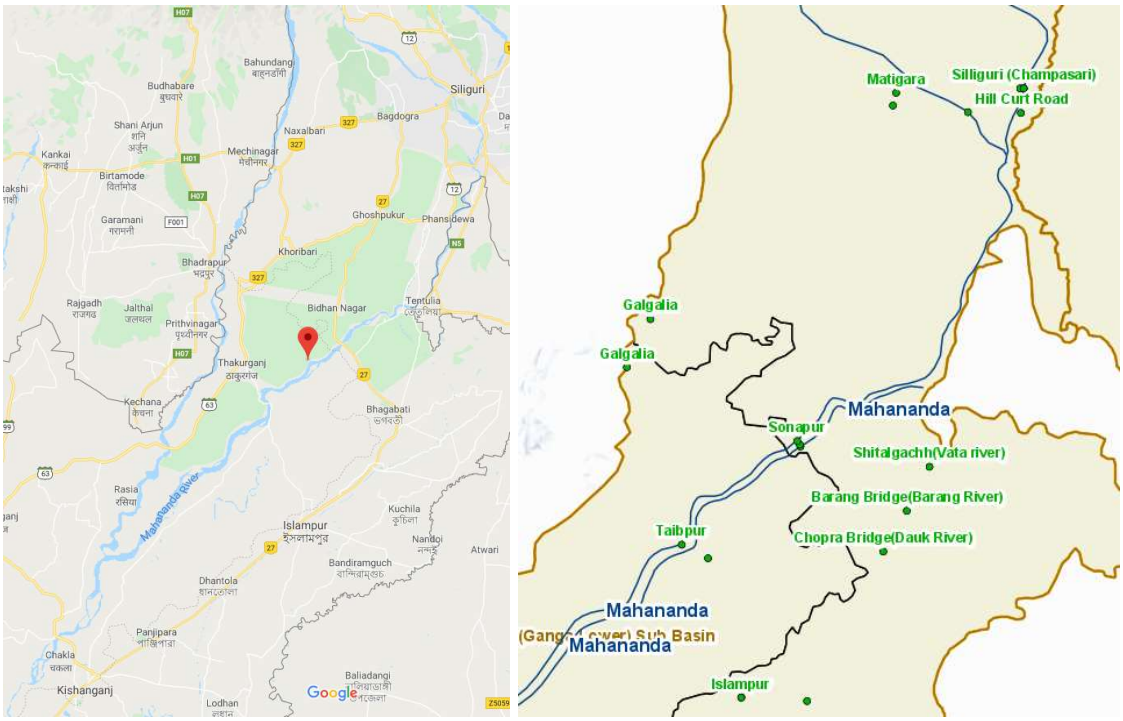


Figure 1. Description of the study area. (Source: Google maps and eSWIS)

Table 1. Details of studied WQ sites.

Sl. No.	Name of Site	River	Site Code	Date of opening of WQ site	Latitude	Longitude	Location
1.	Champasari	Mahananda	031-LBDJPG	10/07/1977	26°44’21’’	88°25’20’’	West Bengal
2.	Matigara	Balason	040-LBDJPG	01/06/1985	26°43’13’’	88°22’40’’	West Bengal
3.	Sonapur	Mahananda	041-LBDJPG	11/11/1977	26°27’15’’	88°14’40’’	West Bengal

Level-II water quality parameters of Champasari, Matigara and Sonapur sites are studied for the period of 25 years starting from 1994 to 2019 to investigate the limit of drinking water, fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal. The tolerance limit of various parameters based on Bureau of Indian Standards has also recommended water quality parameters for different uses in the standard IS 10500:2012 is appended below:

Water Quality Standards in India (Source IS 10500:2012) Characteristics			
Characteristic	**Requirement (Acceptable Limit)**	**Permissible (Limit in the Absence of Alternate Source)**	**Remarks**
Dissolved Oxygen (DO) mg/L, min	6	4	Source IS 2296:1992)
Biochemical Oxygen demand (BOD) mg/L, max	2	3	Source IS 2296:1992)
pH value	6.5-8.5	No relaxation	
Calcium hardness (as $CaCO_3$), mg/L, max.	75	200	
Magnesium hardness (as $CaCO_3$), mg/L, max.	30	100	
Iron (as Fe), mg/L, max.	0.3	No relaxation	
Chlorides (as Cl), mg/L, max.	250	1000	
Sulphates (as SO_4), mg/L, max.	200	400	
Nitrates (as NO_3), mg/L, max.	45	No relaxation	
Electrical conductivity, micromho/cm, max	-	2250	Source IS 2296:1992)

Water Quality Datasheet for the Period: 2019

1. Site name: Champasari

Parameters	Time period (month/year)						
	06/ 2019	07/ 2019	08/ 2019	09/ 2019	10/ 2019	11/ 2019	12/ 2019
PHYSICAL							
Temp (Degrees Celsius (ºC))	31	32	26	26	28	21	26
pH_GEN (pH unit)	6.7	6.9	7	7	7.2	7.1	7.2
EC_GEN (µmho/cm)	194	97	131	157	163	154	154
CHEMICAL							
Ca^{2+} (mg/L)	32.9	17	35.4	25.5	25.5	33.4	17.6
Mg^{2+} (mg/L)	10.9	10.3	4.3	5.2	7.7	8.7	4.4
Cl^{-}(mg/L)	20	11	9.8	6.5	8.2	8.2	7.3
CO_3^{2-} (mg/L)	1.3	0	0	0	0	0	0
HCO_3^{-} (mg/L)	93.9	57.8	65.4	77.9	60.3	70.4	70.8
Alk-Phen (mg$CaCO_3$/L)	1.08	0	0	0	0	0	0
ALK-TOT (mg$CaCO_3$/L)	79.13	47.38	53.61	63.85	49.43	57.7	58.03
SO_4^{2-} (mg/L)	5.93	-	7.87	-	-	-	11.02
SiO_2(mg/L)	-	33.85	33.49	-	-	-	3.21
BIOLOGICAL/BACTEOROLOGICAL							
DO	4.6	4.3	4.0	3.0	3.0	3.0	4.0
BOD (mg/L)	1.6	1.3	1.7	-	-	-	-
COD (mg/L)	4.8	5.7	7.9	-	-	-	12.0

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, Ca^{2+}, Mg^{2+}, Cl^{-}, CO_3^{2-}, HCO_3^{-}, Alk-Phen, ALK-TOT, SO_4^{2-}, SiO_2, DO, BOD, COD for the period from June, 2019 to December, 2019 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH - 7.2) in the month of August, 2019 & October, 2019 & minimum (pH -6.7) in the month of June, 2019, all during the flood season.
3. The value of EC is maximum (EC-194) in the month of June, 2019 & minimum (EC-97) in the month of July, 2019, all during the flood season.
4. The value of Ca^{2+} is maximum (Ca^{2+}-35.4) in the month of August, 2019 & minimum (Ca^{2+}-17) in the month of July, 2019, all during the flood season.
5. The value of Mg^{2+} is maximum (Mg^{2+} -10.9) in the month of June, 2019 & minimum (Mg^{2+} -4.3) in the month of August, 2019, all during the flood season.
6. The value of Cl^{-} is maximum (Cl^{-} -20) in the month of June, 2019 & minimum (Cl^{-}- 6.5) in the month of September, 2019, all during the flood season.
7. The value of HCO_3^{-} is maximum (HCO_3^{-} -93.9) in the month of June, 2019 & minimum (HCO_3^{-} - 57.8) in the month of July, 2019, all during the flood season.
8. The value of ALK-Phen (mg$CaCO_3$/L) in the month of June, 2019 is 1.08 during the lean period.

9. The value of ALK-TOT ($mgCaCO_3/L$) is maximum (ALK-TOT -79.13) in the month of June, 2019 & minimum (ALK-TOT -47.38) in the month of July, 2019, all during the flood season.
10. The value of SO_4^{2-}(mg/L) is maximum (SO_4^{2-}—11.02) for month December, 2019 during the lean period & minimum (SO_4^{2-} - 5.93) in the month of June, 2019 during the flood period.
11. The value of SiO_2(mg/L) is maximum (SiO_2-33.85) for month of July, 2019 during the flood period & minimum (SiO_2- 3.21) in the month of December, 2019 during the lean period.
12. The value of DO is maximum (DO-4.6) for month of June ,2019 & minimum (DO- 3.0) in the month of September, 2019, all during the flood season.
13. The value of BOD is maximum (BOD-1.7) for month of August, 2019 & minimum (BOD-1.3) in the month of July, 2019, all during the flood season.
14. The value of COD is maximum (COD-12.0) for month of December, 2019 during the lean period & minimum (COD- 4.8) in the month of June, 2019 during the flood period.

2. Site name: Matigara

Parameters	Time period (month/year)						
	06/ 2019	07/ 2019	08/ 2019	09/ 2019	10/ 2019	11/ 2019	12/ 2019
PHYSICAL							
Temp (Degrees Celsius (ºC))	30	30	25	27	28	22	26
pH_GEN(pH unit)	7.2	7	7	6.9	7.2	7.4	7.3
EC_GEN(µmho/cm)	85	76	80	70	70	71	76
CHEMICAL							
Ca^{2+} (mg/L)	17.9	17	15.6	14.2	15.5	14.3	7.2
Mg^{2+} (mg/L)	4.5	13.8	4.3	5.2	4.3	3.8	1.5
Cl^- (mg/L)	18	11	9.8	5.7	7.3	6.4	6.9
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0
HCO_3^- (mg/L)	53.6	45.3	40.2	42.7	42.7	37.7	37.8
Alk-Phen($mgCaCO_3/L$)	0	0	0	0	0	0	0
ALK-TOT($mgCaCO_3/L$)	43.93	37.13	32.95	35	35.0	30.9	31.0
SO_4^{2-} (mg/L)	5.77	-	5.61	-	-	-	6.3
SiO_2(mg/L)	-	39.78	35.16	-	-	-	14.12
BIOLOGICAL/BACTEOROLOGICAL							
DO	4.3	3.7	4.3	4.0	3.6	4.5	4.5
BOD_{5-21} (mg/L)	1.5	0.6	0.7	-	-	-	-
COD (mg/L)	8.1	9.3	7.9	-	-	-	12

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, SiO_2, DO, BOD, COD for the period from June, 2019 to September, 2019 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.

2. The value of pH is maximum (pH - 7.4) in the month November, 2019 of during lean period & minimum (pH -6.9) in the month of September, 2019 during flood period.
3. The value of EC is maximum (EC-85) in the month of June, 2019 during flood period & minimum (EC-70) in the month of October, 2019 during flood period.
4. The value of Ca^{2+} is maximum (Ca^{2+}-17.9) in the month of June, 2019 during flood period & minimum (Ca^{2+}-7.2) in the month of December, 2019 during lean period.
5. The value of Mg^{2+} is maximum (Mg^{2+} -13.8) in the month of July, 2019 during flood period & minimum (Mg^{2+} -1.5) in the month of December, 2019 during lean period.
6. The value of Cl^- is maximum (Cl^- -18) in the month of June, 2019 during flood period & minimum (Cl^- 5.7) in the month of September, 2019 during flood period.
7. The value of HCO_3^- is maximum (HCO_3^- -53.6) in the month of June, 2019 during flood period & minimum (HCO_3^- - 37.7) in the month of November, 2019 during lean period.
8. The value of ALK-TOT ($mgCaCO_3/L$) is (ALK-TOT -43.93) in the month of June, 2019 during flood period & minimum (ALK-TOT -30.9) in the month of November, 2019 during lean period.
9. The value of SO_4^{2-}(mg/L) is maximum (SO_4^{2-}—6.3) in the month December, 2019 during lean period & minimum (SO_4^{2-} - 5.61) in the month of August, 2019 during flood period.
10. The value of SiO_2(mg/L) is maximum (SiO_2-39.78) in the month of July, 2019 during flood period & minimum (SiO_2- 14.12) in the month of December, 2019 during lean period.
11. The value of DO is maximum (DO-4.5) in the month of November, 2019 during lean period & minimum (DO- 3.6) in the month of October, 2019 during flood period.
12. The value of BOD is maximum (BOD-1.5) in the month of June, 2019 during flood period & minimum (BOD- 0.6) in the month of July, 2019 during flood period.
13. The value of COD is maximum (COD-12.0) in the month of December, 2019 during lean period & minimum (COD- 7.9) in the month of August, 2019 flood period.

3. Site name: Sonapur

Parameters	Time period (month/year)						
	06/ 2019	07/ 2019	08/ 2019	09/ 2019	10/ 2019	11/ 2019	12/ 2019
PHYSICAL							
Temp (Degrees Celsius (ºC))	32	32	25	27	29	20	26
pH_GEN (pH unit)	6.9	6.8	7.1	7.1	7.0	7.4	7.4
EC_GEN(µmho/cm)	72	79	96	86	71	99	97
CHEMICAL							
Ca^{2+} (mg/L)	10.4	17	22.7	18.4	12.7	20.6	11.2
Mg^{2+} (mg/L)	4.5	7.7	6	4.3	6.8	5.8	2.9
Cl^- (mg/L)	12	10.2	10.6	5.7	8.9	8.2	6.4
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0
HCO_3^- (mg/L)	44.2	42.7	50.3	55.3	35.2	42.7	57.3
Alk-Phen ($mgCaCO_3/L$)	0	0	0	0	0	0	0
ALK-TOT ($mgCaCO_3/L$)	36.23	35	41.23	45.33	28.85	35.0	46.97
SO_4^{2-} (mg/L)	6.67	-	6.64	-	-	-	7.74

SiO_2(mg/L)		34.31	37.25	-	-	-	15.43
BIOLOGICAL/BACTEOROLOGICAL							
DO	4.2	3.7	4	3.7	3.0	3.8	4.2
BOD_{5-21} (mg/L)	1	0.3	1.3	-	-	-	-
COD (mg/L)	4.5	6.8	7.9	-	-	-	12

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-} , SiO_2, DO, BOD, COD, for the period from June, 2019 to September, 2019 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH - 7.4) in the month of November, 2019 during lean period & minimum (pH -6.8) in the month of June, 2019during flood period.
3. The value of EC is maximum (EC-99) for month of November, 2019 during lean period & minimum (EC-71) in the month of October, 2019 during flood period.
4. The value of Ca^{2+} is maximum (Ca^{2+}-22.7) in the month of August, 2019 during flood period & minimum (Ca^{2+}-10.4) in the month of June, 2019 during flood period.
5. The value of Mg^{2+} is maximum (Mg^{2+} -7.7) in the month of July, 2019 during flood period & minimum (Mg^{2+} -2.9) in the month of December, 2019 during lean period.
6. The value of Cl^- is maximum (Cl^- -12) in the month of June, 2019 during flood period & minimum (Cl^- - 5.7) in the month of September, 2019 during flood period.
7. The value of HCO_3^- is maximum (HCO_3^- -57.3) in the month of December, 2019 during lean period & minimum (HCO_3^- -35.2) in the month of October, 2019 during flood period.
8. The value of ALK-TOT ($mgCaCO_3$/L) is (ALK-TOT -46.97) in the month of December, 2019 during lean period & minimum (ALK-TOT -28.85) in the month of October,2019 during flood period.
9. The value of SO_4^{2-} (mg/L) is maximum (SO_4^{2-} -7.74) in the month December, 2019 during lean period & minimum (SO_4^{2-} -6.64) in the month of August, 2019 during flood period.
10. The value of SiO_2(mg/L) is maximum (SiO2-37.25) in the month of August, 2019 during flood period & minimum (SiO_2- 15.43) in the month of December, 2019 during lean period.
11. The value of DO is maximum (DO-4.2) in the month of June ,2019 during flood period & minimum (DO- 3.0) in the month of October, 2019 during flood period.
12. The value of BOD is maximum (BOD-1.3) in the month of August, 2019 during flood period & minimum (BOD- 0.3) in the month of July,2019 during flood period.
13. The value of COD is maximum (COD-12.0) in the month of December, 2019 during lean period & minimum (COD- 4.5) in the month of June ,2019 flood period.

Water Quality Datasheet for the Period: 2018-2019

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2018	07/ 2018	08/ 2018	09/ 2018	10/ 2018	11/ 2018	12/ 2018	01/ 2019	02/ 2019	03/ 2019	04/ 2019	05/ 2019

PHYSICAL												
Temp(Degrees Celsius (ºC))		29	30	28	27	20	20	18	18	22	21	24
pH_GEN(pH unit)	7.9	7.1	7.4	7	7.4	6.9	6.9	7	7.6	6.9	7.5	7.6
EC_GEN(µmho/cm)	212	141	80.8	109			142.8	108.4	100.5	107.8	151.6	183.5
TDS(mg/L)	146	89	53	76								
CHEMICAL												
Ca^{2+} (mg/L)		16	18.4	16	17.5	17.2	14.75	18.6	21.83	12.02	10.42	19.63
Mg^{2+} (mg/L)		1.9	2.4	6.8	5.2	4	4.5	4.8	17.99	6.33	6.32	1.83
Cl^- (mg/L)	4.2	5.9	5	10.1	3.2	8.2	8.8	12.9	11.9	13.8	14.8	13.75
CO_3^{2-} (mg/L)		8	4	4	4	3	3.2	0	12.24	0	0	0
HCO_3^- (mg/L)		52	68	48	50	54.2	55.5	37.34	64.32	61.02	47.8	107.36
Alk-Phen(mg$CaCO_3$/L)		6.64	3.32	3.32	3.32	2.49	2.66	0	10.16	0	0	0
ALK-TOT(mg$CaCO_3$/L)		55.96	62.4	46.01	47.65	49.43	50.83	30.61	73.12	50.02	39.18	88
BIOLOGICAL/ BACTEOROLOGICAL												
DO	7.6	9.3	11.6	10.4	10.5	9.2	10.2	8.7	7.46	7.4	8.7	6.9
$BOD_{5\text{-}21}$ (mg/L)	0	2.6	1.7	1.6	1.5	1.6	1.5	1.5			1.5	1.2
COD(mg/L)	9.6	2	7.7	8.8	8.2	6	6.2	6.6	6.9	5.52	7.3	4.6

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, DO, BOD, COD for the period from June, 2019 to September, 2019 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) in the month of June, 2018 during the flood period & minimum (pH -6.9) in the month of March,2019 during the lean period.
3. The value of EC is maximum (EC-212) in the month of June,2018, during the flood period & minimum (EC-80) in the month of August,2018 during the flood period.
4. The value of TDS is maximum (TDS-143) in the month June,2018 during flood period & minimum (TDS-53) in the month of August,2018 during flood period.
5. The value of Ca^{2+} is maximum (Ca^{2+}-21.83) in the month of February, 2019, during lean period & minimum (Ca^{2+}-10.42) in the month of April,2019 during lean period.
6. The value of Mg^{2+} is maximum (Mg^{2+}-17.99) in the month of February, 2019, during lean period & minimum (Mg^{2+}-1.83) in the month of July,2018 during flood period.
7. The value of Cl^- is maximum (Cl^- -14.8) in the month of April,2019 during lean period & minimum (Cl^- -3.2) in the month of October,2018 during flood period.
8. The value of CO_3^{2-} is maximum (CO_3^{2-} -12.24) in the month of February, 2019 during lean period & minimum (CO_3^{2-} -0) in the month of May, 2019 during flood period.
9. The value of HCO_3^- is maximum (HCO_3^- -107.36) in the month of May, 2019 during flood period & minimum (HCO_3^- -37.34) in the month of January, 2019 during lean period.
10. The value of Alk-Phen(mg$CaCO_3$/L) is maximum (Alk-Phen -10.16) in the month January,2019 during lean period & minimum (Alk-Phen -0) in the month of November,2018 during lean period.

11. The value of ALK-TOT (mg$CaCO_3$/L) is maximum (ALK-TOT -88) in the month May,2019 during flood period & minimum (ALK-TOT -30.61) in the month of January,2019 during lean period.
12. The value of DO is maximum (DO-11.6) in the month of August,2018 during flood period & minimum (DO- 6.9) in the month of May,2019 during flood period.
13. The value of BOD is maximum (BOD-2.6) in the month of June,2018 during flood period & minimum (BOD- 1.2) in the month of May, 2019 during flood period.
14. The value of COD is maximum (COD-9.6) in the month of June,2018 during flood period & minimum (COD- 1) in the month of July,2018 during the flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2018	07/ 2018	08/ 2018	09/ 2018	10/ 2018	11/ 2018	12/ 2018	01/ 2019	02/ 2019	03/ 2019	04/ 2019	05/ 2019
PHYSICAL												
Temp(Degrees Celsius (ºC))		21	22	22	21	22	20	19	17	20	25	25
pH_GEN(pH unit)	7.4	7.1	6.9	7.1	7.4	7.5	6.8	8.7	7.5	8.1	7.6	8.1
EC_GEN(µmho/cm)	196	98	195	75.5			70.63	71.2	54.59	80.8	78.87	92.7
TDS(mg/L)	131	63	129	52								
CHEMICAL												
Ca^{2+} (mg/L)		8	8.8	7.2	8.2	8.3	10.32	24.4	9.03	10.42	9.61	32.22
Mg^{2+} (mg/L)		1.9	1.5	7.3	5.2	3.1	3.8	4.2	15.65	6.81	5.36	6.42
Cl^- (mg/L)	8.2	6.9	8.9	9.2	8	7	7.2	13.82	10.2	18.4	11.5	16.5
CO_3^{2-} (mg/L)		8	4	0	4	4	3	6.1	24.48	18.12	0	0
HCO_3^- (mg/L)		44	48	22	28	40.8	32.8	87.3	21.45	39.76	59.79	53.68
ALK-TOT(mg$CaCO_3$/L)		49.4	46.01	18.03	29.62	40.11	31.89	81.72	58.38	62.79	49.01	44
Alk-Phen(mg$CaCO_3$/L)		6.64	3.32	0	3.32	3.32	2.49	5.06	20.32	15.04	0	0
BIOLOGICAL/ BACTEOROLOGICAL												
DO		9.3	10.9	12.6	11.2	9	10.5	8.1	7.08	7.4	5.2	4.6
$BOD_{5\text{-}21}$ (mg/L)	0.7	1.8	0.6	**2.7**	2	1.8	1.1	1.7			1.2	1.1
COD(mg/L)	5.7	6	7.7	5.9	6	5.5	6	6.2	6.5	7.36	3.6	8.2

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, DO, BOD, COD in the period from June, 2018 to May, 2019 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.7) in the month of January,2019 during flood period & minimum (pH -6.8) in the month of December,2018 during lean period.
3. The value of EC is maximum (EC-196) in the month of June,2018, during flood period & minimum (EC-54) in the month of February,2019 during lean period.
4. The value of TDS is maximum (TDS-131) in the month June,2018 during flood period & minimum (TDS-52) in the month of September,2018 during flood period.

5. The value of Ca^{2+} is maximum (Ca^{2+}-32.22) in the month of May, 2019, during lean period & minimum (Ca^{2+}-7.2) in the month of September ,2018 during flood period.
6. The value of Mg^{2+} is maximum (Mg^{2+}-15.6) in the month of February, 2019, during lean period & minimum (Mg^{2+}-1.5) in the month of August,2018 during flood period.
7. The value of Cl^- is maximum (Cl^--18.4) in the month of March,2019 during lean period & minimum (Cl^- - 6.9) in the month of July,2018 during flood period.
8. The value of CO_3^{2-} is maximum (CO_3^{2-}-24.48) in the month of February, 2019 during lean period & minimum (CO_3^{2-}-3.0) in the month of December, 2018 during lean period.
9. The value of HCO_3^- is maximum (HCO_3^--87.3) in the month of January, 2019 during lean period & minimum (HCO_3^--21.4) in the month of February, 2019 during flood period.
10. The value of Alk-Phen($mgCaCO_3/L$) is maximum (Alk-Phen -20.32) in the month February,2019 during lean period & minimum (Alk-Phen -0) in the month of September,2018 during flood period.
11. The value of ALK-TOT ($mgCaCO_3/L$) is maximum (ALK-TOT -81.72) in the month January,2019 during lean period & minimum (ALK-TOT -18.03) in the month of September,2018 during flood period.
12. The value of DO is maximum (DO-12.6) in the month of September,2018 during flood period & minimum (DO- 4.6) in the month of May,2019 during flood period.
13. The value of BOD is maximum (BOD-2.7) in the month of September,2018 during flood period & minimum (BOD- 0.6) in the month of August, 2018 during lean period.
14. The value of COD is maximum (COD-8.2) in the month of May,2019 during flood period & minimum (COD- 3.6) in the month of April,2019 lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2018	07/ 2018	08/ 2018	09/ 2018	10/ 2018	11/ 2018	12/ 2018	01/ 2019	02/ 2019	03/ 2019	04/ 2019	05/ 2019
PHYSICAL												
Temp(Degrees Celsius (ºC))		27	27	30	29	22	21	20	19	23	23	25
pH_GEN(pH unit)	8.4	7.1	6.9	6.9	7.3	7.5	7.3	7.3	7.2	7.3	7.4	7.5
EC_GEN(µmho/cm)	198	74	77.3	80.2			94.45	88.4	64.95	72.5	84	87.5
TDS(mg/L)	136	46	52	58								
CHEMICAL												
Ca^{2+} (mg/L)		4.8	7.2	8	7.9	8.3	14.7	20.5	12.8	7.21	10.42	19.63
Mg^{2+}(mg/L)		1.9	2.4	2.9	2.2	3.1	4.5	4.5	11.52	5.84	5.84	0.91
Cl^- (mg/L)	15.4	3	8.9	8.2	8.2	7	7.2	11.05	11.9	11	11	11
CO_3^{2-} (mg/L)		0	0	2	2	4	4.1	0	0	0	0	0
HCO_3^- (mg/L)		28	36	36	28	40.8	42.5	37.34	61.24	58.76	47.8	53.68
Alk-Phen($mgCaCO_3/L$)		0	0	1.66	1.66	3.32	3.4	0	0	0	0	0
ALK-TOT($mgCaCO_3/L$)		22.95	29.51	32.84	26.28	40.11	41.67	30.61	50.2	48.16	39.18	44
BIOLOGICAL/ BACTEOROLOGICAL												
DO	7.4	9.9	8.1	10.3	10.7	9	9.8	7.8	6.52	7.6	7	3.7

BOD_{5-21} (mg/L)	0.9	1.8	0.7	0.8	1.9	1.8	1.4	1.4			1.4	0.8
COD(mg/L)	7.6	4	5.8	4.9	5.5	5.5	5.7	5.8	6.2	3.69	5.5	4.6

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Ca^{2+}, Mg^{2+}, Cl^{-}, CO_3^{2-}, HCO_3^{-}, Alk-Phen, ALK-TOT, DO, BOD, COD for the period from June, 2018 to May, 2019 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.4) in the month of June,2018, during flood period & minimum (pH -6.9) in the month of August,2018 & September,2018 during flood period.
3. The value of EC is maximum (EC-198) in the month of June,2018, during flood period & minimum (EC-64.95) in the month of February,2019 during lean period.
4. The value of TDS is maximum (TDS-136) in the month June,2018 during flood period & minimum (TDS-46) in the month of July,2018 during flood period.
5. The value of Ca^{2+} is maximum (Ca^{2+}-20.5) in the month of January 2019, during lean period & minimum (Ca^{2+}-4.8) in the month of July ,2018 during flood period.
6. The value of Mg^{2+} is maximum (Mg^{2+}-11.52) in the month of February 2019, during lean period & minimum (Mg^{2+}-0.91) in the month of May,2019 during flood period.
7. The value of Cl^{-} is maximum (Cl^{-} -15.4) in the month of June,2018 during flood period & minimum (Cl^{-} - 3) in the month of July,2018 during flood period.
8. The value of HCO_3^{-} is maximum (HCO_3^{-} -61.24) in the month of February, 2019 during lean period & minimum (HCO_3^{-} -28) in the month of July,2018 & October,2018 during flood period.
9. The value of Alk-Phen ($mgCaCO_3/L$) is maximum (Alk-Phen -3.4) in the month November,2018 during lean period & minimum (Alk-Phen -0) in the month of July,2018 during flood period.
10. The value of ALK-TOT ($mgCaCO_3/L$) is maximum (ALK-TOT -50.2) in the month February,2019 during lean period & minimum (ALK-TOT -22.95) in the month of July,2018 during flood period.
11. The value of DO is maximum (DO-10.7) in the month of October,2018 during flood period & minimum (DO- 3.7) in the month of May,2019 during lean period.
12. The value of BOD is maximum (BOD-1.9) in the month of July,2018 during flood period & minimum (BOD- 0.7) in the month of August, 2018 & November,2018 during lean period.
13. The value of COD is maximum (COD-7.6) in the month of June,2018 during flood period & minimum (COD- 3.6) in the month of March,2019 lean period.

Water Quality Datasheet for the Period: 2018

1. Site name: Champasari

PARAMETERS	Time period (month/year)				
	01/2018	02/2018	03/2018	04/2018	05/2018
PHYSICAL					

Temp(Degrees Celsius (ºC))	18	18	21		29
pH_GEN(pH unit)	6.7	6.91	6.83	6.9	7.04
EC_GEN(µmho/cm)	186	102	183	23	192.3
TDS(mg/L)	87	68	120	150	121
CHEMICAL					
Ca^{2+} (mg/L)				7.2	
Mg^{2+} (mg/L)				17	
Cl^- (mg/L)	5.1	4.1	4.6	16	9.3
CO_3^{2-} (mg/L)				0	
HCO_3^-(mg/L)				8	
Alk-Phen(mgCaCO3/L)				0	
ALK-TOT(mgCaCO3/L)				6.56	
SO_4^{2-} (mg/L)				0.9	
BIOLOGICAL/BACTEOROLOGICAL					
DO	6.3	6.5	6.1	7.3	8.6
BOD_{5-21} (mg/L)	1.2	1.1	0.8	1.2	1.2
COD(mg/L)	8	9	4	6	7.9

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD for the period from January, 2018 to May, 2018 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH – 7.04) in the month of May, 2018, during flood period & minimum (pH -6.7) in the month of January, 2018 during lean period.
3. The value of EC is maximum (EC-192.3) in the month of May, 2018, during flood period & minimum (EC-23) in the month of April, 2018 during lean period.
4. The value of TDS is maximum (TDS-150) in the month April,2018 during lean period & minimum (TDS-68) in the month of February,2018 during lean period.
5. The value of Ca^{2+} is (Ca^{2+}-7.2) in the month of April, 2018, during lean period.
6. The value of Mg^{2+} is (Mg^{2+}-17) in the month of April, 2018, during lean period.
7. The value of Cl^- is maximum (Cl^--16) in the of April, 2018 during lean period & minimum (Cl^- - 4.1) in the month of February, 2018 during lean period.
8. The value of HCO_3^- is (HCO_3^- - 8) in the month of April,2018, during lean period.
9. The value of ALK-TOT ($mgCaCO_3/L$) is (ALK-TOT -6.56) in the month of April,2018, during lean period.
10. The value of DO is maximum (DO-8.6) in the month of May, 2018 during flood period & minimum (DO- 6.1) in the month of March, 2019 during lean period.
11. The value of BOD is maximum (BOD-1.2) in the month of January, 2018 during lean period & minimum (BOD- 0.8) in the month of March, 2018 during lean period.
12. The value of COD is maximum (COD-9) in the month of February,2018 during leanperiod & minimum (COD- 4) in the month of March, 2018 lean period.
13. The value of is 0.9 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)				
	01/2018	02/2018	03/2018	04/2018	05/2018
PHYSICAL					
Temp (Degrees Celsius (ºC))	12	12	18		21
pH_GEN(pH unit)	6.8	7.1	7.06	8.43	7.04
EC_GEN(µmho/cm)	84	102	81	82	192.3
TDS(mg/L)	65	68	54	54	48
CHEMICAL					
Ca^{2+} (mg/L)				4.8	
Mg^{2+} (mg/L)				7.7	
Cl^- (mg/L)	4.8	3.6	7.3	5	9.3
CO_3^{2-} (mg/L)				0	
HCO_3^- (mg/L)				32	
ALK-TOT(mg$CaCO_3$/L)				26.23	
SO_4^{2-} (mg/L)				0.65	
Alk-Phen(mg$CaCO_3$/L)				0	
BIOLOGICAL/BACTEOROLOGICAL					
DO	7.2	7.3	6.2	7.3	8.1
$BOD_{5\text{-}21}$ (mg/L)	1.1	1.1	1	1.2	1.4
COD(mg/L)	4	5	8	7	11.9

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD for the period from January, 2018 to May, 2018 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH – 8.4) in the month of April,2018, during lean period & minimum (pH -6.8) in the month of January, 2018 during lean period.
3. The value of EC is maximum (EC-192) in the month of May, 2018, during flood period & minimum (EC-82) in the month of April, 2019 during lean period.
4. The value of TDS is maximum (TDS-68) in the month February,2018 during lean period & minimum (TDS-48) in the month of May, 2018 during flood period.
5. The value of Ca^{2+} is (Ca^{2+}-4.8) in the month of April, 2018, during lean period.
6. The value of Mg^{2+} is (Mg^{2+}-7.7) in the month of April, 2018, during lean period.
7. The value of Cl^- is maximum (Cl^- -9.3) in the month of May, 2018 during flood period & minimum (Cl^- - 3.6) in the month of February, 2018 during lean period.
8. The value of HCO_3^- is (HCO_3^--32) in the month of April,2018, during lean period.
9. The value of ALK-TOT (mg$CaCO_3$/L) is (ALK-TOT -26.23) in the month of April,2018, during lean period.
10. The value of SO_4^{2-} is 0.65 during lean period.

11. The value of DO is maximum (DO-8.1) in the month of May, 2018 during flood period & minimum (DO- 6.2) in the month of March, 2019 during lean period.
12. The value of BOD is maximum (BOD-1.4) in the month of May, 2018 during flood period & minimum (BOD- 1.0) in the month of March, 2018 during lean period.
13. The value of COD is maximum (COD-11.9) in the month of May, 2018 during flood period & minimum (COD- 4) in the month of January, 2019 lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)				
	01/2018	02/2018	03/2018	04/2018	05/2018
PHYSICAL					
Temp (Degrees Celsius (ºC))	16	16	22		26
pH_GEN(pH unit)	7.1	7.1	6.95	9.47	7.32
EC_GEN(µmho/cm)	91	102	109	99	85.9
TDS(mg/L)	72	68	70	66	55
CHEMICAL					
Ca^{2+} (mg/L)				11.2	
Mg^{2+} (mg/L)				6.8	
Cl^{-} (mg/L)	5.2	3.8	4.6	4.2	13
CO_3^{2-} (mg/L)				0	
HCO_3^{-} (mg/L)				32	
Alk-Phen($mgCaCO_3/L$)				0	
ALK-TOT ($mgCaCO_3/L$)				26.23	
SO_4^{2-} (mg/L)				0.8	
BIOLOGICAL/BACTEOROLOGICAL					
DO	7.4	7.5	6.9	7.7	8.6
$BOD_{5\text{-}21}$ (mg/L)	1.1	1	0.9	1.2	1.3
COD (mg/L)	6	8	4	5	6

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Ca^{2+}, Mg^{2+}, Cl^{-}, CO_3^{2-}, HCO_3^{-}, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD for the period from January, 2018 to May, 2018 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH - 9.47) in the month of April,2018, during lean period & minimum (pH -6.95) in the month of March, 2018 during lean period.
3. The value of EC is maximum (EC-109) in the month of March, 2018, during lean period & minimum (EC-85.9) in the month of May, 2019 during flood period.
4. The value of TDS is maximum (TDS-72) in the month January,2018 during lean period & minimum (TDS-55) in the month of May, 2018 during flood period.
5. The value of Ca^{2+} is (Ca^{2+}-11.2) in the month of April, 2018, during lean period.
6. The value of Mg^{2+} is (Mg^{2+}-6.8) in the month of April, 2018, during lean period.
7. The value of Cl^{-} is maximum (Cl^{-} -13) in the month of May, 2018 during flood period & minimum (Cl^{-} - 3.8) in the month of February, 2018 during lean period.

8. The value of HCO_3^- is (HCO_3^--32) in the month of April,2018, during lean period.
9. The value of ALK-TOT ($mgCaCO_3/L$) is (ALK-TOT -26.23) in the month of April,2018, during lean period.
10. The value of SO_4^{2-} is 0.8 during lean period.
11. The value of DO is maximum (DO-8.6) in the month of May, 2018 during flood period & minimum (DO- 6.9) in the month of March, 2019 during lean period.
12. The value of BOD is maximum (BOD-1.3) in the month of May, 2018 during flood period & minimum (BOD- 0.9) in the month of March, 2018 during lean period.
13. The value of COD is maximum (COD-8) in the month of February, 2018 during lean period & minimum (COD- 4) in the the month of March, 2019 lean period.

Water Quality Datasheet for the Period: 2014-2015

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2014	07/ 2014	08/ 2014	09/ 2014	10/ 2014	11/ 2014	12/ 2014	01/ 2015	02/ 2015	03/ 2015	04/ 2015	05/ 2015
PHYSICAL												
Temp(Degrees Celsius (ºC))	24	23	26	24	25	16	16	16	12	20	22	24
pH_GEN(pH unit)	7.3	7.27	7.42	7.12	7.05	7.6	7.54	7.61	7.4	7.2	7.6	6.9
EC_GEN(µmho/cm)	146.42	109.4	107.9	96.1	82.1	114.5	144.5	140.4	174.6	178	166	184.3
TDS(mg/L)	104	85.3	77.7	76.4	59.1	90.5	106.9	113.7	144.9	135.3	134.5	153
Turb(NTU)	3.6	2.5	6	1.3	1.1	2	0.6	1.6	1.2	2	4.3	5.7
CHEMICAL												
Na^+(mg/L)	3.8	4.9	6	2.9	3.6	4.6	2.9	2.7	4.8	6.1	1.8	2
K^+(mg/L)	2.3	3.6	3.9	1.2	1.4	2	2.5	1.4	2.4	4.5	1.6	1.8
Ca^{2+} (mg/L)											32.08	
Mg^{2+} (mg/L)											1.9	
Cl^- (mg/L)	4.58	5.43	6.29	4.29	4	5.43	4.8	3.7	5.1	6.9	2.3	2.5
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											32	
ALK-TOT($mgCaCO_3/L$)											26.23	
Alk-Phen($mgCaCO_3/L$)											0	
SO_4^{2-}(mg/L)											30.2	
BIOLOGICAL/ BACTEOROLOGICAL												
DO(mg/L)											8.2	7
$BOD_{3\text{-}27}$(mg/L)	1.1	1	1.3	1	1.1	1.4	1.1	1.2	1.1	1.2	1.4	1.3
COD(mg/L)	10.2	8.2	10.2	6.1	8.2	10.2	8.2	10.2	10.2	6.1	8.2	8.2

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD for the period from June, 2014 to May, 2015 are within

the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.

2. The value of pH is maximum (pH -7.61) in the month of November, 2014, during lean period & minimum (pH -6.9) in the month of May, 2015 during flood period.
3. The value of EC is maximum (EC-184) in the month of May, 2015 during flood period & minimum (EC-82) in the month of October,2014 during flood period.
4. The value of TDS is maximum (TDS-153) in the month May,2015 during flood period & minimum (TDS-59.1) in the the month of October, 2014 during flood period.
5. The value of Turbidity is maximum (Turb-6) in the month of August, 2014 during flood period & minimum (Turb-0.6) in the month of December, 2014 during lean period.
6. The value of Na^+ is maximum (Na^+-6.1) in the month of March,2015 during lean period & minimum (Na^+-1.8) in the month of April, 2015 during lean period.
7. The value of K^+ is maximum (K^+-4.5) in the month of March, 2015 during lean period & minimum (K^+-1.2) in the month of September, 2014 during lean period.
8. The value of Ca^{2+} in the month of April, 2015 is 32.08 during lean period.
9. The value of Mg^{2+} in the month of April, 2015 is 1.9 during lean period.
10. The value of Cl^- is maximum (Cl^- -6.9) in the month of March,2015 during lean period & minimum (Cl^- - 2.3) in the month of April,2015 during lean period.
11. The value of HCO_3^- in the month of April, 2015 is 32 during lean period.
12. The value of ALK-TOT in the month of April, 2015 is 26.23 during lean period.
13. The value of SO_4^{2-} in the month of April, 2015 is 30.2 during lean period.
14. The value of DO is maximum (DO-8.2) in the month of April, 2015 during lean period & minimum (DO- 7.0) in the month of May,2015 during flood period.
15. The value of BOD is maximum (BOD-1.4) in the month of November,2014 during lean period & minimum (BOD- 1.0) in the month of July, 2014 & September, 2014 during flood period.
16. The value of COD is maximum (COD-10.2) in the month of January, 2014 during lean period & minimum (COD- 6.1) in the month of September, 2014 flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2014	07/ 2014	08/ 2014	09/ 2014	10/ 2014	11/ 2014	12/ 2014	01/ 2015	02/ 2015	03/ 2015	04/ 2015	05/ 2015
PHYSICAL												
Temp(Degrees Celsius (ºC))	23	24	25	23	24	18	17	14	16	21	24	26
pH_GEN(pH unit)	6.9	7.32	8.54	7.06	6.83	7.1	7.4	7.85	7.5	7.5	7.8	6.8
EC_GEN(µmho/cm)	83.46	80.8	86.1	98.2	78.6	79.3	65.6	60.6	77.3	79	98	84.3
TDS(mg/L)	59.3	63	62	77.6	56.6	62.3	48.5	49.1	64.2	60	79.4	70
Turb(NTU)	1.9	1.6	3.4	1	0.8	1.5	0.6	5.6	1.8	2	6.1	3.6
CHEMICAL												
Na^+(mg/L)	4.6	5.6	5.8	4.2	4	5.1	2.9	2.1	3.6	4.5	2	1.7

K^+(mg/L)	1.5	2.2	3.4	2.1	1.9	1.8	1.4	1.4	1.7	4	1.6	1.5
Ca^{2+} (mg/L)											22.46	
Mg^{2+} (mg/L)											6.77	
Cl^- (mg/L)	4.86	6.58	6.01	5.15	6.01	5.72	3.9	3.4	4.3	5.1	2.4	2.2
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											24	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT(mg$CaCO_3$/L)											19.67	
SO_4^{2-} (mg/L)											25.3	
BIOLOGICAL/ BACTEOROLOGICAL												
DO(mg/L)											7.6	6.9
$BOD_{3\text{-}27}$(mg/L)	1	1	1.2	1	1	1.3	1.3	1	1.1	1.2	1.4	1.1
COD(mg/L)	8.16	10.2	8.16	6.1	6.1	10.2	12.2	6.1	8.2	6.1	8.2	4.1

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD in the period from June, 2014 to May, 2015 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.54) in the month of August, 2014, during flood period & minimum (pH -6.8) in the month of May, 2015 during flood period.
3. The value of EC is maximum (EC-98.2) in the month of September, 2014 during flood period & minimum (EC-60.6) in the month of January, 2015 during lean period.
4. The value of TDS is maximum (TDS-79.4) in the month April,2015 during lean period & minimum (TDS-48.5) in the month of December, 2014 during lean period.
5. The value of Turbidity is maximum (Turb-6.1) in the month of April, 2015 during lean period & minimum (Turb-0.6) in the month of December, 2014 during lean period.
6. The value of Na^+ is maximum (Na^+-5.8) in the month of August, 2014 during flood period & minimum (Na^+-1.7) in the month of May, 2015 during flood period.
7. The value of K^+ is maximum (K^+-4.0) in the month of March, 2015 during lean period & minimum (K^+-1.4) in the month of December, 2014 & January, 2015 during lean period.
8. The value of Ca^{2+} in the month of April, 2015 is 22.46 during lean period.
9. The value of Mg^{2+} in the month of April, 2015 is 6.77 during lean period.
10. The value of Cl^- is maximum (Cl^- -6.58) in the month of July, 2014 during flood period & minimum (Cl^- - 2.2) in the month of May, 2015 during flood period.
11. The value of HCO_3^- in the month of April, 2015 is 24 during lean period.
12. The value of ALK-TOT in the month of April, 2015 is 19.67 during lean period.
13. The value of SO_4^{2-} in the month of April, 2015 is 25.3 during lean period.
14. The value of DO is maximum (DO-7.6) in the month of April, 2015 during lean period & minimum (DO- 6.9) in the month of May,2015 during flood period.

15. The value of BOD is maximum (BOD-1.4) in the month of April, 2015 during lean period & minimum (BOD- 1.0) in the month of June, 2014, July, 2014, September, 2014 & October, 2014 during flood period.
16. The value of COD is maximum (COD-12.2) in the month of December, 2014 during lean period & minimum (COD- 4.1) in the month of May, 2015 flood period.

3. Sonapur: 2014-2015

PARAMETERS	Time period (month/year)											
	06/ 2014	07 /2014	08/ 2014	09/ 2014	10/ 2014	11/ 2014	12/ 2014	01/ 2015	02/ 2015	03/ 2015	04/ 2015	05/ 2015
PHYSICAL												
Temp(Degrees Celsius (ºC))	25	23	26	23	24	18	16	14	15	21	18	28
pH_GEN(pH unit)	6.8	7.21	6.98	6.97	6.86	7.4	8.16	7.9	7.7	7.7	7.5	6.7
EC_GEN(µmho/cm)	108.76	79.6	50.5	84.6	76.8	84.5	92.4	91.6	93.7	99	112	89.8
TDS(mg/L)	77.2	62.1	36.4	66.8	55.3	66.8	68.4	74.2	77.8	75.2	90.7	74.5
Turb(NTU)	2.7	1.4	0.8	0.8	0.6	1.8	0.9	2.3	1.3	0.9	5.8	1.1
CHEMICAL												
Na^+ (mg/L)	4	5.6	6.8	3.4	4.8	3.8	2.6	2.4	4.5	5.2	1.6	1.4
K^+ (mg/L)	2	2.3	3.7	1.5	2	1.5	1.8	1.9	1.9	3.9	1.4	1.3
Ca^{2+} (mg/L)											25.66	
Mg^{2+} (mg/L)											2.88	
Cl^- (mg/L)	4.29	6.01	7.15	4.58	5.72	4.86	5.1	3.4	5.4	5.7	2	1.9
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											40	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT(mg$CaCO_3$/L)											32.79	
SO_4^{2-} (mg/L)											26.4	
BIOLOGICAL/ BACTEOROLOGICAL												
DO(mg/L)											7.4	8.1
$BOD_{3\text{-}27}$(mg/L)	0.9	1.1	0.9	0.9	1	1	1.3	1.1	1.2	1.1	1.2	1.1
COD(mg/L)	4.08	6.1	4.08	4	6.1	6.1	12.2	6.1	8.2	4.1	6.1	6.1

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD in the period from June, 2014 to May, 2015 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.1) in the month of December, 2014, during lean period & minimum (pH -6.7) in the month of May, 2015 during flood period.
3. The value of EC is maximum (EC-112) in the month of April, 2015 during lean period & minimum (EC-50.5) in the month of August, 2014 during flood period.
4. The value of TDS is maximum (TDS-90.7) in the month April,2015 during lean period & minimum (TDS-36.4) in the month of August,2014 during flood period.

5. The value of Turbidity is maximum (Turb-5.8) in the month of April,2015 during lean period & minimum (Turb-0.6) in the month of October,2014 during flood period.
6. The value of Na^+ is maximum (Na^+-6.8) in the month of August, 2014 during flood period & minimum (Na^+-1.4) in the month of May, 2015 during flood period.
7. The value of K^+ is maximum (K^+-3.9) in the month of March, 2015 during lean period & minimum (K^+-1.3) in the month of May, 2015 during flood period.
8. The value of Ca^{2+} in the month of April, 2015 is 25.66 during lean period.
9. The value of Mg^{2+} in the month of April, 2015 is 2.88 during lean period.
10. The value of Cl^- is maximum (Cl^--7.15) in the month of August, 2014 during flood period & minimum (Cl^- - 1.9) in the month of May, 2015 during flood period.
11. The value of HCO_3^- in the month of April, 2015 is 40 during lean period.
12. The value of ALK-TOT in the month of April, 2015 is 32.79 during lean period.
13. The value of SO_4^{2-} in the month of April, 2015 is 26.4 during lean period.
14. The value of DO is maximum (DO-8.1) in the month of May,2015 during flood period & minimum (DO- 7.4) in the month of April,2015 during lean period.
15. The value of BOD is maximum (DO-1.3) in the month of December, 2014 during lean period & minimum (DO- 0.9) in the month of June, 2014, August, 2014 & September, 2014 during flood period.
16. The value of COD is maximum (COD-8.2) in the month of February,2015 during lean period & minimum (COD- 4) in the month of September, 2014 flood period.

Water Quality Datasheet for the Period: 2013-2014

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2013	07/ 2013	08/ 2013	09/ 2013	10/ 2013	11/ 2013	12/ 2013	01/ 2014	02/ 2014	03/ 2014	04/ 2014	05/ 2014
PHYSICAL												
Temp(Degrees Celsius (ºC))	28	27	26	27	21	20	11.5	16	16	20	20	27
pH_GEN(pH unit)	7.12	7.34	7.39	7.5	8.1	8.28	8.29	8.7	7.34	6.93	7.1	7.64
EC_GEN(µmho/cm)	175.94	132.5	88.3	96.5	59.21	110.64	81.22	143.4	145.3	186.2	195.2	166.42
TDS(mg/L)	103.8	92.4	70.6	81.1	45	70.8	65	98.9	106.1	141.5	162	106.5
Turb(NTU)	9.8	8.6	12.6	1.5	3.1	1.3	1.5	3.2	3.8	3.7	0.8	1
CHEMICAL												
Na^+ (mg/L)	6.1	5.3	4.17	3.4	2.9	3.4	6.8	6.02	6.41	6.8	3.5	4.3
K^+ (mg/L)	5.1	4.1	4.66	2.4	2.6	2.6	2.16	3.21	2.96	1.9	1.3	3
Ca^{2+} (mg/L)											32.08	
Mg^{2+} (mg/L)											1.9	
Cl^- (mg/L)	7.6	3.71	5.34	2.18	2.57	3.71	6.29	6.29	7.44	7.44	4	4.86
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											108	

Alk-Phen($mgCaCO_3/L$)											0	
ALK-TOT($mgCaCO_3/L$)											88.52	
SO_4^{2-} (mg/L)											22.5	
BIOLOGICAL/ BACTEOROLOGICAL												
BOD_{3-27}(mg/L)	1.3	1.4	1.5	1.3	1.2	0.9	1	1.3	1.2	1.3	1.1	1.3
COD(mg/L)	28	10	30.6	8.16	6.12	8.16	16.32	6.12	8.16	8.16	8.16	10.2

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-} , BOD, COD for the period from June, 2013 to May, 2014 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.7) in the month of January, 2014, during lean period & minimum (pH -6.93) in the month of March, 2014 during lean period.
3. The value of EC is maximum (EC-195.2) in the month of April, 2014 during lean period & minimum (EC-59.21) in the month of October, 2013 during flood period.
4. The value of TDS is maximum (TDS-162) in the month April, 2014 during lean period & minimum (TDS-45) in the month of October, 2013 during flood period.
5. The value of Turbidity is maximum (Turb-12.6) in the month of August, 2013 during flood period & minimum (Turb-0.8) in the month of April, 2013 during lean period.
6. The value of Na^+ is maximum (Na^+-6.8) in the month of December, 2013 & March, 2014 during lean period & minimum (Na^+-2.9) in the month of October, 2013 during flood period.
7. The value of K^+ is maximum (K^+-5.1) in the month of June, 2013 during flood period & minimum (K^+-1.3) in the month of April, 2014 during lean period.
8. The value of Ca^{2+} in the month of April, 2014 is 32.08 during lean period.
9. The value of Mg^{2+} in the month of April, 2014 is 1.9 during lean period.
10. The value of Cl^- is maximum (Cl^- -7.6) in the month of June, 2013 during flood period & minimum (Cl^- - 2.18) in the month of September, 2013 during flood period.
11. The value of HCO_3^- in the month of April, 2014 is 108 during lean period.
12. The value of ALK-TOT in the month of April, 2014 is 88.52 during lean period.
13. The value of SO_4^{2-} in the month of April, 2014 is 22.5 during lean period.
14. The value of BOD is maximum (DO-1.5) in the month of August, 2013 during flood period & minimum (DO- 0.9) in the month of November, 2013 during lean period.
15. The value of COD is maximum (COD-30.6) in the month of August, 2013 during flood period & minimum (COD- 6.12) in the month of October, 2013 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2013	07/ 2013	08/ 2013	09/ 2013	10/ 2013	11/ 2013	12/ 2013	01/ 2014	02/ 2014	03/ 2014	04/ 2014	05/ 2014
PHYSICAL												

Temp(Degrees Celsius (ºC))	28	27	26	27	22	20	12.5	17	18	18	21	26
pH_GEN(pH unit)	7.32	7.56	7.03	7.5	8	8.05	8.19	8.5	7.4	6.89	6.8	7.63
EC_GEN(µmho/cm)	97.7	132.7	80.52	79.26	62.18	93.24	66.47	66.9	150.4	89.74	90.48	96.46
TDS(mg/L)	57.7	105.5	50.7	68.2	44.1	59.7	53.2	46.2	109.8	68.2	75.1	61.7
Turb(NTU)	12.6	10.4	26.4	1	2.4	1.1	2.4	1.9	4.8	2.8	1.8	1.8
CHEMICAL												
Na^+ (mg/L)	6	4.2	3.63	2.8	3	3.6	4.71	4.26	6.46	8.1	4.8	3.8
K^+ (mg/L)	5.1	3.5	2.65	1.76	3.1	2.9	1.63	1.45	2.9	1.5	1.2	1.3
CO_3^{2-} (mg/L)											0	
Ca^{2+} (mg/L)											32.08	
Mg^{2+} (mg/L)											2.87	
Cl^- (mg/L)	6.6	3.78	5.34	1.65	3.14	3.99	4.29	4.58	7.44	8.87	4.58	4
HCO_3^- (mg/L)											92	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT(mg$CaCO_3$/L)											75.41	
SO_4^{2-} (mg/L)											17.5	
BIOLOGICAL/ BACTEOROLOGICAL												
$BOD_{3\text{-}27}$(mg/L)	1.6	1.2	1.3	1.4	1.3	1	0.9	1	1.1	1.2	1.2	1.1
COD(mg/L)	24	10	30.6	8.16	8.16	8.16	12.24	8.16	8.16	8.16	10.2	6.12

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, BOD, COD for the period from June, 2013 to May, 2014 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.5) in the month of January, 2014, during lean period & minimum (pH -6.8) in the month of April, 2014 during lean period.
3. The value of EC is maximum (EC-150.4) in the month of February, 2014 during lean period & minimum (EC-62.18) in the month of October, 2013 during flood period.
4. The value of TDS is maximum (TDS-109.8) in the month February,2014 during lean period & minimum (TDS-44.1) in the month of October, 2013 during flood period.
5. The value of Turbidity is maximum (Turb-26.4) in the month of August,2013 during flood period & minimum (Turb-1) in the month of September,2013 during flood period.
6. The value of Na^+ is maximum (Na^+-8.1) in the month of March, 2014 during lean period & minimum (Na^+-2.8) in the month of September,2013 during flood period.
7. The value of K^+ is maximum (K^+-5.1) in the month of June, 2013 during flood period & minimum (K^+-1.2) in the month of April, 2014 during lean period.
8. The value of Ca^{2+} in the month of April, 2014 is 32.08 during lean period.
9. The value of Mg^{2+} in the month of April, 2014 is 2.87 during lean period.
10. The value of Cl^- is maximum (Cl^- -8.87) in the month of March, 2014 during lean period & minimum (Cl^- - 1.65) in the month of September,2013 during flood period.
11. The value of HCO_3^- in the month of April, 2014 is 92 during lean period.

12. The value of ALK-TOT in the month of April, 2014 is 75.41during lean period.
13. The value of SO_4^{2-} in the month of April, 2014 is 17.5 during lean period.
14. The value of BOD is maximum (DO-1.6) in the month of June, 2013 during flood period & minimum (DO- 0.9) in the month of December, 2013 during lean period.
15. The value of COD is maximum (COD-30.6) in the month of August, 2013 during flood period & minimum (COD- 6.12) in the month of May, 2014 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2013	07/ 2013	08/ 2013	09/ 2013	10/ 2013	11/ 2013	12/ 2013	01/ 2014	02/ 2014	03/ 2014	04/ 2014	05/ 2014
PHYSICAL												
Temp(Degrees Celsius (ºC))				26	22	17	13.4	15	16	18	23	25
pH_GEN(pH unit)				7.6	8.1	7.93	8.28	8.5	7.15	7.19	6.9	7.48
EC_GEN(µmho/cm)				99.8	72.13	106.58	127.6	89.16	85.9	114.8	116.9	118.76
TDS(mg/L)				79.9	49	67.1	102.1	61.5	62.7	87.2	97	76
Turb(NTU)				1.3	3.6	1.6	2.2	2.4	1.4	7.8	1.2	2.1
CHEMICAL												
Na^+ (mg/L)				3.1	3.1	3.9	5.82	6.29	5.84	7.8	4.6	4.9
K^+ (mg/L)				2.38	2.9	3	2.86	2.01	1.76	1.3	1.5	2
Ca^{2+} (mg/L)											28.87	
Mg^{2+} (mg/L)											1.9	
Cl^- (mg/L)				2.1	3.14	4.28	5.15	6.58	6.86	8.58	4	5.43
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											80	
Alk-Phen($mgCaCO_3/L$)											0	
ALK-TOT($mgCaCO_3/L$)											65.57	
SO_4^{2-} (mg/L)											20.6	
BIOLOGICAL/ BACTEOROLOGICAL												
BOD_{3-27}(mg/L)				1.2	1	0.9	0.8	0.8	1	1.1	1	1
COD(mg/L)				10.2	10.2	6.12	10.2	4.08	6.12	6.12	6.12	6.12

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, BOD, COD for the period from June, 2013 to May, 2014 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.5) in the month of January, 2014, during lean period & minimum (pH -6.9) in the month of April, 2014 during lean period.
3. The value of EC is maximum (EC-127.6) in the month of December,2013 during lean period & minimum (EC-72.13) in the month of October, 2013 during flood period.
4. The value of TDS is maximum TDS-102.1) in the month December, 2013 during lean period & minimum (TDS-49) in the month of October, 2013 during flood period.

5. The value of Turbidity is maximum (Turb-7.8) in the month of March, 2014 during lean period & minimum (Turb-1.2) in the month of April, 2014 during lean period.
6. The value of Na^+ is maximum (Na^+-7.8) in the month of March, 2014 during lean period & minimum (Na^+-3.1) in the month of September,2013, October, 2013 during flood period.
7. The value of K^+ is maximum (K^+-3.0) in the month of November,2013 during lean period & minimum (K^+-1.3) in the month of March, 2014 during flood period.
8. The value of Ca^{2+} in the month of April, 2014 is 28.87 during lean period.
9. The value of Mg^{2+} in the month of April, 2014 is 1.9 during lean period.
10. The value of Cl^- is maximum (Cl^--8.58) in the month of March, 2014 during lean period & minimum (Cl^- - 2.1) in the month of September,2013 during flood period.
11. The value of HCO_3^- in the month of April, 2014 is 80 during lean period.
12. The value of ALK-TOT in the month of April, 2014 is 65.57 during lean period.
13. The value of SO_4^{2-} in the month of April, 2014 is 20.6 during lean period.
14. The value of BOD is maximum (DO-1.2) in the month of September, 2013 during flood period & minimum (DO- 0.8) in the month of December, 2013 & January, 2014 during lean period.
15. The value of COD is maximum (COD-10.2) in the month of September, 2013 & October, 2013 during flood period & minimum (COD- 4.08) in the month of February, 2014 to May, 2014during lean & flood period.

Water Quality Datasheet for the Period: 2012-2013

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2012	07/ 2012	08/ 2012	09/ 2012	10/ 2012	11/ 2012	12/ 2012	01/ 2013	02/ 2013	03/ 2013	04/ 2013	05/ 2013
PHYSICAL												
Temp (Degrees Celsius (ºC))	25										25	24
pH GEN (pH unit)	6.8	7	7.08	6.8	7	7.6	8.12	8.16	6.87	8.16	6.82	7.37
EC_GEN(µmho/cm)	73.7	99.8	150	69.1	106.8	68.5	116.5	127.25	160.63	180.9	248.7	288.67
TDS (mg/L)	33.4	43.5	69.1	33.1	49.8	48	60.6	73.1	85.2	91.53	121.5	167
Turb(NTU)	12.8	15.4	10.3	18.6	4.5	2	5.6	1.9	1.8	2	3.9	10.1
CHEMICAL												
Na^+ (mg/L)	7.1	2	8.9	2.5	3.1	5.8	7.23	7.23	7.3	11.05	8.85	7.1
K^+ (mg/L)	5.7	5	6.1	6	5	7	6.58	5.12	5.9	7.53	7.69	5.6
Ca^{2+} (mg/L)											20.84	
Mg^{2+} (mg/L)											1.91	
Cl^- (mg/L)	2.52	3.8	4.99	5.48	9.48	7.98	11.45	9.24	7.69	7.2	14.8	8.8
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											88	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT (mg$CaCO_3$/L)											72.13	

SO_4^{2-} (mg/L)											20.5	
BIOLOGICAL /BACTEOROLOGICAL												
DO (mg/L)	5.4	6.3	7.2	5.9	6.1	6.1	6	6.2	6.2	6	7.7	8.1
BOD_{3-27}(mg/L)	1	1	1.2	1.2	1.4	1	1.1	0.9	1.2	1.2	1.8	1.4
COD (mg/L)		18.36	16.32	18.36	14.28	16.32	14.28	22.44	26.52	10	18	32

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD for the period from June, 2012 to May, 2013 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.1) in the month of March, 2013 during lean period & minimum (pH -6.8) in the month of September, 2012 during flood period.
3. The value of EC in the period from June, June, 2012 to May, 2013 is maximum (EC-288.6) in the month of May,2013 during flood period & minimum (EC-68.5) in the month of November, 2012 during lean period.
4. The value of TDS is maximum (TDS-167) in the month of May,2013 during flood period & minimum (TDS-33.1) in the month of September, 2012 during flood period.
5. The value of Turbidity is maximum (Turb-18.6) in the month of September,2012 flood period & minimum (Turb-1.8) in the month of February,2013 during lean period.
6. The value of Na^+ is maximum (Na^+-11.05) in the month of March, 2013 during lean period & minimum (Na^+-2) in the month of July, 2012 during flood period.
7. The value of K^+ is maximum (K^+-7.69) in the month of April,2013 during lean period & minimum (K^+-5) in the month of July, 2012 during flood period.
8. The value of Ca^{2+} in the month of April, 2013 is 20.84 during lean period.
9. The value of Mg^{2+} in the month of April, 2013 is 1.91 during lean period.
10. The value of Cl^- in the period from June, June, 2012 to May, 2013 is maximum (Cl^- -14.8) in the month of April, 2013 during lean period & minimum (Cl^- - 2.52) in the month of June, 2012 during flood period.
11. The value of HCO_3^- in the month of April, 2013 is 88 during lean period.
12. The value of ALK-TOT in the month of April, 2013 is 72.13 during lean period.
13. The value of SO_4^{2-} in the month of April, 2013 is 20.5 during lean period.
14. The value of DO is maximum (DO-8.1) in the month of May, 2013 during flood period & minimum (DO- 5.4) in the month of June,2012 during flood period.
15. The value of BOD is maximum (BOD-1.8) in the month of during April, 2013 lean period & minimum (BOD- 0.9) in the month of January, 2013 during lean period.
16. The value of COD is maximum (COD-32) in the month of May,2013 during flood period & minimum (COD- 10) in the month of April,2013 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)										
	06/	07/	08/	09/	10/	11/	12/	01/	02/	04/	05/

	2012	2012	2012	2012	2012	2012	2012	2013	2013	2013	2013
PHYSICAL											
Temp(Degrees Celsius (ºC))	21									23	26
pH_GEN(pH unit)	6.8	7	7.38	6.7	7.2	8	9.1	9.1	6.93	7.21	7.56
EC_GEN(µmho/cm)	198.8	80.3	98.5	61.3	96.3	91.5	91.4	88.26	73.12	74.28	80.21
TDS(mg/L)	89.8	36.8	45.4	28.3	45.9	35.9	63.4	50.72	38.72	38.13	47
Turb(NTU)	12.1	26.8	20.5	15.8	5.9	1.9	9.4	2.2	1.6	2.1	9.2
CHEMICAL											
Na^+ (mg/L)	2.3	2.3	5.5	3.1	3.5	5.3	5.46	6.01	6.14	5.19	6.7
K^+ (mg/L)	5.8	4.6	4.7	5.8	4.9	5.8	9.02	4.36	4.82	7.05	5.1
Ca^{2+} (mg/L)										9.62	
Mg^{2+} (mg/L)										2.89	
Cl^- (mg/L)	2.01	4.6	4.49	5.48	8.48	8.48	11.87	8.82	9.82	8.8	8
CO_3^{2-} (mg/L)										0	
HCO_3^- (mg/L)										36	
Alk-Phen(mg$CaCO_3$/L)										0	
ALK-TOT(mg$CaCO_3$/L)										29.51	
SO_4^{2-} (mg/L)										18.1	
BIOLOGICAL/ BACTEOROLOGICAL											
DO(mg/L)	7.2	6.8	6.2	6.1	6.1	5.9	5.8	6.1	6.1	8.3	7.8
$BOD_{3\text{-}27}$(mg/L)	0.9	1	1.1	1.1	1.1	1.2	1.2	1.1	1.1	0.8	1.3
COD(mg/L)		18.36	18.36	18.36	20.4	28.56	6.12	22.44	28.56	9	20

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD for the period from June, 2012 to May, 2013 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -9.1) in the month of December, 2012 & January, 2013 during lean period & minimum (pH -6.7) in the month of September, 2012 during flood period.
3. The value of EC in the period from June, June, 2012 to May, 2013 is maximum (EC-198.8) in the month of June, 2012 during flood period & minimum (EC-61.3) in the month of September, 2012 during flood period.
4. The value of TDS is maximum (TDS-89.8) in the month of June, 2012 during flood period & minimum (TDS-28.3) in the month of September, 2012 during flood period.
5. The value of Turbidity is maximum (Turb-26.8) in the month of July, 2012 flood period & minimum (Turb-1.6) in the month of February, 2013 during lean period.
6. The value of Na^+ is maximum (Na^+-6.7) in the month of May, 2013 during flood period & minimum (Na^+-2.3) in the month of June, 2012 & July, 2012 during flood period.
7. The value of K^+ is maximum (K^+-9.02) in the month of December, 2012 during flood period & minimum (K^+-4.36) in the month of January, 2013 during lean period.
8. The value of Ca^{2+} in the month of April, 2013 is 9.62 during lean period.

9. The value of Mg^{2+} in the month of April, 2013 is 2.89 during lean period.
10. The value of Cl^- in the period from June, June, 2012 to May, 2013 is maximum (Cl^- -11.87) in the month of December, 2012 during lean period & minimum (Cl^- - 2.01) in the month of June, 2012 during flood period.
11. The value of HCO_3^- in the month of April, 2013 is 36 during lean period.
12. The value of ALK-TOT in the month of April, 2013 is 29.51during lean period.
13. The value of SO_4^{2-} in the month of April, 2013 is 18.1 during lean period.
14. The value of DO is maximum (DO-8.3) in the month of April, 2013 during lean period & minimum (DO- 5.8) in the month of December,2012 during lean period.
15. The value of BOD is maximum (BOD-1.3) in the month of during May, 2013 lean period & minimum (BOD- 0.8) in the month of April, 2013 during flood period.
16. The value of COD is maximum (COD-28.56) in the month of February, 2013 during lean period & minimum (COD- 6.12) in the month of December, 2012 during lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2012	07/ 2012	08/ 2012	09/ 2012	10/ 2012	11/ 2012	12/ 2012	01/ 2013	02/ 2013	03/ 2013	04/ 2013	05/ 2013
PHYSICAL												
Temp (Degrees Celsius (ºC))	23										24	25
pH_GEN(pH unit)	7	6.9	6.96	6.5	7	7.8	8.94	8.76	7.05	8.11	7.16	7.28
EC_GEN(µmho/cm)	123	44.6	97.4	48.1	60.6	139.6	75.6	86.84	103.92	117.7	97.08	91.63
TDS (mg/L)	61	19.3	45	22.1	27.6	73.4	52.5	49.92	22.12	59.57	47.42	54
Turb(NTU)	10.4	20.5	14.6	20.1	3.2	2.5	7	2.5	2	1.5	3.4	8.3
CHEMICAL												
Na^+ (mg/L)	2.6	1.7	8	3	2.8	6.1	7.56	7.8	4.7	5.99	4.78	5.6
K^+ (mg/L)	6	3.8	5.7	4.8	3.6	7.5	4.48	4.83	3.46	5.88	4.96	4.8
Ca^{2+}(mg/L)											14.43	
Mg^{2+}(mg/L)											3.86	
Cl^- (mg/L)	2.52	3.8	5.99	4.49	9.98	8.98	13.99	9.24	11.1	7.56	6	8
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											44	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT (mg$CaCO_3$/L)											36.07	
SO_4^{2-} (mg/L)											17.6	
BIOLOGICAL/ BACTEOROLOGICAL												
DO (mg/L)	6.1	6.5	6.1	6.5	5.4	6.3	5.3	7	6	6.3	6.1	7
$BOD_{3\text{-}27}$(mg/L)	0.9	1.1	1.1	1.2	1.3	1.1	1.1	1.1	1	1	1.8	1
COD (mg/L)		14.28	10.2	16.32	20.4	22.44	10.2	26.52	28.56	10.2	17	22

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, DO, BOD, COD for the period from June, 2012 to May, 2013 are within

the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.

2. The value of pH is maximum (pH -8.9) in the month of December, 2012, during flood period & minimum (pH -6.5) in the month of September, 2012 during flood period.
3. The value of EC in the period from June, June, 2012 to May, 2013 is maximum (EC-139) in the month of November, 2012 during flood period & minimum (EC-44) in the month of July,2012 during flood period.
4. The value of TDS is maximum (TDS-73.4) in the month of November,2012 during lean period & minimum (TDS-19.3) in the month of July,2012 during flood period.
5. The value of Turbidity is maximum (Turb-20.5) in the month of July,2012 lean period & minimum (Turb-1.5) in the month of March ,2013 during lean period.
6. The value of Na^+ is maximum (Na^+-8) in the month of August,2012 during flood period & minimum (Na^+-1.7) in the month of July,2012 during flood period.
7. The value of K^+ is maximum (K^+-7.5) in the month of November,2012 during lean period & minimum (K^+-3.4) in the month of February,2013 during flood period.
8. The value of Ca^{2+} in the month of April, 2013 is 14.43 during lean period.
9. The value of Mg^{2+} in the month of April, 2013 is 3.86 during lean period.
10. The value of Cl^- in the period from June, June, 2012 to May, 2013 is maximum (Cl^- -13.9) in the month of December, 2012 during lean period & minimum (Cl^- - 2.5) in the month of June, 2012 during flood period.
11. The value of HCO_3^- in the month of April, 2013 is 44 during lean period.
12. The value of ALK-TOT in the month of April, 2013 is 36.07during lean period.
13. The value of SO_4^{2-} in the month of April, 2013 is 17.6 during lean period.
14. The value of DO is maximum (DO-7) in the month of January,2013 during lean period & minimum (DO- 5.3) in the month of December,2012 during lean period.
15. The value of BOD is maximum (DO-1.8) in the month of April,2013 during lean period & minimum (DO- 0.9) in the month of June, 2012 during flood period.
16. The value of COD is maximum (COD-28.56) in the month of February,2013 during lean period & minimum (COD- 10.2) in the month of August, 2012 during flood period.

Water Quality Datasheet for the Period: 2011-2012

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2011	07/ 2011	08/ 2011	09/ 2011	10/ 2011	11/ 2011	12/ 2011	01/ 2012	02/ 2012	03/ 2012	04/ 2012	05/ 2012
PHYSICAL												
pH_GEN(pH unit)	8.1	7.8	6.9	7.5	7.7	7.2	7.7	6.8		7.58	7	7.2
EC_GEN(µmho/cm)	92	145	100.5	124	112	148	175	142.5		180.9	205.6	90
TDS(mg/L)	52	69	48.3	64	61	77	97	82.6		83.9	95.6	42
Turb(NTU)	16.5	13.8	1.5	1.6	1.4	1.2	0.4	1.1		4.6	5.6	1
CHEMICAL												

Na^+ (mg/L)	6.2	6.36	3.12	7.7	7.6	8.4	8.9	8.4		7.6	7.1	5.1
K^+ (mg/L)	5	5.5	4.23	7	7	7.5	7.2	7.3		6	3.9	3
Ca^{2+} (mg/L)											33.67	
Mg^{2+} (mg/L)											2.91	
Cl^- (mg/L)	2.52	2.52	2.52	2.52	2.52	8.9	3	6		2	22	16
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											80	
ALK-TOT(mg$CaCO_3$/L)											65.57	
Alk-Phen(mg$CaCO_3$/L)											0	
BIOLOGICAL/ BACTEOROLOGICAL												
DO(mg/L)	8.8	7.2	6.4	10.4								
$BOD_{3\text{-}27}$(mg/L)	1.6	0.8	1.6	2.4								

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, DO, BOD for the period from June, 2011 to May, 2012 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.1) in the month of June, 2011 during flood period & minimum (pH -6.8) in the month of January, 2012 during lean period.
3. The value of EC is maximum (EC-205.6) in the month of April, 2012 during lean period & minimum (EC-90) in the month of May, 2012 during flood period.
4. The value of TDS is maximum (TDS-97) in the month of December, 2011 during lean period & minimum (TDS-42) in the month of May, 2012 during flood period.
5. The value of Turbidity is maximum (Turb-16.5) in the month of June, 2011 flood period & minimum (Turb-0.4) in the month of December, 2011 during lean period.
6. The value of Na^+ is maximum (Na^+-8.9) in the month of December, 2011 during lean period & minimum (Na^+-3.12) in the month of August, 2011 during flood period.
7. The value of K^+ is maximum (K^+-7.5) in the month of November, 2011 during lean period & minimum (K^+-3.0) in the month of May, 2012 during flood period.
8. The value of Ca^{2+} in the month of April, 2012 is 33.67 during lean period.
9. The value of Mg^{2+} in the month of April, 2012 is 2.91 during lean period.
10. The value of Cl^- is maximum (Cl^- -22) in the month of April, 2012 during lean period & minimum (Cl^- - 2) in the month of March, 2012 during lean period.
11. The value of HCO_3^- in the month of April, 2012 is 80 during lean period.
12. The value of ALK-TOT in the month of April, 2012 is 65.57 during lean period.
13. The value of DO is maximum (DO-10.4) in the month of September, 2012 during flood period & minimum (DO- 6.4) in the month of August,2012 during flood period.
14. The value of BOD is maximum (BOD-2.4) in the month of September, 2012 during flood period & minimum (BOD- 0.8) in the month of July, 2012 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2011	07 /2011	08/ 2011	09/ 2011	10/ 2011	11/ 2011	12/ 2011	01/ 2012	02/ 2012	03/ 2012	04/ 2012	05/ 2012
PHYSICAL												
pH_GEN(pH unit)	7.9	7.6	6.9	7.6	7.6	7.1	7.25	7.2	6.8	7.7	7.1	7.4
EC_GEN(µmho/cm)	84	120	71.2	128	106	121	90	125	69	84.3	82.5	212
TDS (mg/L)	49	57	34.8	69	58	62	52	62	41	40.5	38.9	102
Turb(NTU)	11.5	14.5	1	1.3	1.3	1.4	0.8	1.8	1.8	5.8	18.8	1.5
CHEMICAL												
Na^+ (mg/L)	5.7	5.9	2.21	7.3	7.35	10.2	7.6	7.2	7.4	7.1	5.3	4.5
K^+ (mg/L)	6.8	5.1	4.02	6.4	6.81	7.5	6.5	6.3	5.5	5.7	3.6	3.5
Ca^{2+} (mg/L)											21.24	
Mg^{2+} (mg/L)											3.64	
Cl^- (mg/L)	2.88	2.01	2.01	2.88	2.88	7.5	2.5	5	4	2	22	16
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											76	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT (mg$CaCO_3$/L)											62.3	
BIOLOGICAL/ BACTEOROLOGICAL												
DO (mg/L)	8.8	6.4	6.4	8.8								
$BOD_{3\text{-}27}$(mg/L)	1.6	1.6	0.8	1.6								

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, DO, BOD for the period from June, 2011 to May, 2012 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) in the month of June,2011, during flood period & minimum (pH -6.8) in the month of February, 2012 during lean period.
3. The value of EC is maximum (EC-212) in the month of May, 2012 during lean period & minimum (EC-69) in the month of February, 2012 during flood period.
4. The value of TDS is maximum (TDS-102) in the month of May, 2012 during lean period & minimum (TDS-34.8) in the month of August, 2011 during flood period.
5. The value of Turbidity is maximum (Turb-18.8) in the month of April, 2012 lean period & minimum (Turb-0.8) in the month of December, 2011 during lean period.
6. The value of Na^+ is maximum (Na^+-10.2) in the month of November, 2011 during lean period & minimum (Na^+-2.2) in the month of August, 2011 during flood period.
7. The value of K^+ is maximum (K^+-7.5) in the month of November, 2011 during flood period & minimum (K^+-3.5) in the month of May, 2012 during flood period.
8. The value of Ca^{2+} in the month of April, 2012 is 21.24 during lean period.
9. The value of Mg^{2+} in the month of April, 2012 is 3.64 during lean period.
10. The value of Cl^- is maximum (Cl^- -22) in the month of May, 2012 during flood period & minimum (Cl^- - 2) in the month of April, 2012 during lean period.

11. The value of HCO_3^- in the month of April, 2012 is 76 during lean period.
12. The value of ALK-TOT in the month of April, 2012 is 62.3 during lean period.
13. The value of DO is maximum (DO-8.8) in the month of September, 2012 during flood period & minimum (DO- 6.4) in the month of August,2012 during flood period.
14. The value of BOD is maximum (BOD-1.6) in the month of September, 2012 during lean period & minimum (BOD- 0.8) in the month of August,2012 during lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2011	07/ 2011	08/ 2011	09/ 2011	10/ 2011	11/ 2011	12/ 2011	01/ 2012	02/ 2012	03/ 2012	04/ 2012	05/ 2012
PHYSICAL												
pH_GEN(pH unit)	8		6.8	7.6	7.6	7.2	7.6	6.84	6.7	8	6.9	8.1
EC_GEN(µmho/cm)	140		78.5	98	83	94	81	96.7	91	134.5	172	78
TDS(mg/L)	74		37.5	56	48	48	47	56.2	50	63.8	82.4	38
Turb(NTU)	12.5	21.5	1.4	1.5	1.1	2.7	1.1	2.9	1	2.6	34.1	1.2
CHEMICAL												
Na^+ (mg/L)	6.7		2.93	8	8.09	8.1	8.9	8.4	7.9	8.3	7.4	3.9
K^+ (mg/L)	7.6		4.32	6.8	7.2	7.1	7.2	7	5.7	5.8	4.8	3.8
Ca^{2+} (mg/L)											28.86	
Mg^{2+} (mg/L)											2.91	
Cl^- (mg/L)	2.52		2.52	2.01	2.01	8.5	2	6.5	4.5	4	18	20
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											80	
ALK-TOT(mg$CaCO_3$/L)											65.57	
Alk-Phen(mg$CaCO_3$/L)											0	
BIOLOGICAL/ BACTEOROLOGICAL												
DO(mg/L)	8	6.4	4.8	8.8								
$BOD_{3\text{-}27}$(mg/L)	0.8	0.8	0.8	0.8								

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, DO, BOD for the period from June, 2011 to May, 2012 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.1) in the month of May, 2012, during flood period & minimum (pH -6.7) in the month of February, 2012 during lean period.
3. The value of EC is maximum (EC-172) in the month of April, 2012 during lean period & minimum (EC-78) in the month of May, 2012 during flood period.
4. The value of TDS is maximum (TDS-82.4) in the month of April, 2012 during lean period & minimum (TDS-37.5) in the month of August, 2011 during flood period.
5. The value of Turbidity is maximum (Turb-34.1) in the month of April, 2012 lean period & minimum (Turb-1.0) in the month of February, 2012 during lean period.

6. The value of Na^+ is maximum (Na^+-8.9) in the month of December, 2011 during lean period & minimum (Na^+-2.9) in the month of August, 2011 during flood period.
7. The value of K^+ is maximum (K^+-7.6) in the month of June, 2011 during flood period & minimum (K^+-3.8) in the month of May, 2012 during flood period.
8. The value of Ca^{2+} in the month of April, 2012 is 28.86 during lean period.
9. The value of Mg^{2+} in the month of April, 2012 is 2.91 during lean period.
10. The value of Cl^- is maximum (Cl^- -20) in the month of May, 2012 during flood period & minimum (Cl^- - 2) in the month of December, 2011 during lean period.
11. The value of HCO_3 in the month of April, 2012 is 80 during lean period.
12. The value of ALK-TOT in the month of April, 2012 is 65.57 during lean period.
13. The value of DO is maximum (DO-8.8) in the month of September, 2012 during lean period & minimum (DO- 4.8) in the month of August,2012 during lean period.
14. The value of BOD in the period from June, 2011 to September, 2011 is 0.8 in the flood period.

Water Quality Datasheet for the Period: 2010-2011

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2010	07/ 2010	08/ 2010	09/ 2010	10/ 2010	11/ 2010	12/ 2010	01/ 2011	02/ 2011	03/ 2011	04/ 2011	05/ 2011
PHYSICAL												
pH_GEN(pH unit)	7.25	7.42	6.9	7.1	6.9	8	7.8	8	7.9	8.2	7.1	7.1
EC_GEN(µmho/cm)	139	178.5	155	141	126	145	94	126	150	169.7	205	103
TDS(mg/L)	68	110	95	74	54	68	47	69	79	83.8	95	52
Turb(NTU)	8.6	16	9	6.4	1.2	0.9	0.5	0.5	0.5	0.5	1	7.1
CHEMICAL												
Na^+ (mg/L)	4.3	3.9	3.4	3.7	3.1	5.7	6.5	8.62	8	7.53	8.65	7.24
K^+ (mg/L)	2.5	3.6	3.5	2.1	3	6	6	7.24	7.7	6.65	7.36	6.3
Ca^{2+} (mg/L)											23.4	
Mg^{2+} (mg/L)											2.3	
Cl^- (mg/L)	7.5	4.53	4.03	3.02	1.51	1.52	3.02	2.01	2.52	2.88	2.52	2.88
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											56	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT(mg$CaCO_3$/L)											45.9	
SO_4^{2-} (mg/L)											1.5	
BIOLOGICAL/ BACTEOROLOGICAL												
BOD_{3-27}(mg/L)	0.8	0.5	0.7	0.4	0.5	0.9	0.8	0.9	0.9	0.8	1	0.3

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, BOD for the period from June, 2010 to May, 2011 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.2) in the month of March, 2011 during lean period & minimum (pH -6.9) in the month of October, 2010 during flood period.
3. The value of EC is maximum (EC-205) in the month of April, 2011 during lean period & minimum (EC-94) in the month of December, 2010 during lean period.
4. The value of TDS is maximum (TDS-110) in the month of July, 2010 during flood period & minimum (TDS-47) in the month of December, 2010 during lean period.
5. The value of Turbidity is maximum (Turb-16.0) in the month of July, 2010 during flood period & minimum (Turb-0.5) in the month of December, 2010 to March, 2011 during lean period.
6. The value of Na^+ is maximum (Na^+-8.65) in the month of April, 2011 during lean period & minimum (Na^+-3.1) in the month of October, 2010 during flood period.
7. The value of K^+ is maximum (K^+-7.7) in the month of February, 2011 during lean period & minimum (K^+-2.1) in the month of September, 2010 during flood period.
8. The value of Ca^{2+} in the month of April, 2011 is 23.4 during lean period.
9. The value of Mg^{2+} in the month of April, 2011 is 2.3 during lean period.
10. The value of Cl^- is maximum (Cl^- -7.5) in the month of June, 2010 during flood period & minimum (Cl^- - 1.51) in the month of October, 2010 during flood period.
11. The value of HCO_3^- in the month of April, 2011 is 56 during lean period.
12. The value of ALK-TOT in the month of April, 2011 is 45.9 during lean period.
13. The value of SO_4^{2-} in the month of April, 2011 is 1.5 during lean period.
14. The value of BOD is maximum (BOD -1.0) in the month of April, 2011 during lean period & minimum (BOD- 0.3) in the month May, 2011 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2010	07/ 2010	08/ 2010	09/ 2010	10/ 2010	11/ 2010	12/ 2010	01/ 2011	02/ 2011	03/ 2011	04/ 2011	05/ 2011
PHYSICAL												
pH_GEN(pH unit)	7.33	7.27	6.98	7.2	7	7.1	7.5	6.9	7.5	8.21	7.2	7.1
EC_GEN(µmho/cm)	98.1	93.8	75.9	73	144	95	76	60	69	121.3	100	83
TDS(mg/L)	47	59	40	34	68	45	38	37	38	59.45	48	39
Turb(NTU)	14	19.5	5.9	6.7	1	1	0.8	0.6	0.6	0.8	1.5	6.5
CHEMICAL												
Na^+ (mg/L)	4.9	3.7	3.5	3	3	3	5.9	7.67	7.7	7.22	7.76	6.2
K^+ (mg/L)	2	2.5	2.4	1.9	4	1.9	5.4	6.33	6.9	5.56	6.21	5.3
Ca^{2+} (mg/L)											26.5	
Mg^{2+} (mg/L)											2.9	
Cl^- (mg/L)	4.53	3.52	4.03	3.02	1.51	2.52	2.52	2.01	2.01	2.01	2.88	2.88
CO_3^{2-} (mg/L)											0	

HCO_3^- (mg/L)											66	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT(mg$CaCO_3$/L)											54.1	
SO_4^{2-} (mg/L)											1.3	
BIOLOGICAL/ BACTEOROLOGICAL												
BOD_{3-27}(mg/L)	0.7	0.6	0.8	0.3	0.5	0.5	0.8	0.8	0.8	0.8	1.1	0.8

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, BOD for the period from June, 2010 to May, 2011 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.21) in the month of march, 2011, during lean period & minimum (pH -6.9) in the month of January, 2011 during lean period.
3. The value of EC is maximum (EC-144) in the month of October,2010 during lean period & minimum (EC-60) in the month of January,2011 during lean period.
4. The value of TDS is maximum (TDS-68) in the month of October,2010 during flood period & minimum (TDS-34) in the month of September, 2010 during flood period.
5. The value of Turbidity is maximum (Turb-19.5) in the month of July, 2010 during flood period & minimum (Turb-0.6) in the month of January, 2011 & February, 2011 during lean period.
6. The value of Na^+ is maximum (Na^+-7.76) in the month of April, 2011 during lean period & minimum (Na^+-3) in the month of November, 2010 during lean period.
7. The value of K^+ is maximum (K^+-6.9) in the month of February, 2011 during lean period & minimum (K^+-1.9) in the month of September, 2010 during flood period.
8. The value of Ca^{2+} in the month of April, 2011 is 26.5 during lean period.
9. The value of Mg^{2+} in the month of April, 2011 is 2.9 during lean period.
10. The value of Cl^- is maximum (Cl^- -4.5) in the month of June, 2010 during flood period & minimum (Cl^- - 1.5) in the month of October, 2010 during flood period.
11. The value of HCO_3^- in the month of April, 2011 is 66 during lean period.
12. The value of ALK-TOT in the month of April, 2011 is 54.1 during lean period.
13. The value of SO_4^{2-} in the month of April, 2011 is 1.3 during lean period.
14. The value of BOD is maximum (BOD -1.1) in the month of April, 2011 during lean period & minimum (BOD- 0.3) in the month September, 2010 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2010	07/ 2010	08/ 2010	09/ 2010	10/ 2010	11/ 2010	12/ 2010	01/ 2011	02/ 2011	03/ 2011	04/ 2011	05/ 2011
PHYSICAL												
pH_GEN(pH unit)	7.44	7.51	7.01	6.9	7.1	7.5	7	7.8	7.6	8.19	7.1	6.8
EC_GEN(µmho/cm)	74.2	98.6	69	75	90	134	105	88	93	115.5	78	114

TDS(mg/L)	37	61	39	33	43	64	49	46	49	57.8	36	68
Turb(NTU)	16	21	8.9	3.3	1.3	1.3	0.5	0.9	0.5	0.6	1	6.4
CHEMICAL												
Na^+(mg/L)	4.2	5.3	3.4	3.5	3.4	6.1	7	8.72	7.5	7.13	7.09	7.32
K^+(mg/L)	2.3	2.7	2.9	2	2.8	6.3	5	7.19	7	5	5.09	5.9
Ca^{2+} (mg/L)											19.5	
Mg^{2+} (mg/L)											1.8	
Cl^- (mg/L)	5.5	2.52	3.52	4.03	2.52	1.5	3.02	2.01	2.01	2.01	2.52	2.52
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											61	
Alk-Phen(mg$CaCO_3$/L)											0	
ALK-TOT(mg$CaCO_3$/L)											50	
SO_4^{2-} (mg/L)											2	
BIOLOGICAL/ BACTEOROLOGICAL												
$BOD_{3\text{-}27}$(mg/L)	0.8	0.4	0.6	0.7	0.6	0.8	0.6	0.4	0.6	0.9	1	0.6

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, BOD for the period from June, 2010 to May, 2011 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.1) in the month of march, 2011, during lean period & minimum (pH -6.8) in the month of May, 2011 during flood period.
3. The value of EC is maximum (EC-134) in the month of November,2010 during lean period & minimum (EC-69) in the month of August,2010 during flood period.
4. The value of TDS is maximum (TDS-68) in the month of May,2011 during flood period & minimum (TDS-33) in the month of September, 2010 during flood period.
5. The value of Turbidity is maximum (Turb-21) in the month of July, 2010 during flood period & minimum (Turb-0.5) in the month of December, 2010 & February, 2011 during lean period.
6. The value of Na^+ is maximum (Na^+-8.72) in the month of January, 2011 during lean period & minimum (Na^+-3.4) in the month of August, 2010 during flood period.
7. The value of K^+ is maximum (K^+-7.19) in the month of January, 2011 during lean period & minimum (K^+-2) in the month of September, 2010 during flood period.
8. The value of Ca^{2+} in the month of April, 2011 is 19.5 during lean period.
9. The value of Mg^{2+} in the month of April, 2011 is 1.8 during lean period.
10. The value of Cl^- is maximum (Cl^- -5.5) in the month of June, 2010 during flood period & minimum (Cl^-- 1.5) in the month of November, 2010 during lean period.
11. The value of HCO_3^- in the month of April, 2011 is 61 during lean period.
12. The value of ALK-TOT in the month of April, 2011 is 50 during lean period.
13. The value of SO_4^{2-} in the month of April, 2012 is 2 during lean period.

14. The value of BOD is maximum (BOD -1.0) in the month of April, 2011 during lean period & minimum (BOD- 0.4) in the month July, 2010 during flood period.

Water Quality Datasheet for the Period: 2009-2010

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2009	07/ 2009	08/ 2009	09/ 2009	10/ 2009	11/ 2009	12/ 2009	01/ 2010	02/ 2010	03/ 2010	04/ 2010	05/ 2010
PHYSICAL												
Temp(Degrees Celsius (ºC))		25		26	25	23						
pH_GEN(pH unit)	7.65	8.05	7.08	7.98	7.21	7.1	7.2	7.49	8.1	7.3	7.7	7.5
EC_GEN(µmho/cm)	138.4	140.9	108.5	120	123.2	111.7	100.6	107.6	90	176	189	88
TDS(mg/L)	66.7	63.9	52.8	69	69.61	61.3	58.3	69	54	96	96	52
Turb(NTU)	2	3	31	10	1	1	1	1	2	1.5	1.5	1.9
CHEMICAL												
Na^+(mg/L)	5.2	5.05	3.13	3.1	3.86	4.73	2.13	2.19	4.2	4.5	2.8	5.1
K^+(mg/L)	2.46	2.7	2.58	2.88	2.38	2.43	1.38	1.31	1.8	1.5	1.4	1.5
Ca^{2+} (mg/L)											28	
Mg^{2+} (mg/L)											2.3	
Cl^- (mg/L)	14.99	4.03	4.99	4.99	1.99	2.99	2.5	2.52	1.9	3.1	2.5	2.8
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											84	
Alk-Phen($mgCaCO_3/L$)											0	
ALK-TOT($mgCaCO_3/L$)											68.85	
BIOLOGICAL/ BACTEOROLOGICAL												
$BOD_{3\text{-}27}$(mg/L)												0.5

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, BOD for the period from June, 2009 to May, 2010 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.1) in the month of February,2010 during lean period & minimum (pH -7.0) in the month of August, 2009 during flood period.
3. The value of EC is maximum (EC-189) in the month of April,2010 during lean period & minimum (EC-88) in the month of May, 2010 during flood period.
4. The value of TDS is maximum (TDS-96) in the month of March, 2010 during lean period & minimum (TDS-52) in the month of May,2010 during flood period.
5. The value of Turbidity is maximum (Turb-31) in the month of August,2009 during flood period & minimum (Turb-1.0) in the month of October, 2009 to January,2010 during flood & lean period.

6. The value of Na^+ is maximum (Na^+-5.2) in the month of June,2009 during flood period & minimum (Na^+-2.1) in the month of December, 2009 during lean period.
7. The value of K^+ is maximum (K^+-2.8) in the month of September, 2009 during flood period & minimum (K^+-1.3) in the month of January, 2010 during lean period.
8. The value of Ca^{2+} in the month of April, 2010 is 28 during lean period.
9. The value of Mg^{2+} in the month of April, 2010 is 2.3 during lean period.
10. The value of Cl^- is maximum (Cl^- -14.9) in the month of june,2009 during flood period & minimum (Cl^- -1.9) in the month of February, 2010 during lean period.
11. The value of HCO_3^- in the month of April, 2010 is 84 during lean period.
12. The value of ALK-TOT in the month of April, 2010 is 68.85 during lean period.
13. The value of BOD in the month of May, 2010 is 0.5 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2009	07/ 2009	08/ 2009	09/ 2009	10/ 2009	11/ 2009	12/ 2009	01/ 2010	02/ 2010	03/ 2010	04/ 2010	05/ 2010
PHYSICAL												
Temp(Degrees Celsius (ºC))		28		28	24	22						
pH_GEN(pH unit)	7.44	7.67	7.18	8.28	7.28	7.25	7.15	7.25	7.9	7.5	8.1	7.9
EC_GEN(µmho/cm)	73	99	77.4	86	78.48	64.4	73.9	67.2	78	159	176	122
TDS(mg/L)	34.8	45.3	36.5	45.5	44.66	34.4	42.8	42	42	92	90	62
Turb(NTU)	1.3	1	51	9	1	1	1	1	1.8	1.8	1	2
CHEMICAL												
Na^+ (mg/L)	3.63	4	3.28	3.49	3.67	3.43	2.08	2.22	4.1	3.7	2.4	3.1
K^+ (mg/L)	2.12	2.2	3.37	3.11	1.98	1.63	1.68	1.62	2	1.5	1.7	1
Ca^{2+} (mg/L)											19	
Mg^{2+} (mg/L)											1.8	
Cl^- (mg/L)	25.49	3.52	5.99	3	2.99	2.99	2	1.51	2.1	2.8	3	2.5
CO_3^{2-} (mg/L)											0	
HCO_3^- (mg/L)											73	
ALK-TOT(mg$CaCO_3$/L)											59.84	
Alk-Phen(mg$CaCO_3$/L)											0	
BIOLOGICAL/ BACTEOROLOGICAL												
$BOD_{3\text{-}27}$(mg/L)												0.4

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, BOD for the period from June, 2009 to May, 2010 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.28) in the month of September, 2009, during flood period & minimum (pH -7.15) in the month of December, 2009 during lean period.

3. The value of EC is maximum (EC-176) in the month of April,2010 during lean period & minimum (EC-64.4) in the month of November, 2009 during lean period.
4. The value of TDS is maximum (TDS-92) in the month of March, 2010 during lean period & minimum (TDS-34.4) in the month of November, 2009 during lean period.
5. The value of Turbidity is maximum (Turb-51) in the month of August,2009 during flood period & minimum (Turb-1.0) in the month of October, 2009 to December, 2009 during flood & lean period.
6. The value of Na^+ is maximum (Na^+-4.1) in the month of February, 2010 during lean period & minimum (Na^+-2.08) in the month of December, 2009 during lean period.
7. The value of K^+ is maximum (K^+-3.37) in the month of August, 2009 during flood period & minimum (K^+-1) in the month of May, 2010 during flood period.
8. The value of Ca^{2+} in the month of April, 2010 is 19 during lean period.
9. The value of Mg^{2+} in the month of April, 2010 is 1.8 during lean period.
10. The value of Cl^- is maximum (Cl^- -25.49) in the month of june,2009 during flood period & minimum (Cl^- -1.51) in the month of January, 2010 during flood period.
11. The value of HCO_3^- in the month of April, 2010 is 73 during lean period.
12. The value of ALK-TOT in the month of April, 2010 is 59.84 during lean period.
13. The value of BOD in the month of May, 2010 is 0.4 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)									
	06/ 2009	07/ 2009	08/ 2009	09/ 2009	12/ 2009	01/ 2010	02/ 2010	03/ 2010	04/ 2010	05/ 2010
PHYSICAL										
Temp(Degrees Celsius (ºC))		23		22						
pH_GEN(pH unit)	7.92	7.78	7.15	9.08	7.31	7.41	7.9	6.9	7.8	7.8
EC_GEN(µmho/cm)	110	104.1	71	89	75.3	68.7	87	169	205	125
TDS(mg/L)	53.3	46.4	34.5	47.6	41.6	43	45	86	109	71
Turb(NTU)	1.6	2	36	8	1.2	1	1.9	0.9	1.9	0.9
CHEMICAL										
Na^+ (mg/L)	5.14	5.19	3.03	2.87	1.96	2.1	3.9	3.2	2	3.8
K^+ (mg/L)	2.32	2.56	2.46	2.8	1.03	1.09	2.1	2.1	1	2
Ca^{2+} (mg/L)									25	
Mg^{2+} (mg/L)									2	
Cl^- (mg/L)	20.99	4.02	5.99	3	2.5	2.01	2.4	2	3	2.1
CO_3^{2-} (mg/L)									0	
HCO_3^- (mg/L)									66	
ALK-TOT(mg$CaCO_3$/L)									54.1	
Alk-Phen(mg$CaCO_3$/L)									0	
BIOLOGICAL/ BACTEOROLOGICAL										
$BOD_{3\text{-}27}$(mg/L)										0.5

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, BOD for the period from June, 2009 to May, 2010 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -9.0) in the month of September, 2009, during flood period & minimum (pH -6.9) in the month of March, 2010 during lean period.
3. The value of EC is maximum (EC-205) in the month of April,2010 during lean period & minimum (EC-68.7) in the month of January,2010 during lean period.
4. The value of TDS is maximum (TDS-109) in the month of April,2010 during lean period & minimum (TDS-34.5) in the month of August,2009 during flood period.
5. The value of Turbidity is maximum (Turb-36) in the month of August,2009 during flood period & minimum (Turb-0.9) in the month of March & May,2010 during lean period.
6. The value of Na^+ is maximum (Na^+-5.19) in the month of July,2009 during flood period & minimum (Na^+-1.96) in the month of December,2009 during flood period.
7. The value of K^+ is maximum (K^+-2.8) in the month of July,2009 during flood period & minimum (K^+-1) in the month of April,2010 during lean period.
8. The value of Ca^{2+} in the month of April, 2010 is 25 during lean period.
9. The value of Mg^{2+} in the month of April, 2010 is 2 during lean period.
10. The value of Cl^- is maximum (Cl^- -20.9) in the month of june,2009 during flood period & minimum (Cl^--2) in the month of March,2010 during flood period.
11. The value of HCO_3^- in the month of April, 2010 is 66 during lean period.
12. The value of ALK-TOT in the month of April, 2010 is 54.1 during lean period.
13. The value of BOD in the month of May, 2010 is 0.5 during flood period.

Water Quality Datasheet for the Period: 2008-2009

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2008	07/ 2008	08/ 2008	09/ 2008	10/ 2008	11/ 2008	12/ 2008	01/ 2009	02/ 2009	03/ 2009	04/ 2009	05/ 2009
PHYSICAL												
Temp(Degrees Celsius (ºC))	25	25	25	25	24	21	18	15	17	26		
pH_GEN(pH unit)	6.7	6.7	7.3	7	6.7	7.5	7.4	6.75	7.85	7.93	7.32	7.4
EC_GEN(µmho/cm)	158	75	85	116	116	123	135	127	125	169.6	156.93	153.6
TDS(mg/L)	112	52	59	73	86	78	78	80.6	73	98	83	71.47
Turb(NTU)	12	84	25	25	1	0.5	0.5	1.5	1	1.5	1.5	1.6
CHEMICAL												
Na^+(mg/L)	14	15	13	10	9	10	9	7	6	8	8.41	8.28
K^+(mg/L)	10	10	10	7	7	7	6	5	4	6	3.46	3.92
Ca^{2+} (mg/L)	10.4	13.4	1.8	17.2							17.64	16.03
Mg^{2+} (mg/L)	14.58	4.13	12.51	5.22							6.8	2.93

Cl^- (mg/L)	11.01	8.88	9.94	6.03	4.97	6.03	6.03	5	6	7	9.93	8.99
CO_3^{2-} (mg/L)	0	0	0	0							0	0
HCO_3^- (mg/L)	58.56	36.6	51.24	61							76	68
Alk-Phen($mgCaCO_3/L$)	0	0	0	0							0	0
ALK-TOT($mgCaCO_3/L$)	48	30	42	50							62.3	55.74

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT for the period from June, 2009 to May, 2010 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) in the month of March,2009 during lean period & minimum (pH -6.7) in the month of June, 2008 during flood period.
3. The value of EC maximum (EC-169) in the month of March, 2009 during lean period & minimum (EC-75) in the month of July, 2008 during flood period.
4. The value of TDS is maximum (TDS-112) in the month of June, 2008 during flood period & minimum (TDS-52) in the month of July, 2008 during flood period.
5. The value of Turbidity is maximum (Turb-84) in the month of July, 2008 during flood period & minimum (Turb-0.5) in the month of November, 2008 & December, 2008 during lean period.
6. The value of Na^+ is maximum (Na^+-15) in the month of July, 2008 during flood period & minimum (Na^+-6) in the month of February, 2009 during lean period.
7. The value of K^+ is maximum (K^+-10) in the month of June, 2008 to August, 2008 during flood period & minimum (K^+-3.46) in the month of April, 2009 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-17.6) in the month of April, 2009 during lean period & minimum (Ca^{2+}-1.8) in the month of August,2008 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -14.5) in the month of June, 2008 during flood period & minimum (Mg^{2+} -2.9) in the month of May, 2009 during flood period.
10. The value of Cl^- is maximum (Cl^- -11.1) in the month of June, 2008 during flood period & minimum (Cl^--4.9) in the month of October, 2008 during flood period.
11. The value of HCO_3^- in the period from June, 2019 to September, 2019 is maximum (HCO_3^- -76) in the month of April,2008 during lean period & minimum (HCO_3^- - 36.6) in the month of July, 2008 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-62.3) in the month of April, 2009 during lean period & minimum (ALK-TOT-30) in the month of July, 2008 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2008	07/ 2008	08/ 2008	09/ 2008	10/ 2008	11/ 2008	12/ 2008	01/ 2009	02/ 2009	03/ 2009	04/ 2009	05/ 2009
PHYSICAL												
Temp(Degrees Celsius (ºC))		26	25	27	25	21	17	16	19	20		
pH_GEN(pH unit)	6.9	6.8	6.8	7.1	6.3	7.05	6.95	6.8	6.89	8.51	7.23	7.4
EC_GEN(µmho/cm)	66.2	62	47	63	61	64	71	58	58.7	81.5	78.8	77.59
TDS(mg/L)	48	43	32	71	45	40	40	41.7	34.2	45	47	35.84

Turb(NTU)	8	75	25	7	1	3	1.5	1	1	0.5	1.7	1
CHEMICAL												
Na^+ (mg/L)	7	9	10	6	10	9	8	3	4	4	6	5.07
K^+ (mg/L)	5	6	8	5	7	6	6	2	3	3	2.51	2.09
Ca^{2+} (mg/L)	8.6	8.6	8.6	8.6							6.41	9.62
Mg^{2+} (mg/L)	4.13	7.29	7.29	12.51							1.95	2.93
Cl^- (mg/L)	6.03	6.03	4.97	4.97	3.9	3.9	6.03	5	5	5	9.93	5.49
CO_3^{2-} (mg/L)	0	0	0	0							0	0
HCO_3^- (mg/L)	31.72	34.16	29.28	36.6							70.47	52
ALK-TOT(mg$CaCO_3$/L)	26	28	24	30							57.76	42.62
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0							0	0

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT for the period from June, 2009 to May, 2010 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.51) in the month of March, 2009 during lean period & minimum (pH -6.3) in the month of October, 2008 during flood period.
3. The value of EC maximum (EC-81.5) in the month of March, 2009 during lean period & minimum (EC-47) in the month of August, 2008 during flood period.
4. The value of TDS is maximum (TDS-71) in the month of September, 2008 during flood period & minimum (TDS-32) in the month of August, 2008 during flood period.
5. The value of Turbidity is maximum (Turb-75) in the month of July, 2008 during flood period & minimum (Turb-0.5) in the month of March, 2009 during lean period.
6. The value of Na^+ is maximum (Na^+-10) in the month of August, 2008 during flood period & minimum (Na^+-3) in the month of January, 2009 during lean period.
7. The value of K^+ is maximum (K^+-8) in the month of August, 2008 during flood period & minimum (K^+-2) in the month of January, 2009 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-9.62) in the month of May, 2009 during flood period & minimum (Ca^{2+}-6.41) in the month of April, 2009 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -12.51) in the month of September, 2008 during flood period & minimum (Mg^{2+} -1.95) in the month of April, 2009 during lean period.
10. The value of Cl^- is maximum (Cl^- -9.93) in the month of April, 2009 during lean period & minimum (Cl^--3.9) in the month of October, 2008 & November, 2008 during flood & lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -70.47) in the month of April, 2009 during lean period & minimum (HCO_3^- - 29.28) in the month of August, 2008 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-57.76) in the month of April, 2009 during lean period & minimum (ALK-TOT-24) in the month of August, 2008 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2008	07/ 2008	08/ 2008	09/ 2008	10/ 2008	11/ 2008	12/ 2008	01/ 2009	02/ 2009	03/ 2009	04/ 2009	05/ 2009

PHYSICAL												
Temp(Degrees Celsius (ºC))	20	19	23	24	22	18	12	11	18	21		
pH_GEN(pH unit)	6.7	6.9	7	7.2	6.24	7.41	7.35	6.9	7.05	8.85	7.35	7.6
EC_GEN(µmho/cm)	95	60	58	70	65	71	73	78	77.7	92.4	114	122.7
TDS(mg/L)	68	41	41	51	48	44	43	52.2	46	51	60	57.89
Turb(NTU)	20	25	23	20	1	4	1	1.5	1	1	1.6	1.3
CHEMICAL												
Na^+ (mg/L)	6	10	11	7	8	9	7	5	6	5	9.22	8.05
K^+ (mg/L)	4	8	7	6	6	5	6	4	5	3	3.25	2.94
Ca^{2+} (mg/L)	8.6	10.4	12	13.8							11.22	14.42
Mg^{2+} (mg/L)	8.38	4.13	4.13	10.45							1.95	1.95
Cl^- (mg/L)	7.1	7.1	6.03	3.9	3.9	4.97	4.97	4	4	5	15.88	7.74
CO_3^{2-} (mg/L)	0	0	0	0							0	0
HCO_3^- (mg/L)	39.04	31.72	34.16	43.92							60	56
Alk-Phen($mgCaCO_3$/L)	0	0	0	0							0	0
ALK-TOT($mgCaCO_3$/L)	32	26	28	36							49.18	45.9

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT for the period from June, 2009 to May, 2010 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.85) in the month of March, 2009 during lean period & minimum (pH -6.24) in the month of October, 2008 during flood period.
3. The value of EC maximum (EC-122.7) in the month of May, 2009 during flood period & minimum (EC-58) in the month of August, 2008 during flood period.
4. The value of TDS is maximum (TDS-68) in the month of June, 2008 during flood period & minimum (TDS-41) in the month of July, 2008 during flood period.
5. The value of Turbidity is maximum (Turb-25) in the month of July, 2008 during flood period & minimum (Turb-1) in the month of February, 2009 & March, 2009 during lean period.
6. The value of Na^+ is maximum (Na^+-11) in the month of August, 2008 during flood period & minimum (Na^+-5) in the month of January, 2009 during lean period.
7. The value of K^+ is maximum (K^+-8) in the month of July, 2008 during flood period & minimum (K^+-2.94) in the month of May, 2009 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-14.42) in the month of May, 2009 during flood period & minimum (Ca^{2+}-8.6) in the month of June, 2008 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -10.45) in the month of September, 2008 during flood period & minimum (Mg^{2+} -1.95) in the month of April, 2009 & May, 2009 during lean & flood period.
10. The value of Cl^- is maximum (Cl^- -15.88) in the month of April, 2009 during lean period & minimum (Cl^--3.9) in the month of September, 2008 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -60) in the month of April, 2009 during lean period & minimum (HCO_3^- - 31.72) in the month of July, 2008 during flood period.

12. The value of ALK-TOT is maximum (ALK-TOT-49.18) in the month of April, 2009 during lean period & minimum (ALK-TOT-26) in the month of July, 2008 during flood period.

Water Quality Datasheet for the Period: 2007-2008

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2007	07/ 2007	08/ 2007	09/ 2007	10/ 2007	11/ 2007	12/ 2007	01/ 2008	02/ 2008	03/ 2008	04/ 2008	05/ 2008
PHYSICAL												
Temp(Degrees Celsius (ºC))	19	21	21	21	21	20	12	13	13	18	24	26
pH_GEN(pH unit)	7.6	7.8	7.4	7.4	7.2	7.3	7.4	7.4	6.8	7.1	6.9	6.8
EC_GEN(µmho/cm)	96.4	107.6	102.7	122.6	135	97.7	126.1	147	151	162	78	190
TDS(mg/L)	58.2	74.5	74.2	83.5	89.5	72	75	84	90	111	56	137
Turb(NTU)	72	65	80	80	5	1	2	2	1	3	2	1
CHEMICAL												
Na^+ (mg/L)	4	8	8.99	3.8	4.81	5.2	4.9	11.04	3.91	3.91	8.05	17.02
K^+ (mg/L)	3.01	3.01	4.03	3.6	3.79	2.89	3.79	5.08	1.96	1.96	5.86	5.86
Ca^{2+} (mg/L)	10.4	8.6	15.4	5.2	7	10.2	22.4	20.6	22.4	18.8	15.4	30.8
Mg^{2+} (mg/L)	4.13	10.45	3.16	14.58	11.54	14.58	2.07	4.13	3.16	9.36	2.07	4.13
Cl^- (mg/L)	8.88	15.98	4.97	8.16	11.01	6.03	7.1	9.94	8.16	13.85	7.1	8.88
CO_3^{2-} (mg/L)	0	2.4	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	36.6	36.6	41.48	90.28	87.84	73.2	97.6	73.2	78.08	80.52	39.04	80.52
ALK-TOT(mg$CaCO_3$/L)	30	34	34	74	72	60	80	60	64	66	32	66
Alk-Phen(mg$CaCO_3$/L)	0	1.99	0	0	0	0	0	0	0	0	0	0
SO_4^{2-} (mg/L)	1.15	1.34	1.49	0.86						1.2	1.2	1.3
o-PO_4^{3-}-P(mg/L)	0.85	0.91	0.81	1.02	0.98					1.56	1.36	0.98
Fe(mg/L)	0.11	0.19	0.11	0.09	0.07					0.11	0.07	0.11

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}P, Fe for the period from June, 2007 to May, 2008 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.8) in the month of July, 2007 during flood period & minimum (pH -6.8) in the month of February, 2008 during lean period.
3. The value of EC maximum (EC-190) in the month of May, 2008 during flood period & minimum (EC-78) in the month of April, 2008 during lean period.
4. The value of TDS is maximum (TDS-137) in the month of May, 2008 during flood period & minimum (TDS-56) in the month of April, 2008 during lean period.
5. The value of Turbidity is maximum (Turb-80) in the month of August,2007 during flood period & minimum (Turb-1) in the month of May,2008 during flood period.
6. The value of Na^+ is maximum (Na^+-17.02) in the month of May, 2008 during flood period & minimum (Na^+-3.8) in the month of September, 2007 during flood period.

7. The value of K^+ is maximum (K^+-5.86) in the month of April, 2008 during lean period & minimum (K^+-1.96) in the month of February, 2008 & March, 2008 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-30.8) in the month of May, 2008 during flood period & minimum (Ca^{2+}-5.2) in the month of September, 2007 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -14.58) in the month of \September, 2007 during flood period & minimum (Mg^{2+} -2.07) in the month of April, 2008 during lean period.
10. The value of Cl^- is maximum (Cl^- -15.98) in the month of July, 2007 during flood period & minimum (Cl^--4.97) in the month of August, 2007 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -97.6) in the month of December, 2007 during lean period & minimum (HCO_3^- - 36.6) in the month of June, 2007 & July, 2007 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-80) in the month of December,2008 during lean period & minimum (ALK-TOT-30) in the month of June, 2007 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.49) in the month of August, 2007 during flood period & minimum (SO_4^{2-} - 0.86) in the month of September, 2007 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.56) in the month of March, 2008 during lean period & minimum (o-PO_4^{3-}-P - 0.81) in the month of August, 2007 during flood period.
15. The value of Fe is maximum (Fe -0.19) in the month of July, 2007 during flood period & minimum (Fe -0.07) in the month of October, 2007 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2007	07/ 2007	08 /2007	09/ 2007	10/ 2007	11/ 2007	12/ 2007	01/ 2008	02/ 2008	03/ 2008	04/ 2008	05/ 2008
PHYSICAL												
Temp(Degrees Celsius (ºC))	24	24	24	22	20	13	8	12	10	18	13	20
pH_GEN(pH unit)	7.4	7.7	7.2	7.2	7.2	7.5	7.4	7.2	7.1	7.3	6.6	7
EC_GEN(µmho/cm)	79.9	63.8	60.3	61.8	66	57	71.5	69	67	71	78	68
TDS(mg/L)	46.1	46	44	43.6	44.6	36	44.2	39	40	48	54	48
Turb(NTU)	36	44	20	25	3	1	1	0.8	1	2	2	3
CHEMICAL												
Na^+ (mg/L)	6.99	4.99	6.99	4.21	3.61	4.09	3.8	5.06	2.99	5.06	12.88	5.98
K^+ (mg/L)	3.01	1.99	1.02	2.19	2.39	2.5	2.31	1.96	1.96	3.91	10.17	1.96
Ca^{2+} (mg/L)	12	10.4	8.6	5.2	3.4	12	8.6	10.4	10.4	10.2	12	13.8
Mg^{2+} (mg/L)	8.38	8.38	5.22	7.29	8.38	6.32	3.16	6.32	4.13	6.32	3.16	2.07
Cl^- (mg/L)	9.94	13.14	6.03	9.94	13.14	8.16	8.16	4.97	4.97	7.1	6.03	3.9
CO_3^{2-} (mg/L)	0	0	2.4	0	0	0	0	0	0	2.4	2.4	3.6
HCO_3^- (mg/L)	24.4	24.4	17.08	48.8	48.8	36.6	36.6	39.04	41.48	36.6	36.6	39.04
ALK-TOT(mg$CaCO_3$/L)	20	20	18	40	40	30	30	32	34	34	34	38
Alk-Phen(mg$CaCO_3$/L)	0	0	1.99	0	0	0	0	0	0	1.99	1.99	2.99
SO_4^{2-} (mg/L)	0.91	1.01	1.06	0.86	1.01					1.06	1.1	1.01

o-PO_4^{3-}-P(mg/L)	0.89	0.71	0.81	0.94	0.9					0.82	0.84	0.85
Fe(mg/L)	0.11	0.09	0.07	0.06	0.09					0.07	0.07	0.02

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}P, Fe for the period from June, 2007 to May, 2008 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.7) in the month of July, 2007 during flood period & minimum (pH -6.6) in the month of April, 2008 during lean period.
3. The value of EC maximum (EC-79.9) in the month of June, 2007 during flood period & minimum (EC-57) in the month of November, 2007 during lean period.
4. The value of TDS is maximum (TDS-54) in the month of April, 2008 during lean period & minimum (TDS-36) in the month of November, 2007 during lean period.
5. The value of Turbidity is maximum (Turb-44) in the month of July, 2007 during flood period & minimum (Turb-0.8) in the month of January,2008 during lean period.
6. The value of Na^+ is maximum (Na^+-12.88) in the month of April, 2008 during lean period & minimum (Na^+-2.99) in the month of February, 2008 during lean period.
7. The value of K^+ is maximum (K^+-10.17) in the month of April, 2008 during lean period & minimum (K^+-1.02) in the month of August, 2007 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-13.8) in the month of May, 2008 during flood period & minimum (Ca^{2+}-3.4) in the month of October, 2007 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -8.38) in the month of June, 2007 & July, 2007 during flood period & minimum (Mg^{2+} -2.07) in the month of May, 2008 during flood period.
10. The value of Cl^- is maximum (Cl^- -13.14) in the month of July, 2007 during flood period & minimum (Cl^--3.9) in the month of May, 2008 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -48.8) in the month of September, 2007 & October, 2007 during flood period & minimum (HCO_3^- – 17.08) in the month of August, 2007 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-40) in the month of September, 2007 & October, 2007 during flood period & minimum (ALK-TOT-18) in the month of August, 2007 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.1) in the month of April, 2008 during lean period & minimum (SO_4^{2-} – 0.86) in the month of September, 2008 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.94) in the month of September, 2007 during flood period & minimum (o-PO_4^{3-}-P - 0.71) in the month of August, 2007 during flood period.
15. The value of Fe is maximum (Fe -0.11) in the month of June, 2007 during flood period & minimum (Fe -0.02) in the month of May, 2008 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)

	06/ 2007	07/ 2007	08/ 2007	09/ 2007	10/ 2007	11/ 2007	12/ 2007	01/ 2008	02/ 2008	03/ 2008	04/ 2008	05/ 2008
PHYSICAL												
Temp(Degrees Celsius (ºC))	25	29	25	25	25	19	13	12	10	17	20	21
pH_GEN(pH unit)	7.3	7.7	7	7.1	7.3	7.6	7.3	7.4	7.1	7.2	6.5	7
EC_GEN(µmho/cm)	78.8	61.3	53.81	80	86.1	82.4	110.6	88	92	85	73	86
TDS(mg/L)	47.6	43.5	40.2	55.1	57.8	52	62.8	50	55	57	52	64
Turb(NTU)	80	34	25	85	3	1	1	1	1	3	2	2
CHEMICAL												
Na^+ (mg/L)	2.99	6	2.99	5.11	4.9	5.2	4.99	2.99	3.91	2.99	5.98	6.9
K^+ (mg/L)	1.99	3.01	1.99	3.09	2.82	3.01	2.19	1.96	1.96	3.13	3.91	3.13
Ca^{2+} (mg/L)	15.4	8.6	10.4	7	5.2	20.6	13.8	15.4	17.2	15.4	13.8	15.6
Mg^{2+} (mg/L)	5.22	5.22	3.16	9.48	8.38	3.16	2.07	5.22	4.13	3.16	2.07	1.09
Cl^- (mg/L)	9.94	20.94	6.03	8.16	12.07	6.03	8.16	4.97	7.1	3.9	3.9	6.03
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	29.28	26.84	21.96	61	73.2	51.24	48.8	48.8	51.24	51.24	41.48	46.36
ALK-TOT(mg$CaCO_3$/L)	24	22	18	50	60	42	40	40	42	42	34	38
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
SO_4^{2-} (mg/L)	1.44	1.3	1.25	1.44	1.34					1.58	1.25	1.2
o-PO_4^{3-}-P(mg/L)	0.78	0.91	1.05	1.09	1.01					0.8	1.01	0.91
Fe(mg/L)	0.09	0.11	0.13	0.09	0.07					0.06	0.13	0.09

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}P, Fe for the period from June, 2007 to May, 2008 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.7) in the month of July, 2007 during flood period & minimum (pH -6.5) in the month of April, 2008 during lean period.
3. The value of EC maximum (EC-110) in the month of December, 2007 during lean period & minimum (EC-53) in the month of August, 2007 during flood period.
4. The value of TDS is maximum (TDS-64) in the month of May, 2008 during flood period & minimum (TDS-40.2) in the month of August, 2007 during flood period.
5. The value of Turbidity is maximum (Turb-85) in the month of September,2007 during flood period & minimum (Turb-1) in the month of January,2008 during lean period.
6. The value of Na^+ is maximum (Na^+-6.9) in the month of May, 2008 during flood period & minimum (Na^+-2.9) in the month of August, 2007 during flood period.
7. The value of K^+ is maximum (K^+-3.91) in the month of April, 2008 during lean period & minimum (K^+-1.96) in the month of January, 2008 & March, 2008 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-20.6) in the month of November, 2007 during lean period & minimum (Ca-5.2) in the month of October, 2007 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -9.48) in the month of September, 2007 during flood period & minimum (Mg^{2+} -1.09) in the month of May, 2008 during flood period.

10. The value of Cl^- is maximum (Cl^- -20.94) in the month of July, 2007 during flood period & minimum (Cl^--3.9) in the month of March, 2008 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -73.2) in the month of October, 2007 during lean period & minimum (HCO_3^- – 21.96) in the month of August, 2007 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-60) in the month of October,2007 during flood period & minimum (ALK-TOT-18) in the month of August, 2007 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.58) in the month of March,2008 during lean period & minimum (SO_4^{2-} – 1.2) in the month of May, 2008 during flood period.
14. The value of Fe is maximum (Fe -0.13) in the month of August, 2007 during flood period & minimum (Fe -0.06) in the month of March, 2008 during lean period.
15. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.05) in the month of August, 2007 during flood period & minimum (o-PO_4^{3-}-P - 0.78) in the month of June, 2007 during flood period.

Water Quality Datasheet for the Period: 2006-2007

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2006	07/ 2006	08/ 2006	09/ 2006	10/ 2006	11/ 2006	12/ 2006	01/ 2007	02/ 2007	03/ 2007	04/ 2007	05/ 2007
PHYSICAL												
Temp(Degrees Celsius (ºC))	23	24	26	25	24	19	20	11	14	18	28	22
pH_GEN(pH unit)	7.7	7.4	7.7	7.4	7.5	7.3	7.4	6.7	7	7.1	6.8	7.6
EC_GEN(µmho/cm)	148	98	124	81	134	103	89	141.7	124.2	144.2	149	155.4
TDS(mg/L)	103	76	91	52	74	74	66	74	72	95	98.6	112.7
Turb(NTU)	29	0.16	4	160	5	1	1	2	2	1	1	1
CHEMICAL												
Na^+ (mg/L)	3.11	2.9				5.2	4.09	3.47	1.91	2.9	15	6
K^+ (mg/L)	1.72	1.49				1.99	2.31	2.82	2.42	2.7	4.03	4.03
Ca^{2+} (mg/L)	20.6	5.2	10.4	10.4	13.8	12	17.2	12	6.8	12	8.6	12
Mg^{2+} (mg/L)	8.38	11.54	9.36	6.32	9.36	24.06	21.99	20.9	20.9	21.99	20.9	21.99
Cl^- (mg/L)	7.1	17.04	6.03	4.97	6.03	9.94	8.88	8.88	8.16	8.16	0.89	8.16
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	1.2	2.4
HCO_3^- (mg/L)	75.64	61	78.08	53.68	65.88	73.2	78.08	70.76	75.64	85.4	87.84	95.16
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	1	1.99
ALK-TOT(mg$CaCO_3$/L)	62	50	64	44	54	60	64	58	62	70	74	82
SO_4^{2-} (mg/L)	1.15	1.1	1.39	1.39	1.39	1.34	1.39	1.2	1.34	1.44	1.39	1.2
o-PO_4^{3-}-P(mg/L)	1.23	1.02	1.11	0.69	1.19	1	1.06	1.15	0.96	0.92	1.04	1.02
Fe(mg/L)	0.09	0.09	0.11	0.11	0.11	0.13	0.11	0.11	0.09	0.09	0.11	0.13
BIOLOGICAL/ BACTEOROLOGICAL												
DO(mg/L)	7.5	8.2	8.4	8.1	7.6	8.4	11.5	8.6	8.5	8.5	7.9	7.8
$BOD_{3\text{-}27}$(mg/L)	0.3	0.3	0.3	0.4	0.2	0.4	0.5	0.4	0.3	0.3	0.3	0.2

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}P, Fe, DO, BOD for the period from June, 2006 to May, 2007 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.7) in the month of June, 2006during flood period & minimum (pH -6.7) in the month of January, 2007 during lean period.
3. The value of EC is maximum (EC-155) in the month of May, 2007 during flood period & minimum (EC-81) in the month of September,2006 during flood period.
4. The value of TDS is maximum (TDS-112.7) in the month of May, 2007 during flood period & minimum (TDS-52) in the month of September,2006 during flood period.
5. The value of Turbidity is maximum (Turb-160) in the month of September,2006 during flood period & minimum (Turb-0.16) in the month of July,2006 during flood period.
6. The value of Na^+ is maximum (Na^+-15) in the month of April,2007 during lean period & minimum (Na^+-1.9) in the month of February,2007 during lean period.
7. The value of K^+ is maximum (K^+-4.03) in the month of April, 2007 during lean period & minimum (K^+-1.49) in the month of July,2006 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-20.6) in the month of June, 2006 during flood period & minimum (Ca^{2+}-5.2) in the month of July,2006 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -24.06) in the month of November,2006 during lean period & minimum (Mg^{2+} -6.32) in the month of September,2006 during flood period.
10. The value of Cl^- is maximum (Cl^- -17.04) in the month of July, 2007 during flood period & minimum (Cl^--0.89) in the month of April,2006 during lean period.
11. The value of CO_3^{2-} is maximum (CO 3 -2.4) in the month of May, 2007 during flood period.
12. The value of HCO_3^- is maximum (HCO_3^- -95.16) in the month of May, 2007 during flood period & minimum (HCO_3^- – 53.68) in the month of September,2006 during flood period.
13. The value of Alk-Phen is maximum (Alk-Phen -1.99) in the month of May, 2007 during flood period.
14. The value of ALK-TOT is maximum (ALK-TOT-82) in the month of May,2007 during lean period & minimum (ALK-TOT-44) in the month of September,2006 during flood period.
15. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.44) in the month of March, 2007 during lean period & minimum (SO_4^{2-}-1.1) in the month of July, 2006 during flood period.
16. The value of o-PO4-P is maximum (o-PO4-P -1.23) in the month of June, 2006 during flood period & minimum (o-PO4-P -0.69) in the month of September, 2006 during flood period.
17. The value of Fe is maximum (Fe -0.13) in the month of May, 2007 during flood period & minimum (Fe -0.09) in the month of July, 2006 during flood period.
18. The value of DO is maximum (DO-11.5) in the month of December,2006 during lean period & minimum (DO-7.5) in the month of June, 2006 during lean period.
19. The value of BOD is maximum (BOD -0.5) in the month of December,2006 during lean period & minimum (BOD -0.2) in the month of May, 2007 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2006	07/ 2006	08/ 2006	09/ 2006	10/ 2006	11/ 2006	12/ 2006	01/ 2007	02/ 2007	03/ 2007	04/ 2007	05/ 2007
PHYSICAL												
Temp (Degrees Celsius (ºC))	25.5	24.5	24.5	23.5	22.5	20	14	13	13	16	22.5	23.5
pH_GEN(pH unit)	7.3	7.3	7.5	7.3	7.3	7.2	7.3	6.9	6.9	7.1	6.6	7.5
EC_GEN(µmho/cm)	75	68	63	72	70	66	67	66.4	70.2	80.4	73.2	64
TDS(mg/L)	49	52	45	46	46	41	46	35.8	40	56	48.4	45.6
Turb(NTU)	3	20	4	65	3	2	1	2	1	1	1	5
CHEMICAL												
Na^+ (mg/L)	2.53	2.53				5.06	3.91	4.21	1.91	2	15	8
K^+ (mg/L)	1.21	1.09				2.19	2.62	2.11	1.92	1.8	4.03	1.99
Ca^{2+} (mg/L)	10.4	6.8	8.6	8.6	8.6	8.6	10.4	10.4	8.6	10.4	8.6	8.6
Mg^{2+} (mg/L)	5.22	7.41	4.13	8.38	8.38	21.99	12.51	13.61	14.58	17.74	20.9	14.58
Cl^- (mg/L)	7.45	7.45	7.45	4.97	6.03	9.94	9.94	8.88	9.94	8.88	8.88	11.01
CO_3^{2-} (mg/L)	2.4	0	0	0	0	0	0	0	0	0	1.2	1.2
HCO_3^- (mg/L)	34.16	41.48	39.04	39.04	39.04	34.16	48.8	31.72	36.6	43.92	87.84	63.44
ALK-TOT ($mgCaCO_3$/L)	32	34	32	32	32	28	40	26	30	36	74	54
Alk-Phen($mgCaCO_3$/L)	1.99	0	0	0	0	0	0	0	0	0	1	1
SO_4^{2-} (mg/L)	1.01	0.86	1.01	0.91	1.2	1.25	1.39	1.34	1.1	1.15	1.39	1.01
o-PO_4^{3-}-P(mg/L)	0.75	0.94	0.56	0.63	0.59	0.75	0.9	1	0.9	0.84	1.04	0.9
Fe(mg/L)	0.07	0.09	0.07	0.09	0.13	0.11	0.11	0.09	0.07	0.06	0.11	0.09
BIOLOGICAL/ BACTEOROLOGICAL												
BOD_3-27(mg/L)	0.3	0.2	0.3	0.2	0.5	0.5	0.7	0.3	0.3	0.1	0.1	0.2
DO (mg/L)	7.3	8.2	8.2	7.8	8.7	8.9	11.7	8.3	8	7.9	7.5	7.7

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}P, Fe, DO, BOD for the period from June, 2006 to May, 2007 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.5) in the month of May, 2007 during flood period & minimum (pH -6.6) in the month of April, 2007 during lean period.
3. The value of EC maximum (EC-80.4) in the month of March, 2007 during lean period & minimum (EC-63) in the month of August, 2006 during flood period.
4. The value of TDS is maximum (TDS-56) in the month of March, 2007 during lean period & minimum (TDS-35.8) in the month of January, 2007 during lean period.
5. The value of Turbidity is maximum (Turb-65) in the month of September, 2006 during flood period & minimum (Turb-1) in the month of December, 2006 during lean period.
6. The value of Na^+ is maximum (Na^+-15) in the month of April, 2007 during lean period & minimum (Na^+-1.91) in the month of February, 2007 during lean period.
7. The value of K^+ is maximum (K^+-4.03) in the month of April, 2007 during lean period & minimum (K^+-1.09) in the month of July, 2006 during flood period.

8. The value of Ca^{2+} is maximum (Ca^{2+}-10.4) in the month of June, 2006 during flood period & minimum (Ca^{2+}-6.8) in the month of July, 2006 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -21.99) in the month of November, 2006 during lean period & minimum (Mg^{2+} -4.13) in the month of August, 2006 during flood period.
10. The value of Cl^- is maximum (Cl^- -11.01) in the month of May, 2007 during flood period & minimum (Cl^--4.97) in the month of September, 2006 during flood period.
11. The value of CO_3^{2-} is maximum (CO_3^{2-} -2.4) in the month of June, 2006 during flood period.
12. The value of HCO_3^- is maximum (HCO_3^- -87.84) in the month of April, 2007 during lean period & minimum (HCO_3^- – 31.72) in the month of January, 2007 during lean period.
13. The value of Alk-Phen is maximum (Alk-Phen -1.99) in the month of June, 2006 during flood period.
14. The value of ALK-TOT is maximum (ALK-TOT-74) in the month of April, 2007 during lean period & minimum (ALK-TOT-26) in the month of January, 2007 during lean period.
15. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.39) in the month of December, 2006 during lean period & minimum (SO_4^{2-}-0.86) in the month of July, 2006 during flood period.
16. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.04) in the month of April, 2007 during lean period & minimum (o-PO_4^{3-}-P -0.56) in the month of August, 2006 during flood period.
17. The value of Fe is maximum (Fe -0.13) in the month of October, 2006 during flood period & minimum (Fe -0.06) in the month of March, 2007 during lean period.
18. The value of DO is maximum (DO-11.7) in the month of December,2006 during lean period & minimum (DO-7.3) in the month of June, 2006 during lean period.
19. The value of BOD is maximum (BOD -0.7) in the month of December,2006 during lean period & minimum (BOD -0.1) in the month of April,2007 during lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2006	07/ 2006	08/ 2006	09 /2006	10/ 2006	11/ 2006	12/ 2006	01/ 2007	02/ 2007	03/ 2007	04/ 2007	05/ 2007
PHYSICAL												
Temp(Degrees Celsius (ºC))	28	27	31	25	26	20	16.5	14	14	20	22	22
pH_GEN(pH unit)	7.5	7.2	7.6	7.3	7.4	7.2	7.2	7	7	7	6.8	7.8
EC_GEN(µmho/cm)	86	56	84	81	105	82	54	87.8	87.4	72.4	71.6	70
TDS(mg/L)	55	42	60	54	55	52	36	47.4	51	49	48	52.1
Turb(NTU)	11	9		85	4	2	1	2	2	1	1	
CHEMICAL												
Na^+ (mg/L)	2.81	2.9				0.41	3.5	3.91	2.81	2.69	6	4
K^+ (mg/L)	1.21	1.29				2.31	2.5	2.19	1.99	2.42	1.02	1.99
Ca^{2+} (mg/L)	12	5.2	10.4	10.4	6.8	8.6	8.6	8.6	15.4	10.4	12	8.6
Mg^{2+} (mg/L)	5.22	7.29	6.32	9.36	13.61	26.12	18.83	15.67	11.54	13.61	15.67	17.74
Cl^- (mg/L)	4.97	8.88	8.16	4.97	6.03	8.88	9.94	8.16	7.1	6.03	6.03	8.88
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	1.2	0	0
HCO_3^- (mg/L)	53.68	31.72	58.56	48.8	46.36	48.8	34.16	56.12	61	78.08	73.2	70.76

Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	1	0	0
ALK-TOT(mg$CaCO_3$/L)	44	26	48	40	38	40	28	46	50	66	60	58
SO_4^{2-} (mg/L)	1.15	0.91	1.39	1.15	1.34	1.49	1.49	1.25	1.39	1.34	1.49	1.44
o-PO_4^{3-}-P(mg/L)	1.11	0.82	0.96	0.98	1	0.99	0.99	1.09	1.15	0.94	0.92	0.82
Fe(mg/L)	0.11	0.11	0.11	0.15	0.09	0.11	0.09	0.15	0.09	0.07	0.06	0.09

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}P, Fe for the period from June, 2006 to May, 2007 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.8) in the month of May, 2007 during flood period & minimum (pH -6.8) in the month of April, 2007 during lean period.
3. The value of EC maximum (EC-105) in the month of October, 2006 during flood period & minimum (EC-54) in the month of December, 2006 during lean period.
4. The value of TDS is maximum (TDS-60) in the month of August, 2006 during flood period & minimum (TDS-36) in the month of December, 2006 during lean period.
5. The value of Turbidity is maximum (Turb-85) in the month of September, 2006 during flood period & minimum (Turb-1) in the month of December, 2006 during lean period.
6. The value of Na^+ is maximum (Na^+-6) in the month of April, 2007 during lean period & minimum (Na^+-0.41) in the month of November, 2006 during lean period.
7. The value of K^+ is maximum (K^+-2.5) in the month of December, 2006 during lean period & minimum (K^+-1.02) in the month of April, 2007 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-15.4) in the month of February, 2007 during flood period & minimum (Ca^{2+}-5.2) in the month of July, 2006 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -26.12) in the month of November, 2006 during lean period & minimum (Mg^{2+} -5.22) in the month of June, 2006 during flood period.
10. The value of Cl^- is maximum (Cl^- -9.94) in the month of December, 2006 during lean period & minimum (Cl^--4.97) in the month of June, 2006 during flood period.
11. The value of CO_3^{2-} is maximum (CO_3^{2-} -1.2) in the month of March, 2007 during lean period.
12. The value of HCO_3^- is maximum (HCO_3^- -78.08) in the month of March, 2007 during lean period & minimum (HCO_3^- – 31.72) in the month of July, 2006 during flood period.
13. The value of Alk-Phen is maximum (Alk-Phen -1) in the month of March, 2007 during flood period.
14. The value of ALK-TOT is maximum (ALK-TOT-66) in the month of March, 2007 during lean period & minimum (ALK-TOT-26) in the month of July, 2006 during flood period.
15. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.49) in the month of November, 2006 & December, 2006 during lean period & minimum (SO4-0.91) in the month of July, 2006 during flood period.
16. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.15) in the month of February, 2007 during lean period & minimum (o-PO_4^{3-}-P -0.82) in the month of May, 2007 during flood period.

17. The value of Fe is maximum (Fe -0.15) in the month of September, 2006 during flood period & minimum (Fe -0.06) in the month of April, 2007 during lean period.

Water Quality Datasheet for the Period: 2005-2006

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2005	07/ 2005	08/ 2005	09/ 2005	10/ 2005	11/ 2005	12/ 2005	01/ 2006	02/ 2006	03/ 2006	04/ 2006	05/ 2006
PHYSICAL												
Temp(Degrees Celsius (ºC))	26	27	28	28	27	24	19	14	17	19	23	23
pH_GEN(pH unit)	6.8	7.4	7.3	7.5	7.6	7.5	7.5	7.4	7.8	7.6	7.1	7.9
EC_GEN(µmho/cm)	79	82	117	118	116	124	121	131	137.4	128.2	165	154
TDS(mg/L)	56	61	83	90	77	75	74	71	62	82	106	109
Turb(NTU)	22	75	80	1	35	2	1	1	0.3	1	1	1
CHEMICAL												
Na^+ (mg/L)		2.76	2.99	2.99	3.22	2.76	2.99	2.76	2.99	2.76	2.99	3.45
K^+ (mg/L)	1.8	1.99	1.6	1.68	1.49	1.21	1.68	1.41	3.36	1.8	1.49	1.8
Ca^{2+} (mg/L)	10.2	12	12	17.2	19	15.6	13.8	25.8	17.2	10.4	15.4	22.4
Mg^{2+} (mg/L)	13.61	10.45	8.26	7.29	5.22	4.13	6.32	18.83	19.8	14.58	8.38	4.13
Cl^- (mg/L)	8.88	4.97	8.16	11.01	11.01	8.88	8.88	13.14	8.16	9.94	9.94	8.16
CO_3^{2-} (mg/L)	2.4	0	0	0	0	0	0	0	0	0	0	2.4
HCO_3^- (mg/L)	90.28	95.16	61	63.44	61	63.44	73.2	68.32	78.08	75.64	85.4	78.08
Alk-Phen(mg$CaCO_3$/L)	1.99	0	0	0	0	0	0	0	0	0	0	1.99
ALK-TOT(mg$CaCO_3$/L)	78	78	50	52	50	52	60	56	64	62	70	68
SO_4^{2-} (mg/L)	1.34	1.54	1.63	1.44	1.54	1.25	1.34	1.49	1392	1.39	1.44	1.25
o-PO_4^{3-}-P(mg/L)	0.84	0.64	0.87	0.82	0.62	0.78	0.71	0.92	0.84	0.63	1.55	1.13
Fe(mg/L)	0.11	0.13	0.11	0.09	0.11	0.09	0.09		0.06	0.06	0.07	0.11
DO(mg/L)	7.4	7.6	7.5	7.4	8.3	8.3	8.4	8.1	8.2	8.7	7.9	7.9
$BOD_{3\text{-}27}$(mg/L)	0.5	0.5	0.4	0.3	0.4	0.4	0.4	0.2	0.3	0.7	0.3	0.1

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe, DO, BOD for the period from June, 2005 to May, 2006 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) in the month of May, 2006 flood period & minimum (pH -6.8) in the month of June, 2005 during flood period.
3. The value of EC is maximum (EC-165) in the month of April,2006 during lean period & minimum (EC-79) in the month of June, 2005 during flood period.
4. The value of TDS is maximum (TDS-109) in the month of May, 2006 during flood period & minimum (TDS-56) in the month of June, 2005 during flood period.
5. The value of Turbidity is maximum (Turb-80) in the month of August,2005 during flood period & minimum (Turb-0.3) in the month of February, 2006 during flood period.

6. The value of Na^+ is maximum (Na^+-3.45) in the month of May, 2006 during lean period & minimum (Na^+-2.76) in the month of July,2005 during lean period.
7. The value of K^+ is maximum (K^+-3.36) in the month of February, 2006 during lean period & minimum (K^+-1.21) in the month of November,2005 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-25.8) in the month of January, 2006 during lean period & minimum (Ca^{2+}-10.2) in the month of June, 2005 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -19.8) in the month of February, 2006 during lean period & minimum (Mg^{2+} -4.13) in the month of November, 2005 during lean period.
10. The value of Cl^- is maximum (Cl^- 13.14) in the month of January, 2006 during flood period & minimum (Cl^--4.97) in the month of July, 2005 during lean period.
11. The value of CO_3^{2-} is maximum (CO_3^{2-} -2.4) in the month of May, 2006 during flood period.
12. The value of HCO_3^- is maximum (HCO_3^- -95.16) in the month of July,2005 during flood period & minimum (HCO_3^- – 61) in the month of August,2005 during flood period.
13. The value of Alk-Phen is maximum (Alk-Phen -1.99) in the month of May, 2006 during flood period.
14. The value of ALK-TOT is maximum (ALK-TOT-78) in the month of May,2006 during lean period & minimum (ALK-TOT-50) in the month of August,2005 during flood period.
15. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.54) in the month of July,2005 during flood period & minimum (SO_4^{2-}-1.25) in the month of November,2005 during flood period.
16. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.55) in the month of April, 2006 during lean period & minimum (o-PO_4^{3-}-P -0.62) in the month of October, 2005 during flood period.
17. The value of Fe is maximum (Fe -0.13) in the month of July, 2005 during flood period & minimum (Fe -0.06) in the month of March, 2006 during lean period.
18. The value of DO is maximum (DO-8.7) in the month of March, 2006 during lean period & minimum (DO-7.4) in the month of June, 2005 during flood period.
19. The value of BOD is maximum (BOD -0.7) in the month of March, 2006 during lean period & minimum (BOD -0.1) in the month of May, 2006 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2005	07/ 2005	08/ 2005	09/ 2005	10/ 2005	11/ 2005	12/ 2005	01/ 2006	02/ 2006	03/ 2006	04/ 2006	05/ 2006
PHYSICAL												
Temp(Degrees Celsius (ºC))	25.5	23.5	25.5	23.5	23.5	19.5	17.5	15.5	17.5	18.5	22.5	24.5
pH_GEN(pH unit)	7.1	7	7.2	7.4	7.2	7.3	7.2	7.4	7.7	7.5	7.2	7.3
EC_GEN(µmho/cm)	77	59	59	61	64	64	68	71	75.9	66.2	77	74.2
TDS(mg/L)	55	44	42	48	43	41	39	38	40	42	50	55
Turb(NTU)	50	38	34	2	5	2	0.8	0.4	0.3	1	1	1
CHEMICAL												
Na^+ (mg/L)		2.76	2.99	2.99	2.99	2.99	0.6	2.53	2.76	2.99	2.3	2.07
K^+ (mg/L)	1.49	1.49	1.68	1.6	1.21	1.41	4.3	0.9	1.02	1.21	1.29	1.41

Ca^{2+} (mg/L)	8.6	12	12	8.6	12	8.6	12	15.4	15.4	8.6	8.6	10.4
Mg^{2+} (mg/L)	10.45	20.9	6.32	8.26	5.22	5.22	3.16	11.54	31.35	5.22	9.36	4.13
Cl^- (mg/L)	8.88	4.97	6.03	8.88	8.88	8.16	7.1	13.14	6.03	6.03	7.1	11.01
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	19.52	24.4	29.28	29.28	29.28	29.28	48.8	39.04	41.48	46.36	46.36	41.48
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	16	20	24	24	24	24	40	32	34	38	38	34
SO_4^{2-} (mg/L)	0.62	0.62	0.77	1.06	0.67	0.77	0.53	0.62	0.67	0.62	0.86	0.77
o-PO_4^{3-}-P(mg/L)	0.73	0.74	0.81	0.8	0.53	0.62	0.57	0.73	0.61	0.62	0.53	0.53
Fe(mg/L)	0.11	0.13	0.15	0.09	0.06	0.07	0.07	0.07	0.07	0.06	0.06	0.06
DO(mg/L)	6.8	7	8.3	8	8.6	8.5	8.2	7.8	8	8.5	7.6	7.6
$BOD_{3\text{-}27}$(mg/L)	0.5	0.3	0.3	0.4	0.4	0.3	0.6	0.3	0.4	0.6	0.3	0.1

Based on the result of analysis the inference is as below:

1. The value of pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe, DO, BOD in the period from June, 2005 to May, 2006 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.7) in the month of February, 2006 during lean period & minimum (pH -7.0) in the month of July, 2005 during flood period.
3. The value of EC is maximum (EC-77) in the month of June, 2005 during flood period & minimum (EC-59) in the month of July, 2005 & August, 2005during flood period.
4. The value of TDS is maximum (TDS-55) in the month of June, 2005 during flood period & minimum (TDS-38) in the month of January, 2006 during lean period.
5. The value of Turbidity is maximum (Turb-50) in the month of June, 2005 during flood period & minimum (Turb-0.3) in the month of February, 2006 during lean period.
6. The value of Na^+ is maximum (Na^+-2.99) in the month of August, 2005 to November, 2005 during lean & flood period & minimum (Na^+-0.6) in the month of December, 2005 during lean period.
7. The value of K^+ is maximum (K^+-4.3) in the month of December, 2005 during lean period & minimum (K^+-0.9) in the month of January, 2006 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-15.4) in the month of January, 2006 & February, 2006 during lean period & minimum (Ca^{2+}-8.6) in the month of March, 2006 & April, 2006 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -31.35) in the month of February, 2006 during lean period & minimum (Mg^{2+} -3.16) in the month of December, 2005 during lean period.
10. The value of Cl^- is maximum (Cl^- 13.14) in the month of January, 2006 during lean period & minimum (Cl^--4.97) in the month of July, 2005 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -48.8) in the month of December, 2005during lean period & minimum (HCO_3^- – 19.52) in the month of June, 2005 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-40) in the month of December, 2005 during lean period & minimum (ALK-TOT-16) in the month of June, 2005 during flood period.

13. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.06) in the month of September, 2005during flood period & minimum (SO_4^{2-}-0.53) in the month of December, 2005 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.81) in the month of August, 2005 during flood period & minimum (o-PO_4^{3-}-P -0.53) in the month of April, 2006 & May, 2006 during lean & flood period.
15. The value of Fe is maximum (Fe -0.15) in the month of August, 2005 during flood period & minimum (Fe -0.06) in the month of March, 2006 to May, 2006 during lean & flood period.
16. The value of DO is maximum (DO-8.6) in the month of October,2005 during flood period & minimum (DO-7.0) in the month of July, 2005 during flood period.
17. The value of BOD is maximum (BOD -0.6) in the month of March,2006 during lean period & minimum (BOD -0.1) in the month of May, 2006 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2005	07/ 2005	08/ 2005	09/ 2005	10/ 2005	11/ 2005	12/ 2005	01/ 2006	02/ 2006	03/ 2006	04/ 2006	05/ 2006
PHYSICAL												
Temp(Degrees Celsius (ºC))	28	25	29	29	27	21	18	16	19	21	24	25.5
pH_GEN(pH unit)	7.2	7.3	7	7.4	7.1	7.2	7.5	7.5	7.9	7.4	7.3	7.5
EC_GEN(µmho/cm)	72	63	50	78	78	77	92	93	93.3	82	79	65.6
TDS(mg/L)	52	46	36	59	48	48	50	48	47	52	53	48
Turb(NTU)	5	12	18	2	8	3	0.8	1	0.4	0.3	1	1
CHEMICAL												
Na^+(mg/L)		3.68	3.22	2.99	2.76	2.99	2.53	2.07	2.76	2.53	2.07	2.3
K^+(mg/L)	1.49	1.41	1.56	1.6	1.68	1.41	1.6	1.49	1.6	1.41	1.49	1.72
Ca^{2+} (mg/L)	10.2	8.6	6.8	12	13.8	17.2	10.4	24	15.4	10.4	12	10.4
Mg^{2+} (mg/L)	12.51	8.26	10.45	6.32	4.13	2.19	5.22	3.16	10.33	8.38	7.29	4.13
Cl^- (mg/L)	8.16	12.07	7.1	9.94	7.1	8.88	8.16	13.85	8.16	4.97	6.03	8.16
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	53.68	63.44	31.72	48.8	34.16	46.36	56.12	53.68	53.68	56.12	46.36	43.92
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	44	52	26	40	28	38	46	44	44	46	38	36
SO_4^{2-} (mg/L)	0.82	1.1	1.25	1.34	1.06	1.2	1.15	1.2	1.06	0.96	1.34	1.06
o-PO_4^{3-}-P(mg/L)	0.81	0.82	0.75	0.81	0.63	0.74	0.73	0.81	0.65	0.65	0.86	0.88
Fe(mg/L)	0.13	0.13	0.13	0.11	0.09	0.07	0.09	0.07	0.09	0.06	0.17	0.15

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe in the the period from June, 2005 to May, 2006 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) in the month of February, 2006 during lean period & minimum (pH -7.0) in the month of August, 2005 during flood period.

3. The value of EC is maximum (EC-93.3) in the month of February, 2006 during lean period & minimum (EC-50) in the month of August, 2005 during flood period.
4. The value of TDS is maximum (TDS-59) in the month of September, 2005 during flood period & minimum (TDS-36) in the month of August, 2005 during flood period.
5. The value of Turbidity is maximum (Turb-18) in the month of August, 2005 during flood period & minimum (Turb-0.3) in the month of March, 2006 during lean period.
6. The value of Na^+ is maximum (Na^+-3.68) in the month of July, 2005 during flood period & minimum (Na^+-2.07) in the month of January,2006 during lean period.
7. The value of K^+ is maximum (K^+-1.72) in the month of May,2006 during flood period & minimum (K^+-1.41) in the month of November,2005 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-24) in the month of January, 2006 during lean period & minimum (Ca^{2+}-6.8) in the month of August, 2005 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -12.51) in the month of June, 2005 during flood period & minimum (Mg^{2+} -2.19) in the month of November, 2005 during lean period.
10. The value of Cl^- is maximum (Cl^- 13.85) in the month of January, 2006 during lean period & minimum (Cl^--4.97) in the month of March, 2006 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -63.44) in the month of July, 2005during flood period & minimum (HCO_3^- – 31.72) in the month of August, 2005 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-52) in the month of July, 2005 during flood period & minimum (ALK-TOT-26) in the month of August, 2005 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.34) in the month of September, 2005during flood period & minimum (SO_4^{2-}-0.82) in the month of June, 2005 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.88) in the month of May, 2006 during lean period & minimum (o-PO_4^{3-}-P -0.63) in the month of October, 2005 during flood period.
15. The value of Fe is maximum (Fe -0.17) in the month of April, 2006 during lean period & minimum (Fe -0.06) in the month of March, 2006 during lean period.

Water Quality Datasheet for the Period: 2004-2005

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2004	07/ 2004	08/ 2004	09/ 2004	10/ 2004	11/ 2004	12/ 2004	01/ 2005	02/ 2005	03/ 2005	04/ 2005	05/ 2005
PHYSICAL												
Temp(Degrees Celsius (ºC))	27	27	27	25	27	24	21	17	17	24	25.5	28
pH_GEN(pH unit)	7.45	7.29	7.2	7.2	6.5	7.6	7.1	7.2	7.1	7.5	7.5	7.6
EC_GEN(µmho/cm)	174	80	66	127	142	129	128	134	162	142	150	155
TDS(mg/L)	112	54	52	86	93	77	78	76	97	92	104	103
Turb(NTU)	60	74	6	0.8	1	2	0.9	1	1	0.8	1	1
CHEMICAL												

Na^+ (mg/L)				5.06	3.91	3.91		1.24	0			
K^+ (mg/L)	3.09	2.89	1.8	1.49	1.6	1.41	1.8	2.11	1.8	1.99	2.11	1.6
Ca^{2+} (mg/L)	36.2	32.8	18.8	12	25.8	8.6	10.2	6.8	13.8	10.2	6.8	8.6
Mg^{2+} (mg/L)	40.82	26.12	4.13	7.29	3.16	8.26	4.37	6.2	33.41	10.45	13.61	17.74
Cl^- (mg/L)	14.91	7.1	12.07	14.2	8.88	7.81	7.81	12.07	24.5	12.07	11.01	9.94
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	31.72	58.56	80.52	58.56	31.72	68.32	68.32	58.56	59.78	73.2	53.68	78.08
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0			0	0	0
ALK-TOT(mg$CaCO_3$/L)	26	48	66	48	26	56	56			60	44	64
SO_4^{2-} (mg/L)	2.74	3.22	1.34	1.54	3.31	3.07	3.22	2.5	1.3	1.15	1.01	1.2
o-PO_4^{3-}-P(mg/L)	0.58	0.61	0.5	0.38	0.83	0.67	0.63	0.52	0.55	0.75	0.68	0.78
Fe(mg/L)	0.09	0.13	0.17	0.11	0.15	0.19	0.17	0.11	0.19	0.13	0.3	0.11
DO(mg/L)					8	8.4	7.3	7.8	9.2	7.2	7.1	8.1
$BOD_{3\text{-}27}$(mg/L)					0.6	0.5	0.5	0.3	0.7	0.3	0.2	0.4

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe, DO, BOD for the period from June, 2004 to May, 2005 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.6) in the month of November, 2004 lean period & minimum (pH -6.5) in the month of October, 2004 during flood period.
3. The value of EC is maximum (EC-174) in the month of June, 2004 during flood period & minimum (EC-66) in the month of August, 2004 during flood period.
4. The value of TDS is maximum (TDS-112) in the month of June, 2004 during flood period & minimum (TDS-52) in the month of August, 2004 during flood period.
5. The value of Turbidity is maximum (Turb-74) in the month of July, 2004 during flood period & minimum (Turb-0.8) in the month of March, 2005 during lean period.
6. The value of Na^+ in the period from June, 2004 to May, 2005 is maximum (Na^+-5.06) in the month of September, 2004 during flood period & minimum (Na^+-0.0) in the month of February, 2005 during lean period.
7. The value of K^+ is maximum (K^+-3.09) in the month of June, 2004 during flood period & minimum (K^+-1.41) in the month of November, 2004 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-36.2) in the month of June, 2004 during flood period & minimum (Ca^{2+}-6.8) in the month of January, 2005 & April, 2005during lean period.
9. The value of Mg^{2+} in the is maximum (Mg^{2+}-40.82) in the month of June, 2004 during flood period & minimum (Mg^{2+}-3.16) in the month of October, 2004 during flood period.
10. The value of Cl^- is maximum (Cl^--24.5) in the month of February, 2005 during lean period & minimum (Cl^--7.1) in the month of July, 2004 during flood period.
11. The value of CO_3^{2-} is (CO_3^{2-} -0.0).
12. The value of HCO_3^- is maximum (HCO_3^- -80.52) in the month of August, 2004 during flood period & minimum (HCO_3^- – 31.72) in the month of June, 2004 & October, 2004 during flood period.

13. The value of Alk-Phen is maximum (Alk-Phen -0.0).
14. The value of ALK-TOT is maximum (ALK-TOT-66) in the month of August, 2004 during lean period & minimum (ALK-TOT-26) in the month of June, 2004 during flood period.
15. The value of SO_4^{2-} is maximum (SO_4^{2-} -3.31) in the month of October,2004 during flood period & minimum (SO_4^{2-}-1.01) in the month of April, 2005 during lean period.
16. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.83) in the month of October, 2004 during flood period & minimum (o-PO_4^{3-}-P -0.38) in the month of September, 2004 during lean period.
17. The value of Fe is maximum (Fe -0.3) in the month of April,2005 during lean period & minimum (Fe -0.09) in the month of June, 2004 during flood period.
18. The value of DO is maximum (DO-9.2) in the month of February,2005 during lean period & minimum (DO-7.1) in the month of April, 2005 during lean period.
19. The value of BOD is maximum (BOD -0.7) in the month of February,2005 during lean period & minimum (BOD -0.2) in the month of April,2005 during lean period.

2. Site name: Matigara

parameters	Time period (month/year)											
	06/ 2004	07/ 2004	08/ 2004	09/ 2004	10/ 2004	11/ 2004	12/ 2004	01/ 2005	02/ 2005	03/ 2005	04/ 2005	05/ 2005
PHYSICAL												
Temp(Degrees Celsius (ºC))	25	23.5	25.5	24.5		18.5	17.5	14.5	14.5	19.5	22	23.5
pH_GEN(pH unit)	7.36	7.02	7.06	7.6	7.2	7.6	7.4	7.5	7.5	7.4	7.7	7.6
EC_GEN(µmho/cm)	64	57	32	68	64	66	64	67	68	71	77	71
TDS(mg/L)	34	40	24	44	43	39	39	40	42	49	55	49
Turb(NTU)	8	39	3	3	0.8	2	1	1	2	1	1	6
CHEMICAL												
Na^+ (mg/L)				4.14	3.68	3.22						
K^+ (mg/L)	1.6	1.8	1.92	1.21	1.02	1.09	0.78	1.02	1.21	1.09	1.41	1.6
Ca^{2+} (mg/L)	17.2	15.4	10.2	10.2	18.8	5.2	8.6	6.8	8.6	8.6	5.2	6.8
Mg^{2+} (mg/L)	12.51	31.35	9.36	4.13	3.16	3.04	4.37	4.37	13.61	8.26	10.45	12.51
Cl^- (mg/L)	8.16	7.1	8.88	8.88	14.91	9.94	8.88	11.01	7.1	8.88	8.88	6.03
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	41.48	36.6	41.48	36.6	31.72	53.68	38.43	43.92	36.6	39.04	41.48	36.6
ALK-TOT(mg$CaCO_3$/L)	34	30	34	30	26	44	31.5	36	30	32	34	30
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
SO_4^{2-} (mg/L)	1.63	1.63	0.96	0.77	3.22	3.79	3.31	3.89	0.62	0.62	0.77	0.77
o-PO_4^{3-}-P(mg/L)	0.88	0.88	0.64	0.47	0.48	0.39	0.37	0.39	0.36	0.37	0.28	0.52
Fe(mg/L)	0.06	0.06	0.13	0.07	0.07	0.11	0.11	0.09	0.2	0.15	0.11	0.09
DO(mg/L)					8.1	8.5	6.6	8.1	9.9	7.6	7.5	8.8
$BOD_{3\text{-}27}$(mg/L)					0.5	0.4	0.3	0.3	0.5	0.6	0.3	0.6

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe, DO, BOD for the period from June, 2004 to May, 2005

are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.

2. The value of pH is maximum (pH -7.7) in the month of April, 2005 during lean period & minimum (pH -7.02) in the month of July, 2004 during flood period.
3. The value of EC is maximum (EC-77) in the month of April, 2005 during lean period & minimum (EC-32) in the month of August, 2004 during flood period.
4. The value of TDS is maximum (TDS-55) in the month of April, 2005 during lean period & minimum (TDS-24) in the month of August, 2004 during flood period.
5. The value of Turbidity is maximum (Turb-39) in the month of July, 2004 during flood period & minimum (Turb-0.8) in the month of October, 2004 during flood period.
6. The value of Na^+ is maximum (Na^+-4.14) in the month of September, 2004 during flood period & minimum (Na^+-3.22) in the month of November, 2004 during lean period.
7. The value of K^+ is maximum (K^+-1.92) in the month of August, 2004 during flood period & minimum (K^+-0.78) in the month of December, 2004 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-18.8) in the month of October, 2004 during flood period & minimum (Ca^{2+}-5.2) in the month of April, 2005during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -31.35) in the month of July, 2004 during flood period & minimum (Mg^{2+} -3.04) in the month of November, 2004 during lean period.
10. The value of Cl^- is maximum (Cl^--14.91) in the month of October, 2004 during flood period & minimum (Cl^--6.03) in the month of May, 2005 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -53.68) in the month of November, 2004 during lean period & minimum (HCO_3^- – 31.72) in the month of October, 2004 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-44) in the month of November, 2004 during lean period & minimum (ALK-TOT-26) in the month of October, 2004 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -3.89) in the month of January, 2005 during lean period & minimum (SO_4^{2-}-0.62) in the month of February, 2005 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.88) in the month of June, 2004 & July, 2004 during flood period & minimum (o-PO_4^{3-}-P -0.28) in the month of April, 2005 during lean period.
15. The value of Fe is maximum (Fe -0.2) in the month of February, 2005 during lean period & minimum (Fe -0.06) in the month of June, 2004 & July, 2004 during flood period.
16. The value of DO is maximum (DO-9.9) in the month of February, 2005 during lean period & minimum (DO-6.6) in the month of December, 2004 during lean period.
17. The value of BOD is maximum (BOD -0.6) in the month of May, 2005 during flood period & minimum (BOD -0.3) in the month of April,2005 during lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2004	07/ 2004	08/ 2004	09/ 2004	10/ 2004	11/ 2004	12/ 2004	01/ 2005	02/ 2005	03/ 2005	04/ 2005	05/ 2005

PHYSICAL												
Temp(Degrees Celsius (ºC))	28	28	29	28	24	20	18	14	14	23.5	25	24
pH_GEN(pH unit)	7.54	6.8	7.03	7.7	7.4	7.5	7.5	7.5	7.6	7.4	7.5	7.5
EC_GEN(µmho/cm)	84	52	39	104	86	92	85	90	92	82	76	84
TDS(mg/L)	49	35	29	70	57	53	51	51	55	55	54	57
Turb(NTU)	9	16	5	0.9	1	2	2	1	1	1	1	2
CHEMICAL												
Na^+ (mg/L)				3.91	2.53	2.07						
K^+ (mg/L)	2.39	2.62	1.6	1.8	1.8	1.6	1.99	1.92	1.8	1.92	1.6	1.92
Ca^{2+} (mg/L)	25.8	12	13.8	13.6	17.2	6.8	8.6	8.6	8.6	13.8	5.2	6.8
Mg^{2+} (mg/L)	11.54	28.19	6.2	4.13	2.07	14.58	7.29	6.2	17.74	7.29	12.51	11.42
Cl^- (mg/L)	9.94	8.88	13.14	11.01	14.91	7.81	7.1	8.88	7.81	7.1	9.94	8.16
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	34.16	36.6	46.36	34.16	51.24	51.24	51.24	53.68	51.24	122	41.48	41.48
Alk-Phen($mgCaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT($mgCaCO_3$/L)	28	30	38	28	42	42	42	44	42	100	34	34
SO_4^{2-} (mg/L)	1.2	1.25	0.38	1.49	1.73	3.46	4.51	1.2	0.67	0.72	0.82	0.62
o-PO_4^{3-}-P(mg/L)	0.76	0.67	0.55	0.37	0.55	0.62	0.56	0.51	0.5	0.61	0.62	0.73
Fe(mg/L)	0.06	0.11	0.19	0.09	0.13	0.11	0.13	0.13	0.19	0.17	0.13	0.13

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2004 to May, 2005 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.6) in the month of February, 2005 lean period & minimum (pH -6.8) in the month of july, 2004 during flood period.
3. The value of EC is maximum (EC-104) in the month of September, 2004 during flood period & minimum (EC-39) in the month of August, 2004 during flood period.
4. The value of TDS is maximum (TDS-70) in the month of November, 2004 during flood period & minimum (TDS-29) in the month of August, 2004 during flood period.
5. The value of Turbidity is maximum (Turb-16) in the month of July, 2004 during flood period & minimum (Turb-0.9) in the month of September, 2005 during flood period.
6. The value of Na^+ is maximum (Na^+-3.91) in the month of September, 2004 during flood period & minimum (Na^+-2.07) in the month of November, 2004 during lean period.
7. The value of K^+ is maximum (K^+-2.6) in the month of July, 2004 during flood period & minimum (K^+-1.6) in the month of November, 2004 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-25.8) in the month of June, 2004 during flood period & minimum (Ca^{2+}-5.2) in the month of April, 2005during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -28.19) in the month of July, 2004 during flood period & minimum (Mg^{2+} -2.07) in the month of October, 2004 during flood period.
10. The value of Cl^- is maximum (Cl^--13.14) in the month of August, 2004 during flood period & minimum (Cl^--7.1) in the month of March, 2005 during lean period.

11. The value of CO_3^{2-} is (CO_3^{2-} -0.0).
12. The value of HCO_3^- is maximum (HCO_3^- -122) in the month of March, 2005 during flood period & minimum (HCO_3^- – 34.16) in the month of June, 2004 during flood period.
13. The value of Alk-Phen is maximum (Alk-Phen -0.0).
14. The value of ALK-TOT is maximum (ALK-TOT-100) in the month of March, 2004 during lean period & minimum (ALK-TOT-28) in the month of June, 2004 during flood period.
15. The value of SO_4^{2-} is maximum (SO_4^{2-} -4.51) in the month of December,2004 during flood period & minimum (SO_4^{2-}-0.62) in the month of May, 2005 during lean period.
16. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.76) in the month of June, 2004 during flood period & minimum (o-PO_4^{3-}-P -0.5) in the month of February, 2004 during lean period.
17. The value of Fe is maximum (Fe -0.17) in the month of March, 2005 during lean period & minimum (Fe -0.06) in the month of June, 2004 during flood period.

Water Quality Datasheet for the Period: 2003-2004

1. Site name: Champasari

PARAMETERS	Time period (month/year)									
	06/ 2003	07/ 2003	08/ 2003	10/ 2003	12/ 2003	01/ 2004	02/ 2004	03/ 2004	04/ 2004	05/ 2004
PHYSICAL										
Temp(Degrees Celsius (ºC))	29	28	28	29	18.5	23	19	22	25	26
pH_GEN(pH unit)	7.16	6.61	6.01	6.8	7.3	7.56	7.15	7.11	7.12	7.76
EC_GEN(µmho/cm)	158.4	99.9	124.3	278	98	121	108	128	138	170
TDS(mg/L)	112	98	93	182.6	111.3	80	61	81	92	109
Turb(NTU)	1	8	10	1	0.5	1	0.8	2	1	18
CHEMICAL										
Na^+(mg/L)	10.1	9.5	2.51	2.51						
K^+(mg/L)	2.5	2.5	3.6	3.21	1.8	1.99	2.62	2.7	3.01	2.42
Ca^{2+} (mg/L)	15.6	8.6	8.6	10.4	21	13.8	31	13.8	24.2	50
Mg^{2+} (mg/L)	17.74	4.13	7.29	9.36	20.9	14.58	2.07	6.32	4.13	11.54
Cl^- (mg/L)	15.98	15.98	12.07	19.88	13.8	12.07	11.72	11.72	11.01	13.85
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	97.6	58.56	29.28	107.36	39	75.64	87.84	34.16	92.72	97.6
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	80	48	24	88	31.97	62	72	28	76	80
SO_4^{2-} (mg/L)	9.98	9.6	19.01	17.18	2.1	2.11	2.4	2.4	2.11	3.22
o-PO_4^{3-}-P(mg/L)	0.35	0.39	0.09	0.04		0.13	0.34	0.73	0.18	0.43
Fe(mg/L)	0.41	0.3	0.45	0.2		0.11	0.11	0.11	0.09	0.07

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2003 to May, 2004 are within

the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.

2. The value of pH is maximum (pH -7.76) in the month of May, 2004 during flood & minimum (pH -6.01) in the month of August, 2003 during flood period.
3. The value of EC is maximum (EC-278) in the month of October, 2003 during flood period & minimum (EC-98) in the month of December, 2003 during lean period.
4. The value of TDS is maximum (TDS-182.6) in the month of October, 2003 during flood period & minimum (TDS-61) in the month of February, 2004 during lean period.
5. The value of Turbidity is maximum (Turb-18) in the month of May, 2004 during flood period & minimum (Turb-0.5) in the month of December, 2003 during lean period.
6. The value of Na^+ is maximum (Na^+-10.1) in the month of June, 2003 during flood period & minimum (Na^+-2.51) in the month of August, 2003 & October, 2003 during flood period.
7. The value of K^+ is maximum (K^+-3.6) in the month of August, 2003 during flood period & minimum (K^+-1.8) in the month of December, 2003 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-50) in the month of May, 2004 during flood period & minimum (Ca^{2+}-8.6) in the month of July, 2003 & August, 2003 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -20.9) in the month of December, 2003 during lean period & minimum (Mg^{2+} -2.07) in the month of February, 2004 during lean period.
10. The value of Cl^- is maximum (Cl^--19.88) in the month of October, 2003 during flood period & minimum (Cl^--11.01) in the month of April, 2004 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -107.36) in the month of October, 2003 during flood period & minimum (HCO_3^- – 29.28) in the month of August, 2003 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-88) in the month of October, 2003 during flood period & minimum (ALK-TOT-24) in the month of August, 2003 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -19.01) in the month of August, 2003 during flood period & minimum (SO_4^{2-}-2.1) in the month of December, 2003 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.73) in the month of March, 2004 during lean period & minimum (o-PO_4^{3-}-P -0.04) in the month of October, 2003 during flood period.
15. The value of Fe is maximum (Fe -0.45) in the month of August, 2003 during flood period & minimum (Fe -0.07) in the month of May, 2004 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)									
	06/ 2003	07/ 2003	08/ 2003	10/ 2003	12/ 2003	01/ 2004	02/ 2004	03/ 2004	04/ 2004	05/ 2004
PHYSICAL										
Temp(Degrees Celsius (ºC))	24.5	28	25.5	23.5		20	16.5	19	20.2	23
pH_GEN(pH unit)	7.2	6.17	7.07	6.85	7.13	7.32	7.06	7.05	6.9	7.37
EC_GEN(µmho/cm)	66.34	84.15	62.9	60	63.62	86	100	72	71	68
TDS(mg/L)	47	75	47.4	41	35	48	55	45	47	46

Turb(NTU)	2	1	7.4	10	2	2	0.8	2	0.9	45
CHEMICAL										
Na^+ (mg/L)	5.8	5.41	1.5	11.5						
K^+ (mg/L)	1.41	1.29	1.8	1.41	1.29	1.49	1.02	1.49	1.09	2.42
Ca^{2+} (mg/L)	13.8	15.6	19	5.2	7	12	12	12	10.4	22.4
Mg^{2+} (mg/L)	5.22	3.16	4.13	16.77	12.51	7.29	13.61	4.13	4.13	9.36
Cl^- (mg/L)	15.98	14.91	17.04	20.94	7.1	6.03	8.16	11.72	9.94	11.72
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	61	48.8	41.48	34.16	19.52	48.8	51.24	19.52	53.68	51.24
Alk-Phen(mg$CaCO_3$/L)	0	0	0		0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	50	40	34		16	40	42	16	44	42
SO_4^{2-} (mg/L)	4.99	8.4	16.42	15.6	1.3	1.58	1.44	1.44	1.06	1.68
o-PO_4^{3-}-P(mg/L)	0.24	0.28	0.19	0.21	0.13	0.18	0.34	0.59	0.19	1.21
Fe(mg/L)	0.3	0.2	0.26	0.24	0.22	0.17	0.17	0.06	0.04	0.06

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2003 to May, 2004 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.37) in the month of May, 2004 during flood period & minimum (pH -6.17) in the month of July, 2003 during flood period.
3. The value of EC is maximum (EC-100) in the month of February, 2004 during lean period & minimum (EC-60) in the month of October, 2003 during flood period.
4. The value of TDS is maximum (TDS-75) in the month of July, 2003 during flood period & minimum (TDS-35) in the month of December, 2003 during lean period.
5. The value of Turbidity is maximum (Turb-45) in the month of May, 2004 during flood period & minimum (Turb-0.8) in the month of February, 2004 during lean period.
6. The value of Na^+ is maximum (Na^+-11.5) in the month of October, 2003 during flood period & minimum (Na^+-1.5) in the month of August, 2003 during flood period.
7. The value of K^+ is maximum (K^+-2.42) in the month of May, 2004 during flood period & minimum (K^+-1.02) in the month of February, 2004 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-22.4) in the month of May, 2004 during flood period & minimum (Ca^{2+}-5.2) in the month of October, 2003 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -16.77) in the month of October, 2003 during flood period & minimum (Mg^{2+} -3.16) in the month of July, 2003 during flood period.
10. The value of Cl^- is maximum (Cl^--20.94) in the month of October, 2003 during flood period & minimum (Cl^--6.03) in the month of January, 2004 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- - 61) in the month of June, 2003 during flood period & minimum (HCO_3^- – 19.52) in the month of December, 2003 during lean period.
12. The value of ALK-TOT is maximum (ALK-TOT-50) in the month of June, 2003 during flood period & minimum (ALK-TOT-16) in the month of December, 2003 during lean period.

13. The value of SO_4^{2-} is maximum (SO_4^{2-} -16.42) in the month of August, 2003 during flood period & minimum (SO_4^{2-}-1.06) in the month of April,2004 during lean period.
14. The value of Fe is maximum (Fe -0.3) in the month of June, 2003 during flood period & minimum (Fe -0.04) in the month of April, 2004 during lean period.
15. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.21) in the month of May, 2004 during lean period & minimum (o-PO_4^{3-}-P -0.13) in the month of December, 2003 during lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)									
	06/ 2003	07/ 2003	08/ 2003	10/ 2003	12/ 2003	01/ 2004	02/ 2004	03/ 2004	04/ 2004	05/ 2004
PHYSICAL										
Temp(Degrees Celsius (ºC))	33	28	28	26		22	18	22	22	28
pH_GEN(pH unit)	7.1	6.17	6.87	6.9	7.13	7.25	7.06	6.6	6.96	7.78
EC_GEN(µmho/cm)	113	84.15	53.9	57	103.4	113	100	90	68	99
TDS(mg/L)	79.2	75	40.4	37	55	60	55	59	45	62
Turb(NTU)	0.5	1	50	10	2	1	0.9	1	1	4
CHEMICAL										
Na^+ (mg/L)	8.4	8.69	1.31	6.9						
K^+ (mg/L)	3.01	3.01	1.6	1.41	1.99	1.92	0.82	1.29	1.21	1.92
Ca^{2+} (mg/L)	13.8	8.6	20.6	8.6	12	10.4	15.6	10.6	12	27.6
Mg^{2+} (mg/L)	4.13	7.29	4.13	11.54	6.32	9.48	13.61	4.13	13.61	7.29
Cl^- (mg/L)	18.1	15.98	18.1	19.17	8.16	8.88	9.94	8.16	11.01	9.94
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	91.5	41.48	48.8	39.04	21.96	53.68	63.44	24.4	48.8	53.68
Alk-Phen(mg$CaCO_3$/L)	0	0	0		0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	75	34	40		18	44	52	20	40	44
SO_4^{2-} (mg/L)	4.99	6	6.24	5.18	1.82	1.49	1.92	1.92	0.72	1.25
o-PO_4^{3-}-P(mg/L)	0.21	0.22	0.02	0.25	0.18	0.18	0.49	0.44	0.24	0.67
Fe(mg/L)	0.3	0.2	0.26	0.2	0.22	0.17	0.22	0.06	0.06	0.06

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2003 to May, 2004 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.78) in the month of May, 2004 during flood & minimum (pH -6.17) in the month of July, 2003 during flood period.
3. The value of EC is maximum (EC-113) in the month of July, 2003 during flood period & minimum (EC-53.9) in the month of August,2003 during flood period.
4. The value of TDS is maximum (TDS-79.2) in the month of June 2003 during flood period & minimum (TDS-37) in the month of October, 2003 during flood period.

5. The value of Turbidity is maximum (Turb-50) in the month of August, 2004 during flood period & minimum (Turb-0.5) in the month of June, 2003 during flood period.
6. The value of Na^+ is maximum (Na^+-8.6) in the month of July, 2003 during flood period & minimum (Na^+-1.31) in the month of August, 2003 & October, 2003 during flood period.
7. The value of K^+ is maximum (K^+-3.01) in the month of July, 2003 during flood period & minimum (K^+-0.82) in the month of February, 2003 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-27.6) in the month of May, 2004 during flood period & minimum (Ca^{2+}-8.6) in the month of July, 2003 & August, 2003 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -13.61) in the month of April, 2004 during lean period & minimum (Mg^{2+} -4.13) in the month of June, 2003 during flood period.
10. The value of Cl^- is maximum (Cl^--18.1) in the month of July, 2003 during flood period & minimum (Cl^--8.16) in the month of March, 2004 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -91.5) in the month of June, 2003 during flood period & minimum (HCO_3^- – 21.96) in the month of December, 2003 during lean period.
12. The value of ALK-TOT is maximum (ALK-TOT-75) in the month of June, 2003 during flood period & minimum (ALK-TOT-18) in the month of December, 2003 during lean period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -6.24) in the month of August, 2003 during flood period & minimum (SO_4^{2-}-0.72) in the month of April,2004 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.67) in the month of May, 2004 during lean period & minimum (o-PO_4^{3-}-P -0.02) in the month of August, 2003 during flood period.
15. The value of Fe is maximum (Fe -0.3) in the month of June, 2003 during flood period & minimum (Fe -0.06) in the month of March, 2004 during lean period.

Water Quality Datasheet for the Period: 2002-2003

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2002	07/ 2002	08/ 2002	09/ 2002	10/ 2002	11/ 2002	12/ 2002	01/ 2003	02/ 2003	03/ 2003	04/ 2003	05/ 2003
PHYSICAL												
Temp(Degrees Celsius (ºC))	26	27	28	28	28	25	22	17	16	21	24	27
pH_GEN(pH unit)	7.84	7.72	7.69	6.95	7.2	7.1	7.25	7.52	7.58	7.95	7.9	7.9
EC_GEN(µmho/cm)	139	105.6	100.8	170	134.1	137	137	130.9	93.4	183.1	216.8	99
TDS(mg/L)	110	360	160	150	140	160	200	200	114	100	140	110
Turb(NTU)	1	9	11	7	0.3	0.9	0.9	0.5	1	1	1	6
CHEMICAL												
Na^+ (mg/L)	7.82	8.05	8.05	7.59	6.9	8.05	8.05	7.59	6.9	6.9	6.9	6.9
K^+ (mg/L)	1.56	1.56	1.96	2.35	1.96	2.35	2.35	2.42	2.11	1.96	2.35	2.74
Ca^{2+} (mg/L)	7	8.6	8.6	8.6	7	10.4	7	7	10.4	8.6	8.6	8.6
Mg^{2+} (mg/L)	11.42	12.51	10.45	10.45	13.36	10.45	7.29	9.48	9.48	8.38	7.29	8.38
Cl^- (mg/L)	12.07	13.14	12.07	12.07	12.07	11.01	14.91	15.98	13.14	13.14	12.07	13.85

CO_3^{2-} (mg/L)	0	0	0	0	1.2	0	0	21	0	0	0	0
HCO_3^- (mg/L)	70.76	70.76	48.8	61	73.2	63.44	75.64	82.96	85.4	73.2	68.32	78.08
ALK-TOT($mgCaCO_3$/L)	58	58	40	50	62	52	62	103	70	60	56	64
Alk-Phen($mgCaCO_3$/L)	0	0	0	0	1	0	0	17.43	0	0	0	0
SO_4^{2-} (mg/L)	18.72	11.52	9.12	9.6	9.6	12.96	12.96	18.72	18.72	17.28	13.92	21.12
o-PO_4^{3-}-P(mg/L)	0.39	0.43	0.41	0.45	0.43	0.65	0.36	0.29	0.26	0.25	0.28	0.24
Fe(mg/L)	0.28	0.24	0.24	0.24	0.37	0.45	0.54	0.5	0.5	0.45	0.45	0.5

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2002 to May, 2003 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.95) in the month of March, 2003 during lean & minimum (pH -6.95) in the month of September, 2002 during flood period.
3. The value of EC is maximum (EC-216.8) in the month of April, 2003 during lean period & minimum (EC-99) in the month of May, 2003 during flood period.
4. The value of TDS is maximum (TDS-360) in the month of July, 2002 during flood period & minimum (TDS-110) in the month of March,2003 during lean period.
5. The value of Turbidity is maximum (Turb-11) in the month of August,2002 during flood period & minimum (Turb-0.3) in the month of October, 2002 during lean period.
6. The value of Na^+ is maximum (Na^+-8.05) in the month of July, 2002 during flood period & minimum (Na^+-6.9) in the month of May, 2003 during flood period.
7. The value of K^+ is maximum (K^+-2.74) in the month of May, 2003 during flood period & minimum (K^+-1.56) in the month of June, 2002 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-10.4) in the month of November, 2002 during lean period & minimum (Ca^{2+}-7) in the month of October, 2002, December, 2002 & January, 2003 during flood & lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -13.36) in the month of October, 2002 during flood period & minimum (Mg^{2+} -7.29) in the month of December, 2002 & April, 2003 during lean period.
10. The value of Cl^- is maximum (Cl^--15.98) in the month of January,2003 during flood period & minimum (Cl^--11.01) in the month of November,2002 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -85.4) in the month of February,2003 during flood period & minimum (HCO_3^- – 61) in the month November, 2002 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-103) in the month of January,2003 during flood period & minimum (ALK-TOT-40) in the month of August, 2002 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -21.12) in the month of May, 2003 during flood period & minimum (SO_4^{2-}-9.6) in the month of September, 2002 & October, 2002 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.65) in the month of November, 2002 during lean period & minimum (o-PO_4^{3-}-P -0.24) in the month of May, 2003 during flood period.

15. The value of Fe is maximum (Fe -0.54) in the month of December, 2002 during lean period & minimum (Fe -0.24) in the month of July, 2002 to September, 2002 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2002	07/ 2002	08/ 2002	09/ 2002	10/ 2002	11/ 2002	12/ 2002	01/ 2003	02/ 2003	03/ 2003	04/ 2003	05/ 2003
PHYSICAL												
Temp(Degrees Celsius (ºC))	24.5	23.5	23.5	24.5	23.5	22.5	18.5	15.5	15.5	16.5	21.5	23.5
pH_GEN(pH unit)	7.75	7.3	7.3	7.75	7.15	7.15	7.15	7.46	7.7	7.31	7.65	7.6
EC_GEN(µmho/cm)	79	62.4	58.6	67.9	59.6	60.8	76.1	69.8	70.1	56.9	62.2	56.6
TDS(mg/L)	104	150	150	100	110	60	150	150	120	120	138	110
Turb(NTU)	3	2	5	0.8	0.6	1	0.6	0.8	2	0.8	0.8	4
CHEMICAL												
Na^+ (mg/L)	6.9	5.29	5.29	5.29	5.29	4.6	4.37	3.91	3.91	3.91	4.14	4.14
K^+ (mg/L)	1.17	1.56	1.17	1.17	1.56	1.96	1.96	1.99	1.8	1.96	1.96	1.96
Ca^{2+} (mg/L)	7	5.2	5.2	5.2	7	7	5.2	5.2	7	8.6	5.2	5.2
Mg^{2+} (mg/L)	7.29	8.38	9.48	9.48	6.32	7.29	7.29	7.29	7.29	11.54	8.26	7.29
Cl^- (mg/L)	11.01	12.07	9.94	11.01	11.01	9.94	12.07	9.94	12.07	13.14	12.07	11.01
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	4.15	34.16	36.6	34.16	36.6	39.04	48.8	43.92	48.8	63.44	56.12	64.05
Alk-Phen($mgCaCO_3/L$)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT($mgCaCO_3/L$)	3.4	28	30	28	30	32	40	36	40	52	46	52.5
SO_4^{2-} (mg/L)	11.52	14.88	6.24	6.72	3.36	9.6	9.6	11.14	14.88	13.92	13.92	13.92
o-PO_4^{3-}-P(mg/L)	0.28	0.34	0.36	0.41	0.36	1.06	0.27	0.2	0.18	0.18	0.2	0.2
Fe(mg/L)	0.28	0.24	0.2	0.19	0.19	0.45	0.48	0.45	0.35	0.28	0.28	0.24

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2002 to May, 2003 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.75) in the month of June, 2002 during flood & minimum (pH -7.15) in the month of October, 2002 during flood period.
3. The value of EC is maximum (EC-79) in the month of June, 2002 during flood period & minimum (EC-56.6) in the month of May, 2003 during flood period.
4. The value of TDS is maximum (TDS-150) in the month of July, 2002 during flood period & minimum (TDS-60) in the month of November, 2002 during lean period.
5. The value of Turbidity is maximum (Turb-5) in the month of August, 2002 during flood period & minimum (Turb-0.6) in the month of October, 2002 during flood period.
6. The value of Na^+ is maximum (Na^+-6.9) in the month of June, 2002 during flood period & minimum (Na^+-3.91) in the month of January to March, 2003 during lean period.
7. The value of K^+ is maximum (K^+-1.99) in the month of January, 2003 during lean period & minimum (K^+-1.17) in the month of June, 2002 during flood period.

8. The value of Ca^{2+} is maximum (Ca^{2+}-8.6) in the month of March, 2003 during lean period & minimum (Ca^{2+}-5.2) in the month of April, 2003 to May, 2003 during flood & lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -11.54) in the month of March, 2003 during lean period & minimum (Mg^{2+} -6.32) in the month of October, 2002 during flood period.
10. The value of Cl^- is maximum (Cl^--13.14) in the month of March, 2003 during lean period & minimum (Cl^--9.94) in the month of August, 2002 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -64.05) in the month of May, 2003 during flood period & minimum (HCO 3 – 4.15) in the month June, 2002 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-52.5) in the month of May, 2003 during flood period & minimum (ALK-TOT-3.4) in the month of June, 2002 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -14.88) in the month of July, 2002 during flood period & minimum (SO_4^{2-}-3.36) in the month of October, 2002 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.06) in the month of November, 2002 during lean period & minimum (o-PO_4^{3-}-P -0.18) in the month of March, 2003 during lean period.
15. The value of Fe is maximum (Fe -0.48) in the month of December, 2003 during lean period & minimum (Fe -0.19) in the month of September, 2002 & October, 2002 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2002	07/ 2002	08/ 2002	09/ 2002	10/ 2002	11/ 2002	12/ 2002	01/ 2003	02/ 2003	03/ 2003	04/ 2003	05/ 2003
PHYSICAL												
Temp(Degrees Celsius (ºC))	29	27	28	30	26	22	20	17	17	21	23	26
pH_GEN(pH unit)	7.76	7.1	6.89	7.15	7.15	7.25	7.2	7.54	7.68	7.69	7.8	7.7
EC_GEN(µmho/cm)	105.6	100.1	100.8	67.9	59.6	68.5	83.7	96	93.4	58.8	61.2	70.7
TDS(mg/L)	110	170	60	84	60	100	102	152	112	72	42	90
Turb(NTU)	1	3	1	1	0.9	1	0.8	0.25	1	0.5	1	5
CHEMICAL												
Na^+ (mg/L)	3.68	4.37	4.6	4.14	4.37	3.91	4.14	4.14	3.91	4.37	4.6	4.83
K^+ (mg/L)	1.17	1.56	1.56	1.56	1.17	1.56	1.56	1.99	1.99	1.96	1.96	1.96
Ca^{2+} (mg/L)	7	8.6	8.6	7	7	7	5.2	7	7	5.2	5.2	5.2
Mg^{2+} (mg/L)	8.38	9.48	10.45	10.45	11.54	11.54	8.38	8.38	7.29	3.16	5.22	6.32
Cl^- (mg/L)	12.07	12.07	12.07	11.01	9.94	11.01	12.07	11.01	14.91	11.01	11.01	12.07
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	36.6	39.04	46.36	41.48	39.04	41.48	61	65.88	70.76	65.88	61	68.32
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	30	32	38	34	32	34	50	54	58	54	50	56
SO_4^{2-} (mg/L)	14.88	11.52	6.24	6.72	3.36	9.6	9.6	14.88	18.72	13.92	13.92	13.92
o-PO_4^{3-}-P(mg/L)	0.32	0.35	0.34	0.39	0.36	0.57	0.29	0.23	0.22	0.2	0.23	0.21
Fe(mg/L)	0.24	0.24	0.2	0.19	0.19	0.45	0.45	0.45	0.41	0.35	0.56	0.45

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe in the period from June, 2002 to May, 2003 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.8) in the month of April, 2003 during lean & minimum (pH -6.89) in the month of August, 2002 during flood period.
3. The value of EC is maximum (EC-105.6) in the month of June, 2002 during flood period & minimum (EC-58.8) in the month of March, 2003 during lean period.
4. The value of TDS is maximum (TDS-170) in the month of July, 2002 during flood period & minimum (TDS-42) in the month of April, 2003 during lean period.
5. The value of Turbidity is maximum (Turb-5) in the month of May, 2003 during flood period & minimum (Turb-0.25) in the month of January, 2003 during lean period.
6. The value of Na^+ is maximum (Na^+-4.83) in the month of May, 2003 during flood period & minimum (Na^+-3.68) in the month of June, 2002 during flood period.
7. The value of K^+ is maximum (K^+-1.99) in the month of January, 2003 & February, 2003 during lean period & minimum (K^+-1.17) in the month of June, 2002 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-8.6) in the month of July, 2002 & August, 2002 during flood period & minimum (Ca^{2+}-5.2) in the month of March, 2003to May, 2003 during flood & lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -11.54) in the month of October, 2002 & November, 2002 during flood & lean period & minimum (Mg^{2+} -3.16) in the month of March, 2003 during lean period.
10. The value of Cl^- is maximum (Cl^--14.91) in the month of February, 2003 during lean period & minimum (Cl^--9.94) in the month of October, 2002 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -70.76) in the month of February, 2003 during lean period & minimum (HCO_3^- – 36.6) in the month June, 2002 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-58) in the month of February, 2003 during lean period & minimum (ALK-TOT-30) in the month of June, 2002 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -18.72) in the month of February, 2003 during flood period & minimum (SO_4^{2-}-3.36) in the month of October, 2002 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.57) in the month of November, 2002 during lean period & minimum (o-PO_4^{3-}-P -0.2) in the month of March, 2003 during lean period.
15. The value of Fe is maximum (Fe -0.56) in the month of April, 2003 during lean period & minimum (Fe -0.19) in the month of September, 2002 & October, 2002 during flood period.

Water Quality Datasheet for the Period: 2001-2002

1. Site name: Champasari

PARAMETERS	Time period (month/year)

	06/ 2001	07/ 2001	08/ 2001	09/ 2001	10/ 2001	11/ 2001	12/ 2001	01/ 2002	02/ 2002	03/ 2002	04/ 2002	05/ 2002
PHYSICAL												
Temp(Degrees Celsius (ºC))	26	28	27	28	26	26	22	19	18	21	25	27
pH_GEN(pH unit)	7.4	6.9	6.45	6.9	6.8	7.35	7.2	8.01	7.85	7.51	7.71	7.58
EC_GEN(µmho/cm)	103.6	155.4	81.6	59.4	119	98.9	105.8	127.9	130.5	131.4	160.6	121
TDS(mg/L)	100	182	140	162	188	164	104	180	160	200	220	106
Turb(NTU)	28	0.7	27	26	0.8	2	1	1	0.6	1	0.9	1
CHEMICAL												
Na^+ (mg/L)	6.44	3.45	2.99	3.45	3.22	3.91		5.98	7.59	7.36	9.2	6.9
K^+ (mg/L)	1.92	1.49	1.72	1.6	1.56	1.76	1.49	6.26	6.26	1.56	1.56	1.56
Ca^{2+} (mg/L)	10.4	10.4	8.6	7	12	8.6	8.6	8.6	7	7	5.2	7
Mg^{2+} (mg/L)	10.45	19.8	7.29	18.83	13.61	18.83	8.38	8.38	8.38	10.45	11.54	9.48
Cl^- (mg/L)	12.07	11.01	11.01	11.01	13.14	12.07	19.88	17.04	14.91	14.91	13.85	13.14
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	97.6	29.28	68.32	61	31.72	56.12	56.12	87.84	85.4	75.64	82.96	82.96
ALK-TOT(mg$CaCO_3$/L)	80	24	56	50	26	46	46	72	70	62	68	68
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
SO_4^{2-} (mg/L)	10.51	7.49	15.02	15.02	9.98			9.12	8.16	8.16	14.88	14.88
o-PO_4^{3-}-P(mg/L)	0.87	0.76	0.83	0.38	0.5			0.88	0.85	0.55	0.37	0.29
Fe(mg/L)	0.32	0.32	0.47	0.5	0.43			0.3	0.28	0.32	0.28	0.35

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2001 to May, 2002 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.01) for month of January, 2002 during lean & minimum (pH -6.45) in the month of August, 2001 during flood period.
3. The value of EC is maximum (EC-160.6) for month of April, 2002 during lean period & minimum (EC-59.4) in the month of September, 2001 during flood period.
4. The value of TDS is maximum (TDS-220) for month of April, 2002 during lean period & minimum (TDS-100) in the month of June, 2001 during flood period.
5. The value of Turbidity is maximum (Turb-28) for month of June, 2001 during flood period & minimum (Turb-0.7) in the month of July, 2001 during flood period.
6. The value of Na^+ is maximum (Na^+-9.2) for month of April, 2002 during lean period & minimum (Na^+-2.99) in the month of August, 2001 during flood period.
7. The value of K^+ is maximum (K^+-6.26) for month of January, 2002 & February, 2002 during lean period & minimum (K^+-1.49) in the month of July, 2001 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-12) for month of October, 2001 during flood period & minimum (Ca^{2+}-5.2) in the month of April, 2002 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -19.8) for month of July, 2001 during flood period & minimum (Mg^{2+} -7.29) for month of August, 2001 during flood period.

10. The value of Cl^- is maximum (Cl^--19.88) for month of December, 2001 during lean period & minimum (Cl^--11.01) in the month of July, 2001 to September, 2001 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -97.6) for month of June, 2001 during flood period & minimum (HCO_3^- – 29.28) in the month July, 2001 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-80) for month of June, 2001 during flood period & minimum (ALK-TOT-24) in the month of July, 2001 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -15.02) for month of August,2002 during flood period & minimum (SO_4^{2-}-7.49) in the month of July, 2001 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.88) for month of January, 2002 during lean period & minimum (o-PO_4^{3-}-P -0.29) in the month of May, 2002during flood period.
15. The value of Fe 002 is maximum (Fe -0.5) for month of September, 2002 during flood period & minimum (Fe -0.28) in the month of July, 2002 to February, 2002 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2001	07/ 2001	08/ 2001	09/ 2001	10/ 2001	11/ 2001	12/ 2001	01/ 2002	02/ 2002	03/ 2002	04/ 2002	05/ 2002
PHYSICAL												
pH_GEN(pH unit)	7.4	7.1	6.15	6.5	7	7.2	7	7.35	7.36	7.2	7.7	7.7
EC_GEN(µmho/cm)	58.3	45.3	38.1	39.6	60	60.9	57	59.6	61.4	80.3	73	71
TDS(mg/L)	86	100	100	170	200	152	100	150	130	150	160	50
Turb(NTU)	17	1	15	31	5	1	1	0.8	0.6	0.8	1	3
CHEMICAL												
Na^+ (mg/L)	4.83	3.91	4.14	4.6	3.91	3.68		0.39	3.68	5.75	5.98	2.99
K^+ (mg/L)	1.6	1.29	1.29	1.41	1.49	1.37	1.45	5.47	4.3	1.17	1.17	1.17
Ca^{2+} (mg/L)	8.6	10.4	10.4	7	8.6	10.4	8.6	5.2	8.6	8.6	8.6	7
Mg^{2+} (mg/L)	7.29	2.07	6.32	14.58	8.38	9.48	2.19	3.16	4.13	4.13	3.16	5.22
Cl^- (mg/L)	13.14	13.14	13.14	11.01	13.14	12.07	14.91	12.07	12.07	13.85	13.85	9.94
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	51.24	34.16	41.48	51.24	63.44	46.36	46.36	36.6	48.8	48.8	43.92	39.04
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	42	28	34	42	52	38	38	30	40	40	36	32
SO_4^{2-} (mg/L)	10.51	12.48	9.98	9.98	4.99			2.88	5.28	5.28	10.08	4.8
Fe(mg/L)	0.32	0.24	0.41	0.43	0.33			0.32	0.28	0.33	0.24	0.35
o-PO_4^{3-}-P(mg/L)	0.62	0.66	0.66	1.23	0.55			0.79	0.75	0.43	0.29	0.27

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2001 to May, 2002 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.7) for month of May, 2002 during flood & minimum (pH -6.1) in the month of August, 2001 during flood period.

3. The value of EC maximum (EC-80.3) for month of March, 2002 during lean period & minimum (EC-38.1) in the month of August, 2001 during flood period.
4. The value of TDS is maximum (TDS-200) for month of October, 2001 during flood period & minimum (TDS-50) in the month of May, 2002 during flood period.
5. The value of Turbidity is maximum (Turb-31) for month of September, 2001 during flood period & minimum (Turb-0.6) in the month of February, 2002 during lean period.
6. The value of Na^+ is maximum (Na^+-5.98) for month of April, 2002 during lean period & minimum (Na^+-0.39) in the month of January, 2002 during lean period.
7. The value of K^+ is maximum (K^+-5.47) for month of January, 2002 during lean period & minimum (K^+-1.17) in the month of March to May, 2002 during lean & flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-10.4) for month of July, 2001 during flood period & minimum (Ca^{2+}-5.2) in the month of Januarry, 2002 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -14.58) for month of September, 2001 during flood period & minimum (Mg^{2+} -2.07) for month of July, 2001 during flood period.
10. The value of Cl^- is maximum (Cl^--14.91) for month of December, 2001 during lean period & minimum (Cl^--9.94) in the month of May, 2002 during flood period.
11. The value of HCO_3^- for is maximum (HCO_3^- -63.44) for month of October, 2001 during flood period & minimum (HCO_3^- – 34.16) in the month July, 2001 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-52) for month of October, 2001 during flood period & minimum (ALK-TOT-28) in the month of July, 2001 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -12.48) for month of July,2001 during flood period & minimum (SO_4^{2-}-2.88) in the month of January, 2002 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.23) for month of September, 2001 during flood period & minimum (o-PO_4^{3-}-P -0.29) in the month of April, 2002 during lean period.
15. The value of Fe is maximum (Fe -0.43) for month of September, 2002 during flood period & minimum (Fe -0.24) in the month of July, 2001 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2001	07/ 2001	08/ 2001	09/ 2001	10/ 2001	11/ 2001	12/ 2001	01/ 2002	02/ 2002	03/ 2002	04/ 2002	05/ 2002
PHYSICAL												
pH_GEN(pH unit)	7.2	7.05	6.3	6.85	6.95	7.1	7.1	7.65	7.45	7.15	7.84	7.74
EC_GEN(µmho/cm)	51.8	48.3	50.8	46.2	63	60.9	73.3	76.7	84.5	102.2	109.5	71
TDS(mg/L)	60	70	40		50	60	80	130	140	140	140	70
Turb(NTU)	3	4.5	5.5	2	1	1	0.5	1	0.9	1	0.8	12
CHEMICAL												
Na^+ (mg/L)	5.75	3.45	4.14	3.91	4.6	3.22		6.44	8.51	3.91	4.37	4.6
K^+ (mg/L)	1.8	1.6	1.6	1.72	1.8	1.41	1.25	7.04	6.65	1.17	1.17	1.17
Ca^{2+} (mg/L)	8.6	8.6	6.8	8.6	8.6	5.2	7	5.2	7	8.6	7	5.2
Mg^{2+} (mg/L)	6.32	5.22	6.32	9.48	7.29	7.29	5.22	5.22	5.22	5.22	4.13	6.32
Cl^- (mg/L)	13.85	12.07	13.14	9.94	12.07	11.01	13.85	12.07	13.14	13.14	12.07	12.07
CO_3^{2-} (mg/L)	0	0	2.4	0	0	0	0	0	0	0	0	0

HCO_3^- (mg/L)	48.8	51.24	34.16	56.12	63.44	43.92	53.68	75.64	61	65.88	61	46.36
Alk-Phen($mgCaCO_3/L$)	0	0	1.99	0	0	0	0	0	0	0	0	0
ALK-TOT($mgCaCO_3/L$)	40	42	32	46	52	36	44	62	50	54	50	38
SO_4^{2-} (mg/L)	7.01	7.49	9.98	9.98	9.98			6.24	5.28	2.88	10.08	10.08
o-PO_4^{3-}-P(mg/L)	0.74	0.78	0.74	0.83	0.6			0.75	0.75	0.44	0.32	0.28
Fe(mg/L)	0.32	0.24	0.41	0.43	0.43			0.26	0.26	0.24	0.26	0.28

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2001 to May, 2002 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.8) for month of April, 2002 during lean & minimum (pH -6.3) in the month of September, 2001 during flood period.
3. The value of EC maximum (EC-109.5) for month of April, 2002 during lean period & minimum (EC-46.2) in the month of September, 2001 during flood period.
4. The value of TDS is maximum (TDS-140) for month of April, 2002 during lean period & minimum (TDS-40) in the month of August, 2001 during flood period.
5. The value of Turbidity is maximum (Turb-12) for month of May, 2002 during flood period & minimum (Turb-0.8) in the month of April, 2002 during lean period.
6. The value of Na^+ is maximum (Na^+-8.5) for month of February, 2002 during lean period & minimum (Na^+-3.2) in the month of November, 2001 during lean period.
7. The value of K^+ is maximum (K^+-7.04) for month of January, 2002 during lean period & minimum (K^+-1.25) in the month of December, 2001 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-8.6) for month of June 2001 during flood period & minimum (Ca^{2+}-5.2) in the month of November, 2001 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -9.48) for month of September, 2001 during flood period & minimum (Mg^{2+} -4.13) for month of April, 2002 during flood period.
10. The value of Cl^- is maximum (Cl^--13.85) for month of June, 2001 during lean period & minimum (Cl^--9.94) in the month of September, 2001 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -75.64) for month of January, 2002 during flood period & minimum (HCO_3^- – 34.16) in the month August, 2001 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-62) for month of January, 2002 during lean period & minimum (ALK-TOT-32) in the month of August, 2001 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -10.08) for month of May, 2002 during flood period & minimum (SO_4^{2-}-2.28) in the month of March, 2002 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.83) for month of September, 2001 during flood period & minimum (o-PO_4^{3-}-P -0.28) in the month of May, 2002during flood period.
15. The value of Fe is maximum (Fe -0.43) for month of September, 2002 during flood period & minimum (Fe -0.24) in the month of July, 2001 during flood period.

Water Quality Datasheet for the Period: 2000-2001

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 2000	07/ 2000	08/ 2000	09/ 2000	10/ 2000	11/ 2000	12/ 2000	01/ 2001	02/ 2001	03/ 2001	04/ 2001	05/ 2001
PHYSICAL												
pH_GEN(pH unit)	7.1	7.4	7.7	7.1	7.4	7.7	7.7	7.65	7.85	7.3	7.75	6.95
EC_GEN(µmho/cm)	118.8	74.8	68	82.2	89.1	148.5	142.7	127.7	132.8	113.4	139.7	120.6
TDS(mg/L)	100	150	110	140	100	80	80	64	70	90	160	80
Turb(NTU)	2	4.5	3.5	1.5	1	0.5	1	0.9	1	0.4	0.9	0.9
CHEMICAL												
Na^+ (mg/L)	2.53	2.76	4.14	2.99	3.91	4.6	7.36	6.9	6.9	6.44	5.98	6.67
K^+ (mg/L)	2.5	1.29	1.49	1.29	1.49	1.96	1.49	1.72	1.92	1.92	1.92	2.11
Ca^{2+} (mg/L)	10.4	7	12	12	13.8	30	5.2	8.6	12	13.8	8.6	8.6
Mg^{2+} (mg/L)	5.22	4.13	5.22	6.32	9.36	8.38	18.83	10.45	7.29	7.29	10.45	10.45
Cl^- (mg/L)	13.14	11.01	9.94	9.94	8.88	11.01	11.01	12.07	11.01	11.01	9.94	13.85
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	74.42	80.52	31.72	63.44	46.36	65.88	75.64	56.12	48.8	75.64	85.4	92.72
ALK-TOT(mg$CaCO_3$/L)	61	66	26	52	38	54	62	46	40	62	70	76
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
SO_4^{2-} (mg/L)	8.02	3.98	3.79	7.49	38.69	20.02	22.51	12	9.02	15.02	15.02	7.01
o-PO_4^{3-}-P(mg/L)	0.34	1.15	1.27	0.88	0.6	0.59	0.75	0.68	0.76	0.91	0.87	0.79
Fe(mg/L)	0.24	0.24	0.15	0.07	0.11	0.15	0.13	0.17	0.15	0.2	0.15	0.17

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2000 to May, 2001 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.8) for month of February, 2001 during lean & minimum (pH -6.9) in the month of May, 2001 during flood period.
3. The value of EC is maximum (EC-148.5) for month of November, 2000 during lean period & minimum (EC-68) in the month of August, 2000 during flood period.
4. The value of TDS is maximum (TDS-160) for month of April, 2001 during lean period & minimum (TDS-64) in the month of January, 2001 during flood period.
5. The value of Turbidity is maximum (Turb-4.5) for month of July, 2000 during flood period & minimum (Turb-0.4) in the month of March, 2001 during lean period.
6. The value of Na^+ is maximum (Na^+-7.3) for month of December,2000 during lean period & minimum (Na^+-2.5) in the month of June, 2000 during flood period.
7. The value of K^+ is maximum (K^+-2.5) for month of June, 2000 during flood period & minimum (K^+-1.29) in the month of July, 2000 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-13.8) for month of October, 2000 during flood period & minimum (Ca^{2+}-5.2) in the month of December, 2000 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -18.8) for month of December, 2000 during lean period & minimum (Mg^{2+} -4.13) for month of July,2000 during flood period.

10. The value of Cl^- is maximum (Cl^--13.8) for month of May, 2001 during lean period & minimum (Cl^--8.8) in the month of July, 2001 to October,2000 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -92.72) for month of May, 2001 during flood period & minimum (HCO_3^- – 31.72) in the month August,2000 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-76) for month of May, 2001 during flood period & minimum (ALK-TOT-26) in the month of August, 2000 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -38.69) for month of October, 2000 during flood period & minimum (SO_4^{2-}-3.98) in the month of July, 2000 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.27) for month of August, 2000 during flood period & minimum (o-PO_4^{3-}-P -0.34) in the month of June, 2000 during flood period.
15. The value of Fe is maximum (Fe -0.24) for month of June, 2000 & July, 2000 during flood period & minimum (Fe -0.07) in the month of September, 2000 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 2000	07/ 2000	08/ 2000	09/ 2000	10/ 2000	11/ 2000	12/ 2000	01/ 2001	02/ 2001	03/ 2001	04/ 2001	05/ 2001
PHYSICAL												
pH_GEN(pH unit)	7.3	7.4	7.85	7.25	7.4	7.41	6.85	7.12	7.18	7	7.35	6.6
EC_GEN(µmho/cm)	66	64.7	40.8	48	54.8	75.4	71.9	65.5	68.6	70.9	63.5	70
TDS(mg/L)	110	218	70	150	138	110	40	40	52	100	60	170
Turb(NTU)								0.8	0.9	0.6	0.9	0.8
CHEMICAL												
Na^+ (mg/L)	3.91	3.22	3.91	4.14	3.91	5.29	6.21	5.75	4.6	4.37	4.83	4.37
K^+ (mg/L)	1.99	1.49	1.09	1.02	1.29	1.09	1.13	1.41	1.41	1.6	1.41	1.49
Ca^{2+} (mg/L)	8.6	8.6	10.4	10.4	12	25.8	3.4	7	12	8.6	8.6	5.2
Mg^{2+} (mg/L)	6.32	8.38	4.13	5.22	8.38	15.67	24.06	15.67	12.51	5.22	2.19	5.22
Cl^- (mg/L)	11.01	11.01	8.88	7.1	8.88	8.88	11.01	9.94	8.88	7.1	8.88	14.91
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	46.36	51.24	43.92	39.04	34.16	43.92	53.68	34.16	39.04	48.8	41.48	46.36
ALK-TOT(mg$CaCO_3$/L)	38	42	36	32	28	36	44	28	32	40	34	38
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
SO_4^{2-} (mg/L)	12	8.02	7.49	3.79	4.99	9.98	7.49	9.02	9.02	4.99	7.49	7.01
o-PO_4^{3-}-P(mg/L)	0.34	1.34	1.34	0.56	0.67	1.21	1.26	0.57	0.49	0.66	0.56	0.59
Fe(mg/L)	0.2	0.15	0.2	0.17	0.11	0.09	0.07	0.17	0.15	0.2	0.41	0.26

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2000 to May, 2001 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.8) for month of August, 2000 during flood & minimum (pH -6.6) in the month of May, 2001 during flood period.

3. The value of EC maximum (EC-75.4) for month of November, 2000 during lean period & minimum (EC-40.8) in the month of August, 2000 during flood period.
4. The value of TDS is maximum (TDS-218) for month of July, 2000 during lean period & minimum (TDS-40) in the month of December, 2000 during lean period.
5. The value of Turbidity is maximum (Turb-0.9) for month of April, 2001 during flood period & minimum (Turb-0.6) in the month of March, 2001 during lean period.
6. The value of Na^+ is maximum (Na^+-6.21) for month of December,2000 during lean period & minimum (Na^+-3.2) in the month of July, 2000 during flood period.
7. 09. The value of K^+ is maximum (K^+-1.9) for month of June, 2000 during flood period & minimum (K^+-1.02) in the month of September, 2000 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-25.8) for month of November, 2000 during lean period & minimum (Ca^{2+}-3.4) in the month of December, 2000 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -24.06) for month of December, 2000 during lean period & minimum (Mg^{2+} -2.19) for month of April,2001 during lean period.
10. The value of Cl^- is maximum (Cl^--14.91) for month of May, 2001 during lean period & minimum (Cl^--7.1) in the month of September, 2000 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -53.68) for month of December, 2000 during lean period & minimum (HCO_3^- – 34.16) in the month October,2000 during flood period.
12. The value of ALK-TOT in the period from June, 2000 to May, 2001 is maximum (ALK-TOT-44) for month of December, 2000 during lean period & minimum (ALK-TOT-28) in the month of October, 2000 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -12) for month of June, 2000 during flood period & minimum (SO_4^{2-}-3.79) in the month of September, 2000 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.26) for month of December, 2000 during flood period & minimum (o-PO_4^{3-}-P -0.34) in the month of June, 2000 during flood period.
15. The value of Fe is maximum (Fe -0.26) for month of May, 2001 during flood period & minimum (Fe -0.07) in the month of December, 2000 during lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 2000	07/ 2000	08/ 2000	09/ 2000	10/ 2000	11/ 2000	12/ 2000	01/ 2001	02/ 2001	03/ 2001	04/ 2001	05/ 2001
PHYSICAL												
pH_GEN(pH unit)	7.2	7.5	7.6	7.2	7.6	7.54	7.35	7.6	7.15	7.31	7.3	6.6
EC_GEN(µmho/cm)	82.9	61.2	51.1	58.7	50.8	81.2	88.2	72.2	76.4	80.3	63.5	76.2
TDS(mg/L)	70	90	60	50	100	86	50	80	50	90	80	60
Turb(NTU)	2	3.5	4.5	2	1.5			0.5	1	0.5	1	1.5
CHEMICAL												
Na^+ (mg/L)	3.91	4.6	3.91	3.91	3.45	4.14	4.14	2.53	5.06	5.29	5.52	5.29
K^+ (mg/L)	1.99	1.6	1.8	1.21	1.49	1.21	1.06	14.86	1.6	1.49	1.72	1.92
Ca^{2+} (mg/L)	7	10.4	10.4	8.6	12	25.8	5.2	10.4	8.6	8.6	12	8.6
Mg^{2+} (mg/L)	5.22	2.19	5.22	4.13	0.52	6.32	19.8	8.38	9.48	7.29	4.13	3.16

Cl^- (mg/L)	12.07	11.01	8.16	8.16	7.1	45.79	8.88	8.16	8.88	8.88	9.94	14.91
CO_3^{2-} (mg/L)	0	0	0	0	0	22.8	0	0	0	0	0	0
HCO_3^- (mg/L)	53.68	63.44	36.6	39.04	46.36	17.08	43.92	41.48	43.92	58.56	56.12	51.24
Alk-Phen($mgCaCO_3/L$)	0	0	0	0	0	18.92	0	0	0	0	0	0
ALK-TOT($mgCaCO_3/L$)	44	52	30	32	38	52	36	34	36	48	46	42
SO_4^{2-} (mg/L)	8.02	8.02	3.79	7.49	4.99	20.02	11.28	12	9.02	9.98	3.79	7.01
o-PO_4^{3-}-P(mg/L)	0.41	1.57	1.27	0.56	0.65	0.82	1.05	0.41	0.44	0.62	0.71	0.64
Fe(mg/L)	0.24	0.2	0.3	0.07	0.06	0.09	0.07	0.19	0.19	0.2	0.15	0.17

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 2000 to May, 2001 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.6) for month of August, 2000 during flood & minimum (pH -6.6) in the month of May, 2001 during flood period.
3. The value of EC is maximum (EC-88.2) for month of December, 2000 during lean period & minimum (EC-50.8) in the month of October, 2000 during flood period.
4. The value of TDS (TDS-100) for month of October, 2000 during flood period & minimum (TDS-50) in the month of December, 2000 during lean period.
5. The value of Turbidity is maximum (Turb-4.5) for month of August, 2000 during flood period & minimum (Turb-0.5) in the month of March, 2001 during lean period.
6. The value of Na^+ is (Na^+-5.52) for month of April,2001 during lean period & minimum (Na^+-2.53) in the month of January, 2001 during lean period.
7. The value of K^+ for is maximum (K^+-14.86) for month of January, 2001 during lean period & minimum (K^+-1.06) in the month of December, 2000 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-25.8) for month of November, 2000 during lean period & minimum (Ca^{2+}-5.2) in the month of December, 2000 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -19.8) for month of December, 2000 during lean period & minimum (Mg^{2+} -0.52) for month of October,2000 during flood period.
10. The value of Cl^- is maximum (Cl^--45.79) for month of November, 2000 during lean period & minimum (Cl^--7.1) in the month of October, 2000 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -63.44) for month of July, 2000 during flood period & minimum (HCO_3^- – 17.08) in the month November,2000 during lean period.
12. The value of ALK-TOT is maximum (ALK-TOT-52) for month of November, 2000 during lean period & minimum (ALK-TOT-30) in the month of August, 2000 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -20.02) for month of November, 2000 during lean period & minimum (SO_4^{2-}-3.79) in the month of August, 2000 during flood period.
14. The value of o-PO_4^{3-}- is maximum (o-PO_4^{3-}-P -1.57) for month of July, 2000 during flood period & minimum (o-PO_4^{3-}-P -0.41) in the month of June, 2000 during flood period.
15. The value of Fe is maximum (Fe -0.3) for month of August, 2000 during flood period & minimum (Fe -0.06) in the month of October, 2000 during flood period.

Water Quality Datasheet for the Period: 1999-2000

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 1999	07/ 1999	08/ 1999	09/ 1999	10/ 1999	11/ 1999	12/ 1999	01/ 2000	02/ 2000	03/ 2000	04/ 2000	05/ 2000
PHYSICAL												
pH_GEN(pH unit)	7.5	7.5	7.95	8.1	7.9	7.8	7.8	7.55	7.8	7.23	7.45	7.5
EC_GEN(µmho/cm)	109.6	115.3	88.2	67.2	73.9	104	66.1	130.9	73.3	134.1	137.3	145.2
TDS(mg/L)	260	220	270	200	210	270	340	270	300	300	334	130
Turb(NTU)								1	0.5	0.5	1	1.5
CHEMICAL												
K^+ (mg/L)	3.91	3.52	3.52	3.13	2.74	3.13	2.74	2.74	3.13	2.74	2.74	2.82
Ca^{2+} (mg/L)	5.2	7	8.6	10.4	7	10.4	8.6	8.6	12	12	24.2	24
Mg^{2+} (mg/L)	12.51	11.54	11.54	5.22	12.51	13.36	17.01	14.58	14.58	13.61	4.13	5.22
Cl^- (mg/L)	9.94	8.16	9.94	8.16	6.03	12.07	8.16	8.88	7.1	8.16	8.16	9.94
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	102.48	68.32	65.88	75.64	61	68.32	73.2	61	65.88	82.96	92.72	78.08
Alk-Phen($mgCaCO_3/L$)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT($mgCaCO_3/L$)	84	56	54	62	50	56	60	50	54	68	76	64
SO_4^{2-} (mg/L)	0.91	0.82	0.62	1.49	0.48	4.99						
o-PO_4^{3-}-P(mg/L)	0.04	0.02	0.02	0.01	0.03	0.36	0.12	0.25	0.51	0.66	0.38	0.33
Fe(mg/L)	0.11	0.17	0.11	0.09	0.07	0.24						

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1999 to May, 2000 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.1) for month of September, 1999 during flood period & minimum (pH -7.23) in the month of March, 2000 during lean period.
3. The value of EC is maximum (EC-145.2) for month of May, 2000 during flood period & minimum (EC-66.1) in the month of December, 1999 during lean period.
4. The value of TDS is maximum (TDS-340) for month of December, 1999 during lean period & minimum (TDS-130) in the month of May, 2000 during flood period.
5. The value of Turbidity is maximum (Turb-1.5) for month of May, 2000 during flood period & minimum (Turb-0.5) in the month of February, 2000 & March, 2000 during lean period.
6. The value of K^+ is maximum (K^+-3.91) for month of June, 1999 during flood period & minimum (K^+-2.74) in the month of December, 1999, January, 2000, march, 2000 & April, 2000 during lean period.
7. The value of Ca^{2+} is maximum (Ca^{2+}-24.2) for month of April, 2000 during lean period & minimum (Ca^{2+}-5.2) in the month of June, 1999 during flood period.
8. The value of Mg^{2+} is maximum (Mg^{2+} -17.01) for month of December, 1999 during lean period & minimum (Mg^{2+} -4.13) for month of April, 2000 during flood period.

9. The value of Cl^- is maximum (Cl^--12.07) for month of November, 1999 during lean period & minimum (Cl^--6.03) in the month of October, 1999 during flood period.
10. The value of HCO_3^- is maximum (HCO_3^- -102.48) for month of June, 1999 during flood period & minimum (HCO_3^- – 61) in the month October, 1999 during flood period.
11. The value of ALK-TOT is maximum (ALK-TOT-84) for month of June, 1999 during flood period & minimum (ALK-TOT-50) in the month of January, 2000 during lean period.
12. The value of SO_4^{2-} is maximum (SO_4^{2-} - 4.99) for month of November, 1999 during lean period & minimum (SO_4^{2-}-048) in the month of October, 1999 during flood period.
13. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.66) for month of March, 2000 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of September, 1999 during flood period.
14. The value of Fe for is maximum (Fe -0.24) for month of November, 1999 during lean period & minimum (Fe -0.07) in the month of October, 1999 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 1999	07/ 1999	08/ 1999	09/ 1999	10/ 1999	11/ 1999	12/ 1999	01/ 2000	02/ 2000	03/ 2000	04/ 2000	05/ 2000
PHYSICAL												
pH_GEN(pH unit)	7.4	7.2	7.7	7.7	8.05	7.4	7.5	7.35	7.01	7.06	7.3	7.1
EC_GEN(µmho/cm)	68.5	54.3	40.7	47	40.7	56.1	61.1	54.9	56.9	73.4	85	52.8
TDS(mg/L)	260	284	280	190	196	300	250	300	290	350	360	120
CHEMICAL												
K^+ (mg/L)	2.74	3.13	3.52	1.96	1.96	2.35	2.35	1.96	2.35	1.96	2.35	1.99
Ca^{2+} (mg/L)	7	8.6	5.2	7	8.6	7	8.6	12	10.4	8.6	13.8	18
Mg^{2+} (mg/L)	6.32	8.38	9.48	2.19	5.22	14.58	13.36	16.77	15.67	7.29	6.32	5.22
Cl^- (mg/L)	8.88	8.88	9.94	8.88	7.1	14.91	7.1	8.16	9.94	11.01	11.01	8.88
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	87.84	53.68	56.12	53.68	43.92	56.12	63.44	53.68	61	41.48	46.36	41.48
Alk-Phen(mg$CaCO_3$/L)						0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)						46	52	44	50	34	38	34
SO_4^{2-} (mg/L)	0.72	0.62	0.38	0.48	0.48	2.5						
o-PO_4^{3-}-P(mg/L)	0.05	0.02	0.02	0.01	0.01	0.19	0.12	0.21	0.55	0.68	0.44	0.37
Fe(mg/L)	0.19	0.11	0.17	0.09	0.06	0.24						

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1999 to May, 2000 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.05) for month of October, 1999 during flood period & minimum (pH -7.01) in the month of February,2000 during lean period.
3. The value of EC is maximum (EC-85) for month of April, 2000 during lean period & minimum (EC-40.7) in the month of October, 1999 during flood period.

4. The value of TDS is maximum (TDS-360) for month of April, 2000 during lean period & minimum (TDS-120) in the month of May, 2000 during flood period.
5. The value of K^+ is maximum (K^+-3.52) for month of August,1999 during flood period & minimum (K^+-1.96) for month of January, 2000, during lean period.
6. The value of Ca^{2+} is maximum (Ca^{2+}-18) for month of May, 2000 during flood period & minimum (Ca^{2+}-5.2) in the month of August, 1999 during flood period.
7. The value of Mg^{2+} is maximum (Mg^{2+} -16.7) for month of January, 1999 during lean period & minimum (Mg^{2+} -5.22) for month of May, 2000 during flood period.
8. The value of Cl^- is maximum (Cl^- -14.91) for month of November, 1999 during lean period & minimum (Cl^- -7.1) in the month of October, 1999 during flood period.
9. The value of HCO_3^- is maximum (HCO_3^- -87.84) for month of June, 1999 during flood period & minimum (HCO_3^- – 41.48) in the month May, 2000 during flood period.
10. The value of ALK-TOT is maximum (ALK-TOT-52) for month of December, 1999 during lean period & minimum (ALK-TOT-34) in the month of March, 2000 during lean period.
11. The value of SO_4^{2-} is maximum (SO_4^{2-} -2.5) for month of November, 1999 during lean period & minimum (SO_4^{2-} -0.38) in the month of August, 1999 during flood period.
12. The value of o-PO_4^{3-} -P is maximum (o-PO_4^{3-} -P -0.68) for month of March, 2000 during lean period & minimum (o-PO_4^{3-} -P -0.01) in the month of October, 1999 during flood period.
13. The value of Fe is maximum (Fe -0.24) for month of November, 1999 during lean period & minimum (Fe -0.06) in the month of October, 1999 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 1999	07/ 1999	08/ 1999	09/ 1999	10/ 1999	11/ 1999	12/ 1999	01/ 2000	02/ 2000	03/ 2000	04/ 2000	05/ 2000
PHYSICAL												
pH_GEN(pH unit)	7.5	7.7	8	8.15	8.05	7.6	7.6	7.3	7.8	7.08	7	7.25
EC_GEN(µmho/cm)	54.8	74.6	67.8	53.8	53.8	33.7	74.8	69.8	89.6	97.9	78.5	55.6
TDS(mg/L)	136	100	74	74	74	70	130	62	90	110	90	90
Turb(NTU)								1		0.5		1.5
CHEMICAL												
K^+ (mg/L)	3.52	3.91	3.52	2.74	2.35	2.35	2.74	1.96	2.35	1.96	2.35	2.19
Ca^{2+} (mg/L)	7	8.6	7	5.2	8.6	8.6	10.4	8.6	8.6	12	17.2	20
Mg^{2+} (mg/L)	10.45	11.54	12.51	3.16	8.38	15.8	13.36	15.67	14.58	6.32	2.07	3.16
Cl^- (mg/L)	11.01	9.94	8.88	9.94	8.16	13.14	9.94	9.94	7.1	11.01	13.14	11.01
NO_3^--N(mgN/L)	0.04	0.03	0.03	0.03	0.03	0.01	0.01					
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	112.24	63.44	61	65.88	73.2	65.88	70.76	68.32	65.88	58.56	29.28	61
Alk-Phen(mg$CaCO_3$/L)							0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)							58	56	54	48	24	50
SO_4^{2-} (mg/L)	0.67	0.62	0.62	1.01	0.96	3.74						
o-PO_4^{3-} -P(mg/L)	0.04	0.02	0.03	0.03	0.03	0.29	0.19					

Fe(mg/L)	0.11	0.17	0.17	0.09	0.09	0.24						

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, K^+, Ca^{2+}, Mg^{2+}, Cl^-, NO_3^--N, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1999 to May, 2000 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.0) for month of September, 1999 during flood period & minimum (pH -7.08) in the month of March, 2000 during lean period.
3. The value of EC is maximum (EC-89.6) for month of February, 2000 during lean period & minimum (EC-33.7) in the month of November, 1999 during lean period.
4. The value of TDS is maximum (TDS-136) for month of June, 1999 during flood period & minimum (TDS-62) in the month of January, 2000 during lean period.
5. The value of Turbidity is maximum (Turb-1.5) for month of May, 2000 during flood period & minimum (Turb-0.5) in the month of March, 2000 during lean period.
6. The value of K^+ is maximum (K^+-3.91) for month of July, 1999 during flood period & minimum (K^+-1.96) for month of January, 2000, during lean period.
7. The value of Ca^{2+} for is maximum (Ca^{2+}-17.2) for month of April, 2000 during lean period & minimum (Ca^{2+}-5.2) in the month of September, 1999 during flood period.
8. The value of Mg^{2+} is maximum (Mg^{2+} -15.8) for month of November, 1999 during lean period & minimum (Mg^{2+} -2.07) for month of April, 2000 during lean period.
9. The value of Cl^- is maximum (Cl^- -13.14) for month of November, 1999 during lean period & minimum (Cl^- -7.1) in the month of February, 2000 during flood period.
10. The value of HCO_3^- is maximum (HCO_3^- -112.24) for month of June, 1999 during flood period & minimum (HCO_3^- – 29.28) in the month April, 1999 during lean period.
11. The value of ALK-TOT is maximum (ALK-TOT-58) for month of December, 1999 during lean period & minimum (ALK-TOT-24) in the month of April, 2000 during lean period.
12. The value of SO_4^{2-} is maximum (SO_4^{2-} -3.74) for month of November, 1999 during lean period & minimum (SO_4^{2-} -0.62) in the month of July, 1999 during flood period.
13. The value of o-PO_4^{3-} -P is maximum (o-PO_4^{3-} -P -0.29) for month of November, 1999 during lean period & minimum (o-PO_4^{3-} -P -0.02) in the month of July, 1999 during flood period.
14. The value of Fe is maximum (Fe -0.24) for month of November, 1999 during lean period & minimum (Fe -0.09) in the month of October, 1999 during flood period.

Water Quality Datasheet for the Period: 1998-1999

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 1998	07/ 1998	08/ 1998	09/ 1998	10/ 1998	11/ 1998	12/ 1998	01/ 1999	02/ 1999	03/ 1999	04/ 1999	05/ 1999
PHYSICAL												
EC_GEN(µmho/cm)		145.2	59.4	63.2	81.4	122.1	122.1	129.6	124.5	112.1	137	143.3

TDS(mg/L)		380	332	80	130	60	200	112	140	200	260	250
CHEMICAL												
Na^+ (mg/L)		4.14	3.68	5.98	5.75	5.29	5.75	5.06	4.6	4.14	5.06	
K^+ (mg/L)		2.74	3.13	3.13	3.13	3.13	3.91	3.52	3.91	3.91	4.3	2.74
Ca^{2+} (mg/L)		5.2	8.6	5.2	7	1.8	3.4	8.6	10.4	10.4	10.4	5.2
Mg^{2+} (mg/L)		19.8	20.9	17.74	15.67	9.48	12.51	9.48	10.45	9.36	10.45	12.51
Cl^- (mg/L)		8.88	7.1	8.88	9.94	8.16	8.88	11.01	8.16	8.16	7.1	8.88
CO_3^{2-} (mg/L)		0	0	0	0	0	0	0	0	1.2	0	0
HCO_3^- (mg/L)		73.2	109.8	97.6	85.4	73.2	91.5	97.6	85.4	92.72	90.28	100.04
Alk-Phen($mgCaCO_3/L$)		0	0	0	0	0	0	0	0	1	0	0
ALK-TOT($mgCaCO_3/L$)		60	90	80	70	60	75	80	70	78	74	82
SO_4^{2-} (mg/L)		0.34	0.38	0.48	0.48	0.48	0.48	0.96	0.96	0.86	0.82	1.25
o-PO_4^{3-}-P(mg/L)		0.03	0.02	0.02	0.01	0.02	0.01	0.02	0.02	0.03	0.02	0.03
Fe(mg/L)		0.11	0.09	0.09	0.11	0.15	0.13	0.07	0.09	0.09	0.09	0.06

Based on the result of analysis the inference is as below:

1. Parameters EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from July, 1998 to May, 1999 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of EC is maximum (EC-145.2) for month of July,1998 during flood period & minimum (EC-59.4) in the month of August, 1998 during flood period.
3. The value of TDS is maximum (TDS-380) for month of July, 1998 during flood period & minimum (TDS-60) in the month of November,1998 during lean period.
4. The value of Na^+ is maximum (Na^+-5.9) for month of September,1998 during flood period & minimum (Na^+-3.68) in the month of August,1998 during flood period.
5. The value of K^+ is maximum (K^+-3.9) for month of March,1999 during flood period & minimum (K^+-2.74) in the month of July, 1998 during flood period.
6. The value of Ca^{2+} is maximum (Ca^{2+}-10.4) for month of February,1999 during lean period & minimum (Ca^{2+}-1.8) in the month of November, 1998 during lean period.
7. The value of Mg^{2+} is maximum (Mg^{2+} -20.9) for month of August,1998 during flood period & minimum (Mg^{2+} -9.36) for month of March,1999 during lean period.
8. The value of Cl^- is maximum (Cl^- -11.01) for month of January,1999 during lean period & minimum (Cl^- -7.1) in the month of August,1998 during flood period.
9. The value of HCO_3^- is maximum (HCO_3^- -109.8) for month of August,1998 during flood period & minimum (HCO_3^- – 73.2) in the month November, 1998 during lean period.
10. The value of ALK-TOT is maximum (ALK-TOT-90) for month of August,1998 during flood period & minimum (ALK-TOT-60) in the month of July,1998 during flood period.
11. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.25) for month of May,1999 during flood period & minimum (SO_4^{2-} -0.34) in the month of July, 1998 during flood period.
12. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.03) for month of July, 1998 during flood period & minimum (o-PO_4^{3-}-P -0.01) in the month of December, 1998 during lean period.

13. The value of Fe is maximum (Fe 0.15) for month of May,1999 during flood period & minimum (Fe -0.06) in the month of November,1998 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 1998	07/ 1998	08/ 1998	09/ 1998	10/ 1998	11/ 1998	12/ 1998	01/ 1999	02/ 1999	03/ 1999	04/ 1999	05/ 1999
PHYSICAL												
EC_GEN(µmho/cm)	121.4	56.1	56.1	105.6	70.8	69.2	69	64.8	73.9	68.5	62.3	62.3
TDS(mg/L)	160	120	280	440	180	90	240	80	160	172	212	200
CHEMICAL												
Na^+ (mg/L)	5.06	4.6	4.37	3.22	4.83	4.37	4.37	4.6	3.91	3.22	3.91	
K^+ (mg/L)	1.96	1.96	2.35	2.35	3.52	2.35	2.74	3.91	0.39	3.91	3.52	1.96
Ca^{2+}(mg/L)	7	3.4	3.4	5.2	3.4	5.2	3.4	8.6	7	8.6	8.6	7
Mg^{2+}(mg/L)	11.54	13.61	11.54	16.77	17.74	14.58	13.61	7.29	5.22	7.29	9.36	4.13
Cl^- (mg/L)	8.88	8.88	7.81	7.81	9.94	11.01	8.88	7.1	7.1	9.94	11.01	8.16
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	79.3	85.4	97.6	91.5	109.8	85.4	91.5	85.4	67.1	80.52	87.84	97.6
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0							0	
ALK-TOT(mg$CaCO_3$/L)	65	70	80	75							72	
SO_4^{2-} (mg/L)	0.29	0.53	0.62	0.96	0.48	0.48	0.48	0.48	0.48	0.67	0.86	0.48
o-PO_4^{3-}-P(mg/L)	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.05
Fe(mg/L)	0.07	0.09	0.11	0.09	0.11	0.15	0.17	0.09	0.07	0.09	0.06	0.06

Based on the result of analysis the inference is as below:

1. Parameters EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1998 to May, 1999 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of EC is maximum (EC-121.4) for month of June, 1998 during flood period & minimum (EC-56.1) in the month of August, 1998 during flood period.
3. The value of TDS is maximum (TDS-440) for month of September, 1998 during flood period & minimum (TDS-80) in the month of January, 1999 during lean period.
4. The value of Na^+ is maximum (Na^+-5.06) for month of June,1998 during flood period & minimum (Na^+-2.53) in the month of March,1999 during lean period.
5. The value of K^+ is maximum (K^+-3.91 for month of January,1999 during lean period & minimum (K^+-0.39) in the month of February, 1999 during lean period.
6. The value of Ca^{2+} is maximum (Ca^{2+}-8.6) for month of March,1999 & April,1999 during lean period & minimum (Ca^{2+}-3.4) in the month of October, 1998 during flood period.
7. The value of Mg^{2+} is maximum (Mg^{2+} -17.74) for month of October, 1998 during flood period & minimum (Mg^{2+} -4.13) for month of May,1999 during flood period.
8. The value of Cl^- is maximum (Cl^--11.01) for month of November, 1998 during lean period & minimum (Cl^--7.1) in the month of January, 1999 during lean period.

9. The value of HCO_3^- is maximum (HCO_3^- -109.8) for month of October, 1998 during flood period & minimum (HCO_3^- – 67.1) in the month February, 1999 during lean period.
10. The value of ALK-TOT is maximum (ALK-TOT-80) for month of August,1998 during lean period & minimum (ALK-TOT-65) in the month of June,1998 during flood period.
11. The value of SO_4^{2-} is maximum (SO_4^{2-} -0.96) for month of September, 1998 during flood period & minimum (SO_4^{2-}-0.29) in the month of June, 1998 during flood period.
12. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.05) for month of May, 1999 during flood period & minimum (o-PO_4^{3-}-P -0.01) in the month of December, 1998 during lean period.
13. The value of Fe is maximum (Fe 0.17) for month of December, 1999 during flood period & minimum (Fe -0.06) in the month of May,1999 during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 1998	07/ 1998	08/ 1998	09/ 1998	10/ 1998	11/ 1998	12/ 1998	01/ 1999	02/ 1999	03/ 1999	04/ 1999	05/ 1999
PHYSICAL												
EC_GEN(µmho/cm)	62.6	52.8	49.5	79.2	81.4	77.3	89.6	89.1	85.6	65.9	74.8	62.3
TDS(mg/L)	310	200	240	420	186	210	200	146	200	160	212	140
CHEMICAL												
Na^+ (mg/L)	5.29	4.6	4.14	4.6	3.91	2.53	2.76	3.68	2.99	3.22	3.68	
K^+ (mg/L)	1.96	2.74	2.74	3.13	3.52	2.35	2.35	3.91	3.91	4.3	3.91	2.74
Ca^{2+} (mg/L)	7	5.2	7	5.2	1.8	5.2	5.2	10.4	13.8	10.4	10.4	5.2
Mg^{2+} (mg/L)	9.48	12.51	17.74	17.74	19.8	17.74	16.77	6.32	13.61	7.29	7.29	7.29
Cl^- (mg/L)	6.03	7.81	7.1	7.81	8.16	8.88	8.16	9.94	8.16	8.88	7.1	8.88
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3(mg/L)	73.2	73.2	73.2	91.5	91.5	109.8	91.5	85.4	73.2	78.08	75.64	102.48
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0					0
ALK-TOT(mg$CaCO_3$/L)	60	60	60	75	75	90	75					84
SO_4^{2-} (mg/L)	0.72	0.29	0.43	0.48	0.48	0.48	0.48	0.48	0.48	0.82	1.01	1.01
o-PO_4^{3-}-P(mg/L)	0.01	0.03	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.03
Fe(mg/L)	0.11	0.09	0.09	0.09	0.09	0.13	0.13	0.11	0.09	0.11	0.09	0.15

Based on the result of analysis the inference is as below:

1. Parameters EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1998 to May, 1999 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of EC is maximum (EC-89.6) for month of December, 1998 during lean period & minimum (EC-49.5) in the month of August, 1998 during flood period.
3. The value of TDS is maximum (TDS-420) for month of September, 1998 during flood period & minimum (TDS-140) in the month of May, 1999 during lean period.
4. The value of Na^+ is maximum (Na^+-5.29) for month of June,1998 during flood period & minimum (Na^+-2.53) in the month of November,1998 during lean period.

5. The value of K^+ is maximum (K^+-4.3) for month of March,1999 during lean period & minimum (K^+-1.96) in the month of June, 1998 during flood period.
6. The value of Ca^{2+} is maximum (Ca^{2+}-13.8) for month of February,1999 during lean period & minimum (Ca^{2+}-1.8) in the month of October, 1998 during flood period.
7. The value of Mg^{2+} is maximum (Mg^{2+} -19.8) for month of October, 1998 during flood period & minimum (Mg^{2+} -6.32) for month of January,1999 during lean period.
8. The value of Cl^- is maximum (Cl^--8.8) for month of May, 1999 during lean period & minimum (Cl^--6.03) in the month of June, 1998 during flood period.
9. The value of HCO_3^- is maximum (HCO_3^- -109.8) for month of November, 1998 during lean period & minimum (HCO_3^- – 73.2) in the month June, 1998 during flood period.
10. The value of ALK-TOT is maximum (ALK-TOT-90) for month of November,1998 during lean period & minimum (ALK-TOT-60) in the month of July,1998 during flood period.
11. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.01) for month of May,1999 during flood period & minimum (SO_4^{2-}-0.29) in the month of July, 1998 during flood period.
12. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.03) for month of July, 1998 during flood period & minimum (o-PO_4^{3-}-P -0.01) in the month of December, 1998 during lean period.
13. The value of Fe is maximum (Fe 0.15) for month of May,1999 during flood period & minimum (Fe -0.09) in the month of July,1998 during flood period.

Water Quality Datasheet for the Period: 1997-1998

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 1997	07/ 1997	08/ 1997	09/ 1997	10/ 1997	11/ 1997	12/ 1997	01/ 1998	02/ 1998	03/ 1998	04/ 1998	05/ 1998
PHYSICAL												
pH_GEN(pH unit)	7.29	7.26	7.05	7.38	7.49	7.21	7.35	7.73	8.1	8.19		
EC_GEN(µmho/cm)	113	34	94.8	62.1	87.2	77.9	96.5	106	124.5	140		
TDS(mg/L)	220	200	156	176	256	60	106	260	206	220		
CHEMICAL												
Na^+ (mg/L)	4	3.8	5.84	4.14	5.04	4.76	5.96	6.9	8.05	4.83		
K^+ (mg/L)	3.91	3.91	3.91	2.97	2.89	2.35	2.74	2.74	2.74	2.35		
Ca^{2+} (mg/L)	17.2	18.8	22	17.2	5.2	5.2	5.2	8.6	3.4	8.4		
Mg^{2+} (mg/L)	5.22	3.16	6.2	5.22	5.22	3.16	2.07	9.36	13.61	16.65		
Cl^- (mg/L)	9.94	11.01	13.14	7.81	9.94	8.88	7.81	7.81	7.81	7.1		
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0		
HCO_3^- (mg/L)	92.72	80.52	56.12	65.88	46.36	48.8	43.92	91.5	91.5	85.4		
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0		
ALK-TOT(mg$CaCO_3$/L)	76	66	46	54	38	40	36	75	75	70		
SO_4^{2-} (mg/L)	0.96	1.25	1.34	1.3	1.58	1.06	1.3	0.38	0.53	0.29		
o-PO_4^{3-}-P(mg/L)	0.02	0.02	0.01	0.1	0.03	0.02	0.02	0.09	0.04	0.08		
Fe(mg/L)	0.11	0.07	0.07	0.15	0.06	0.04	0.02	0.11	0.09	0.09		

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from July, 1997 to May, 1998 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.19) for month of March, 1998 during lean period & minimum (pH -7.05) in the month of August, 1997 during flood period.
3. The value of EC is maximum (EC-140.0) for month of March, 1998 during lean period & minimum (EC-34) in the month of July, 1997 during flood period.
4. The value of TDS is maximum (TDS-360) for month of October, 1997 during flood period & minimum (TDS-60) in the month of November,1997 during lean period.
5. The value of Na^+ is maximum (Na^+-8.05) for month of February, 1997 during lean period & minimum (Na^+-3.8) in the month of July,1997 during flood period.
6. The value of K^+ is maximum (K^+-3.9) for month of June, 1997 during flood period & minimum (K^+-2.35) in the month of March, 1998 during lean period.
7. The value of Ca^{2+} is maximum (Ca^{2+}-22) for month of August, 1997 during flood period & minimum (Ca^{2+}-3.4) in the month of February, 1997 during lean period.
8. The value of Mg^{2+} is maximum (Mg^{2+} -16.65) for month of March, 1998 during lean period & minimum (Mg^{2+} -2.07) for month of December, 1997 during lean period.
9. The value of Cl^- is maximum (Cl^--13.14) for month of August, 1997 during flood period & minimum (Cl^--7.1) in the month of March, 1998 during lean period.
10. The value of HCO_3^- is maximum (HCO_3^- -92.72) for month of June, 1997 during flood period & minimum (HCO_3^- – 43.92) in the month December, 1997during lean period.
11. The value of ALK-TOT is maximum (ALK-TOT-76) for month of June, 1997 during flood period & minimum (ALK-TOT-36) in the month of December,1997 during flood period.
12. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.58) for month of October,1998 during flood period & minimum (SO_4^{2-}-0.29) in the month of March, 1998 during lean period.
13. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.1) for month of September,1997 during flood period & minimum (o-PO_4^{3-}-P -0.01) in the month of August,1997 during lean period.
14. The value of Fe is maximum (Fe 0.15) for month of September,1997 during flood period & minimum (Fe -0.02) in the month of December, 1997 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 1997	07/ 1997	08/ 1997	09/ 1997	10/ 1997	11/ 1997	12/ 1997	01/ 1998	02/ 1998	03/ 1998	04/ 1998	05/ 1998
PHYSICAL												
pH_GEN(pH unit)	8.15	7.6	7.5	7.52	7.1	7.35	7.46	8.2	7.85	7.9		
EC_GEN(µmho/cm)	142	55	45.8	85	67.4	60.5	88.5	61	54.5	62.3	53.7	78.4
TDS(mg/L)	190	300	100	110	144	68	96	220	140	128	226	280
CHEMICAL												
Na^+ (mg/L)	2.53	4.83	4.14	4.83	4.6	4.37	4.83	5.06	4.83	5.06	5.29	4.14
K^+ (mg/L)	3.13	2.35	2.35	2.35	2.74	1.96	1.96	1.96	1.96	2.35	1.96	1.56
Ca^{2+} (mg/L)	8.6	12	4.2	17.2	3.4	5.2	8.6	8.6	6.8	8.4	17.2	5.2

Mg^{2+} (mg/L)	0.97	2.07	3.16	5.22	7.29	5.22	0.97	6.32	8.38	22.96	15.67	17.74
Cl^- (mg/L)	7.1	7.1	11.01	7.81	8.88	8.88	3.9	7.81	9.94	7.81	7.1	8.88
HCO_3^- (mg/L)	61	63.44	36.6	78.08	53.68	61	73.2	48.8	54.9	48.8	48.8	146.4
Alk-Phen(mgCaCO3/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT($mgCaCO_3$/L)	50	52	30	64	44	50	60	40	45	40	40	120
SO_4^{2-} (mg/L)	0.48	0.38	0.05	0.77	0.53	0.67	0.38	0.24	0.24	0.96	0.91	0.82
o-PO_4^{3-}-P(mg/L)	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.06	0.05	0.05	0.04	0.01
Fe(mg/L)	0.09	0.06	0.06	0.19	0.06	0.07	0.02	0.15	0.09	0.09	0.11	0.07

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe in the period from July, 1997 to May, 1998 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.2) for month of January, 1998 during lean period & minimum (pH -7.1) in the month of October, 1997 during flood period.
3. The value of EC is in the period from June, 1997 to May, 1998 maximum (EC-142) for month of June, 1997 during flood period & minimum (EC-45.8) in the month of August, 1997 during flood period.
4. The value of TDS is maximum (TDS-300) for month of July, 1997during flood period & minimum (TDS-68) in the month of November,1997 during lean period.
5. The value of Na^+ is maximum (Na^+-5.29) for month of April, 1998 during lean period & minimum (Na^+-2.53) in the month of June,1997 during flood period.
6. The value of K^+ is maximum (K^+-3.13) for month of June,1997 during lean period & minimum (K^+-1.56) in the month of May, 1998 during lean period.
7. The value of Ca^{2+} is maximum (Ca^{2+}-17.2) for month of September, 1997 during flood period & minimum (Ca^{2+}-3.4) in the month of October, 1997 during lean period.
8. The value of Mg^{2+} is maximum (Mg^{2+} -22.96) for month of March, 1998 during lean period & minimum (Mg^{2+} -0.97) for month of June,1997 during flood period.
9. The value of Cl^- is maximum (Cl^--11.01) for month of August, 1997 during flood period & minimum (Cl^--3.9) in the month of December, 1997 during lean period.
10. The value of HCO_3^- is maximum (HCO_3^- -146.4) for month of May, 1998 during flood period & minimum (HCO_3^- – 36.6) in the month August,1997during flood period.
11. The value of ALK-TOT is maximum (ALK-TOT-120) for month of May, 1998 during flood period & minimum (ALK-TOT-30) in the month of August,1997 during flood period.
12. The value of SO_4^{2-} is maximum (SO_4^{2-} -0.96) for month of March, 1998 during lean period & minimum (SO_4^{2-}-0.05) in the month of August, 1997 during flood period.
13. The value of o-PO_4^{3-}-P for is maximum (o-PO_4^{3-}-P -0.06) for month of January, 1998 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of June, 1997 during flood period.
14. The value of Fe is maximum (Fe 0.19) for month of September, 1997 during flood period & minimum (Fe -0.02) in the month of December, 1997 during lean period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 1997	07/ 1997	08/ 1997	09/ 1997	10/ 1997	11/ 1997	12/ 1997	01/ 1998	02/ 1998	03/ 1998	04/ 1998	05/ 1998
PHYSICAL												
pH_GEN(pH unit)	8.05	7.5	7.38	7.38	7.66	7.64	7.8	7.85	8.04	7.87		
EC_GEN(µmho/cm)	64.7	54.4	62.1	65.4	71.9	58.3	72.4	81.4	85.6	85.6	103.7	65.4
TDS(mg/L)	160	220	200	180	220	176	150	132	308	160	80	68
CHEMICAL												
ALK-TOT($mgCaCO_3/L$)	80	81	42	38	32	36	40	60	60	50	65	65
Na^+ (mg/L)	5.06	3.22	4.83	3.22	5.29	5.52	7.13	5.29	3.91	3.91	5.98	4.83
K^+ (mg/L)	3.13	3.13	3.52	2.74	3.13	3.13	3.91	1.96	1.96	1.56	1.96	1.96
Ca^{2+} (mg/L)	8.6	13.8	22	13	6.8	8.6	6.8	6.8	5.2	17.2	8.4	8.6
Mg^{2+} (mg/L)	3.16	2.07	2.07	3.16	3.16	2.07	3.16	7.29	9.48	8.26	9.48	9.48
Cl^- (mg/L)	7.81	7.81	13.14	8.88	7.81	7.81	6.03	7.81	7.81	9.94	6.03	7.1
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	97.6	98.82	51.24	46.36	39.04	43.92	48.8	73.2	73.2	61	79.3	79.3
Alk-Phen($mgCaCO_3/L$)	0	0	0	0	0	0	0	0	0	0	0	0
SO_4^{2-} (mg/L)	0.86	0.77	0.96	0.86	1.3	0.62	0.77	0.34	0.38	0.48	0.29	0.34
o-PO_4^{3-}-P(mg/L)	0.03	0.04	0.02	0.01	0.02	0.02	0.01	0.03	0.06	0.06	0.05	0.02
Fe(mg/L)	0.11	0.07	0.04	0.09	0.06	0.06	0.02	0.11	0.11	0.07	0.09	0.07

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from July, 1997 to May, 1998 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.05) for month of June, 1997 during flood period & minimum (pH -7.38) in the month of August, 1997 & September, 1997 during flood period.
3. The value of EC is maximum (EC-103.7) for month of April, 1998 during lean period & minimum (EC-54.4) in the month of July, 1997 during flood period.
4. The value of TDS is maximum (TDS-308) for month of February 1998 during lean period & minimum (TDS-68) in the month of May, 1998 during flood period.
5. The value of Na^+ is maximum (Na^+-7.13) for month of December, 1997 during lean period & minimum (Na^+-3.22) in the month of July,1997 & September, 1997 during flood period.
6. The value of K^+ is maximum (K^+-3.91) for month of December, 1997 during lean period & minimum (K^+-1.56) in the month of March, 1998 during lean period.
7. The value of Ca^{2+} is maximum (Ca^{2+}-22) for month of August, 1997 during flood period & minimum (Ca^{2+}-5.2) in the month of February, 1997 during lean period.
8. The value of Mg^{2+} is maximum (Mg^{2+} -9.48) for month of February, 1998 & April, 1998 during lean period & minimum (Mg^{2+} -2.07) for month of July, 1997 & August, 1997 during flood period.
9. The value of Cl^- is maximum (Cl^--13.14) for month of August, 1997 during flood period & minimum (Cl^--6.03) in the month of December, 1997 & April, 1998 during lean period.

10. The value of HCO_3^- is maximum (HCO_3^- -98.82) for month of July, 1997 during flood period & minimum (HCO_3^- – 39.04) in the month October, 1997during flood period.
11. The value of ALK-TOT is maximum (ALK-TOT-81) for month of July, 1997 during flood period & minimum (ALK-TOT-32) in the month of October, 1997 during flood period.
12. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.3) for month of October, 1998 during flood period & minimum (SO_4^{2-}-0.29) in the month of April, 1998 during lean period.
13. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.6) for month of February, 1998 & March, 1998 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of December, 1997 during lean period.
14. The value of Fe is maximum (Fe 0.11) for month of January, 1998 & February, 1998 during lean period & minimum (Fe -0.02) in the month of December, 1997 during lean period.

Water Quality Datasheet for the Period: 1996-1997

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 1996	07/ 1996	08/ 1996	09/ 1996	10/ 1996	11/ 1996	12/ 1996	01/ 1997	02/ 1997	03/ 1997	04/ 1997	05/ 1997
PHYSICAL												
pH_GEN(pH unit)	8.75	8.31	6.97	6.83	7.2	7.6	7.02	7.3	7.35	7.41	7.13	7.58
EC_GEN(µmho/cm)	110	92	70	126	126	110.01	139	126	109	127	141	122
TDS(mg/L)	224	320	296	240	196	140	122	200	140	76	180	160
CHEMICAL												
Na^+ (mg/L)	4.83	4.83	5.06	2.53	3.68	5.75	1.84	7.82	8.28	9.66	8.74	2.64
K^+ (mg/L)	0.78	2.74	2.74	1.96	1.96	1.56	3.52	2.89	2.7	3.09	1.21	1.17
Ca^{2+} (mg/L)	15.4	5.2	12	5.2	6.8	22.2	24	10.4	8.6	5.2	8.2	3.4
Mg^{2+} (mg/L)	15.67	14.7	4.13	22.96	21.87	4.13	8.38	29.28	6.32	9.36	9.36	12.51
Cl^- (mg/L)	4.97	6.03	2.84	4.97	2.48	2.13	4.97	4.97	4.97	2.84	7.1	7.1
CO_3^{2-} (mg/L)	2.4	3.6	3.6	0	0	0	0	0	0	4.8	0	0
HCO_3^- (mg/L)	35.38	14.64	31.72	43.92	31.72	24.4	12.2	26.84	56.12	56.12	87.84	104.92
Alk-Phen(mg$CaCO_3$/L)	1.99	2.99	2.99	0	0	0	0	0	0	3.98	0	0
ALK-TOT(mg$CaCO_3$/L)	33	18	32	36	26	20	10	22	46	54	72	86
SO_4^{2-} (mg/L)	1.15	1.01	0.82	1.49	1.58	1.39	0.77	0.91	0.67	0.24	1.25	0.53
o-PO_4^{3-}-P(mg/L)	0.04	0.06	0.02	0.01	0.01	0.2	0.1	0.01	0.01	0.01	0.02	0.08
Fe(mg/L)	0.24	0.17	0.07	0.09	0.24	0.09	0.02	0.11	0.09	0.04	0.02	0.09

Based on the result of analysis the inference is as below:

1. Parameters of pH, EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1996 to May, 1997 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.7) for month of July, 1996 during flood period & minimum (pH -6.8) in the month of September, 1996 during flood period.
3. The value of EC is maximum (EC-141) for month of April, 1996 during lean period & minimum (EC-70) in the month of August, 1996 during flood period.

4. 4. The value of Ca^{2+} is maximum (Ca^{2+}-24) for month of December,1996 during flood period & minimum (Ca^{2+}-3.4) in the month of March, 1998 during lean period.
5. The value of Mg^{2+} is maximum (Mg^{2+} -29.28) for month of January,1997 during lean period & minimum (Mg^{2+} -4.13) for month of November, 1997 during lean period.
6. The value of HCO_3^- is maximum (HCO_3^- -104.92) for month of May, 1997 during flood period & minimum (HCO_3^- – 12.2) in the month December, 1996 during lean period.
7. The value of Cl^- is maximum (Cl^--7.1) for month of April, 1997 & May, 1997 during lean & flood period & minimum (Cl^--2.13) in the month of November, 1996 during lean period.
8. The value of Na^+ is maximum (Na^+-9.66) for month of March, 1997 during lean period & minimum (Na^+-2.53) in the month of September,1996 during flood period.
9. The value of K^+ is maximum (K^+-3.52) for month of December, 1996 during lean period & minimum (K^+-0.78) in the month of June, 1996 during flood period.
10. The value of TDS is maximum (TDS-320) for month of July, 1996 during flood period & minimum (TDS-76) in the month of March, 1997 during lean period.
11. The value of ALK-TOT is maximum (ALK-TOT-86) for month of May, 1997 during flood period & minimum (ALK-TOT-10) in the month of December, 1996 during lean period.
12. The value of HAR-Total is maximum (HAR_Total-148.01) for month of January,1997 during lean period & minimum (HAR_Total-47.21) in the month of August,1996 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.58) for month of October,1996 during flood period & minimum (SO_4^{2-}-0.24) in the month of March,1997 during lean period.
14. The value of Fe is maximum (Fe 0.15) for month of June, 1996 during flood period & minimum (Fe -0.06) in the month of April, 1997 during lean period.
15. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.2) for month of November, 1996 during flood period & minimum (o-PO_4^{3-}-P -0.01) in the month of September, 1998 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 1996	07/ 1996	08/ 1996	09/ 1996	10/ 1996	11/ 1996	12/ 1996	01/ 1997	02/ 1997	03/ 1997	04/ 1997	05/ 1997
PHYSICAL												
pH_GEN(pH unit)	8.7	8.35	6.83	6.59	6.86	6.96	7.52	7.41	7.57	7.16	7.2	7.72
EC_GEN(µmho/cm)	182	55	42	49	79	69	56	87.4	68.9	35.3	53	40.7
TDS(mg/L)	160	112	108	380	116	180	210	84	160	72	80	142
CHEMICAL												
Na^+ (mg/L)	2.76	4.6	6.67	3.45	4.37	4.37	2.07	5.75	7.13	7.36	9.89	21.85
K^+ (mg/L)	1.17	1.96	1.17	1.17	1.17	1.17	1.17	2.19	2.19	4.73	0.78	0.78
Ca^{2+} (mg/L)	6.8	8.6	10.4	6.8	12	6.8	8.6	12	13.8	10.4	8.2	3.4
Mg^{2+} (mg/L)	8.38	12.51	8.38	10.45	24.06	10.33	7.29	4.13	7.29	6.32	4.25	4.13
Cl^- (mg/L)	6.03	15.27	6.03	6.74	7.81	2.13	5.68	5.68	1.77	3.9	4.97	9.94
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	24.4	14.64	24.4	34.16	48.8	29.28	91.5	29.28	29.28	68.32	36.6	56.12

Alk-Phen(mgCaCO$_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mgCaCO$_3$/L)	20	12	20	28	40	24	75	24	24	56	30	46
SO_4^{2-} (mg/L)	0.82	0.43	0.29	0.34	1.44	0.96	1.06	0.24	0.43	0.48	0.62	0.48
o-PO_4^{3-}-P(mg/L)	0.03	0.08	0.13	0.01	0.01	0.28	0.2	0.01	0.01	0.03	0.02	0.02
Fe(mg/L)	0.61	0.35	0.02	0.07	0.09	0.09	0.19	0.09	0.07	0.02	0.04	0.09

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1996 to May, 1997 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of is maximum (pH -8.7) for month of June, 1996 during flood period & minimum (pH -6.59) in the month of September, 1996 during flood period.
3. The value of EC is maximum (EC-182) for month of of June, 1996 during flood period & minimum (EC-35.3) in the month of March, 1997 during lean period.
4. The value of TDS is maximum (TDS-380) for month of September, 1996 during flood period & minimum (TDS-72) in the month of March, 1997 during lean period.
5. The value of Na^+ is maximum (Na^+-21.85) for month of May, 1997 during flood period & minimum (Na^+-2.07) in the month of, December, 1996 during lean period
6. The value of K^+ is maximum (K^+-4.73) for month of March, 1997 during lean period & minimum (K^+-0.78) in the month of May, 1997 during flood period.
7. The value of Ca^{2+} is maximum (Ca^{2+}-13.8) for month of February, 1997 during lean period & minimum (Ca^{2+}-3.4) in the month of May, 1997 flood period.
8. The value of Mg^{2+} is maximum (Mg^{2+} -24.06) for month of October, 1996 during flood period & minimum (Mg^{2+} -4.13) for month of May, 1997 during flood period.
9. The value of Cl^- is maximum (Cl^--15.27) for month of July, 1996 during flood period & minimum (Cl^--1.77) in the month of February, 1997 during lean period.
10. The value of HCO_3^- is maximum (HCO_3^- -91.5) for month of December, 1996 during lean period & minimum (HCO_3^- – 14.6) in the month July, 1996 during flood period.
11. The value of ALK-TOT is maximum (ALK-TOT-75) for month of December, 1996 during lean period & minimum (ALK-TOT-12) in the month of July, 1996 during flood period.
12. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.44) for month of October, 1996 during flood period & minimum (SO_4^{2-}-0.24) in the month of January, 1997 during lean period.
13. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.28) for month of November, 1996 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of January,1997 during lean period.
14. The value of is maximum (Fe 0.61) for month of June, 1996 during flood period & minimum (Fe -0.02) in the month of March, 1997 & August, 1996 during lean & flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 1996	07/ 1996	08/ 1996	09/ 1996	10/ 1996	11/ 1996	12/ 1996	01/ 1997	02/ 1997	03/ 1997	04/ 1997	05/ 1997

PHYSICAL												
pH_GEN(pH unit)	8.65	8.3	6.86	6.48	6.97	7.1	7.53	7.3	7.26	7.22	7.66	7.69
EC_GEN(µmho/cm)	50	64	84	107	107	81	85	103	103	106	92	40.7
TDS(mg/L)	124	200	140	116	220	200	200	244	140	72	164	92
CHEMICAL												
Na^+ (mg/L)	5.52	5.98	5.29	3.68	5.06	5.29	3.91	9.2	9.66	11.04	10.58	2.99
K^+ (mg/L)	2.35	3.13	3.13	1.56	1.17	2.74	1.96	3.91	4.69	5.86	1.17	0.78
Ca^{2+} (mg/L)	8.6	13.8	8.6	8.6	17.2	12	10.4	6.8	12	5.2	8.2	5.2
Mg^{2+} (mg/L)	18.83	7.29	7.29	13.61	22.96	7.29	10.45	8.38	13.61	11.42	5.22	5.22
Cl^- (mg/L)	7.1	6.03	3.9	2.84	2.84	3.9	2.13	1.07	2.84	4.97	8.88	9.23
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	39.04	21.96	14.64	26.84	12.2	39.04	29.28	34.16	41.48	53.68	58.56	92.72
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	32	18	12	22	10	32	24	28	34	44	48	76
SO_4^{2-} (mg/L)	1.15	1.01	0.19	2.02	1.1	1.49	0.05	0.43	0.29	0.53	1.25	0.53
o-PO_4^{3-}-P(mg/L)	0.06	0.05	0.05	0.01	0.01	0.04	0.09	0.01	0.01	0.01	0.01	0.1
Fe(mg/L)	0.45	0.17	0.07	0.11	0.24	0.13	0.24	0.19	0.11	0.02	0.02	0.09

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1996 to May, 1997 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.65) for month of June, 1996 during flood period & minimum (pH -6.48) in the month of September, 1996 during flood period.
3. The value of EC is maximum (EC-107) for month of September, 1996 & October, 1996 during flood period & minimum (EC-40.7) in the month of May, 1997 during flood period.
4. The value of TDS is maximum (TDS-244) for month of January, 1997 during lean period & minimum (TDS-72) in the month of March, 1997 during lean period.
5. The value of Na^+ is maximum (Na^+-11.04) for month of March, 1997 during lean period & minimum (Na^+-2.99) in the month of May, 1997 during flood period.
6. The value of K^+ is maximum (K^+-5.86) for month of March, 1997 during lean period & minimum (K^+-0.78) in the month of May, 1997 during flood period.
7. The value of Ca^{2+} is maximum (Ca^{2+}-17.2) for month of October, 1996 during flood period & minimum (Ca^{2+}-5.2) in the month of March, 1997 & May, 1997 during lean & flood period.
8. The value of Mg^{2+} is maximum (Mg^{2+} -22.96) for month of October, 1996 during flood period & minimum (Mg^{2+} -5.22) for month of April, 1997 & May, 1997 during lean & flood period.
9. The value of Cl^- is maximum (Cl^--9.23) for month of May, 1997 during flood period & minimum (Cl^--1.07) in the month of January, 1997 during lean period.
10. The value of HCO_3^- is maximum (HCO_3^- -92.72) for month of May, 1997 during flood period & minimum (HCO_3^- – 12.2) in the month October, 1996 during flood period.

11. The value of ALK-TOT is maximum (ALK-TOT-76) for month of May, 1997 during flood period & minimum (ALK-TOT-10) in the month of October, 1996 during flood period.
12. The value of SO_4^{2-} is maximum (SO_4^{2-} -2.02) for month of September, 1996 during flood period & minimum (SO_4^{2-}-0.05) in the month of December, 1996 during lean period.
13. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.1) for month of May, 1997 during flood period & minimum (o-PO_4^{3-}-P -0.01) in the month of January, 1997 to April, 1997 during lean period.
14. The value of Fe is maximum (Fe 0.45) for month of June, 1996 during flood period & minimum (Fe -0.02) in the month of March, 1997 & April, 1997 during lean period.

Water Quality Datasheet for the Period: 1995-1996

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 1995	07/ 1995	08/ 1995	09/ 1995	10/ 1995	11/ 1995	12/ 1995	01/ 1996	02/ 1996	03/ 1996	04/ 1996	05/ 1996
PHYSICAL												
pH_GEN(pH unit)	7.61			7.76	8.46	8.12	7.69	7.75	7.79	7.56	7.68	7.29
EC_GEN(µmho/cm)	68.5	47	73.9	93.4	106	106	114.9	100	100			
TDS(mg/L)	186	200	98	104	200	90	348	140	100	184	188	160
Turb(NTU)	3	3	2	3	4	2	4					
CHEMICAL												
Na^+ (mg/L)	3.22	1.38	2.99	2.99	3.91	3.91	4.14	4.83	4.83	5.06	4.6	2.99
K^+ (mg/L)	2.35	1.96	2.74	2.35	2.74	1.96	2.35	1.96	1.56	1.17	1.56	1.96
Ca^{2+} (mg/L)	12	6.8	10.2	12	12	22.4	13.8	13.8	12	12.4	12	25.8
Mg^{2+} (mg/L)	2.07	20.9	10.45	19.8	4.37	6.32	10.45	15.67	22.96	13.61	10.45	12.51
Cl^- (mg/L)	2.13	2.84	9.94	6.03	3.9	6.03	2.13	6.03	4.97	3.9	6.03	3.9
NO_3^--N(mgN/L)	0.07	0.04	0.08	0.03	0.01	0.07	0.01					
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	3.6	0	2.4	2.4	0
HCO_3^- (mg/L)	24.4	12.2	21.96	29.28	24.4	26.84	24.4	29.28	26.84	19.52	19.52	29.28
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	2.99	0	1.99	1.99	0
ALK-TOT(mg$CaCO_3$/L)	20	10	18	24	20	22	20	30	22	20	20	24
SO_4^{2-} (mg/L)	1.68	1.87	2.4	0.96	0.86	0.62	0.77	0.58	0.82	1.25	0.53	0.82
o-PO_4^{3-}-P(mg/L)	0.01	0.05	0.02	0.04	0.06	0.06	0.04	0.01	0.01	0.06	0.16	0.09
Fe(mg/L)	0.35	0.37	0.02	0.04	0.06	0.02	0.02	0.07	0.06	0.02	0.09	0.02

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, NO_3—N, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1995 to May, 1996 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.46) for month of October, 1995 during flood period & minimum (pH -7.29) in the month of May, 1996 during flood period.
3. The value of EC is maximum (EC-114.9) for month of December, 1995 during lean period & minimum (EC-47) in the month of July, 1995 during flood period.

4. The value of TDS is maximum (TDS-348) for month of December, 1995 during lean period & minimum (TDS-90) in the month of November,1995 during lean period.
5. The value of Turb (NTU) is maximum (Turb -4) for month of December, 1995 during lean period & minimum (Turb -2) in the month of August 1995 during flood period.
6. The value of Na^+ is maximum (Na^+-5.06) for month of March, 1996 during lean period & minimum (Na^+-1.38) in the month of July, 1995 during flood period.
7. The value of K^+ is maximum (K^+-2.74) for month of October, 1996 during flood period & minimum (K^+-1.17) in the month of March,1996 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-25.8) for month of May, 1996 during flood period & minimum (Ca^{2+}-6.8) in the month of July, 1995 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -22.96) for month of February, 1996 during lean period & minimum (Mg^{2+} -2.07) for month of June, 1995 during flood period.
10. The value of Cl^- is maximum (Cl^--9.94) for month of August, 1995 during flood period & minimum (Cl^--2.13) in the month of June, 1995 & December, 1995 during lean & flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -29.28) for month of January, 1996 & May, 1996 during lean & flood period & minimum (HCO_3^- – 12.2) in the month July, 1995 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-30) for month of January,1996 during lean period & minimum (ALK-TOT-10) in the month of July, 1995 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -2.4) for month of August,1995 during flood period & minimum (SO_4^{2-}-0.53) in the month of April,1996 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.16) for month of April,1996 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of June, 1995 during flood period.
15. The value of Fe is maximum (Fe 0.37) for month of July, 1996 during flood period & minimum (Fe -0.02) in the month of May, 1996 during flood period.
16. The value of NO_3^--N(mgN/L) is maximum (NO_3^--N -0.08) for month of August,1995 during flood period & minimum (NO_3^--N -0.01) in the month of December,1995 during lean period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 1995	07/ 1995	08/ 1995	09/ 1995	10/ 1995	11/ 1995	12/ 1995	01/ 1996	02/ 1996	03/ 1996	04/ 1996	05/ 1996
PHYSICAL												
pH_GEN(pH unit)	7.85			7.87	8.22	8.02	7.45	7.58	7.48	7.69	7.22	7.85
EC_GEN(µmho/cm)	65	50.9	67.2	51.4	63.6	63.6	63.2	55	60			
TDS(mg/L)	152	120	196	104	128	80	52	88	104	108	110	122
Turb(NTU)	2	1	2	2	1	1	1					
CHEMICAL												
Na^+ (mg/L)	3.91	2.76	3.22	2.76	3.45	3.68	4.14	3.91	4.14	4.6	4.83	2.99
K^+ (mg/L)	2.35	2.35	2.35	1.96	1.96	1.96	1.56	1.56	1.56	0.78	0.78	0.78
Ca^{2+} (mg/L)	6.8	8.6	8.6	6.8	8.6	15.4	6.8	13.8	6.8	10.4	10.4	19

Mg^{2+} (mg/L)	9.36	12.51	3.16	15.67	3.16	3.16	5.22	7.29	14.58	12.51	12.51	9.36
Cl^- (mg/L)	4.97	6.03	8.16	6.03	2.84	6.03	6.03	3.9	3.9	4.97	4.97	5.68
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	0	0	0	0
HCO_3^- (mg/L)	17.08	19.52	19.52	14.64	14.64	24.4	12.81	14.64	19.52	19.52	17.08	19.52
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	14	16	16	12	12	20	10.5	12	16	16	14	16
SO_4^{2-} (mg/L)	1.49	0.96	1.87	0.67	0.77	1.1	0.96	0.48	0.48	0.67	0.24	1.1
o-PO_4^{3-}-P(mg/L)	2.22	0.06	0.02	0.12	0.02	0.05	0.02	0.01	0.01	0.06	0.04	0.12
Fe(mg/L)	0.2	0.56	0.02	0.04	0.02	0.02	0.02	0.04	0.06	0.02	0.09	0.02

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1995 to May, 1996 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -8.22) for month of October, 1995 during flood period & minimum (pH -7.29) in the month of April, 1996 during lean period.
3. The value of EC is maximum (EC-67) for month of August, 1995 during flood period & minimum (EC-50) in the month of July, 1995 during flood period.
4. The value of TDS is maximum (TDS-196) for month of August, 1995 during flood period & minimum (TDS-52) in the month of December, 1995 during lean period.
5. The value of Turb (NTU) is maximum (Turb -2) for month of June, 1995 during flood period & minimum (Turb 1) in the month of December, 1995 during lean period.
6. The value of Na^+ is maximum (Na^+-4.8) for month of April,1996 during lean period & minimum (Na^+-2.76) in the month of July, 1995 during flood period.
7. The value of K^+ is maximum (K^+-2.35) for month of May, 1996 during flood period & minimum (K^+-0.78) in the month of June, 1995 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-19) for month of May,1996 during flood period & minimum (Ca^{2+}-6.8) in the month of July, 1995 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -15.67) for month of September,1995 during flood period & minimum (Mg^{2+} -3.16) for month of August, 1995 & October, 1995 during flood period.
10. The value of Cl^- is maximum (Cl^--8.16) for month of August, 1995 during flood period & minimum (Cl^--2.84) in the month of October, 1995 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -24.4) for month of November, 1995 during lean period & minimum (HCO_3^- – 12.81) in the month December, 1995 during lean period.
12. The value of ALK-TOT is maximum (ALK-TOT-20) for month of November, 1995 during lean period & minimum (ALK-TOT-10.5) in the month of December, 1995 during lean period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -1.87) for month of August,1995 during flood period & minimum (SO_4^{2-}-0.24) in the month of April, 1996 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -2.22) for month of June, 1995 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of January,1996 during lean period.

15. The value of Fe is maximum (Fe 0.56) for month of July, 1995 during flood period & minimum (Fe -0.02) in the month of October, 1995 flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 1995	07/ 1995	08/ 1995	09/ 1995	10/ 1995	11/ 1995	12/ 1995	01/ 1996	02/ 1996	03/ 1996	04/ 1996	05/ 1996
PHYSICAL												
pH_GEN(pH unit)	7.4			7.86	8.26	8.04	7.56	7.69	7.61	7.56	7.68	7.29
EC_GEN(µmho/cm)	92.5	50.9	40.3	84.1	84.8	76.3	86.2	120	99			
TDS(mg/L)	332	248	356	160	316	72	112	80	112	132	112	178
Turb(NTU)	4	2	3	2	3	2	2					
CHEMICAL												
Na^+ (mg/L)	5.98	2.3	2.3	2.76	3.45	3.68	3.68	8.51	4.6	5.52	5.52	4.14
K^+ (mg/L)	3.91	2.35	2.74	1.96	1.96	1.96	2.35	3.91	1.56	1.96	0.78	2.35
Ca^{2+} (mg/L)	12	12	10.2	8.6	17	13.8	10.2	17.2	10.2	13.8	5.2	15.4
Mg^{2+} (mg/L)	6.2	24.06	3.16	14.58	3.16	17.74	6.2	12.51	16.65	9.36	18.83	6.32
Cl^- (mg/L)	4.97	2.13	8.16	3.9	4.97	3.9	2.84	2.84	3.9	3.9	4.97	6.03
CO_3^{2-} (mg/L)	1.2	0	0	0	3.6	0	0	1.2	0	0	3.6	0
HCO_3^- (mg/L)	17.08	21.96	17.08	17.08	9.76	19.52	17.08	26.84	21.96	14.64	26.84	19.52
Alk-Phen(mg$CaCO_3$/L)	1	0	0	0	2.99	0	0	1	0	0	2.99	0
ALK-TOT(mg$CaCO_3$/L)	16	18	14	14	14	16	14	24	18	12	28	16
SO_4^{2-} (mg/L)	2.06	0.24	1.92	0.96	0.96	1.1	0.86	1.06	1.1	1.97	0.77	0.1
o-PO_4^{3-}-P(mg/L)	0.36	0.09	0.02	0.18	0.01	0.01	0.04	0.04	0.02	0.08	0.07	0.08
Fe(mg/L)	0.24	0.6	0.07	0.09	0.02	0.02	0.02	0.02	0.09	0.02	0.3	0.07

Based on the result of analysis the inference is as below:

1.Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1995 to May, 1996 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.

2.The value of pH is maximum (pH -8.26) for month of October, 1995 during flood period & minimum (pH -7.29) in the month of May, 1996 during flood period.

3. The value of EC is maximum (EC-120) for month of January, 1996 during lean period & minimum (EC-40.3) in the month of August, 1995 during flood period.

4. The value of TDS is maximum (TDS-356) for month of August, 1995 during flood period & minimum (TDS-72) in the month of November, 1995 during lean period.

5. The value of Turb (NTU) is maximum (Turb -4) for month of June, 1995 during flood period & minimum (Turb -2) in the month of December, 1995 during lean period.

6. The value of Na^+ is maximum (Na^+-8.51) for month of January, 1996 during lean period & minimum (Na^+-2.3) in the month of July, 1995 & August, 1995 during flood period.

7. The value of K^+ is maximum (K^+-3.91) for month of June, 1995 during flood period & minimum (K^+-0.78) in the month of April, 1996 during lean period.

8. The value of Ca^{2+} is maximum (Ca^{2+}-17.2) for month of January, 1996 during lean period & minimum (Ca^{2+}-5.2) in the month of April, 1996 during lean period.

9. The value of Mg^{2+} is maximum (Mg^{2+} -24.06) for month of July, 1995 during flood period & minimum (Mg^{2+} -3.16) for month of August, 1995 & October, 1995 during flood period.
10. The value of Cl^- is maximum (Cl^--8.16) for month of August, 1995 during flood period & minimum (Cl^--2.13) in the month of July, 1995 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -26.84) for month of January, 1996 & April, 1996 during lean period & minimum (HCO_3^- – 9.76) in the month October, 1995 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-28) for month of April, 1996 during lean period & minimum (ALK-TOT-12) in the month of March, 1995 during lean period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -2.06) for month of June, 1995 during flood period & minimum (SO_4^{2-}-0.1) in the month of May, 1996 during flood period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.36) for month of June, 1995 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of October, 1995 & November, 1995 during lean & flood period.
15. The value of Fe is maximum (Fe 0.24) for month of June, 1995 during flood period & minimum (Fe -0.02) in the month of October, 1995 to January, 1996 during lean & flood period.

Water Quality Datasheet for the Period: 1994-1995

1. Site name: Champasari

PARAMETERS	Time period (month/year)											
	06/ 1994	07/ 1994	08/ 1994	09/ 1994	10/ 1994	11/ 1994	12/ 1994	01/ 1995	02/ 1995	03/ 1995	04/ 1995	05/ 1995
PHYSICAL												
pH_GEN(pH unit)	7.35	7.58	7.75	7.68	7.69	7.65	7.88	7.99	7.54	7.64	7.14	7.65
EC_GEN(µmho/cm)	127	77.2	81.6	76.8	97.9	51	112.2	100	105	102.8	95.2	89
TDS(mg/L)	204	140	248	208	208	196	208	114	200	104	100	100
Turb(NTU)	2	9	23	16	13	1	2	1	0.9	1	1	1
CHEMICAL												
Na^+(mg/L)	10.01	3.29	3.7	2.9	6.9	5.59	3.61	5.29	5.75	2.53	6.21	7.13
K^+(mg/L)	2.7	3.6	10.09	3.21	2.42	2.82	2.62	2.78	2.39	2.7	4.69	2.35
Ca^{2+} (mg/L)	1.8	6.8	5	5.2	8.6	3.4	15.4	13.6	3.4	14	18.8	8.6
Mg^{2+} (mg/L)	2.43	1.09	6.2	3.04	8.26	7.29	16.65	19.8	13.49	4.13	12.51	10.33
Cl^- (mg/L)	4.97	4.97	4.97	9.94	3.9	5.68	7.81	4.97	5.68	4.97	3.9	2.84
NO_3^--N(mgN/L)	0	0.07	0.01	0.31	0.1	0.06	0.1	0.03	0.24	0.01	0.01	0.01
CO_3^{2-} (mg/L)	0	0	12	0	0	0	0	0	18	0	0	1.2
HCO_3^- (mg/L)	78.08	61	48.8	75.64	94.55	73.2	79.3	126.27	75.03	36.6	18.91	29.28
Alk-Phen(mg$CaCO_3$/L)	0	0	9.96	0	0	0	0	0	14.94	0	0	1
ALK-TOT(mg$CaCO_3$/L)	64	50	60	62	77.5	60	65	103.5	91.5	30	15.5	26
SO_4^{2-} (mg/L)	3.89	4.22	3.89	5.52	3.7	4.22	3.22	1.68	1.34	3.31	2.5	1.1
o-PO_4^{3-}-P(mg/L)	0.05	0.08	0.03	0.04	0.11	0.49	0.23	0.34	0.02	0.33	0.25	0.26
Fe(mg/L)	0.06	0.24	0.02	0.04	0.02	0.2	0.02	0.02	0.02	0.06	0.07	0.04

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, NO_3—N, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1994 to May, 1995 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.99) for month of January, 1995 during lean period & minimum (pH -7.14) in the month of April, 1995 during lean period.
3. The value of EC is maximum (EC-127) for month of June, 1994 during flood period & minimum (EC-51) in the month of November, 1994 during lean period.
4. The value of Na^+ is maximum (Na^+-10.01) for month of June, 1994 during flood period & minimum (Na^+-2.53) in the month of March, 1995 during lean period.
5. The value of K^+ is maximum (K^+-10.09) for month of August, 1994 during flood period & minimum (K^+-2.4) in the month of October, 1995 during flood period.
6. The value of TDS is maximum (TDS-248) for month of August, 1994 during flood period & minimum (TDS-100) in the month of May, 1995 during flood period.
7. The value of Turb (NTU) is maximum (Turb -23) for month of August, 1994 during flood period & minimum (Turb -0.2) in the month of February, 1995 during lean period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-18.8) for month of April, 1995 during lean period & minimum (Ca^{2+}-1.8) in the month of June, 1994 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -19.8) for month of January, 1995 during lean period & minimum (Mg^{2+} -1.09) for month of July, 1994 during flood period.
10. The value of Cl^- is maximum (Cl^--9.94) for month of September, 1994 during flood period & minimum (Cl^--2.84) in the month of May, 1995 during flood period.
11. The value of HCO_3^- is maximum (HCO_3^- -126.27) for month of January, 1995 during lean period & minimum (HCO_3^- – 18.91) in the month April, 1995 during lean period.
12. The value of ALK-TOT is maximum (ALK-TOT-103.5) for month of January,1995 during lean period & minimum (ALK-TOT-26) in the month of May, 1995 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -5.52) for month of September,1994 during flood period & minimum (SO_4^{2-}-1.1) in the month of May, 1995 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.49) for month of November,1994 during lean period & minimum (o-PO_4^{3-}-P -0.02) in the month of February, 1995 during lean period.
15. The value of Fe is maximum (Fe 0.24) for month of July, 1994 during flood period & minimum (Fe -0.02) in the month of August, 1994 during flood period.

2. Site name: Matigara

PARAMETERS	Time period (month/year)											
	06/ 1994	07/ 1994	08/ 1994	09/ 1994	10/ 1994	11/ 1994	12/ 1994	01/ 1995	02/ 1995	03/ 1995	04/ 1995	05/ 1995
PHYSICAL												
pH_GEN(pH unit)	7.31	7.11	7.62	7.98	7.47	7.55	7.8	7.81	7.4	7.61	7.95	7.2
EC_GEN(µmho/cm)	52.4	60.1	54.4	52.8	48.9	86.7	81.6	88.3	70.6	58.7	45.3	97.9
TDS(mg/L)	135	156	104	44	44	76	142	200	172	128	136	160
Turb(NTU)	3	5	2	4	1	1	2	0.8	1	1	1	1

CHEMICAL												
Na^+ (mg/L)	8.21	4	4.39	3.2	6.21	5.59	2.69	5.52	5.75	2.76	5.29	4.83
K^+ (mg/L)	2.5	1.99	1.99	1.6	1.99	2.31	2.11	2.27	2.19	2.27	3.52	1.56
Ca^{2+} (mg/L)	1.8	5	8.6	8.6	8.6	5.2	10.2	5.2	3.4	6.8	6.8	6.8
Mg^{2+} (mg/L)	5.22	4.13	0.97	15.67	7.29	26.12	5.22	16.65	6.2	11.42	14.58	20.66
Cl^- (mg/L)	6.03	8.16	8.16	12.78	7.81	5.68	6.74	3.9	4.97	4.97	3.9	4.97
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	2.4	0	0	0
HCO_3^- (mg/L)	26.84	48.8	36.6	48.8	50.63	97.6	48.8	48.8	53.68	21.35	12.2	9.76
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	1.99	0	0	0
ALK-TOT(mg$CaCO_3$/L)	22	40	30	40	41.5	80	40	40	48	17.5	10	8
SO_4^{2-} (mg/L)	1.73	2.02	3.22	2.3	3.31	1.1	3.22	1.06	1.3	2.16	2.5	0.77
o-PO_4^{3-}-P(mg/L)	0.71	0.05	0.02	0.03	0.98	0.39	0.53	0.02	0.09	0.32	0.25	0.41
Fe(mg/L)	0.04	0.02	0.02	0.04	0.04	0.06	0.02	0.15	0.02	0.04	0.09	0.07

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1994 to May, 1995 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) for month of September, 1994 during flood period & minimum (pH -7.1) in the month of July, 1994 during flood period.
3. The value of EC is maximum (EC-98) for month of May,1995 during flood period & minimum (EC-45) in the month of April, 1995 during lean period.
4. The value of TDS is maximum (TDS-200) for month of January, 1995 during lean period & minimum (TDS-44) in the month of September, 1994 during flood period.
5. The value of Turb (NTU) is maximum (Turb -5) for month of July, 1994 during flood period & minimum (Turb -0.8) in the month of January, 1995 during lean period.
6. The value of Na^+ is maximum (Na^+-8.21) for month of June, 1994 during lean period & minimum (Na^+-2.76) in the month of March, 1994 during flood period.
7. The value of K^+ is maximum (K^+-3.52) for month of April, 1995 during lean period & minimum (K^+-1.56) in the month of May, 1995 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-10.2) for month of December, 1994 during lean period & minimum (Ca^{2+}-1.8) in the month of June, 1994 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -26.12) for month of November, 1994 during lean period & minimum (Mg^{2+} -0.97) for month of August, 1994 during flood period.
10. The value of Cl^- is maximum (Cl^--12.78) for month of September, 1994 during flood period & minimum (Cl^--3.9) in the month of January,1995 & April, 1995 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -97.6) for month of November, 1994 during lean period & minimum (HCO_3^- – 9.76) in the month May, 1995 during flood period.
12. The value of ALK-TOT is maximum (ALK-TOT-80) for month of November, 1994 during lean period & minimum (ALK-TOT-8) in the month of May, 1995 during flood period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} – 3.22) for month of August, 1994 during flood period & minimum (SO_4^{2-}-0.77) in the month of May, 1995 during flood period.

14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.98) for month of October, 1994 during flood period & minimum (o-PO_4^{3-}-P -0.02) in the month of January, 1995 during lean period.
15. The value of Fe is maximum (Fe 0.15) for month of January, 1995 during lean period & minimum (Fe -0.02) in the month of July, 1994, during flood period.

3. Site name: Sonapur

PARAMETERS	Time period (month/year)											
	06/ 1994	07/ 1994	08/ 1994	09/ 1994	10/ 1994	11/ 1994	12/ 1994	01/ 1995	02/ 1995	03/ 1995	04/ 1995	05/ 1995
PHYSICAL												
pH_GEN(pH unit)	7.35	6.93	7.69	7.72	7.52	7.66	7.89	7.38	7.38	7.62	7.05	7.75
EC_GEN(µmho/cm)	87.3	69.1	72.6	62.4	73.2	81.6	192.1	82.36	94.2	93	81.6	75.6
TDS(mg/L)	168	184	276	272	268	210	82	180	124	96	112	320
Turb(NTU)	3	11	19	3	4	2	2	0.8	0.9	0.6	1	1
CHEMICAL												
Na^+ (mg/L)	10.01	4.21	3.7	5.8	8.6	6.39	4.09	6.9	6.44	5.29	10.35	9.89
K^+ (mg/L)	4.3	3.09	2.82	2.31	2.82	3.32	3.52	3.4	3.09	3.68	5.08	2.74
Ca^{2+} (mg/L)	3.4	10.2	3.4	8.6	17.2	8.6	13.6	12	8.6	14	16.6	8.6
Mg^{2+} (mg/L)	9.48	2.07	7.29	5.1	1.09	23.94	3.64	8.26	7.29	14.58	37.54	10.33
Cl^- (mg/L)	8.88	6.03	8.88	12.78	5.68	2.84	5.68	3.9	3.9	5.68	2.84	4.97
CO_3^{2-} (mg/L)	0	0	0	0	0	0	0	0	4.8	0	0	1.2
HCO_3^- (mg/L)	46.36	53.68	29.28	56.12	67.71	91.5	90.28	73.2	46.36	21.35	31.11	21.96
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0	0	0	0	0	3.98	0	0	1
ALK-TOT(mg$CaCO_3$/L)	38	44	24	46	55.5	75	74	60	46	17.5	25.5	20
o-PO_4^{3-}-P(mg/L)	0.08	0.09	0.05	0.03	0.33	0.56	0.08	0.01	0.01	0.42	0.45	0.32
SO_4^{2-} (mg/L)	4.22	4.32	2.69	1.68	3.12	3.98	2.78	1.49	1.58	3.17	0.1	1.15
Fe(mg/L)	0.02	0.22	0.02	0.04	0.02	0.11	0.02	0.07	0.02	0.02	0.11	0.02

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from June, 1994 to May, 1995 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.89) for month of December, 1994 during lean period & minimum (pH -6.93) in the month of July, 1994 during flood period.
3. The value of EC is maximum (EC-192.1) for month of December, 1994 during lean period & minimum (EC-62.4) in the month of September, 1994 during flood period.
4. The value of TDS is maximum (TDS-320) for month of May, 1995 during flood period & minimum (TDS-82) in the month of December, 1994 during lean period.
5. The value of Turb (NTU) is maximum (Turb -19) for month of August, 1994 during flood period & minimum (Turb -0.6) in the month of March, 1995 during lean period.
6. The value of Na^+ is maximum (Na^+-10.35) for month of April, 1995 during lean period & minimum (Na^+-3.7) in the month of August, 1994 during flood period.

7. The value of K^+ is maximum (K^+-5.08) for month of April, 1995 during lean period & minimum (K^+-2.31) in the month of September, 1994 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-17.2) for month of October, 1994 during flood period & minimum (Ca^{2+}-3.4) in the month of June, 1994 & august, 1994 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -37.54) for month of April, 1995 during lean period & minimum (Mg^{2+} -1.09) for month of October, 1994 during flood period.
10. The value of Cl^- is maximum (Cl^--12.78) for month of September, 1994 during flood period & minimum (Cl^--2.84) in the month of November, 1994 & April, 1995 during lean period.
11. The value of HCO_3^- is maximum (HCO_3^- -91.5) for month of November, 1994 during lean period & minimum (HCO_3^- – 21.35) in the month March, 1995 during lean period.
12. The value of ALK-TOT is maximum (ALK-TOT-75) for month of November, 1994 during lean period & minimum (ALK-TOT-17.5) in the month of March, 1995 during lean period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} - 4.32) for month of July, 1994 during flood period & minimum (SO_4^{2-}-0.1) in the month of April, 1995 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -0.56) for month of November, 1994 during lean period & minimum (o-PO_4^{3-}-P -0.01) in the month of January, 1995 & February, 1995 during lean period.
15. The value of Fe is maximum (Fe 0.22) for month of July, 1994 during flood period & minimum (Fe -0.02) in the month of December, 1994, February, 1995& March, 1995 during lean period.

Water Quality Datasheet for the Period: 1994

1. Site name: Champasari

PARAMETERS	Time period (month/year)			
	02/1994	03/1994	04/1994	05/1994
PHYSICAL				
pH_GEN(pH unit)	7.62	7.1	6.91	7.49
EC_GEN(µmho/cm)	102	100.8	195.8	127.3
TDS(mg/L)	208	100	162	160
Turb(NTU)	7	3	2	3
CHEMICAL				
Na^+ (mg/L)	3.4	7.22	8.21	8
K^+ (mg/L)	2.5	28.15	3.21	2.19
Ca^{2+} (mg/L)	6.8	3.4	7	10.2
Mg^{2+} (mg/L)	4.13	10.45	9.72	6.2
Cl^- (mg/L)	8.16	14.2	8.16	4.97
NO_3^--N(mgN/L)	0.29	0.2	0.28	0.06
CO_3^{2-} (mg/L)	0	0	0	0
HCO_3^- (mg/L)	19.52	48.8	17.08	82.96
Alk-Phen(mg$CaCO_3$/L)	0	0	0	0
ALK-TOT(mg$CaCO_3$/L)	16	40	14	68
SO_4^{2-} (mg/L)	1.92	7.39	18.38	15.02

o-PO_4^{3-}-P(mg/L)	0.2	0.09	0.12	3.27
Fe(mg/L)	0.24	0.71	0.32	0.19

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, NO_3—N, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from February, 1994 to May, 1994 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.6) for month of February, 1994 during lean period & minimum (pH -6.9) in the month of April, 1994 during lean period.
3. The value of EC maximum (EC-195.8) for month of April,1994 during lean period & minimum (EC-59.4) in the month of March, 1994 during lean period.
4. The value of TDS is maximum (TDS-208) for month of February, 1994 during lean period & minimum (TDS-100) in the month of March,1994 during lean period.
5. The value of Turb (NTU) is maximum (Turb -7) for month of February, 1994 during lean period & minimum (Turb -2) in the month of April,1994 during lean period.
6. The value of Na^+ is maximum (Na^+-8.2) for month of April, 1994 during lean period & minimum (Na^+-3.4) in the month of February, 1994 during lean period.
7. The value of K^+ is maximum (K^+-28.15) for month of March,1994 during lean period & minimum (K^+-2.19) in the month of May, 1994 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-10.2) for month of May, 1994 during lean period & minimum (Ca^{2+}-3.4) in the month of March,1994 during lean period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -10.4) for month of March,1994 during flood period & minimum (Mg^{2+} -4.1) for month of February, 1994 during lean period.
10. The value of Cl^- is maximum (Cl^--14.2) for month of March,1994 during lean period & minimum (Cl^--4.9) in the month of May, 1994 during flood period
11. The value of HCO_3^- is maximum (HCO_3^- -82.96) for month of May, 1994 during flood period & minimum (HCO_3^- – 17.08) in the month April,1994 during lean period.
12. The value of ALK-TOT is maximum (ALK-TOT-68) for month of May, 1994 during flood period & minimum (ALK-TOT-14) in the month of April, 1994 during lean period.
13. The value of SO_4^{2-} is maximum (SO_4^{2-} -18.38) for month of April, 1994 during lean period & minimum (SO_4^{2-}-1.92) in the month of February, 1994 during lean period.
14. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -3.27) for month of May, 1994 during flood period & minimum (o-PO_4^{3-}-P -0.09) in the month of March,1994 during lean period.
15. The value of Fe is maximum (Fe 0.71) for month of March, 1994 during lean period & minimum (Fe -0.19) in the month of May, 1994 during flood period.
16. The value of NO_3^--N(mgN/L) is maximum (NO_3^--N -0.29) for month of February, 1994 during lean period & minimum (NO_3^--N -0.06) in the month of May,1994 during flood period.

2. Matigara: 1994

PARAMETERS	Time period (month/year)			
	02/1994	03/1994	04/1994	05/1994

pH_GEN(pH unit)	7.78	6.95	7.97	7.76
EC_GEN(µmho/cm)	65	67.2	73.4	75.7
PHYSICAL				
TDS(mg/L)	160	86	86	200
Turb(NTU)	1	2	3	2
CHEMICAL				
Na^+ (mg/L)	2.39	5.29	7.11	4.6
K^+ (mg/L)	1.72	2.5	2.7	1.49
Ca^{2+} (mg/L)	6.8	13.8	5.2	1.4
Mg^{2+} (mg/L)	17.37	3.16	1.22	4.13
Cl^- (mg/L)	11.01	6.03	2.84	6.03
CO_3^{2-} (mg/L)	0	4.8	2.4	0
HCO_3^- (mg/L)	34.16	34.16	34.16	43.92
Alk-Phen(mg$CaCO_3$/L)	0	3.98	1.99	0
ALK-TOT(mg$CaCO_3$/L)	28	36	32	36
SO_4^{2-} (mg/L)	7.39	1.82	10.7	10.61
o-PO_4^{3-}-P(mg/L)	0.04	0.07	0.07	0.28
Fe(mg/L)	0.24	0.25	0.09	0.19

Based on the result of analysis the inference is as below:

1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from February, 1994 to May, 1994 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) for month of April, 1994 during lean period & minimum (pH -6.9) in the month of March 1994 during lean period.
3. The value of EC is maximum (EC-76.2) for month of May,1994 during lean period & minimum (EC-63) in the month of February, 1994 during lean period.
4. The value of TDS is maximum (TDS-204) for month of March,1994 during lean period & minimum (TDS-86) in the month of March during lean period.
5. The value of Turb (NTU) is maximum (Turb -3) for month of April, 1994 during lean period & minimum (Turb -1) in the month of February, 1994 during lean period.
6. The value of Na^+ is maximum (Na^+-8) for month of March, 1994 during lean period & minimum (Na^+-2.3) in the month of February, 1994 during lean period.
7. The value of K^+ is maximum (K^+-6.3) for month of March,1994 during lean period & minimum (K^+-1.4) in the month of May, 1994 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-13.8) for month of March, 1994 during lean period & minimum (Ca^{2+}-1.4) in the month of May, 1994 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -17.37) for month of February, 1994 during lean period & minimum (Mg^{2+} -1.09) for month of May, 1994 during lean period.
10. The value of Cl^- is maximum (Cl^--13.85) for month of February,1994 during lean period & minimum (Cl^--2.84) in the month of April, 1994 during flood period.
11. The value of CO_3^{2-} is maximum (CO_3^{2-}-3.6) for month of April, 1994 during lean period & minimum (CO_3^{2-} – 0.0) in the month March,1994 during lean period.

12. The value of HCO_3^- is maximum (HCO_3^- 65.88) for month of April,1994 during lean period & minimum (HCO_3^- – 19.52) in the month February,1994 during lean period.
13. The value of ALK-TOT is maximum (ALK-TOT-60) for month of April, 1994 during flood period & minimum (ALK-TOT-16) in the month of February,1994 during lean period.
14. The value of SO_4^{2-} is maximum (SO_4^{2-} -10.7) for month of April,1994 during lean period & minimum (SO_4^{2-}-1.82) in the month of March, 1994 during lean period.
15. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -1.41) for month of April, 1994 during flood period & minimum (o-PO_4^{3-}-P -0.04) in the month of February,1994 during lean period.
16. The value of Fe is maximum (Fe 0.56) for month of May, 1994 during lean period & minimum (Fe -0.07) in the month of April, 1994 during flood period.

3. Site name: Sonapur

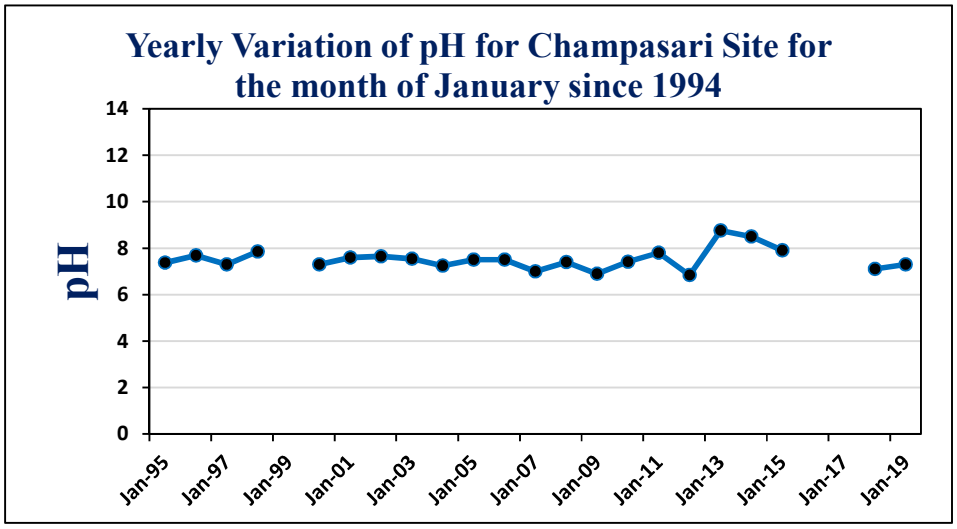
PARAMETERS	Time period (month/year)			
	02/1994	03/1994	04/1994	05/1994
PHYSICAL				
pH_GEN(pH unit)	7.88	7.3	7.46	7.71
EC_GEN(µmho/cm)	89.4	100.8	156.6	97.9
TDS(mg/L)	140	200	196	160
Turb(NTU)	1	3	2	2
CHEMICAL				
Na^+ (mg/L)	3.4	8	6.39	10.01
K^+ (mg/L)	2.5	4.81	6.1	2.31
Ca^{2+} (mg/L)	5.2	10.4	15.6	8.6
Mg^{2+} (mg/L)	7.29	3.16	4.86	2.07
Cl^- (mg/L)	11.01	6.03	6.03	6.03
CO_3^{2-} (mg/L)	0	4.8	1.2	0
HCO_3^- (mg/L)	31.72	51.24	73.2	61
Alk-Phen(mg$CaCO_3$/L)	0	3.98	1	0
ALK-TOT(mg$CaCO_3$/L)	26	50	62	50
SO_4^{2-} (mg/L)	3.41	1.82	1.18	6
o-PO_4^{3-}-P(mg/L)	0.13	0.06	0.12	2.65
Fe(mg/L)	0.24	0.17	0.06	0.19

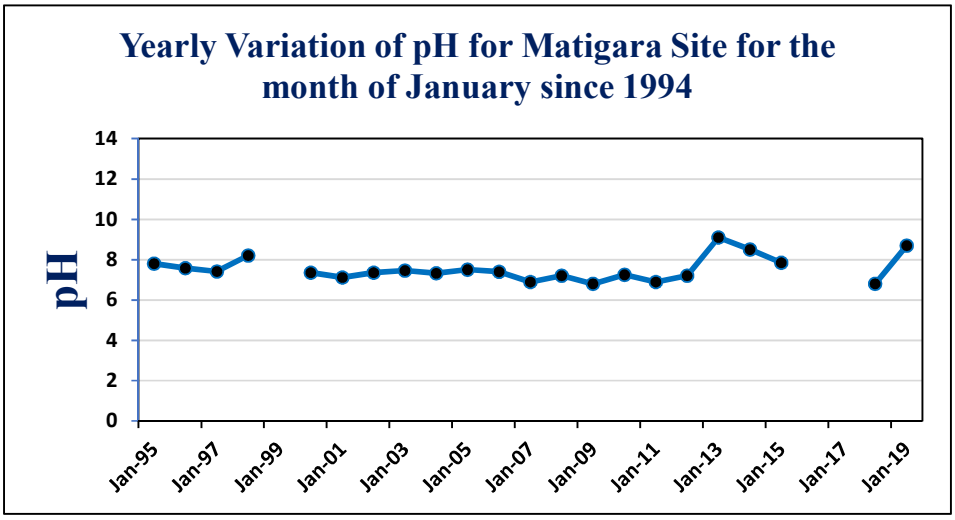
Based on the result of analysis the inference is as below:

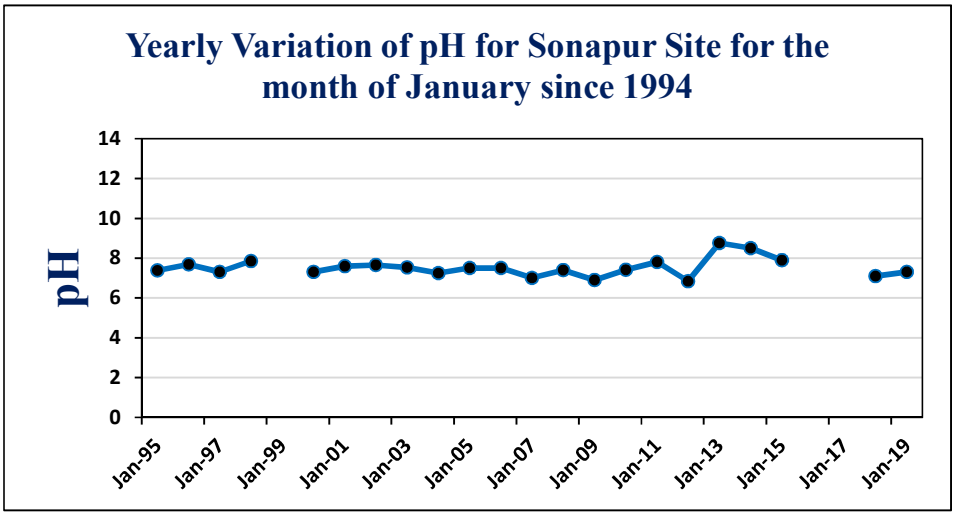
1. Parameters pH, EC, TDS, Turbidity, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, CO_3^{2-}, HCO_3^-, Alk-Phen, ALK-TOT, SO_4^{2-}, o-PO_4^{3-}-P, Fe for the period from February, 1994 to May, 1994 are within the tolerance limit for drinking water, Fish culture, wild life propagation, irrigation, industrial cooling or controlled waste disposal.
2. The value of pH is maximum (pH -7.9) for month of February, 1994 during lean period & minimum (pH -7.3) in the month of March 1994 during lean period.
3. The value of EC is maximum (EC-156.6) for month of April,1994 during lean period & minimum (EC-88.1) in the month of March, 1994 during lean period.
4. The value of TDS is maximum (TDS-260) for month of April,1994 during lean period & minimum (TDS-100) in the month of February, during lean period.

5. The value of Turb (NTU) for is maximum (Turb -3) for month of March, 1994 during lean period & minimum (Turb -1) in the month of February, 1994 during lean period.
6. The value of Na^+ is maximum (Na^+-10.01) for month of May, 1994 during lean period & minimum (Na^+-3.4) in the month of February, 1994 during lean period.
7. The value of K^+ is maximum (K^+-6.1) for month of April,1994 during lean period & minimum (K^+-1.92) in the month of May, 1994 during flood period.
8. The value of Ca^{2+} is maximum (Ca^{2+}-15.6) for month of April, 1994 during lean period & minimum (Ca^{2+}-5.2) in the month of May,1994 during flood period.
9. The value of Mg^{2+} is maximum (Mg^{2+} -7.2) for month of February, 1994 during lean period & minimum (Mg^{2+} -3.1) for month of March, 1994 during lean period.
10. The value of Cl^- is maximum (Cl^--13.85) for month of February,1994 during lean period & minimum (Cl^--4.9) in the month of April, 1994 during flood period.
11. The value of CO_3^{2-} is maximum (CO_3^{2-} -4.8) for month of February, 1994 during lean period & minimum (CO_3^{2-} – 0.0) in the month March,1994 during lean period.
12. The value of HCO_3^- is maximum (HCO_3^- 75.64) for month of April,1994 during lean period & minimum (HCO_3^- – 17.08) in the month February,1994 during lean period.
13. The value of ALK-TOT is maximum (ALK-TOT-62) for month of April, 1994 during flood period & minimum (ALK-TOT-22) in the month of February,1994 during lean period.
14. The value of SO_4^{2-} is maximum (SO_4^{2-} -7.39) for month of February, 1994 during lean period & minimum (SO_4^{2-}-0.82) in the month of March, 1994 during lean period.
15. The value of o-PO_4^{3-}-P is maximum (o-PO_4^{3-}-P -2.65) for month of May, 1994 during flood period & minimum (o-PO_4^{3-}-P -0.06) in the month of March,1994 during lean period.
16. The value of Fe is maximum (Fe 0.24) for month of February, 1994 during lean period & minimum (Fe -0.06) in the month of April, 1994 during flood period.

Yearly Variation of pH for Champasari, Matigara and Sonapur Site for the month of January since 1994







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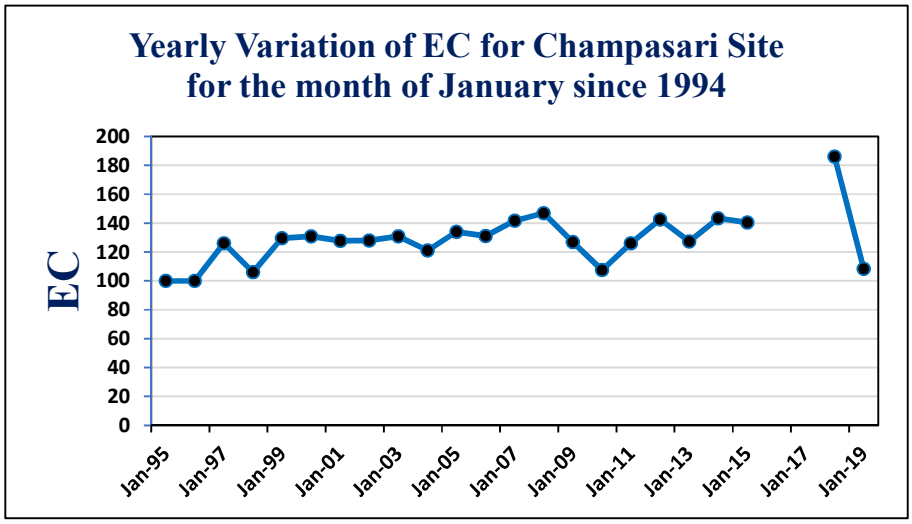
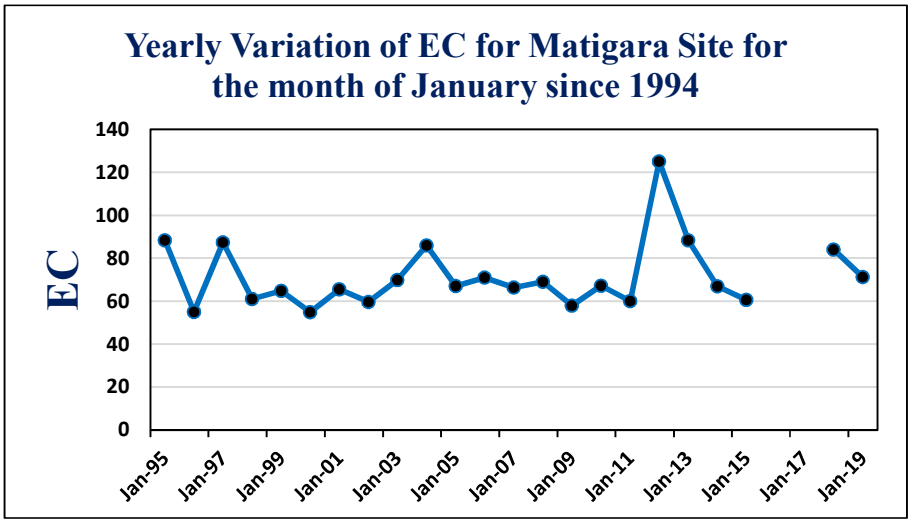
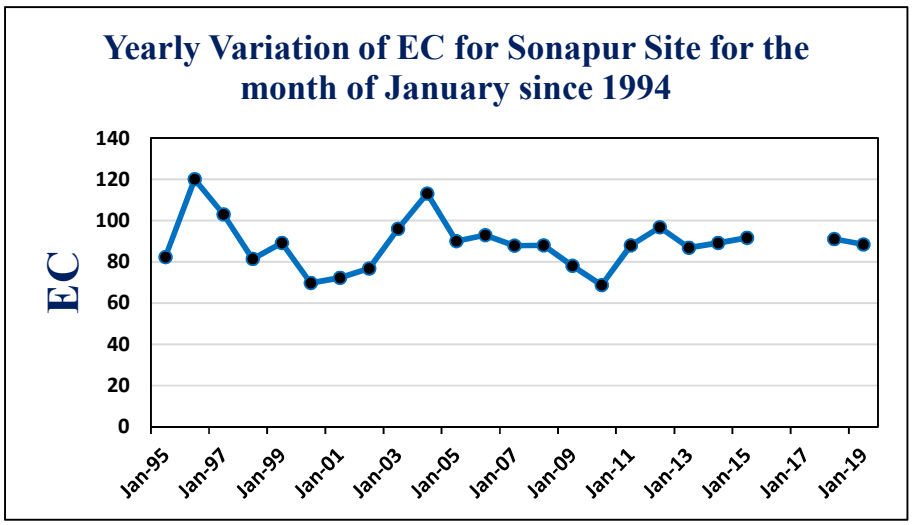
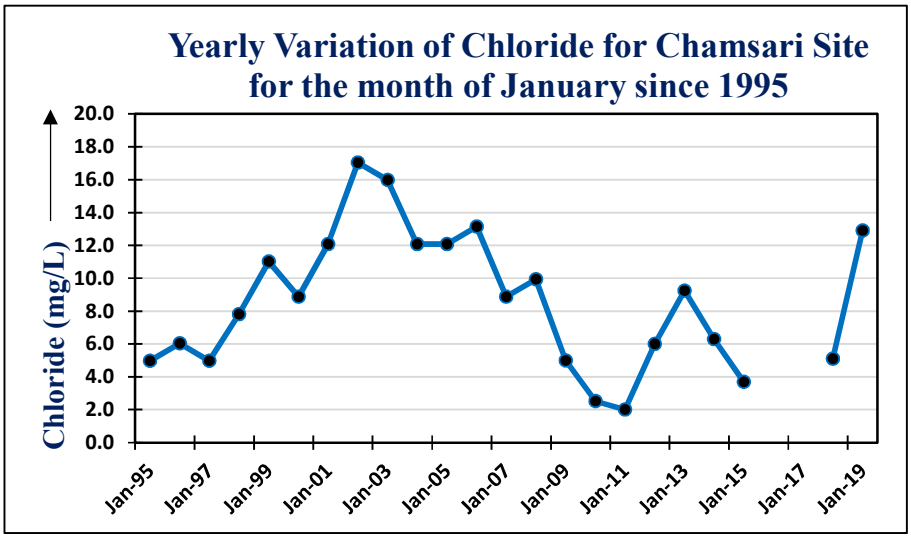
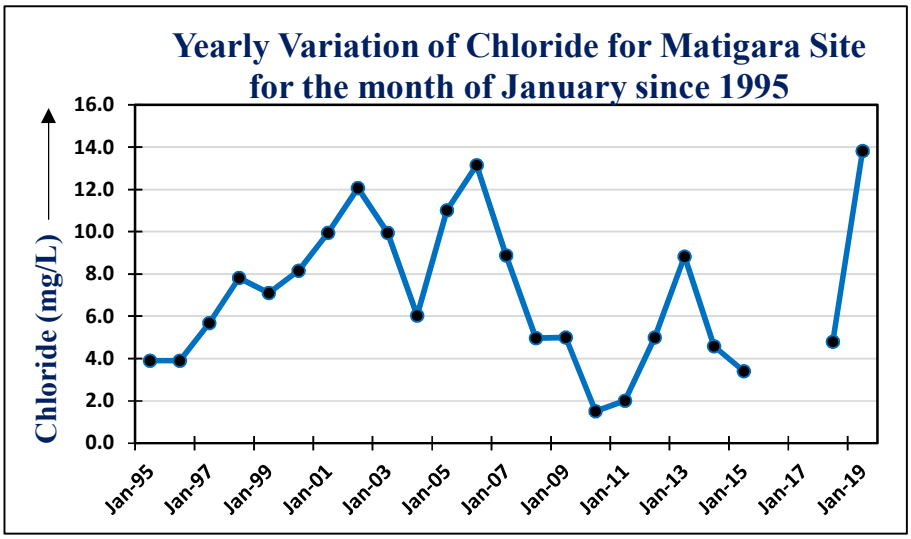


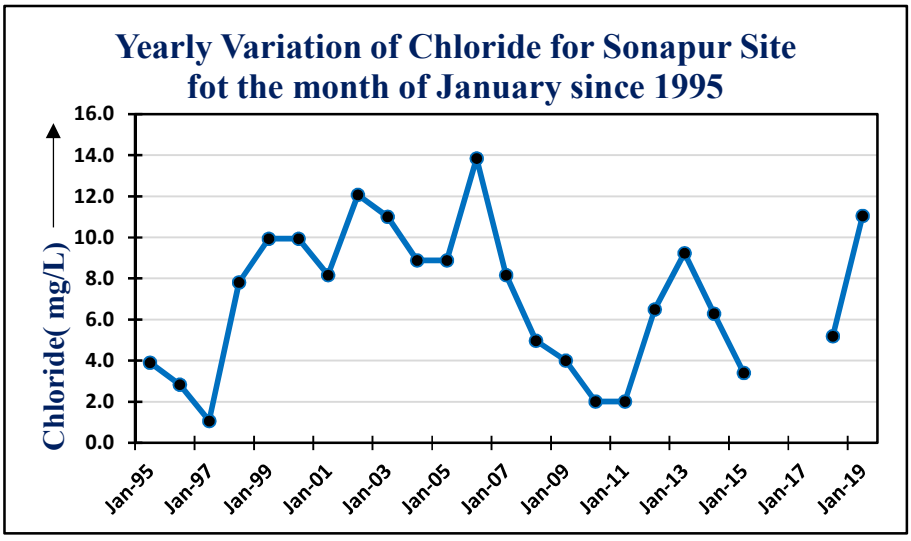




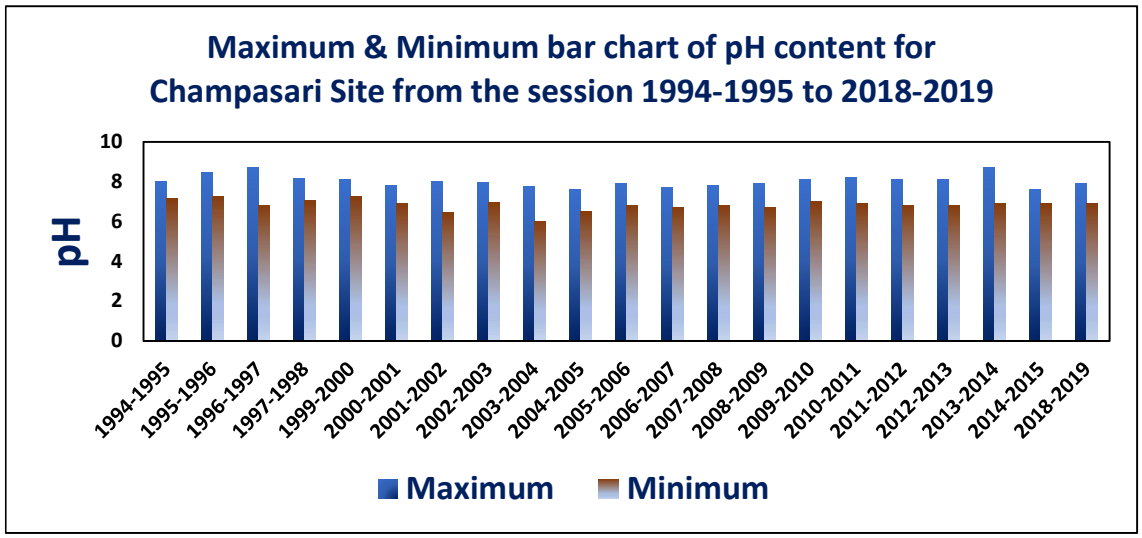
Yearly Variation of Chloride content for Champasari, Matigara and Sonapur Site for the month of January since 1994

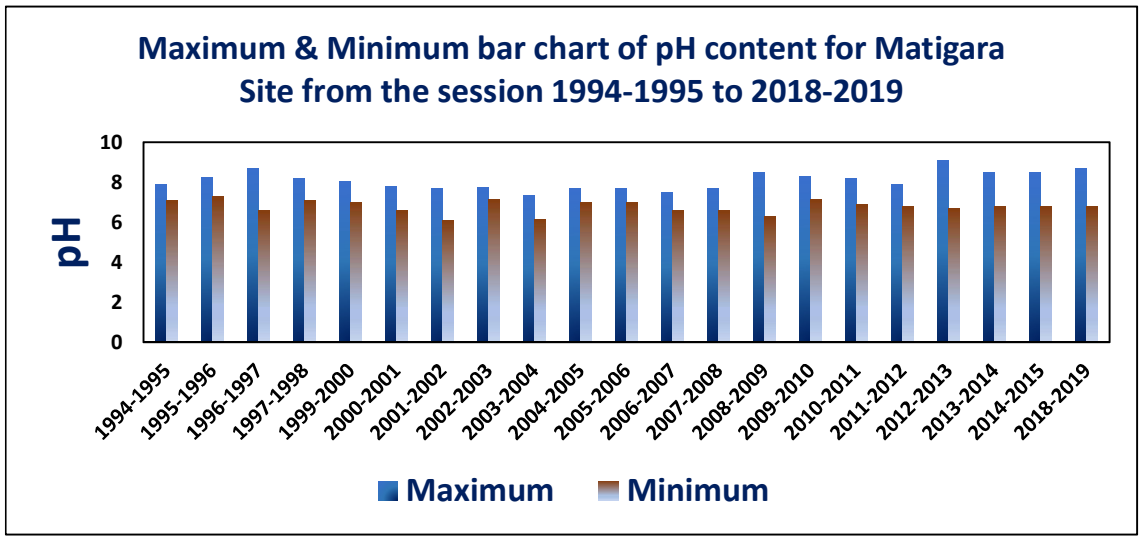


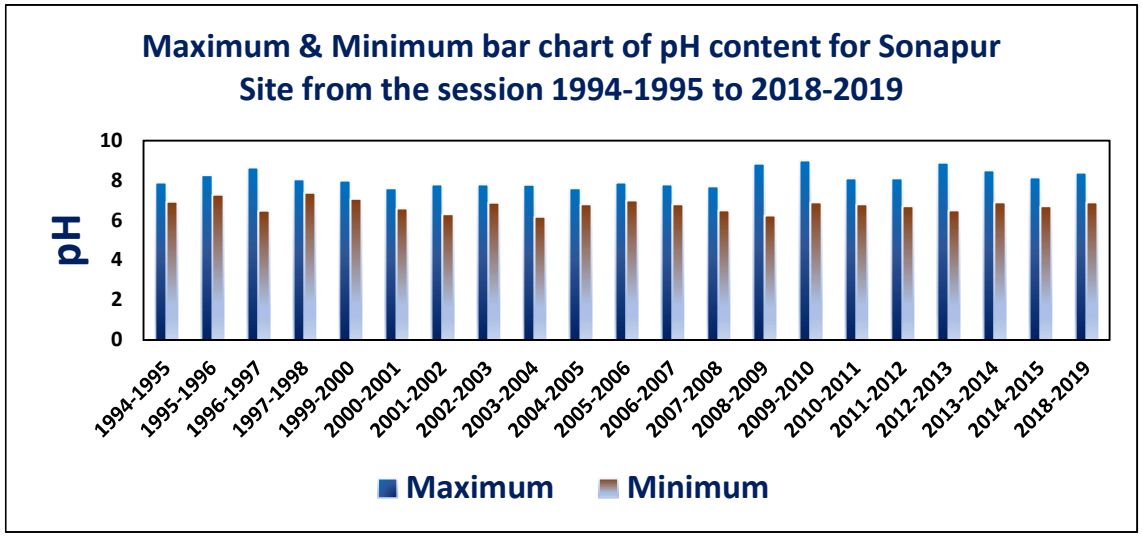




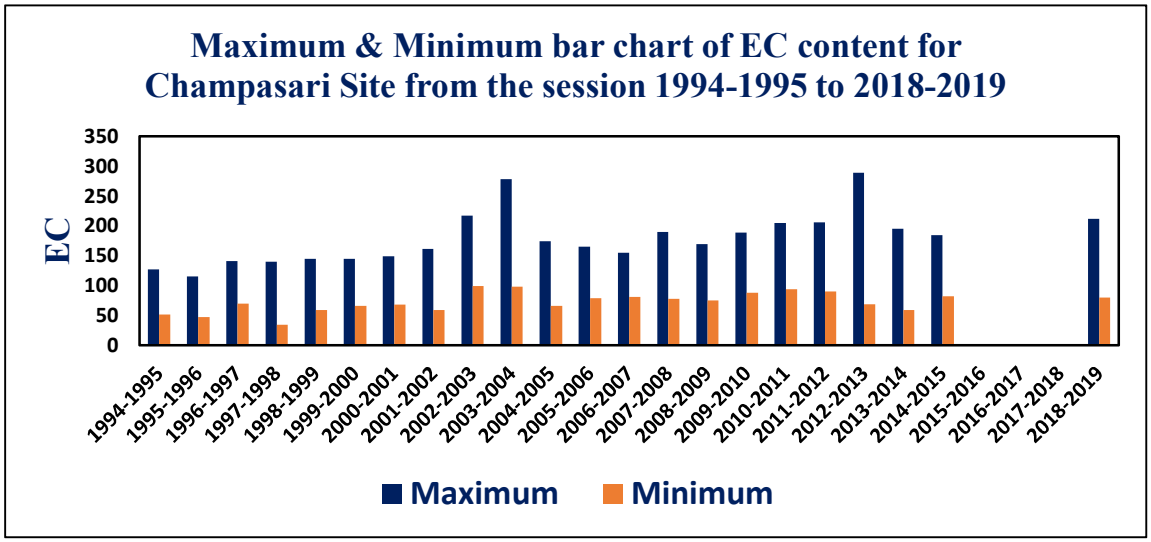
Maximum & Minimum bar chart of pH content for Champasari, Matigara and Sonapur Site from the session 1994-1995 to 2018-2019

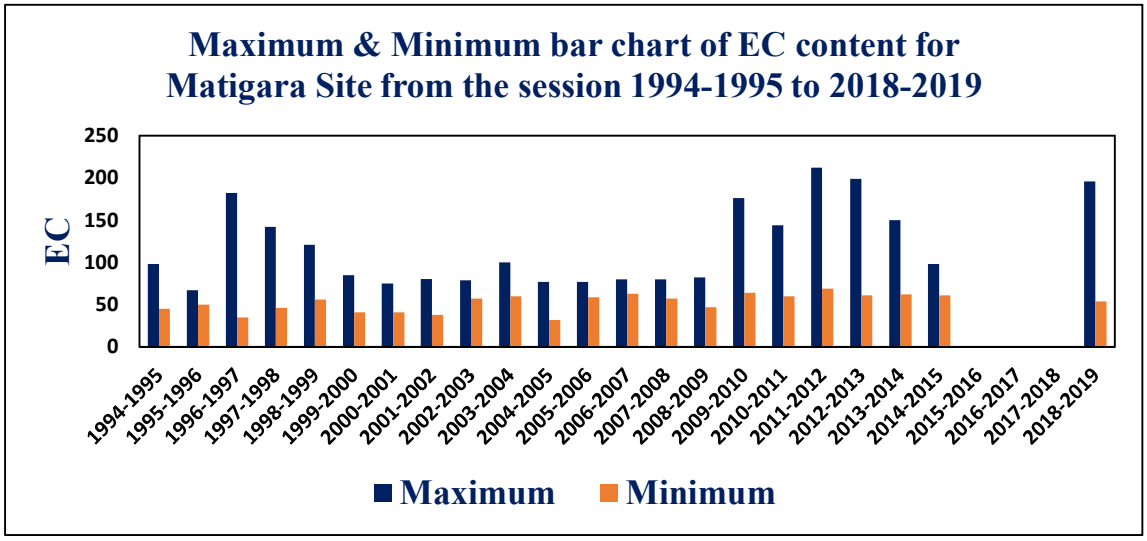


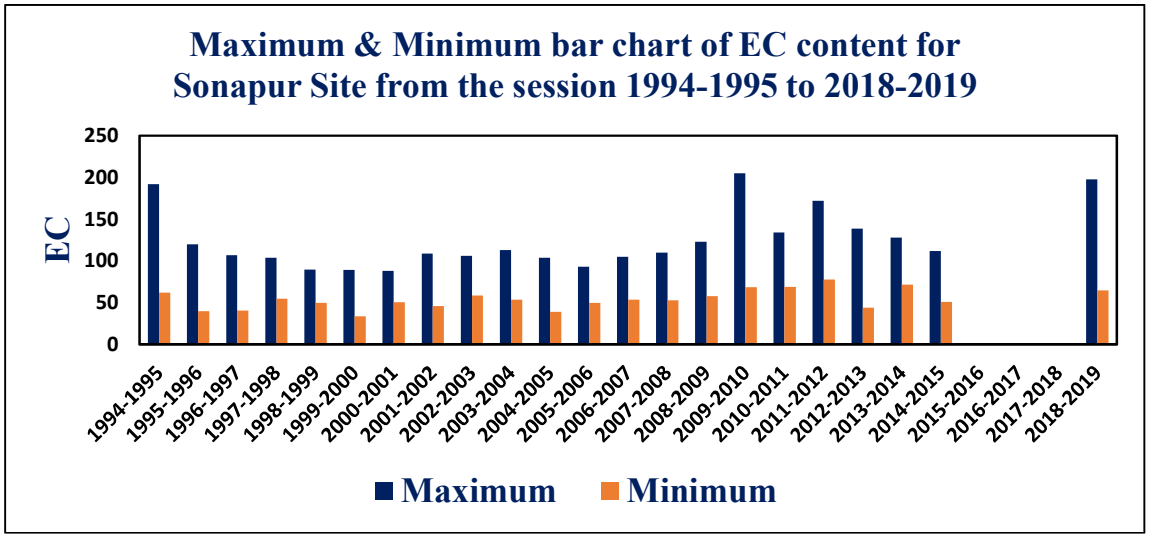




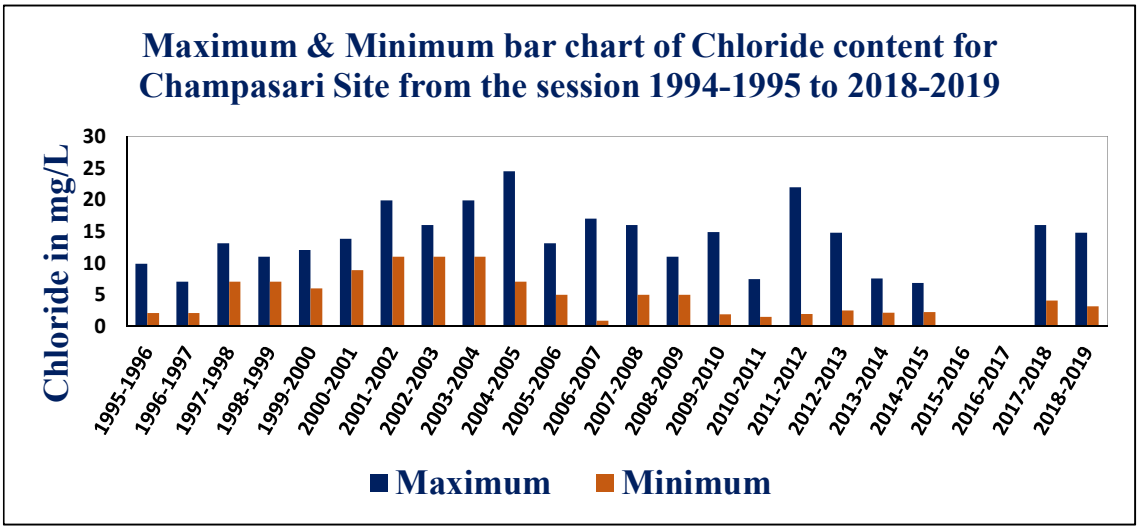
Maximum & Minimum bar chart of EC content for Champasari, Matigara and Sonapur Site from the session 1994-1995 to 2018-2019

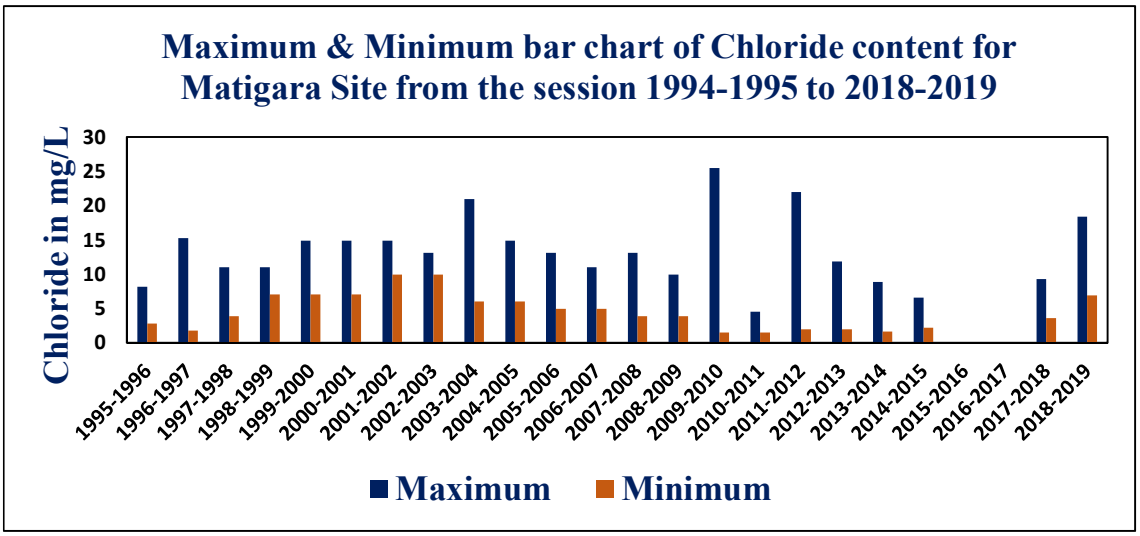


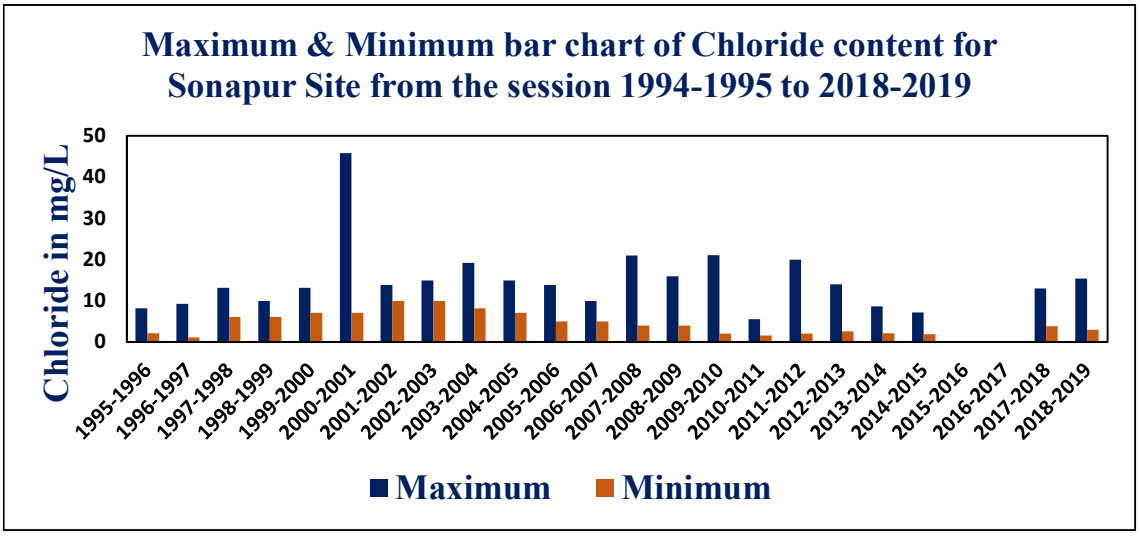




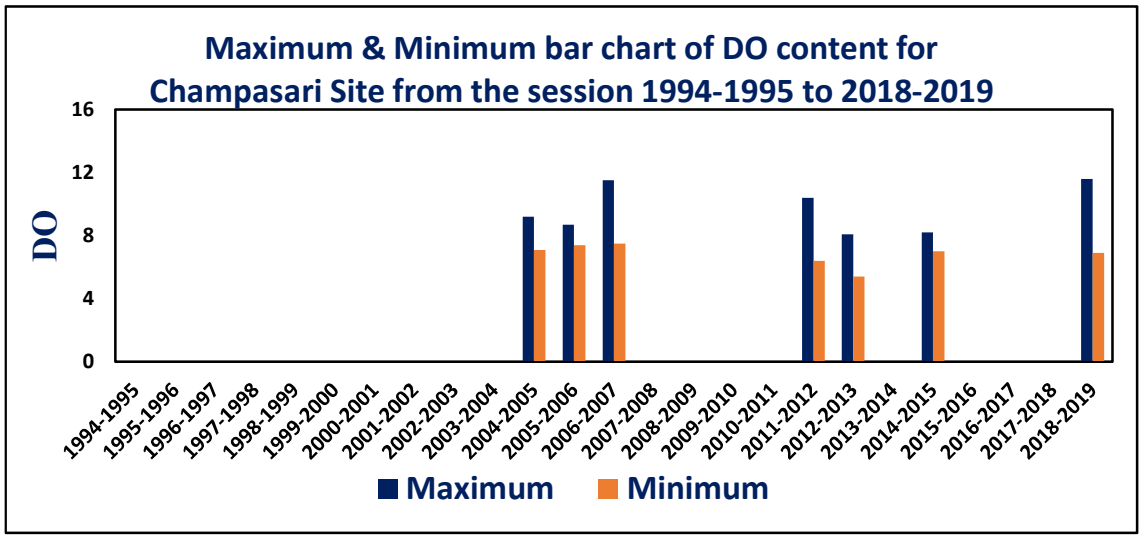
Maximum & Minimum bar chart of Chloride content for Champasari, Matigara and Sonapur Site from the session 1994-1995 to 2018-2019

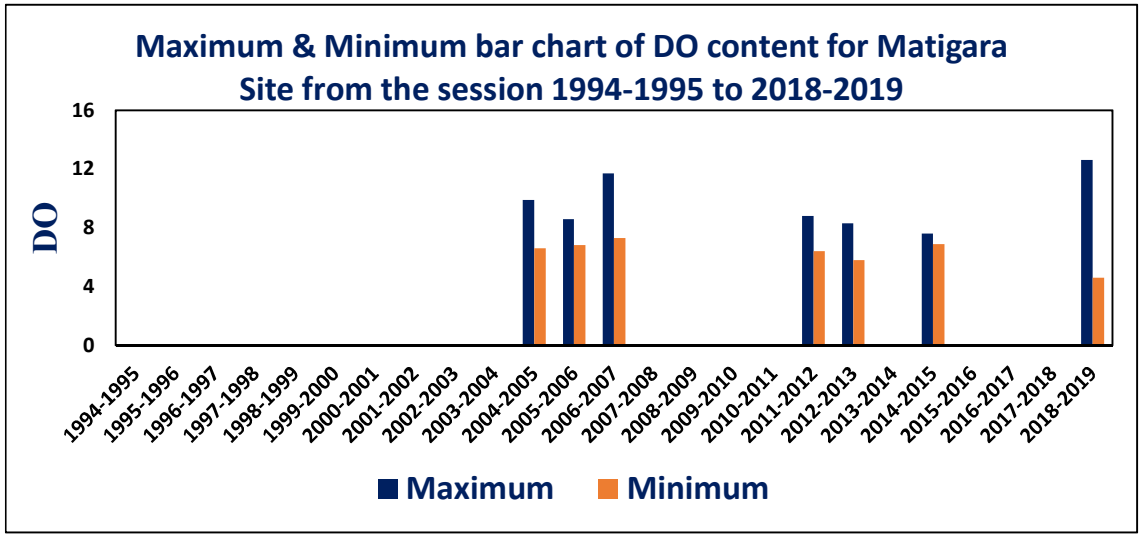


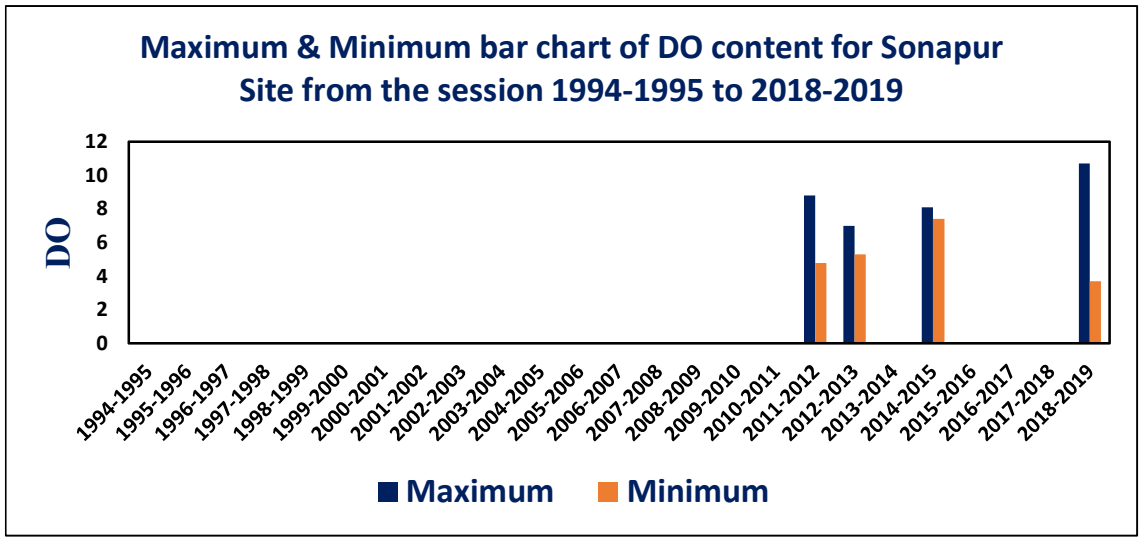




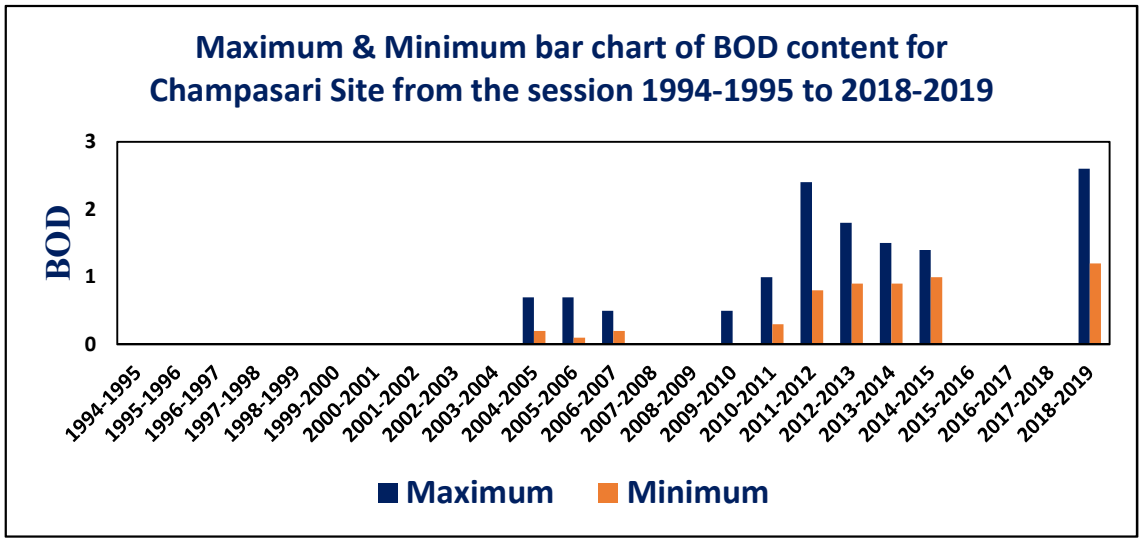
Maximum & Minimum bar chart of DO content for Champasari, Matigara and Sonapur Site from the session 1994-1995 to 2018-2019

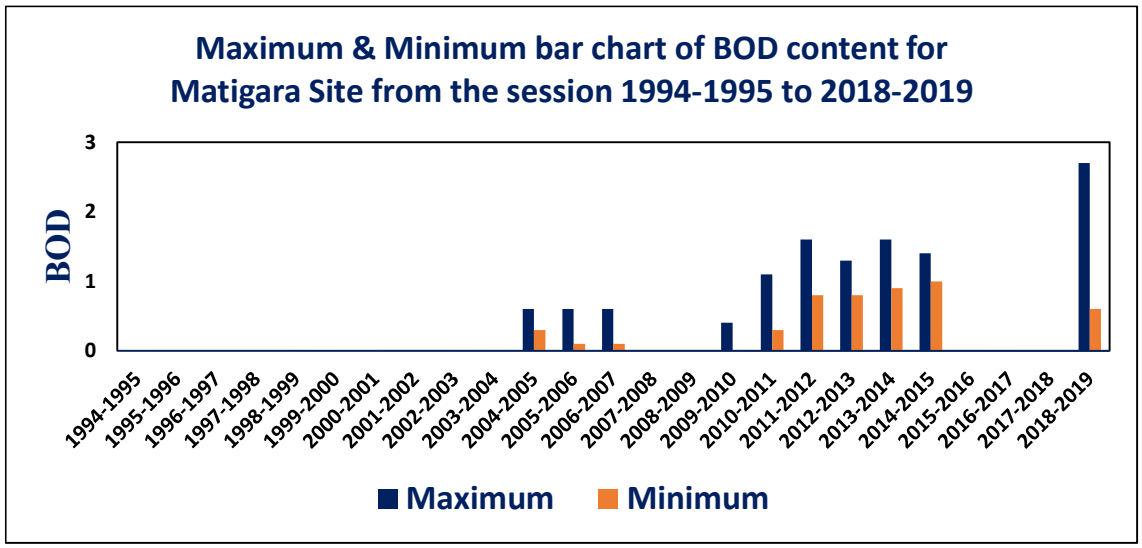


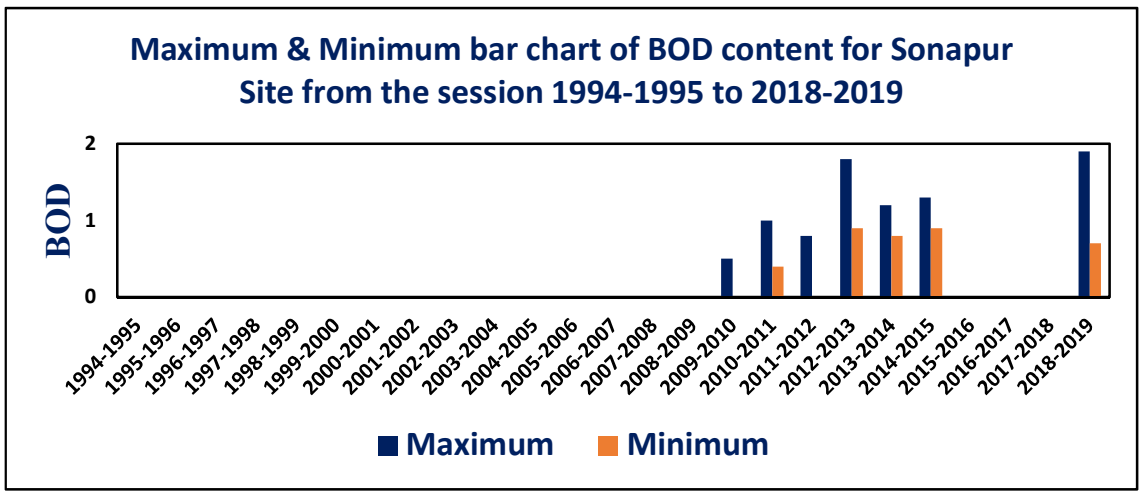




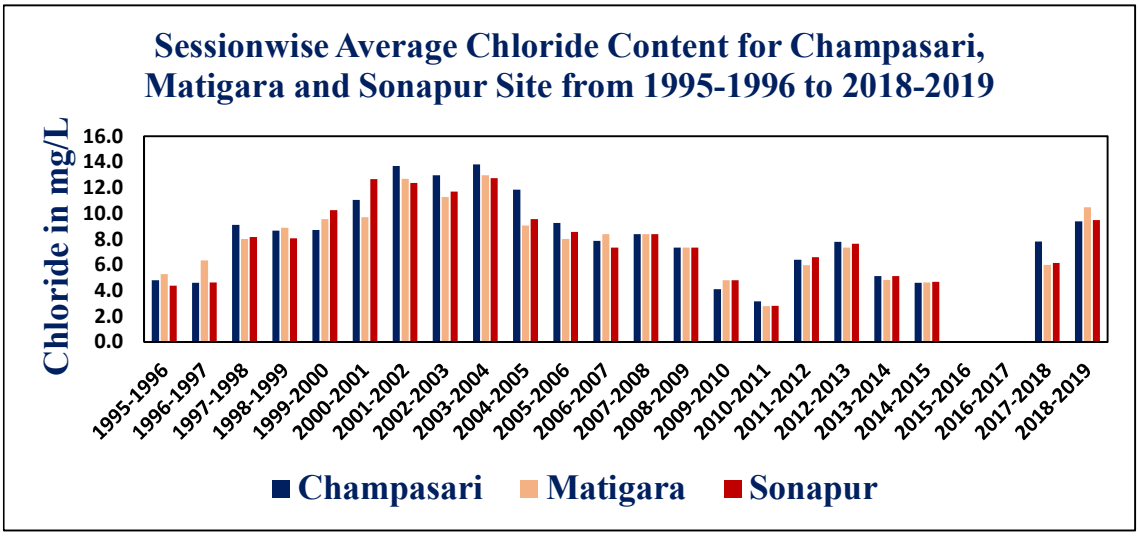
Maximum & Minimum bar chart of BOD content for Champasari, Matigara and Sonapur Site from the session 1994-1995 to 2018-2019

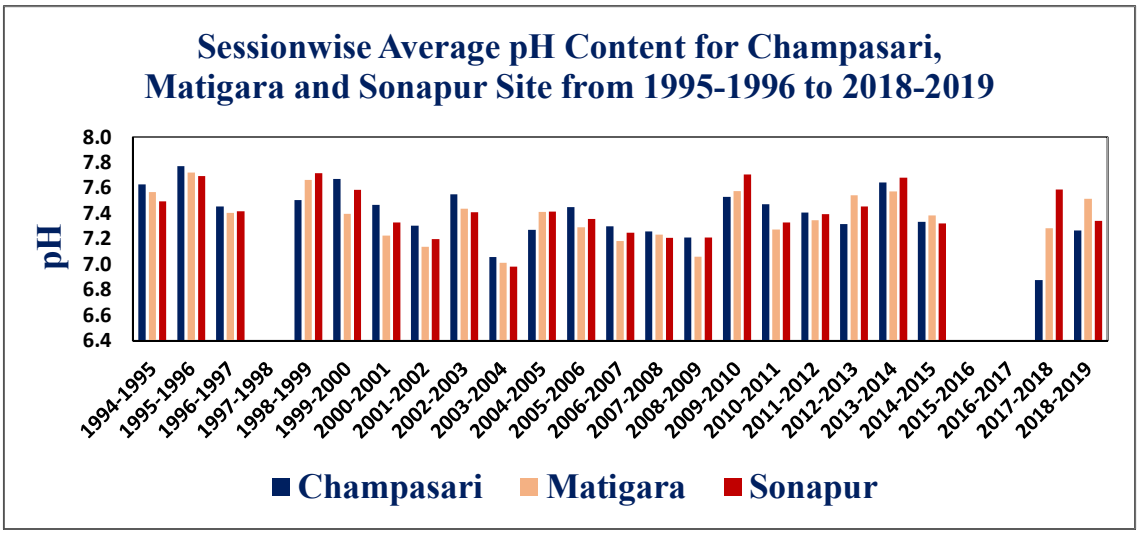


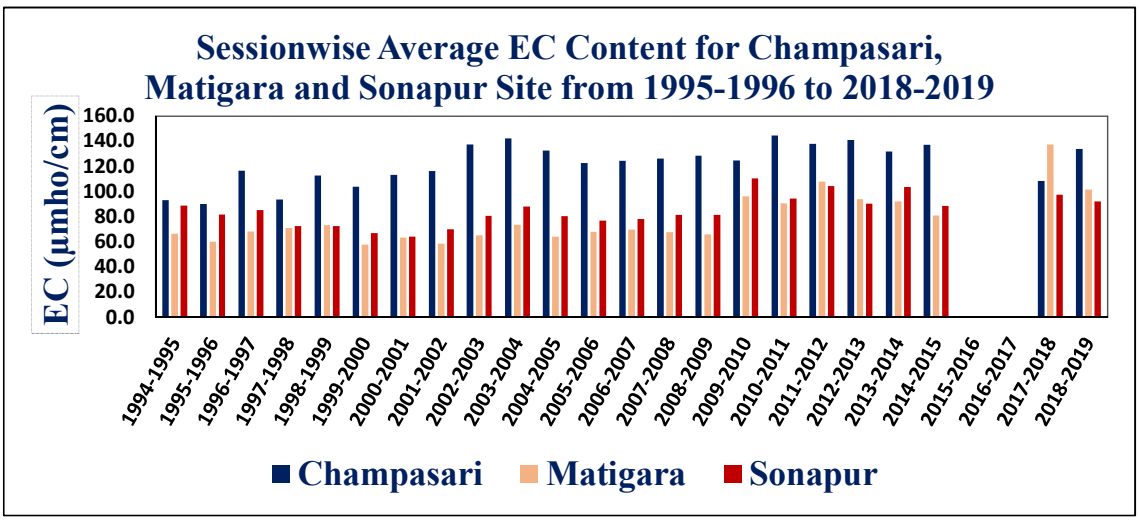


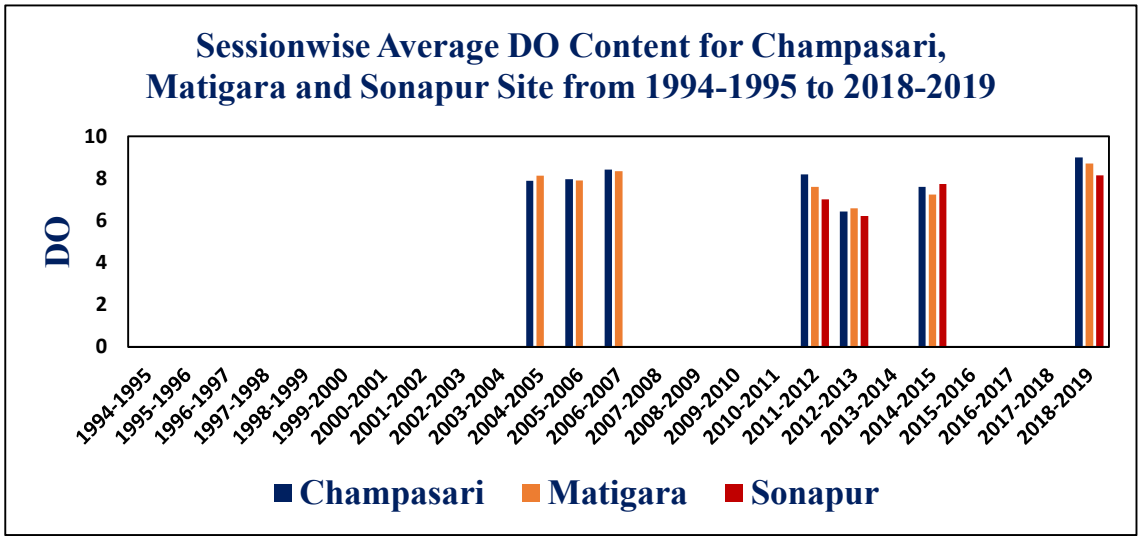


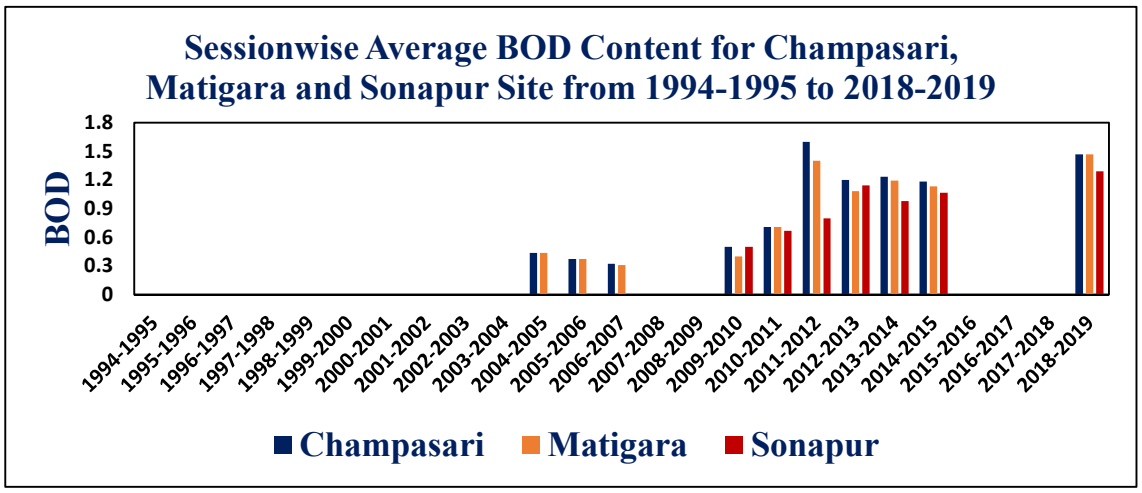
Session wise Average Content of WQ Parameters for Champasari, Matigara and Sonapur Site from 1994-1995 to 2018-2019








Sessionwise Average DO Content for Champasari, Matigara and Sonapur Site from 1994-1995 to 2018-2019
DO
10
8
6
4
2
0
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
2008-2009
2009-2010
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017
2017-2018
2018-2019
Champasari
Matigara
Sonapur


Sessionwise Average BOD Content for Champasari, Matigara and Sonapur Site from 1994-1995 to 2018-2019
BOD
1.8
1.5
1.2
0.9
0.6
0.3
0
1994-1995
1995-1996
1996-1997
1997-1998
1998-1999
1999-2000
2000-2001
2001-2002
2002-2003
2003-2004
2004-2005
2005-2006
2006-2007
2007-2008
2008-2009
2009-2010
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017
2017-2018
2018-2019
Champasari
Matigara
Sonapur

Inference

Having analysed 25 years data it can be inferred that even though the population of Siliguri City & its adjoining area increased substantially over the years and dependency of river water in terms of domestic uses, agricultural uses, uses in industries have been increased manifold, still the quality of water in respect of various parameters pertaining to these rivers are well within the tolerance limit except the BOD value for the month of June, 2018 & September, 2018 for site(s) Champasari & Matigara respectively when the value attained as 2.6 mg/L & 2.7 mg/L respectively against the permissible vale of 2.0 mg/L for drinking purposes. However, the BOD value thereafter in the year 2019 came under normalcy.

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- Moumita et. al., International Journal of Multidisciplinary Research and development, Volume 2, Issue 11, November 2015; Page No. 22-26.

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CENTRAL WATER COMMISSION
WATER QUALITY LABORATORY LEVEL – II, RAIPUR (CG), 492010
UNDER MAHANADI DIVISION, BURLA (ODISHA)

WATER QUALITY SCENARIO (2010-2019) OF MAHANADI RIVER – A CASE STUDY

Prepared by:

This report is prepared by Senior Research Assistants posted at Water Quality Laboratory Level–II, Mahanadi Division, Central Water Commission, Raipur (CG)

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2. Anup Kumar Sharma, SRA

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Contents:

1. Introduction

As water is the basic need of the habitants, its safeness must be studied before use. The present study aims at detecting the water quality scenario of the Mahanadi River in respect of physico-chemical parameters. Although in rural areas of developing countries, majority of water quality problems are related to bacteriological and other biological contaminations, a significant number of very serious problems may also occur as a result of physico-chemical impurity of water resources. With rapid industrialization and urbanization, the river water pollution is increasing rapidly. Thus, physico-chemical quality of river water is very important. So, constant monitoring of river water quality is needed so as to record any alteration in quality and outbreak of health disorders. The present study emphasize on the river water quality of two different stations of Mahanadi basin as given below and aims at detecting the quality of water in respect of physico-chemical parameters studies.

2. Basin Description

2.1 Introduction

River Mahanadi is one of the major inter-state east flowing rivers in the peninsular India. During the course of its traverse, it drains fairly large areas of Chhattisgarh and Odisha and Comparatively very small areas in the state of Jharkhand, Maharashtra and Madhya Pradesh. The basin encompasses the area within geographical co-ordinates of 80^{o} 30' to 86^{o} 50' East Longitudes and 19^{o} 20' to 23^{o} 35' of North latitudes. The basin is physically bounded in the North by Central India hills, in the South and East by the Eastern Ghats, and in the West by Maikala hill range. The total catchment area of the basin is 1, 41,600 sq. km.

Table below shows state wise break-up of the drainage area and the percentage with reference to total area of the basin.

Sl. No.	**Name of the State**	**Drainage Area (km^2)**	**% of Total Area**
1	Chhattisgarh	74,970	52.9
2	Odisha	65,600	46.3
3	Jharkhand	650	0.5
4	Maharashtra	250	0.2
5	Madhya Pradesh	130	0.1
	Total	**1, 41,600**	**100.0**

2.2 River System

River Mahanadi originates at an elevation of about 442 meter above mean sea level near Pharsiya village near Nagri town in Dhamtari district of Chattisgarh. Total length of the river from its origin to outfall into the Bay of Bengal is about 851 km out of which 357 km is in Chhattisgarh and the balance 494 km in Odisha. During its traverse, a number of tributaries join the river on both the banks. Mahanadi has 8 major tributaries, out of which 6 join it upstream of Hirakud reservoir, while the balance 2 join it down stream of Hirakud.

The catchment upstream of Hirakud reservoir has an area of 83,400 km². The major tributaries in this reach are Seonath, Ib, Pairi, Jonk, Hasdeo and Mand. The catchment downstream of Hirakud reservoir has an area of 58,200 km². The major tributaries in this reach are Tel and Ong. Though, the catchment area of downstream portion is less than that of the catchment upstream of Hirakud reservoir, it has been seen that the contribution of downstream area to the total flood in Mahanadi is equally significant.

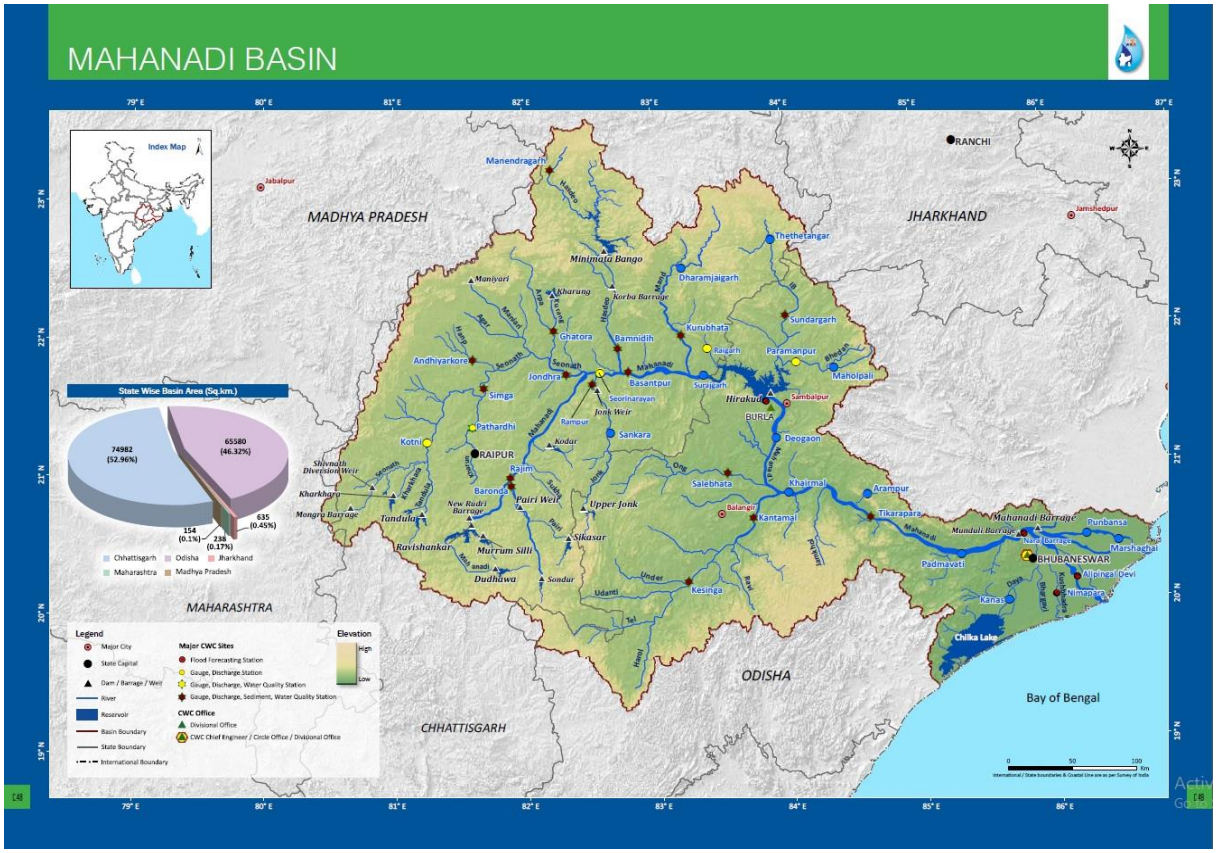
The three major tributaries, namely Seonath and Ib on the Left Bank and Tel on the Right Bank, together constitute nearly 46.63 % of the total catchment area of the river Mahanadi.

Seonath, which is the largest tributary of Mahanadi, rises from an elevation of 533 meter in village Kotgai, District Durg (Chhattisgarh), and drains three districts of Chhattisgarh, namely, Durg, Rajnandgaon and Bilaspur.

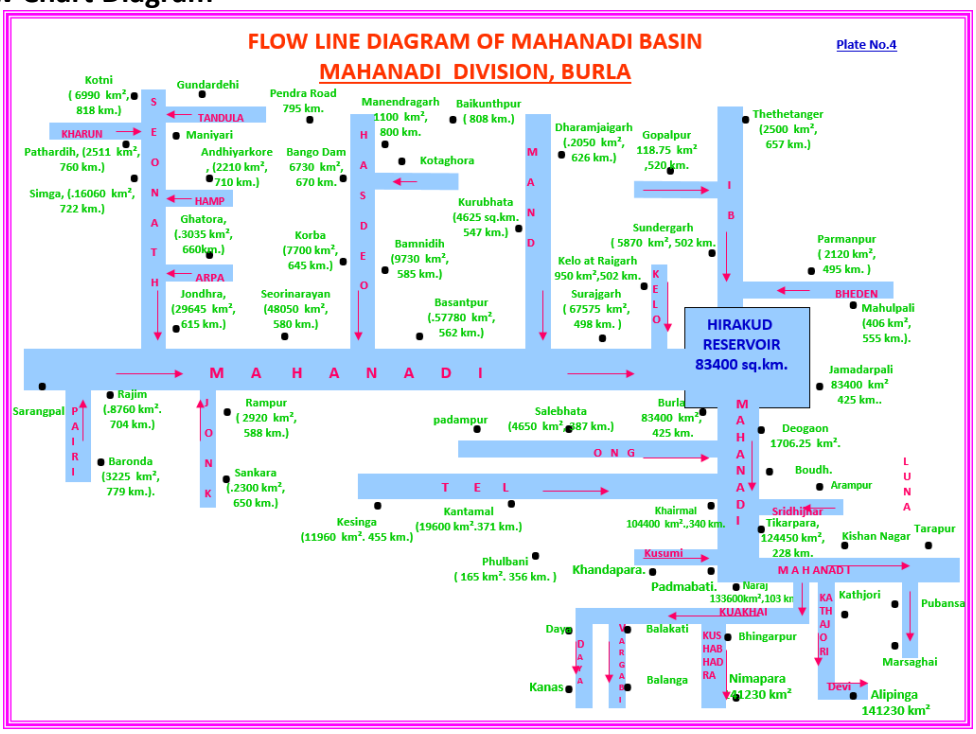
Tel, which is the second largest tributary of Mahanadi, rises from an elevation of 700 m in village Jorigram of Nabarangpur district of Odisha and drains five districts of Odisha, namely Nabarangpur, Kalahandi, Bolangir, Boudh and Kandhamal.

Ib, which is the third largest tributary of Mahanadi, rises from an elevation of 762 m in village Pandrapat, District Raigarh (Chattisgarh). It drains Raigarh and Jashpur districts of Chhattisgarh, along with three districts of Odisha, namely Sundargarh, Jharsuguda and Sambalpur.

2.3 Basin Map



2.4 Flow Chart Diagram



2.5 Water Quality Stations

Under WQ Lab Level – II Raipur, There are total 22 stations where Level-I laboratory is present, out of which 21 are of type Gauge/ Discharge/ Sediment/ Water Quality (GDSQ), 1 is of type Gauge /Discharge/ Water Quality (GDQ); and 15 additional stations where Level-I laboratory is not present.

In accordance with the definition given in the "Uniform Protocol on Water Quality Monitoring Notification" 2005, subsequently updated during 2017, water quality monitoring stations are further classified into three types i.e. (1) Baseline station (2) Trend station and (3) Flux station. Out of total 37 stations, there are (i) 1 Baseline station, (ii) 33 Trend stations and (iii) 3 Flux stations.

For this report, we are considering two stations namely (1) Rajim and (2) Basantpur which are situated on right and left bank of Mahanadi river respectively.

2.5.1 Station Information

S/N	Station	River	Station Code	Type	Latitude / Longitude	Level – 1 lab	Type (WQ)	District	State
1	Rajim	Mahanadi	EM000U7	GDSQ	20°58'30" / 81°52'51"	Yes	Trend	Gariaband	Chhattisgarh
2	Basantpur	Mahanadi	EM000R2	GDSQ	21°44'18" / 82°47'9"	Yes	Trend	Janjgir-Champa	Chhattisgarh

2.5.2 Data Availability

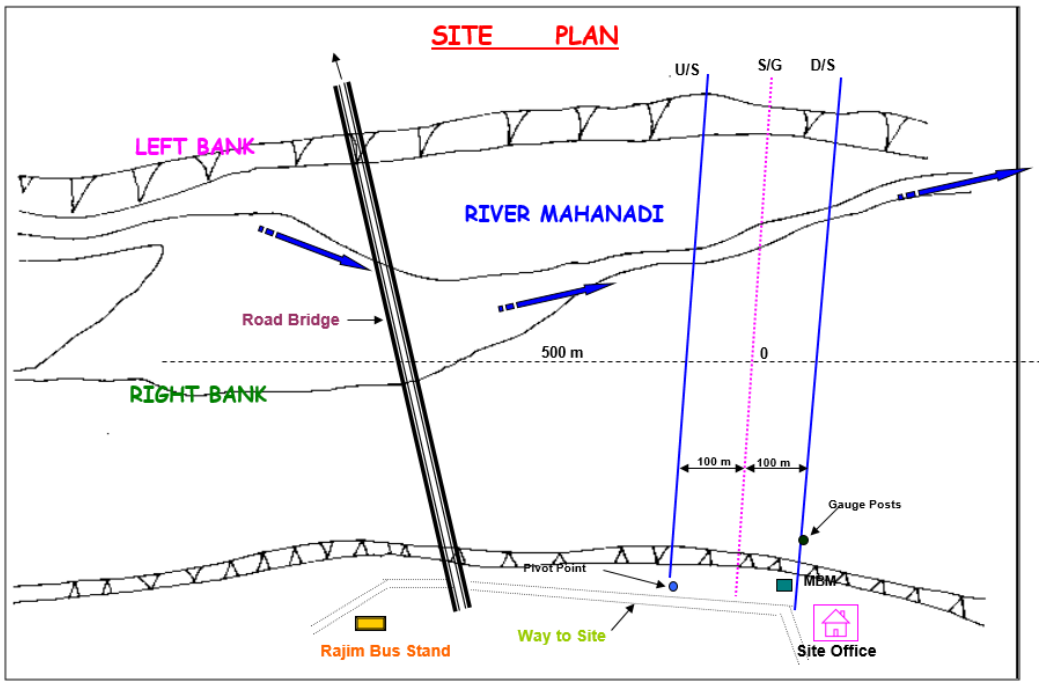
S/N	Station	Type	Date	
			From	To
1	Rajim	Gauge	01.02.1971	Continuing
		Discharge	01.02.1971	Continuing
		Sediment	04.12.1972	Continuing
		Water Quality	01.09.1972	Continuing
2	Basantpur	Gauge	01.02.1971	Continuing
		Discharge	11.05.1971	Continuing
		Sediment	07.04.1973	Continuing
		Water Quality	01.09.1972	Continuing

2.5.3 Site Plan

2.5.3.1 Rajim Site

CENTRAL WATER COMMISSION, MAHANADI DIVISION, BURLA

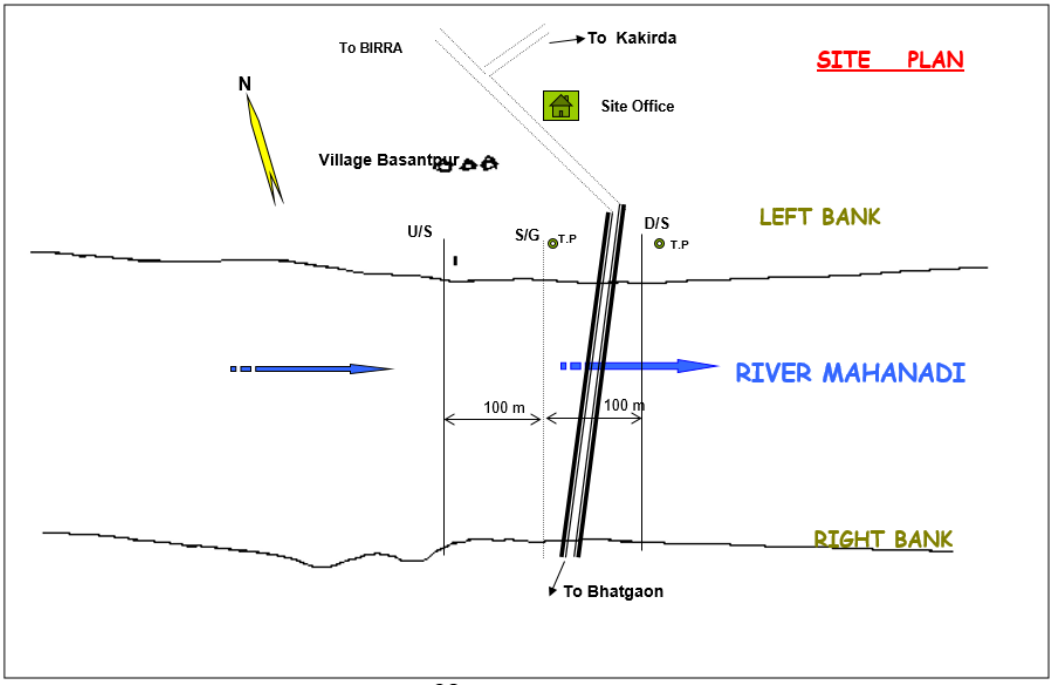
Site : RAJIM Code : EM000U7 Sub-Division :UMSD Raipur



2.5.3.2 Basantpur Site

CENTRAL WATER COMMISSION, MAHANADI DIVISION, CWC BURLA

Site : BASANTPUR Code : EM000R2 Sub-Division: MMSD-I CWC Raipur



3. Water Quality

3.1 Parameters

Based on the data available for the period (2010-2019), five physico-chemical parameters i.e. Temperature, pH, Electrical Conductivity, Dissolved Oxygen and Bio-Chemical Oxygen Demand are considered for preparing this report.

3.2 Analytical Method

Standard analytical methods are followed for measuring those above said five physico-chemical parameters i.e. Temperature, pH, Electrical Conductivity, Dissolved Oxygen and Bio-Chemical Oxygen Demand.

3.3 Tolerance limits

3.3.1 Class of Water

Classification	Type of use
Class A	Drinking water source without conventional treatment but after disinfection
Class B	Outdoor bathing
Class C	Drinking water source with conventional treatment followed by disinfection.
Class D	Fish culture and wild life propagation
Class E	Irrigation, industrial cooling or controlled waste disposal

3.3.2 Tolerance Limits for Inland Surface Waters

TABLE-1: Tolerance Limits for Inland Surface Waters, CLASS – A

S. No.	Characteristic	Tolerance
(i)	pH	6.5 to 8.5
(ii)	Dissolved Oxygen, mg/l,	6.0
(iii)	Bio-chemical Oxygen Demand	2.0

TABLE- 2: Tolerance Limits for Inland Surface Waters, CLASS – B

S. No	Characteristic	Tolerance Limit
(i)	pH Value	6.5 to 8.5
(ii)	Dissolved Oxygen, mg/l,Max	5.0
(iii)	Biochemical Oxygen Demand (5 days at 20 °C), Max	3.0

TABLE - 3: Tolerance Limits for Inland Surface Waters, CLASS – C

S.No.	Characteristic	Tolerance Limit
(i)	pH Value	6.5 to 8.5
(ii)	Dissolved Oxygen, mg/l Minimum	4.0
(iii)	Biochemical Oxygen Demand	3.0

TABLE- 4: Tolerance Limits for Inland Surface Waters, CALSS – D

S.No.	Characteristic	Tolerance Limit
(1)	**(2)**	**(3)**
(i)	pH value	6.5 to 8.5
(ii)	Dissolved Oxygen, mg/l, Min.	4.0

TABLE- 5: Tolerance Limits for Inland Surface Waters, CLASS – E

S.No.	Characteristic	Tolerance Limit
(1)	**(2)**	**(3)**
(i)	pH value	6.0 to 8.5
(ii)	Electrical Conductance at 25°C, µS, Max	2250

3.4 Data

3.4.1 Rajim

3.4.1.1 Temperature in °C

Temperature in °C	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	19.0	-	-	-	-	-	28.0	27.0	25.0	27.0	21.0	22.0		28.0	19.0	24.1
2011	20.0	20.0	22.0	-	-	-	28.0	27.0	27.0	25.0	23.5	22.0		28.0	20.0	23.8
2012	-	-	-	-	-	-	24.0	23.0	27.5	28.0	22.5	-		28.0	22.5	25.0
2013	-	-	-	-	-	-	25.5	25.0	28.5	26.5	23.5	19.0		28.5	19.0	24.7
2014	-	-	-	-	-	-	-	27.0	27.0	29.0	24.0	21.5		29.0	21.5	25.7
2015	22.0	-	-	-	-	-	-	28.0	-	-	-	-		28.0	22.0	25.0
2016		-	-	-	-	-	-		29.5	26.5	-	-		29.5	26.5	28.0
2017		-	-	-	-	-	-	-	30.0	28.0	26.0	-		30.0	26.0	28.0
2018		-	-	-	-	-	-	28.3	26.6	29.0	-	-		29.0	26.6	28.0
2019		-	-	-	-	-	28.5	24.0	25.5	27.0	27.5	18.0		28.5	18.0	25.1

3.4.1.2 pH

pH	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	7.24	-	-	-	-	-	7.53	7.54	7.40	7.70	7.66	7.49		7.70	7.24	7.51
2011	7.46	7.28	7.83	-	-	-	6.80	7.30	7.50	7.80	7.20	7.80		7.83	6.80	7.44
2012	-	-	-	-	-	-	7.30	6.80	8.00	8.10	7.70	-		8.10	6.80	7.58
2013	-	-	-	-	-	-	8.44	8.00	7.83	7.88	7.69	8.28		8.44	7.69	8.02
2014	-	-	-	-	-	-	-	7.55	7.75	7.65	7.26	7.89		7.89	7.26	7.62
2015	8.33	-	-	-	-	-	-	7.95	-	-	-	-		8.33	7.95	8.14
2016		-	-	-	-	-	-	6.72	7.22	6.90	-	-		7.22	6.72	6.95
2017		-	-	-	-	-	-	-	8.15	8.30	8.12	-		8.30	8.12	8.19
2018		-	-	-	-	-	-	7.81	7.59	6.90	-	-		7.81	6.90	7.43
2019		-	-	-	-	-	7.39	7.38	7.36	7.55	7.79	7.60		7.79	7.36	7.51

3.4.1.3 EC at 25°C in µmho/cm

EC at 25°C in µmho/cm	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	304	-	-	-	-	-	109	192	101	116	135	122		304	101	154
2011	132	310	260	-	-	-	139	118	94	112	135	132		310	94	159
2012	-	-	-	-	-	-	130	118	104	124	160	-		160	104	127
2013	-	-	-	-	-	-	104	59	92	108	126	118		126	59	101
2014	-	-	-	-	-	-	-	85	108	118	114	108		118	85	107
2015	176			-	-	-	-	158	-	-	-	-		176	158	167
2016	-	-	-	-	-	-	-	68	60	82	-	-		82	60	70
2017	-	-	-	-	-	-	-	-	121	109	113	-		121	109	114
2018	-	-	-	-	-	-	-	119	63	69	-	-		119	63	84
2019	-	-	-	-	-	-	91	57	56	82	79	90		91	56	76

3.4.1.4 DO in mg/L

DO in mg/L	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	4.0	-	-	-	-	-	5.0	4.8	6.8	7.0	7.7	7.0		7.7	4.0	6.0
2011	6.9	4.4	4.8	-	-	-	6.8	5.4	7.2	5.8	8.3	7.5		8.3	4.4	6.3
2012	-	-	-	-	-	-	6.1	4.8	6.8	8.6	8.0	-		8.6	4.8	6.9
2013	-	-	-	-	-	-	7.1	7.3	6.4	6.4	8.9	8.1		8.9	6.4	7.4
2014	-	-	-	-	-	-	-	5.6	4.8	7.3	8.9	8.6		8.9	4.8	7.0
2015	8.7	-	-	-	-	-	-	5.4	-	-	-	-		8.7	5.4	7.1
2016	-	-	-	-	-	-	-	6.4	7.1	6.9	-	-		7.1	6.4	6.8
2017	-	-	-	-	-	-	-	-	5.9	7.0	6.9	-		7.0	5.9	6.6
2018	-	-	-	-	-	-	-	6.6	7.0	6.1	-	-		7.0	6.1	6.6
2019	-	-	-	-	-	-	4.7	5.1	6.3	6.0	4.8	6.8		6.8	4.7	5.6

3.4.1.5 BOD in mg/L

BOD in mg/L	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	1.6	-	-	-	-	-	0.8	1.0	0.6	0.6	1.2	0.2		1.6	0.2	0.9
2011	0.5	1.4	1.0	-	-	-	0.4	1.4	0.6	0.9	1.1	0.7		1.4	0.4	0.9
2012	-	-	-	-	-	-	0.9	1.3	1.0	1.4	1.2	-		1.4	0.9	1.2
2013	-	-	-	-	-	-	0.7	0.9	0.1	0.5	0.4	0.4		0.9	0.1	0.5
2014	-	-	-	-	-	-	-	2.6	1.1	0.2	2.5	0.9		2.6	0.2	1.5
2015	1.6	-	-	-	-	-	-	0.1	-	-	-	-		1.6	0.1	0.9
2016	-	-	-	-	-	-	-	1.2	0.4	0.5	-	-		1.2	0.4	0.7
2017	-	-	-	-	-	-	-	-	1.6	2.0	0.7	-		2.0	0.7	1.4
2018	-	-	-	-	-	-	-	0.9	0.7	0.7	-	-		0.9	0.7	0.8
2019	-	-	-	-	-	-	0.7	0.2	0.7	0.1	1.0	0.8		1.0	0.1	0.6

3.4.2 Basantpur

3.4.2.1 Temperature in °C

Temperature in °C	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	15.5	16.0	22.0	25.0	24.5	31.0	25.0	25.0	27.5	30.5	30.0	20.0		31.0	15.5	24.3
2011	20.0	20.0	21.0	24.5	30.0	31.5	27.0	32.5	28.0	28.5	21.0	18.5		32.5	18.5	25.2
2012	22.5	20.0	21.5	26.0	29.5	28.0	36.0	39.0	20.0	13.8	14.6	15.0		39.0	13.8	23.8
2013	17.0	18.0	20.0	22.0	16.0	29.0	26.0	26.5	26.5	27.0	24.0	22.0		29.0	16.0	22.8
2014	20.5	20.5	21.0	29.0	28.0	30.0	31.0	27.5	29.0	30.0	25.5	22.5		31.0	20.5	26.2
2015	19.0	18.5	23.0	26.5	28.0	30.1	26.6	28.1	28.2	29.5	25.8	22.8		30.1	18.5	25.5
2016	20.0	23.5	24.2	30.6	36.0	32.5	31.5	29.8	29.0	27.5	27.2	23.0		36.0	20.0	27.9
2017	20.0	22.0	29.0	31.5	31.0	33.8	31.0	31.0	30.4	30.5	28.5	24.5		33.8	20.0	28.6
2018	21.5	21.5	25.0	25.5	27.5	32.5	31.5	28.5	28.2	33.0	27.5	18.3		33.0	18.3	26.7
2019	19.5	20.0	26.0	28.5	32.0	33.0	33.6	27.0	29.7	28.5	28.5	26.4		33.6	19.5	27.7

3.4.2.2 pH

pH	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	7.28	7.65	7.64	7.70	7.36	7.61	7.36	7.40	7.39	7.00	7.20	7.48		7.70	7.00	7.42
2011	7.42	7.35	7.20	7.56	7.14	7.40	7.10	7.20	6.90	7.80	7.50	7.80		7.80	6.90	7.36
2012	7.80	8.00	7.30	8.10	7.30	8.20	7.30	6.80	7.30	6.80	7.30	8.00		8.20	6.80	7.52
2013	7.80	8.00	8.10	8.10	8.20	8.36	8.11	8.04	7.35	8.04	7.36	8.25		8.36	7.35	7.98
2014	8.40	8.40	7.85	7.90	8.10	8.16	8.36	8.48	8.22	7.63	8.43	8.20		8.48	7.63	8.18
2015	8.42	8.42	8.43	8.30	8.24	8.40	7.82	7.81	7.55	8.07	8.22	8.15		8.43	7.55	8.15
2016	8.20	8.36	8.46	8.40	8.45	8.15	8.40	7.35	7.50	7.50	8.05	8.10		8.46	7.35	8.08
2017	8.42	8.47	8.23	8.35	7.70	8.20	7.65	7.92	7.70	8.20	8.13	8.49		8.49	7.65	8.12
2018	8.05	7.60	7.45	7.38	7.70	8.10	7.60	7.28	7.20	7.40	7.37	7.18		8.10	7.18	7.53
2019	7.05	7.52	7.64	7.51	8.32	8.33	8.18	7.35	7.37	7.24	7.68	7.28		8.33	7.05	7.62

3.4.2.3 EC at 25°C in µmho/cm

EC at 25°C in µmho/cm	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	283	375	245	293	305	312	366	231	179	250	440	370		440	179	304
2011	310	310	356	395	314	319	316	236	226	174	275	276		395	174	292
2012	385	261	400	357	285	342	306	372	232	309	324	346		400	232	327
2013	378	367	363	357	240	294	208	225	156	189	314	485		485	156	298
2014	495	441	342	347	336	338	371	122	206	196	260	206		495	122	305
2015	330	354	295	223	179	161	168	218	138	193	223	229		354	138	226
2016	230	225	240	314	251	186	221	193	230	102	219	236		314	102	221
2017	219	238	228	265	353	201	180	202	164	185	219	228		353	164	224
2018	276	235	270	347	205	255	261	170	118	160	179	173		347	118	221
2019	206	198	190	263	190	206	187	135	104	68	74	151		263	68	164

3.4.2.4 DO in mg/L

DO in mg/L	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	7.7	7.0	7.4	5.0	4.7	4.0	4.2	6.3	6.0	5.2	6.5	7.2		7.7	4.0	5.9
2011	8.3	7.0	6.3	6.5	4.8	5.7	5.8	5.0	6.0	6.5	5.4	7.7		8.3	4.8	6.3
2012	8.4	8.2	5.7	4.7	6.0	4.0	5.3	7.6	6.0	6.1	7.0	7.4		8.4	4.0	6.4
2013	7.3	7.1	6.6	5.4	5.1	4.5	5.8	6.3	6.3	5.1	7.8	7.9		7.9	4.5	6.3
2014	7.5	8.2	6.5	6.3	5.8	6.2	6.4	5.6	7.8	6.3	8.7	8.3		8.7	5.6	7.0
2015	7.9	7.8	7.2	5.9	6.1	5.5	5.6	4.5	5.7	5.6	6.4	6.6		7.9	4.5	6.2
2016	8.1	8.2	6.7	6.5	8.1	5.2	5.9	6.2	7.2	6.0	6.9	6.9		8.2	5.2	6.8
2017	7.2	8.1	8.1	6.9	5.2	6.0	5.2	6.0	6.8	6.3	6.6	7.5		8.1	5.2	6.7
2018	7.5	6.5	5.8	5.1	7.0	5.8	6.8	6.1	5.6	6.2	6.7	7.3		7.5	5.1	6.4
2019	7.2	7.3	6.2	4.1	5.5	4.2	5.0	5.5	6.5	4.6	5.6	7.0		7.3	4.1	5.7

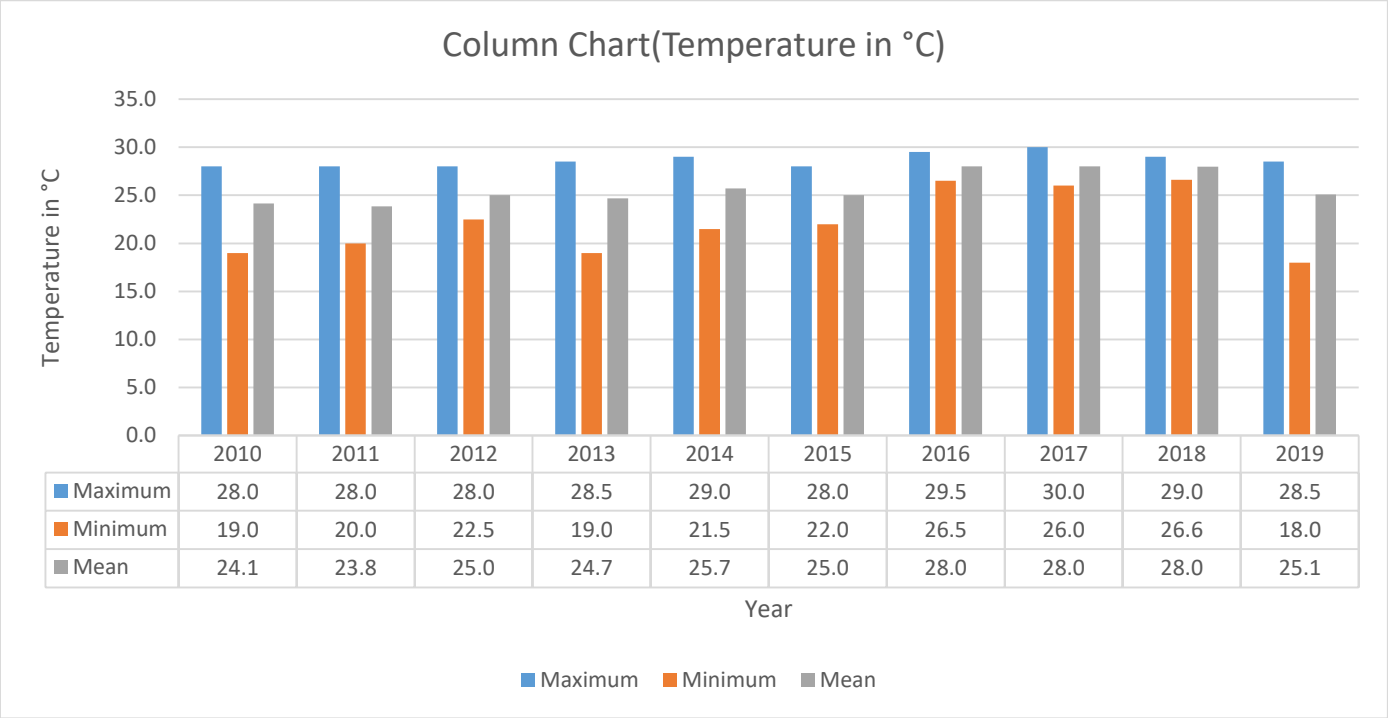
3.4.2.5 BOD in mg/L

BOD in mg/L	January	February	March	April	May	June	July	August	September	October	November	December		Maximum	Minimum	Mean
2010	1.2	0.7	1.2	1.2	0.9	1.0	0.9	0.8	0.5	0.9	0.7	2.0		2.0	0.5	1.0
2011	0.6	0.4	0.7	1.2	1.5	2.0	1.1	0.8	0.4	0.5	0.5	0.6		2.0	0.4	0.9
2012	0.6	0.8	0.7	1.2	2.2	0.5	0.7	1.7	1.0	0.9	1.0	0.4		2.2	0.4	1.0
2013	1.4	0.8	1.4	0.4	0.2	1.1	1.1	1.9	0.2	0.4	0.5	0.5		1.9	0.2	0.8
2014	1.3	0.7	1.2	0.5	1.6	0.6	0.1	1.5	0.5	0.4	1.9	0.9		1.9	0.1	0.9
2015	0.5	0.4	0.9	0.6	0.7	0.2	0.1	0.4	0.7	0.7	0.6	0.6		0.9	0.1	0.5
2016	0.6	1.0	0.2	1.9	1.4	0.8	0.6	0.5	1.6	1.0	1.3	0.7		1.9	0.2	1.0
2017	0.8	1.0	2.1	1.6	1.0	0.7	0.8	0.9	1.3	0.7	0.8	0.8		2.1	0.7	1.0
2018	1.4	0.7	0.5	0.6	0.8	0.4	0.6	0.8	0.5	0.7	0.9	0.8		1.4	0.4	0.7
2019	1.2	0.7	0.5	0.5	0.1	0.5	0.7	0.2	0.7	0.3	1.4	1.8		1.8	0.1	0.7

3.5 Graphs

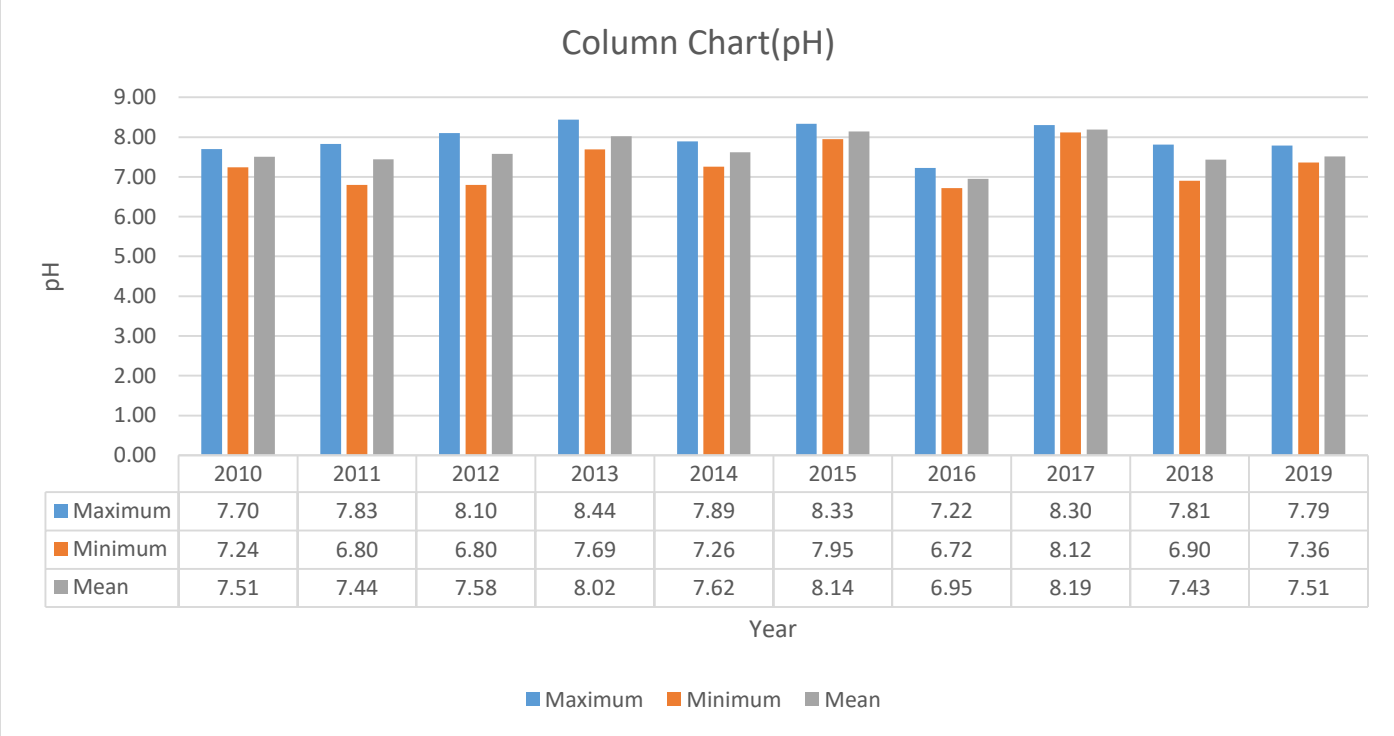
3.5.1 Rajim

3.5.1.1 Temperature (in °C) vs Year



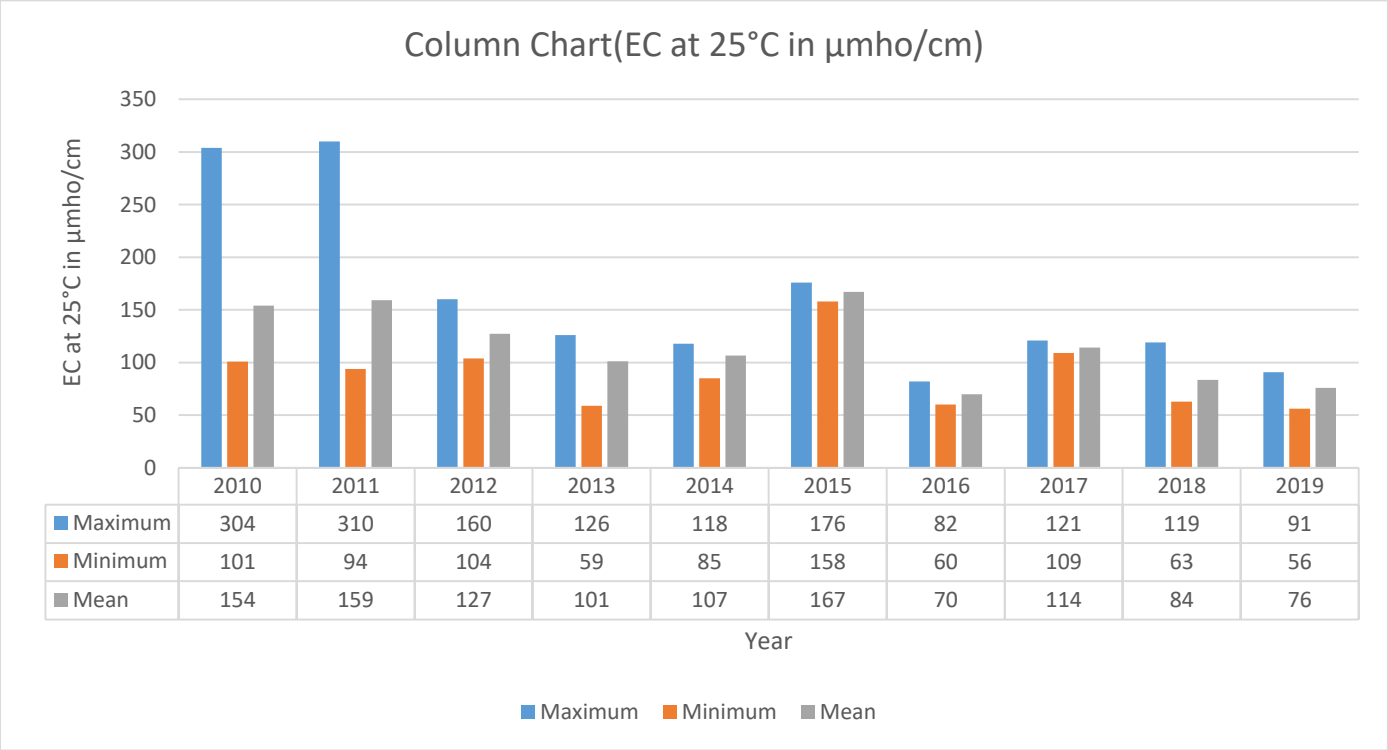
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	28.0	28.0	28.0	28.5	29.0	28.0	29.5	30.0	29.0	28.5
Minimum	19.0	20.0	22.5	19.0	21.5	22.0	26.5	26.0	26.6	18.0
Mean	24.1	23.8	25.0	24.7	25.7	25.0	28.0	28.0	28.0	25.1

3.5.1.2 pH vs Year



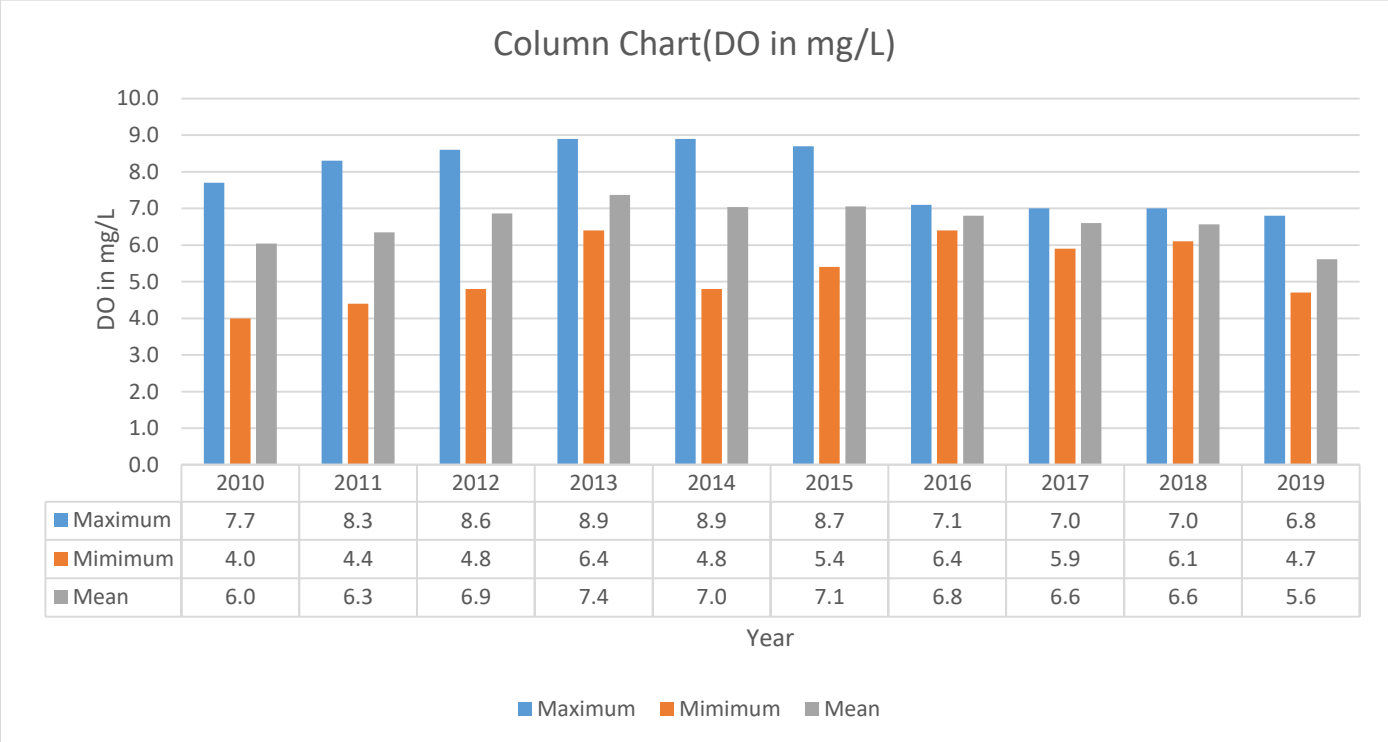
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	7.70	7.83	8.10	8.44	7.89	8.33	7.22	8.30	7.81	7.79
Minimum	7.24	6.80	6.80	7.69	7.26	7.95	6.72	8.12	6.90	7.36
Mean	7.51	7.44	7.58	8.02	7.62	8.14	6.95	8.19	7.43	7.51

3.5.1.3 EC (at 25°C in µmho/cm) vs Year



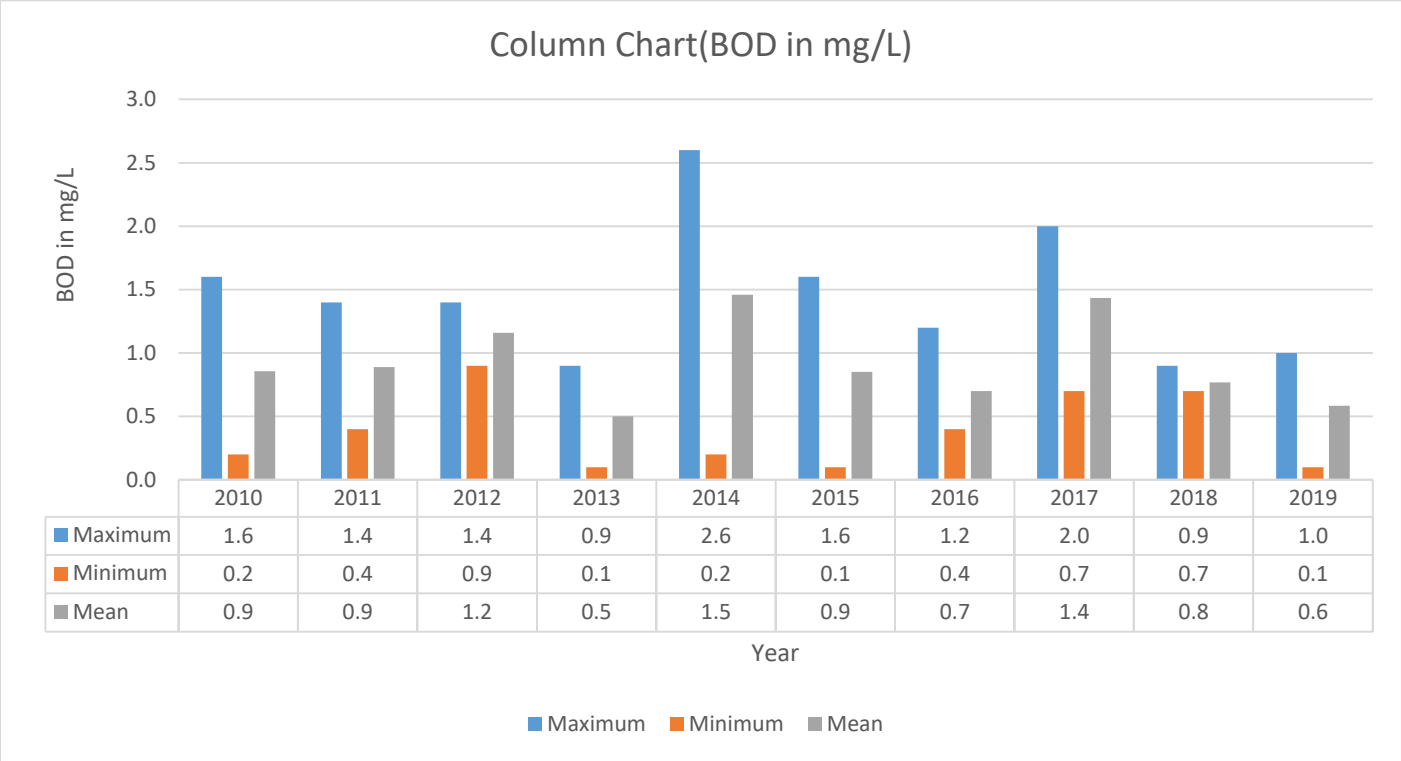
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	304	310	160	126	118	176	82	121	119	91
Minimum	101	94	104	59	85	158	60	109	63	56
Mean	154	159	127	101	107	167	70	114	84	76

3.5.1.4 DO (in mg/L) vs Year



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	7.7	8.3	8.6	8.9	8.9	8.7	7.1	7.0	7.0	6.8
Mimimum	4.0	4.4	4.8	6.4	4.8	5.4	6.4	5.9	6.1	4.7
Mean	6.0	6.3	6.9	7.4	7.0	7.1	6.8	6.6	6.6	5.6

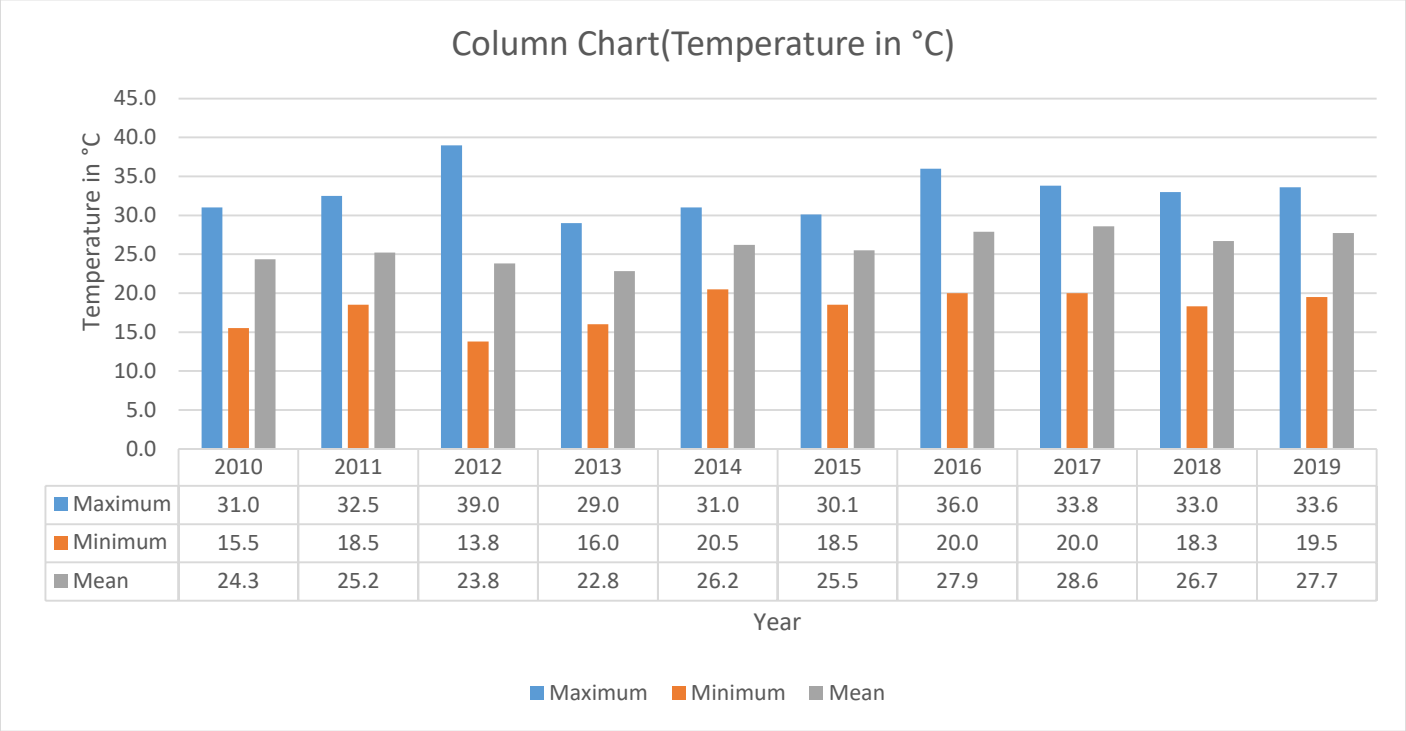
3.5.1.5 BOD (in mg/L) vs Year



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	1.6	1.4	1.4	0.9	2.6	1.6	1.2	2.0	0.9	1.0
Minimum	0.2	0.4	0.9	0.1	0.2	0.1	0.4	0.7	0.7	0.1
Mean	0.9	0.9	1.2	0.5	1.5	0.9	0.7	1.4	0.8	0.6

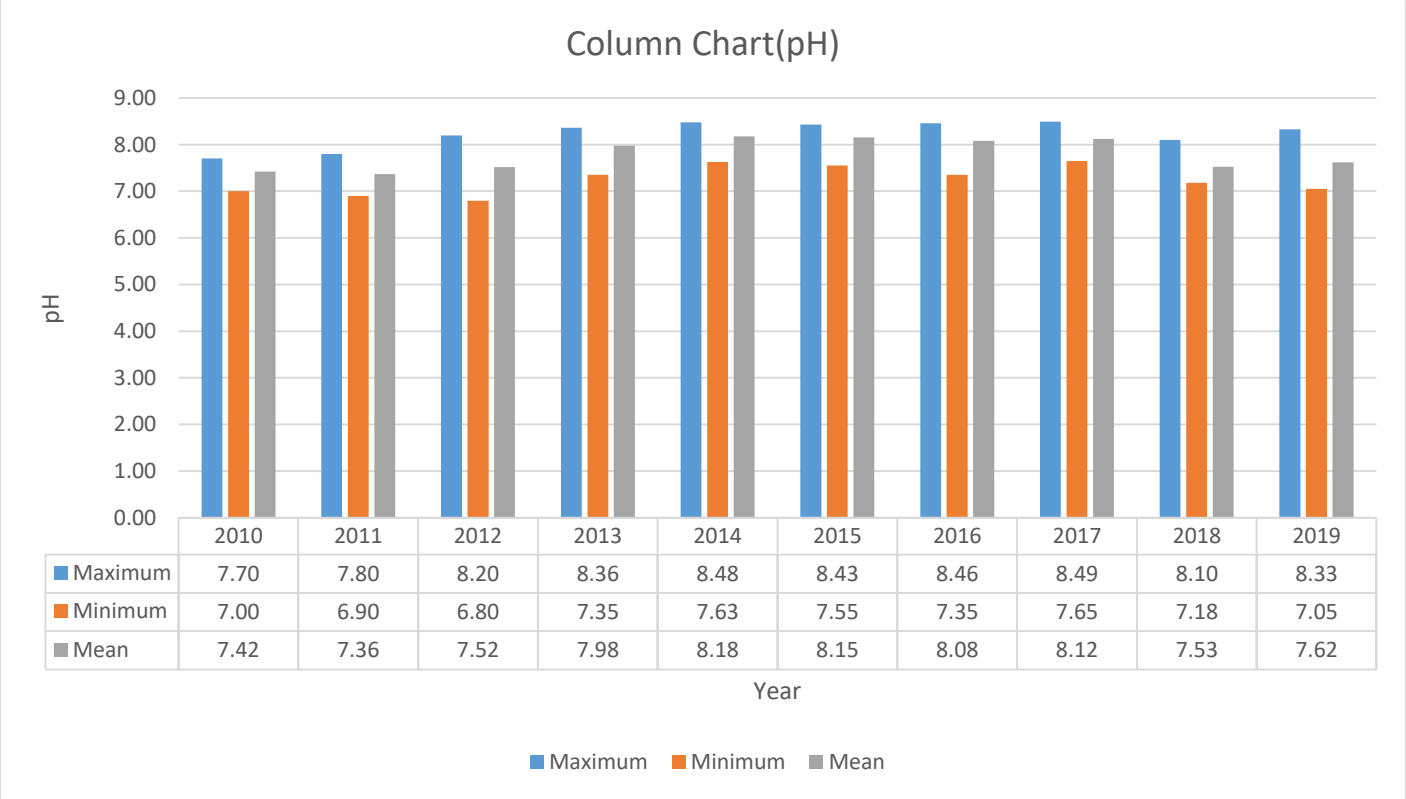
3.5.2 Basantpur

3.5.2.1 Temperature (in °C) vs Year



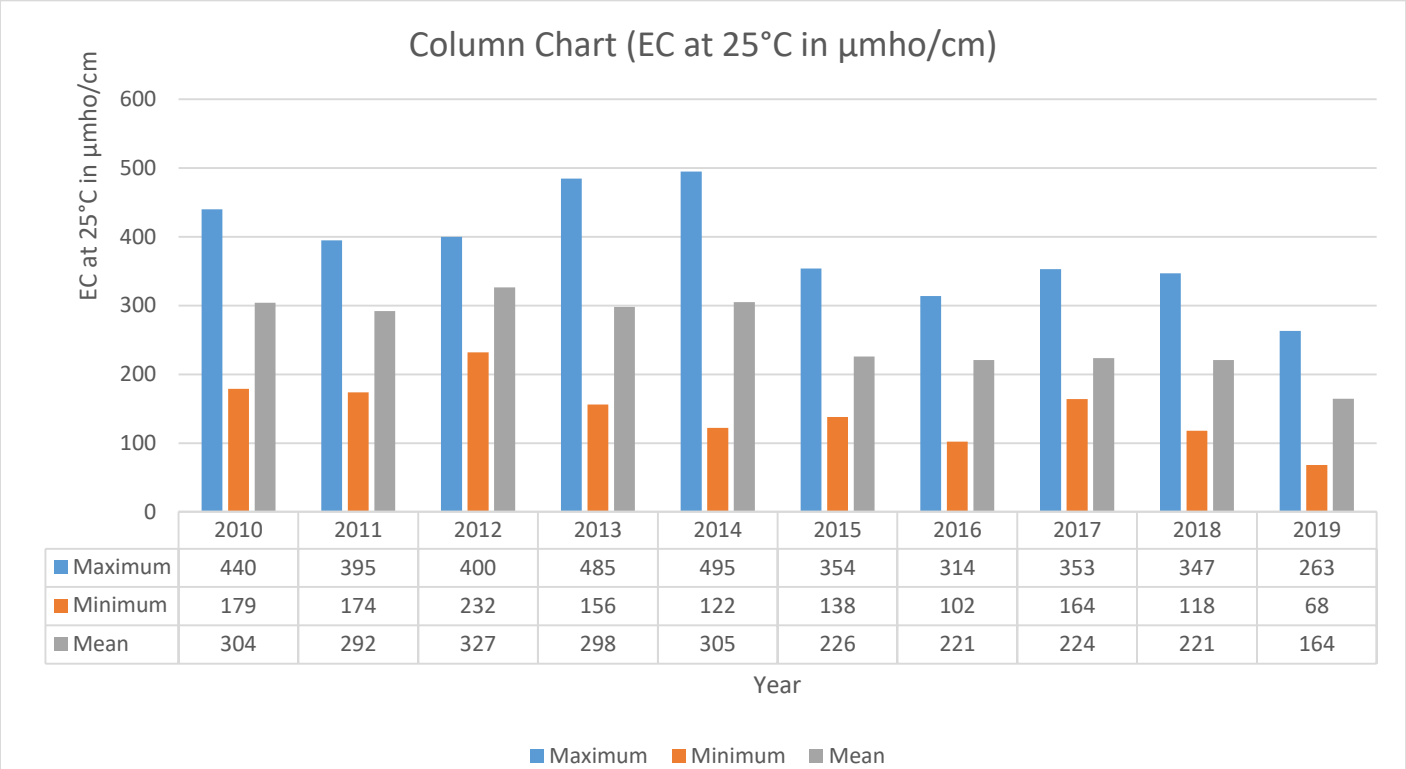
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	31.0	32.5	39.0	29.0	31.0	30.1	36.0	33.8	33.0	33.6
Minimum	15.5	18.5	13.8	16.0	20.5	18.5	20.0	20.0	18.3	19.5
Mean	24.3	25.2	23.8	22.8	26.2	25.5	27.9	28.6	26.7	27.7

3.5.2.2 pH vs Year



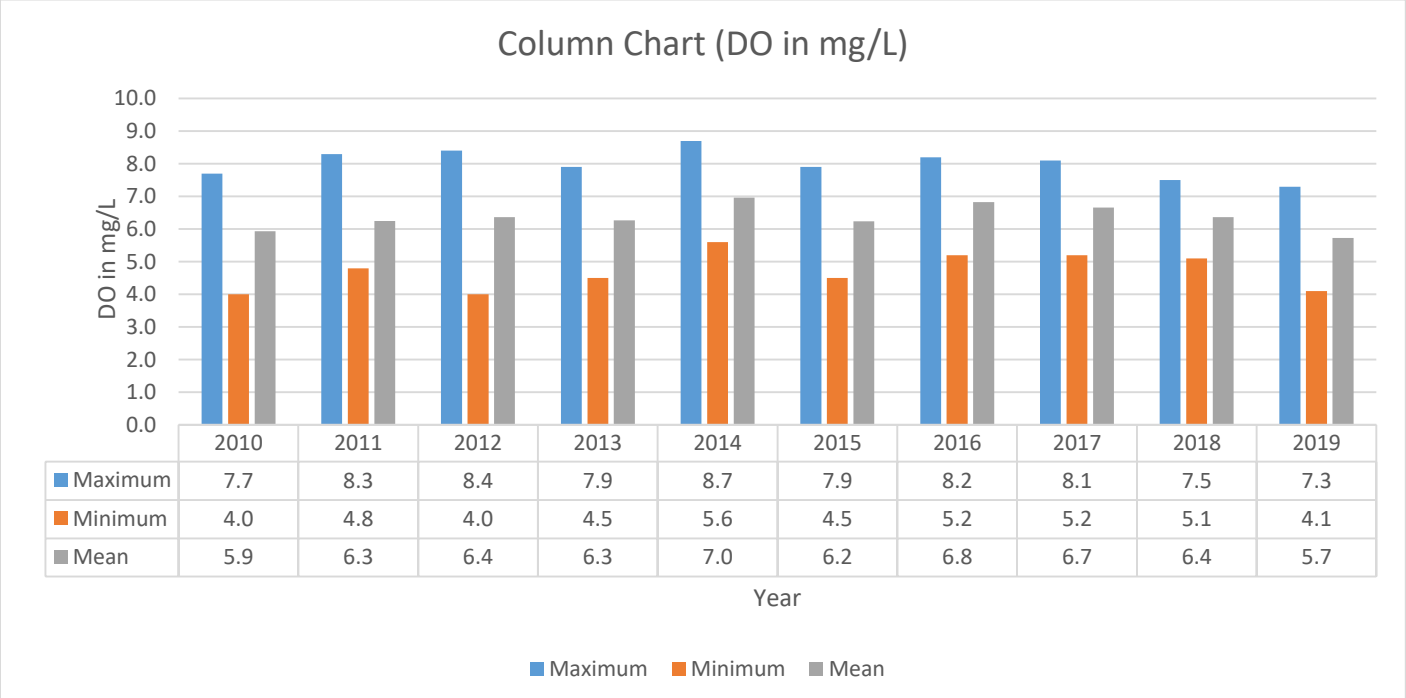
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	7.70	7.80	8.20	8.36	8.48	8.43	8.46	8.49	8.10	8.33
Minimum	7.00	6.90	6.80	7.35	7.63	7.55	7.35	7.65	7.18	7.05
Mean	7.42	7.36	7.52	7.98	8.18	8.15	8.08	8.12	7.53	7.62

3.5.2.3 EC (at 25°C in µmho/cm) vs Year



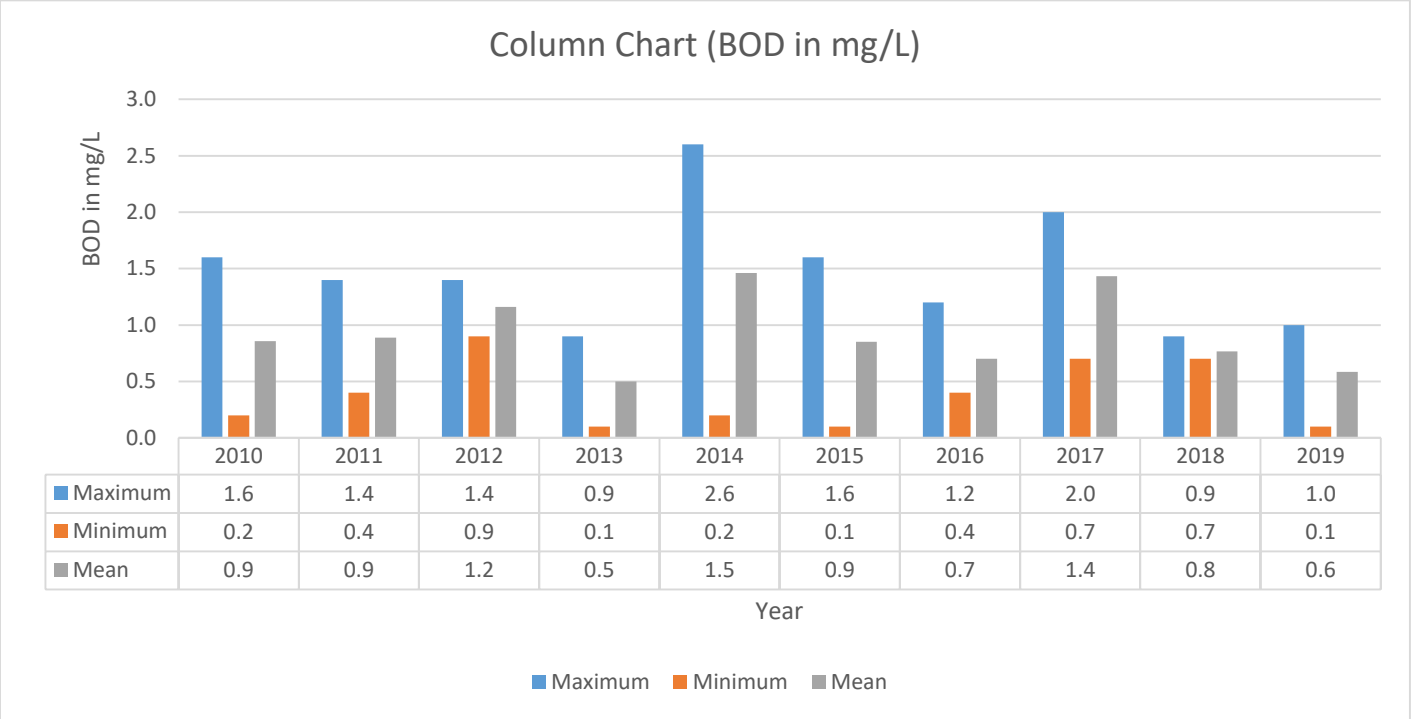
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	440	395	400	485	495	354	314	353	347	263
Minimum	179	174	232	156	122	138	102	164	118	68
Mean	304	292	327	298	305	226	221	224	221	164

3.5.2.4 DO (in mg/L) vs Year



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	7.7	8.3	8.4	7.9	8.7	7.9	8.2	8.1	7.5	7.3
Minimum	4.0	4.8	4.0	4.5	5.6	4.5	5.2	5.2	5.1	4.1
Mean	5.9	6.3	6.4	6.3	7.0	6.2	6.8	6.7	6.4	5.7

3.5.2.5 BOD (in mg/L) vs Year



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Maximum	1.6	1.4	1.4	0.9	2.6	1.6	1.2	2.0	0.9	1.0
Minimum	0.2	0.4	0.9	0.1	0.2	0.1	0.4	0.7	0.7	0.1
Mean	0.9	0.9	1.2	0.5	1.5	0.9	0.7	1.4	0.8	0.6

3.6 Results and Discussions

TEMPERATURE: Temperature is an important factor to influence the physico-chemical parameters and the biological reaction in water. It is one of the most important fundamental variables in river ecology. Higher values of temperature reduce the solubility of gases and dissolved oxygen by increasing molecular activity and pushing the gas molecules out of the spaces between moving water molecules. In addition, it increases metabolic rates that affect BOD decay, sediment oxygen demand, nitrification, photosynthesis, and respiration which subsequently causes depletion in dissolved oxygen. In this study, highest temperature of 30^{o}C (September, 2017) and 39^{o}C (August, 2012) were recorded for Site Rajim and Basantpur respectively. Lowest temperature of 18^{o}C (December, 2019) and 13.8^{o}C (October, 2012) were recorded for Site Rajim and Basantpur respectively.

pH: The pH of water is the measure of how acidic or basic the water is on a scale of 0-14. The pH of most natural water sources lies within the range of 6.5 - 8.5 with 7.0 being neutral. Higher the pH from neutral value, higher the basicity of water. And lower the pH from neutral value, higher the acidity of water. The optimum pH for river water is around 7.4. Extremes in pH can make a river inhospitable to life. Low pH is especially harmful to immature fish and insects and also speeds the leaching of heavy metals. In this study, all the water samples are found to have pH value within the tolerance limit as prescribed by BIS. Highest pH of 8.44 (July, 2013) and 8.49 (December, 2017) were recorded for Site Rajim and Basantpur respectively. Lowest pH of 6.80 (July, 2011 & August, 2012) and 6.80 (October, 2012) were recorded for Site Rajim and Basantpur respectively.

ELECTRICAL CONDUCTIVITY: Electrical conductivity is used as a basic index in judging the suitability of water for potable properties. Conductivity is a measure of the ability of water to pass an electric current. Pure water is a poor conductor of electricity. Presence of impurities, acids, bases and salts in water make it relatively good conductor of electricity. Conductivity of water is increased by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, phosphate etc anions and sodium, magnesium, calcium, iron, aluminum etc cations. Organic compounds like oil, phenol, alcohol, sugar etc do not conduct electrical current very well and therefore have a low conductivity when in water. Greater is the conductivity, greater are anions and cations in water and greater is the dissolved matters (electrolytes) in it. Discharges to streams can change the conductivity depending on their make-up. A failing sewage system would raise the conductivity because of presence of chloride, phosphate and nitrate; and oil spill would lower the conductivity. With increased air pollution, the acid rain also adds to the conductivity of surface water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25^{o}C. In this study, highest EC (at 25^{o}C) of 310 µmho/cm (February, 2011) and 495 µmho/cm (January, 2014) were reported for Site Rajim and Basantpur respectively. Lowest EC (at 25^{o}C) of 56 µmho/cm (September, 2019) and 68 µmho/cm (October, 2019) were reported for Site Rajim and Basantpur respectively. Present studies reveal that all the samples analyzed, had conductivity values well within the tolerance limit prescribed by WHO, 1984.

DISSOLVED OXYGEN: "Dissolved oxygen refers to the concentration of oxygen gas incorporated in water. Oxygen enters water by direct absorption from the atmosphere, which is enhanced by turbulence. Water also absorbs oxygen released by aquatic plants during photosynthesis. Sufficient DO is essential for growth and reproduction of aerobic aquatic life." – United States Environment Protection Agency.

So, DO is one of the most important physico-chemical parameters for water quality assessment of river water and a fundamental variable in river ecology. It reflects the physical and biological processes prevailing in the water and shows metabolic balance. An adequate supply of dissolved oxygen gas is essential for survival of aquatic organisms. A deficiency is a sign of unhealthy river. Too much DO is not healthy, either. Extremely high level of DO usually result from photosynthesis by a large amount of plants. Great uncontrolled plant growth, especially algal blooms, is often the result of fertilizer runoff. This phenomenon is called cultural eutrophication. Also, high D.O. levels speed up corrosion in water pipes. For diverse fish population the D.O. level must range from 4 - 9 mg/l. For different classes of water, the tolerance limits are listed in Para 3.1 in this report. However, according to European Economic Community, the standard value of D.O. is 5 mg/l for drinking water. In this report, highest DO of 8.9 mg/l (November, 2013 & November, 2014) and 8.7 mg/l (November, 2014) were reported for Site Rajim and Basantpur respectively. Lowest DO of 4.0 mg/l (January, 2010) and 4.0 mg/l (June, 2010 & June, 2012) were reported for Site Rajim and Basantpur respectively.

BIOCHEMICAL OXYGEN DEMAND: A stream system not only produces oxygen, but also consumes it. The degree of microbial mediated oxygen consumption in water is known as biochemical oxygen demand. Respiration by aquatic animals, decomposition, and various chemical reactions consume oxygen. Wastewater from sewage treatment plants often contains organic materials that are decomposed by micro-organisms, which use oxygen in process. Other sources of oxygen-consuming waste water include stromwater runoff from farmland or urban streets, feedlots, and failing septic systems. BOD is measured in its dissolved form as dissolved oxygen (DO) by the quantity of oxygen utilized by suitable micro-organisms during 5 days period incubation at 20^{o}C or 3 days period incubation at 27^{o}C. BOD is an indicator to what extent the water is polluted. If its value is 6.0 mg/l or more in a water body, then it is said to be polluted. In this report, highest BOD of 2.6 mg/l (August, 2014) and 2.2 mg/l (May, 2012) were reported for Site Rajim and Basantpur respectively. Lowest BOD of 0.1 mg/l (September, 2013, August, 2015, & October, 2019) and 0.1 mg/l (July, 2014, July, 2015, & May, 2019) were reported for Site Rajim and Basantpur respectively. This study reveals that BOD values for the entire period of 10 years falls under the permissible limit as prescribed by BIS for India.

4. Conclusions

The present study reveals that the water quality of Mahanadi River is good as compared to the five physico-chemical parameters considered here. All the values fall well inside the permissible tolerance limits as prescribed by Bureau of Indian Standards (BIS) adopted for India. However, due to increased industrial and human activities in river and along its bank a constant monitoring of the water quality of the river is a must to maintain the river water quality.

5. References

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Present Water Quality Scenario of the Brahmani River

A Case Study

Eastern Rivers Water Quality Laboratory

Eastern Rivers Division

Central Water Commission, Bhubaneswar

Present Water Quality Scenario of Brahmani River –A Case Study

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Abstract: *The present Study is aimed at assessing the current water quality standard along the stretch of Brahmani river in terms of physico-chemical parameters. In the selected study area, river Brahmani is receiving a considerable amount of industrial wastes and witnessing a considerable amount of human and agricultural activities . Samples are being collected in nine CWC sampling stations along the entire stretches of the river during the period from May-2010 to June-2019 on the first working day of every month. Various physico-chemical parameters like pH, EC, Total Hardness, Total Alkalinity, Sodium, Potassium, Calcium, Magnesium, Sulphate D.O., B.O.D. etc. were analyzed. The present study indicates that the water quality of Brahmani river is well within tolerance limits at the CWC sampling stations in the Brahmani Basin taking the physico-chemical parameters into considerations.*

Key Words: Brahmani river, Physico-chemical parameters, pH ,EC, Total hardness, D.O, B.O.D.

I . Introduction

As water is the basic need of the habitants, its safeness must be studied before use. The present study aims at detecting the quality of water across the Brahmani river in respect of physico-chemical parameters. In India majority of water quality problems are related to bacteriological and other biological contaminations. A significant number of very serious problems may also occur as a result of physico -chemical impurities in water resources. With rapid industrialization, urbanization and ever increasing population, the river water pollution is increasing rapidly. The physico - chemical quality of river water is very important from the health point of view. Thus, constant monitoring of river water quality is needed so as to record any alteration in quality and to prevent outbreak of health disorders. The present study aims at detecting the quality of water in respect of physico-chemical parameters.

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II. Study Area

River Brahmani, the second largest river of Odisha is one of the major inter-state peninsular river systems in India. The river Brahmani,known as South koel in the upper reaches,originates near Nagri village in Ranchi District of Jharkhand at an elevation of 600m.The confluence of the rivers Koel and the Sankh tributary at Vedvyasa near Rourkela in the district of Sundargarh gives rise to the river Brahmani. It travels southward through the districts of Sundargarh, Deogarh, Angul, Dhenkanal, Jajpur, and Kendrapara finally flowing into Bay of Bengal. After Jenapur, it divides into two rivers namely Brahmani and Kharasrota (Kharasuan). The major flow of water goes into Kharasrota. After covering a few kilometers, the river Birupa a branch of river Mahanadi joins Brahmani and it flows onwards in the name of Brahmani though its major portion of water comes from the river Birupa. The study area covers nine major sampling points covering Sankh at Tilga, Koel at Jareikela and Brahmani river from Vedvyasa near Panposh up to Jenapur. In this stretch, the river Brahmani is joined by several drains and streams carrying industrial effluents, city wastages, mining residues etc. along with a number of tributaries. Jenapur is the last sampling point. The description of location of sampling stations ,flow line diagram of the river Brahmani and map of Brahmani basin given in Table-1,Fig-I and Fig-II respectively.

Table:1

Sample Code	Name of the station	River/ Tributary	State	District	Description of the location
S_1	Tilga	Sankh	Jharkhand	Simdega	Upstream of Panposh
S_2	Jaraikela	Koel	Odisha	Sundergarh	Upstream of Panposh
S_3	Panposh	Brahmani	Odisha	Sundergarh	Confluence of Koel and Sankh to form Brahmani
S_4	(R S P)	Brahmani	Odisha	Sundergarh	Mixing point of Rourkela Steel Plant Effluent with Brahmani
S_5	Gomlai	Brahmani	Odisha	Sundergarh	About 50 km down stream of Rourkela
S_6	Talcher	Brahmani	Odisha	Anugul	About 5 km upstream of the Nalco effluent confluence with Brahmani
S_7	Nandira	Brahmani	Odisha	Anugul	confluence of Nalco effluent with Brahmani
S_8	Kamalanga	Brahmani	Odisha	Anugul	1.5 km down stream of the confluence of Nalco effluent with Brahmani
S_9	Jenapur	Brahmani	Odisha	Jajpur	Before the bifurcation of Brahmani to form Kharasrota

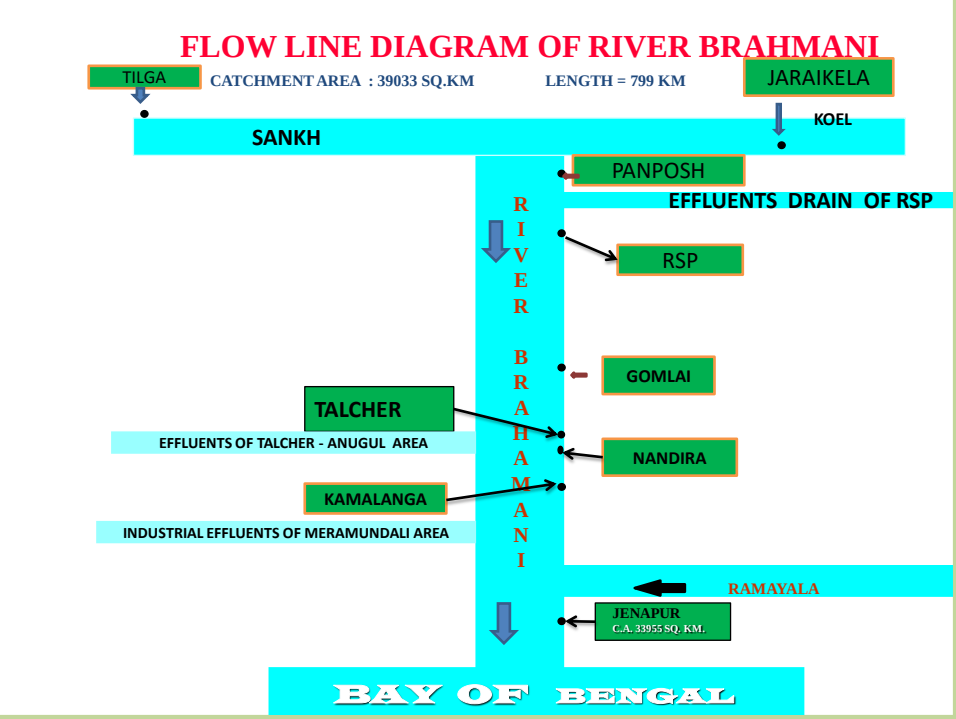

Fig-I - (LINE DIAGRAM OF RIVER BRAHMANI SHOWING LOCATIONS OF SAMPLING STATIONS)

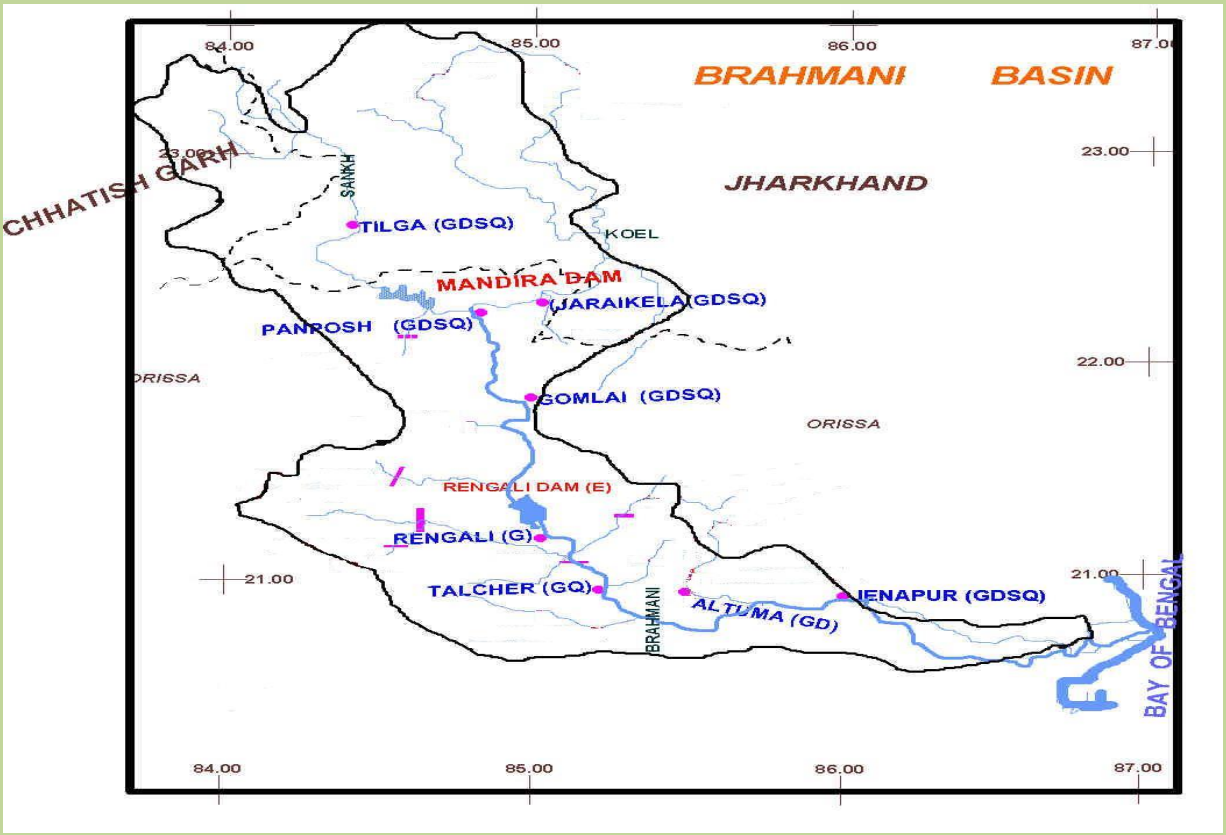

Fig-II - (MAP OF BRAHMANI BASIN WITH LOCATION OF CWC SITES)

II. Materials and Methods

Water samples were collected every month, from *May-2010 to June-2019* from nine different stations as mentioned in the above table, in clean and dry polythene bottles. The water samples were collected and preserved for testing of various parameters at 4° C throughout the period of chemical analysis.

The pH and dissolved oxygen of water samples were measured immediately after sampling at the field itself. Samples were subjected to filtration before chemical analysis. The determination of the total hardness was carried out by EDTA complexometric titration method (APHA, 2005).The Winkler's alkali iodide-azide method was followed for the estimation of D.O. and B.O.D.

III. Results and Discussion

TEMPERATURE: Temperature is an important factor to influence the physico-chemical parameters and the biological reaction in water. Higher values of temperature accelerate the chemical reaction and reduce the solubility of gases and dissolved oxygen. In the present study temperature varied from 22°C to 35°C.

pH LEVEL: The pH of most raw water sources lies within the range of 6.5 - 8.5 . For all the water samples the average value of PH was in the range 7.4 to 7.8.So the average values were found to be well within the tolerance limit. The pH value ranges from 9.2 to 6.2. RSP recorded the maximum pH value 9.2 and Jaraikela recorded the minimum pH value 6.2.The value of PH for all stations are given in Table-2 and its variation in Fig-III.

ELECTRICAL CONDUCTIVITY: Pure water is a poor conductor of electricity. Presence of acids , bases and salts in water makes it relatively good conductor of electricity. With increased air pollution , the acid rain also adds to the conductivity of surface water. Greater conductivity,means more anions and cations are in water and more is the dissolved matter & electrolyte are in it. Electrical conductivity is used as a basic index in judging the suitability of water for potable properties. Kamalanga recorded the highest conductivity value 1138 µ mho/cm. The minimum conductivity value 48 µ mho/cm is recorded at Tilga. Tolerance limit for conductivity for class A surface water as Prescribed by BIS(ISI) is 2250 µ mho/cm.Hence Present studies revealed that all the samples recorded, had conductivity values well within the tolerance limit . The value EC for all stations are given in Table-2 and its variation in Fig-IV.

CHLORIDE: Chloride is present in all natural waters, but mostly the concentrations are low. In most surface streams, chloride concentrations are lower than those of sulfate or bicarbonate. Exceptions occur where streams receive inflows of high-chloride ground water or industrial waste or are affected by oceanic tides. Tolerance limit for Chloride for class A surface water as Prescribed by BIS(ISI) is 250mg/lit..Present studies reveal that in all samples collected from all nine sampling stations the chloride concentration lies between 1-75 mg/lit i.e is within permissible limit.The highest concentration of chloride is 75 mg/l at Jenapur and lowest concentration is 1mg/l at Tilga.The value of Chloride for all stations are given in Table-3 and its variation in Fig-V.

TOTAL ALKALINITY: Alkalinity is not a pollutant. It is a total measure of the substances in water that have acid neutralizing capacity. Alkalinity indicates the power of a solution to react with acid and

buffer its pH , that is the power to restrict its pH from changing (Webber and Stamm , 1963). It is due to salts of weak acids and bicarbonates and is estimated in terms of an equivalent amount of calcium carbonate. No permissible values of total alkalinity are given by WHO & ISI . Most natural water has a pH of 5.5-7.5 and HCO_3^- is the dominant carbon species (Stednick, 1991).In the present study the value of bicarbonate in all sampling points ranges between 0 to 149.8.The average value of Bicarbonate ranges 1.4 to 89.4. The value of Bicarbonate for all stations given in Table-3 and its variation in Fig-VI.

TOTAL HARDNESS: Water hardness is the traditional measure of capacity of water to react with soap, Hard water requires a considerable amount of soap to produce lather.. In fresh water, the principal hardness causing ions are calcium and magnesium. The ions of strontium, iron , barium and manganese also contribute to some extent. It is expressed as an equivalent concentration of calcium carbonate. The permissible limit of Total Hardness as calcium carbonate equivalent is 300 mg/l. Our investigation shows that Total Hardness of all the water samples are much below the permissible limit. The value of Calcium and Magnesium for all stations are given in Table-4 and its variation in Fig-VII and Fig-VIII respectively.

SODIUM AND POTASSIUM: Sodium is the chief cation in the extra cellular fluid. About 50% of body sodium is present in the bone, 40% in the extra cellular fluid and the remaining (10%) in the soft tissues whereas potassium is the principal intracellular cation. It is equally important in the extra cellular fluid for specific function such as influencing cardiac muscle activity (Satyanarayan., 2004). According to BIS(ISI) for class A surface water there is no the limit for sodium and for potassium . The average value of sodium and potassium ranges between 7 to 19 mg/l and 2 to 7.3 mg/l reaspectively. The value of Sodium and Potassium for all stations are given in Table-5 and its variation given in Fig-IX and Fig-X respectively.

DISSOLVED OXYGEN: Dissolved oxygen is one of the most important parameters of water quality assessment and reflects the physical and biological processes prevailing in the water and shows metabolic balance. A high D.O. level in a river water sample is good because it makes the water better for drinking as well as for bathing point of view and friendly for aquatic lives. For diverse fish population the D.O. level must range from 4 - 9 mg/l. The river water of Brahmani is good for fish lives. However, Tolerance limit for Dissolve Oxygen for class A surface water as Prescribed by BIS(ISI) is minimum 6mg/lit. The average D.O. values of water samples from the river ranges from 4.9 mg/l to 7.1 mg/l.So the samples collected at the different points are within the permissible range for most of the sites. The value of DO for all stations given in Table-6 and its variation in Fig-XI.

BIOCHEMICAL OXYGEN DEMAND : The degree of microbial mediated oxygen consumption in water is known as biochemical oxygen demand. This parameter is commonly measured by the quantity of oxygen utilized by suitable micro-organisms during 5 days period at 20^oC . It is not a pollutant but an indicator to what extent the water is polluted. Its permissible value for Class A surface water as per BIS(ISI) is 2 mg/l maximum. Present study reveals the mean value of B.O.D of the Brahmani river is 4.3 mg/l at RSP which is the highest average value whereas that of the remaining sampling stations ranges from 0.9 mg/l to 1.3 mg/l(within permissible limit). The high BOD value of RSP may be due the industrial effluents of Rourkela Steel Plant. The value of BOD for all stations given in Table-6 and its variation in Fig-XII.

Name of the Sampling Station	pH			Electrical Conductivity in µ/s		
	Max	Min	Mean	Max	Min	Mean
Tilga-S_1	8.3	6.4	7.4	677	48	120
Jareikela-S_2	8.5	6.2	7.6	460	55	197
Panposh-S_3	8.6	6.5	7.6	590	86	215
R.S.P.-S_4	9.2	5.6	7.5	1037	100	439
Gomlai-S_5	8.5	6.5	7.7	573	68	230
Talcher-S_6	8.6	6.7	7.7	1137	48.1	90.3
Nandira-S_7	8.7	7.2	7.8	1100	108	344
Kamalanga-S_8	8.6	6.8	7.8	1138	102	331
Jenapur-S_9	8.6	6.9	7.7	515	83	177

TABLE-2:(10 year average data of pH and Electrical Conductivity at different sampling stations of Brahmani river)

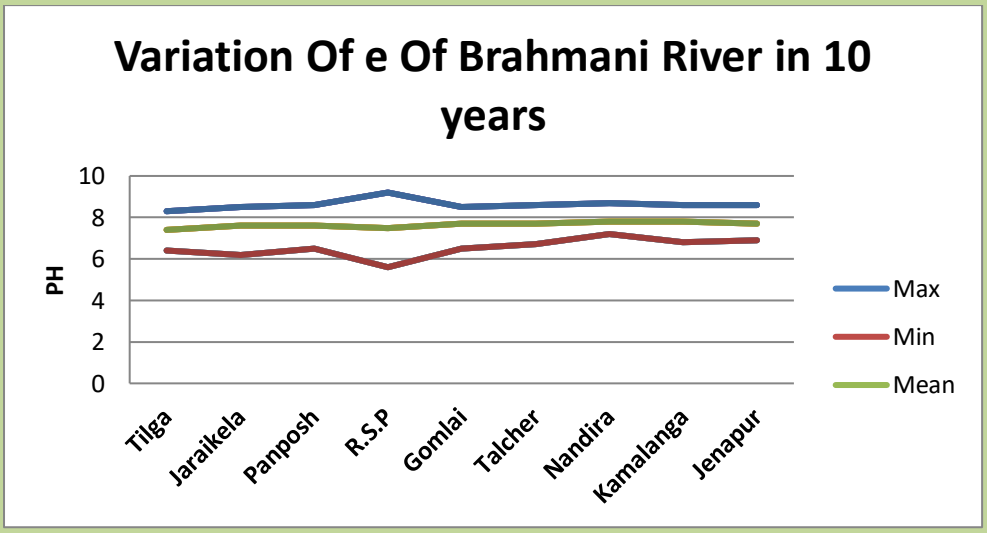

Fig-III (variation of PH of Brahmani River in 10 years)

(TOLERANCE LIMIT OF PH-6.5-8.5 as per BIS Surface water Standard for Class-A Surface water)

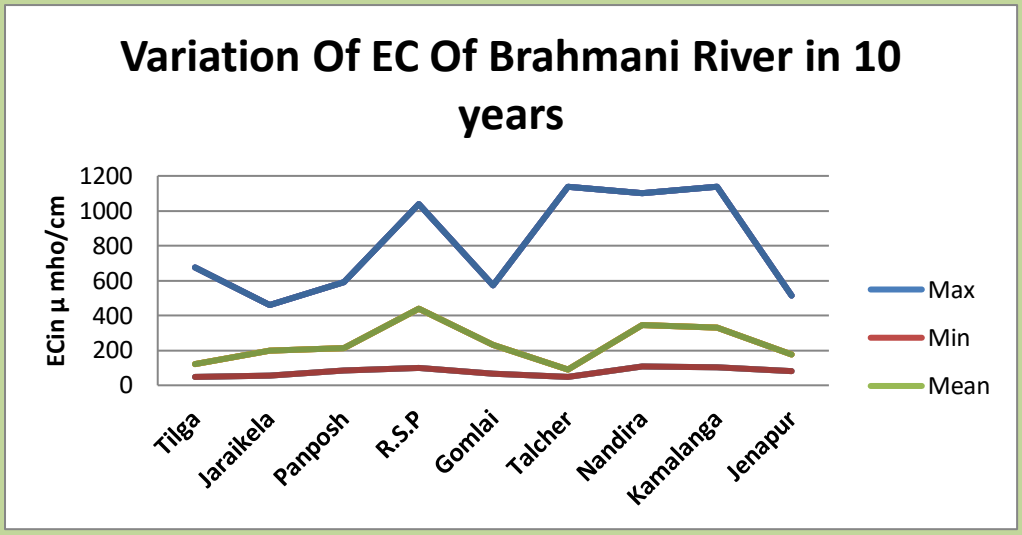

Fig-IV (variation of EC of Brahmani River in 10 years)

(Tolerance limit OF EC-2250 µ mho/cm). (As per BIS Surface water Standard for Class-A Surface water)

Name of the Sampling Station	Chloride(Cl^-) in mg/L			Bicarbonate(HCO_3^-) in mg/L		
	Max	Min	Mean	Max	Min	Mean
Tilga-S_1	36	1	13	90.2	22.5	52.5
Jareikela-S_2	39	8	15	136.3	11.3	82.6
Panposh-S_3	45	7	15	140.9	15.1	81.4
R.S.P.-S_4	68	6	28	208	11.3	88.4
Gomlai-S_5	41	6	17	140.2	22.5	73.2
Talcher-S_6	47	7	15	149.8	16.9	62.7
Nandira-S_7	58	9	21	42.3	0.0	1.4
Kamalanga-S_8	40	8	20	198.1	0.1	89.4
Jenapur-S_9	75	8	16	140.9	21.4	65.2

TABLE-3:(10 year average data of Chloride and Biocarbonate at different sampling stations of Brahmani river)

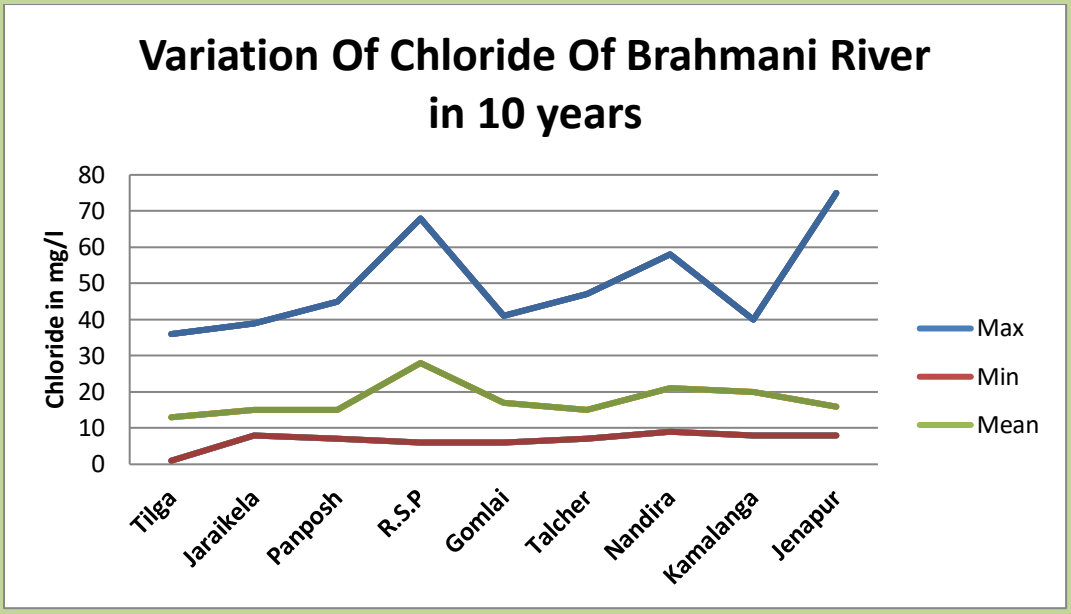

Fig-V (variation of Chloride of Brahmani River in 10 years)

(Tolerance limit OF Cl-250mg/l.(As per BIS Surface water Standard for Class-A Surface water)

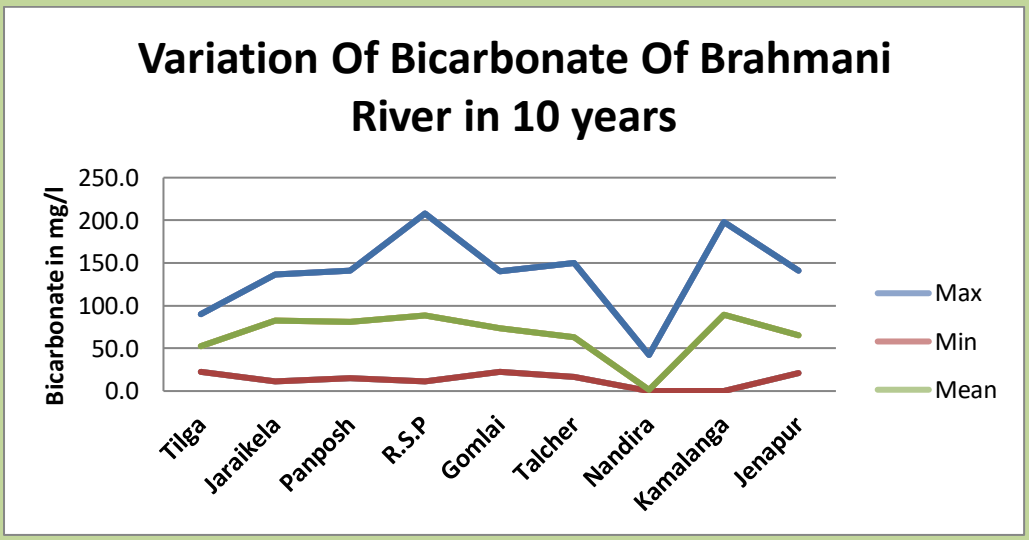

Fig-VI (variation of Bicarbonate of Brahmani River in 10 years)

(Tolerance limit OF Biocarbonate-no limit). (As per BIS Surface water Standard for Class-A Surface water)

Name of the Sampling Station	Calcium(Ca^{++}) in mg/L			Magnesium(Mg^{++}) in mg/L		
	Max	Min	Mean	Max	Min	Mean
Tilga-S_1	96.2	4.8	16.2	18.9	0.1	5.9
Jareikela-S_2	96.2	6.3	24.0	18.5	0.1	9.5
Panposh-S_3	51.1	6.4	22.7	27.3	1.0	8.5
R.S.P.-S_4	75.3	14.4	33.4	27.3	0.1	12.3
Gomlai-S_5	49.7	4.7	23.2	28.2	1.0	9.1
Talcher-S_6	96.2	8.0	24.8	43.6	0.1	8.1
Nandira-S_7	64.5	8.0	29.5	30.1	0.1	11.5
Kamalanga-S_8	65.7	9.5	29.9	36.0	0.1	11.4
Jenapur-S_9	59.3	8.0	21.3	38.9	0.1	8.7

TABLE-4:(10 year average data of Calcium and Magnesium at different sampling stations of Brahmani river)

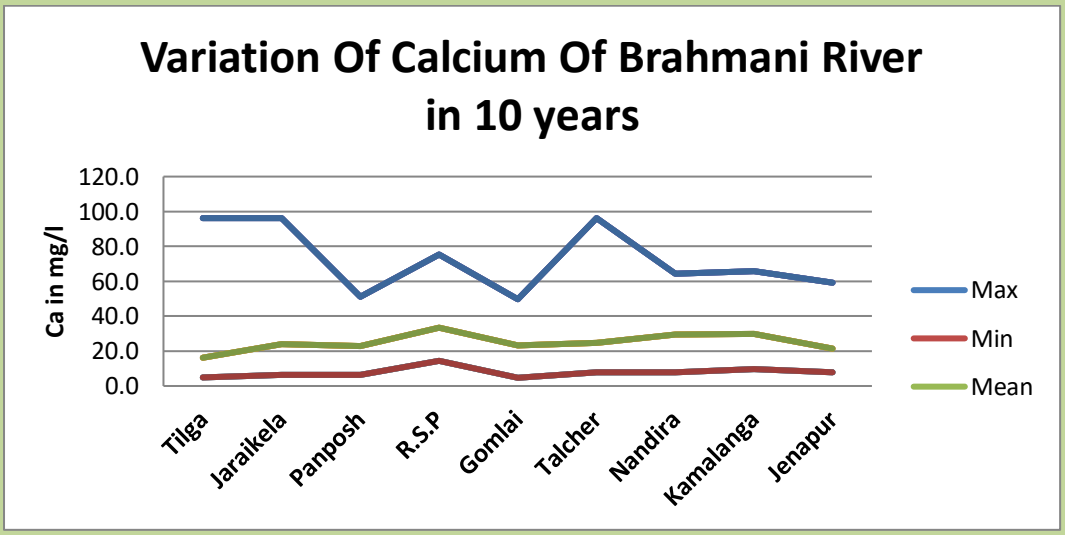

Fig-VII (variation of Calcium of Brahmani River in 10 years)

(Tolerance limit OF Ca-200mg/l). (As per BIS Surface water Standard for Class-A Surface water)

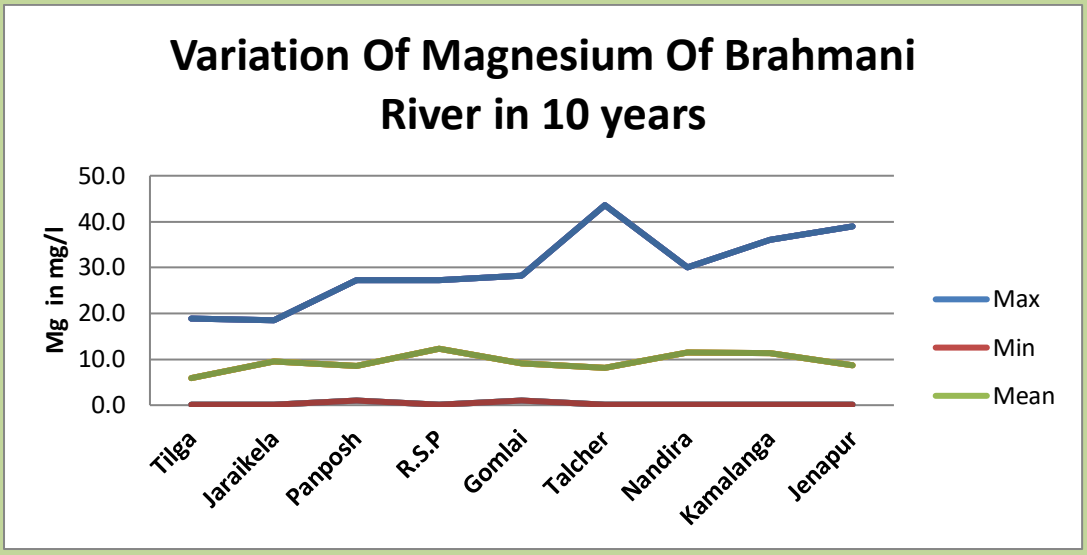

Fig-VIII (variation of Magnesium of Brahmani River in 10 years)

(Tolerance limit OF Mg -100mg/l).(As per BIS Surface water Standard for Class-A Surface water)

Name of the Sampling Station	Sodium (Na^+) in mg/L			Potassium(K^+) in mg/L		
	Max	Min	Mean	Max	Min	Mean
Tilga-S_1	39	1	7	9.5	0.3	2.0
Jareikela-S_2	46	1	8	13.1	0.4	2.7
Panposh-S_3	61	1	9	10.8	0.7	2.8
R.S.P.-S_4	90	3	19	82.6	1.3	7.3
Gomlai-S_5	90	3	13	45.0	0.9	4.7
Talcher-S_6	91	2	10	25.1	0.5	3.3
Nandira-S_7	91	2	18	30.1	0.5	4.6
Kamalanga-S_8	93	3	16	23.4	1.2	4.3
Jenapur-S_9	95	2	11	26.6	0.3	3.2

TABLE-5:(10 year average data of sodium and potassium at different sampling stations of Brahmani river)

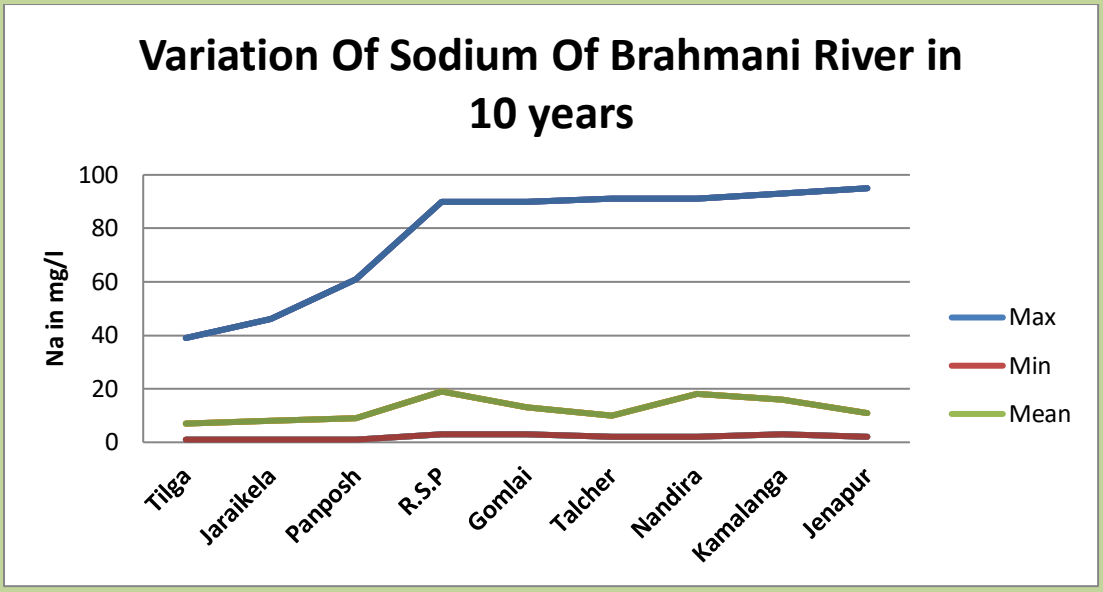

Fig-IX (variation of sodium of Brahmani River in 10 years)

(Tolerance limit OF sodium-no limit). (As per BIS Surface water Standard for Class-A Surface water)

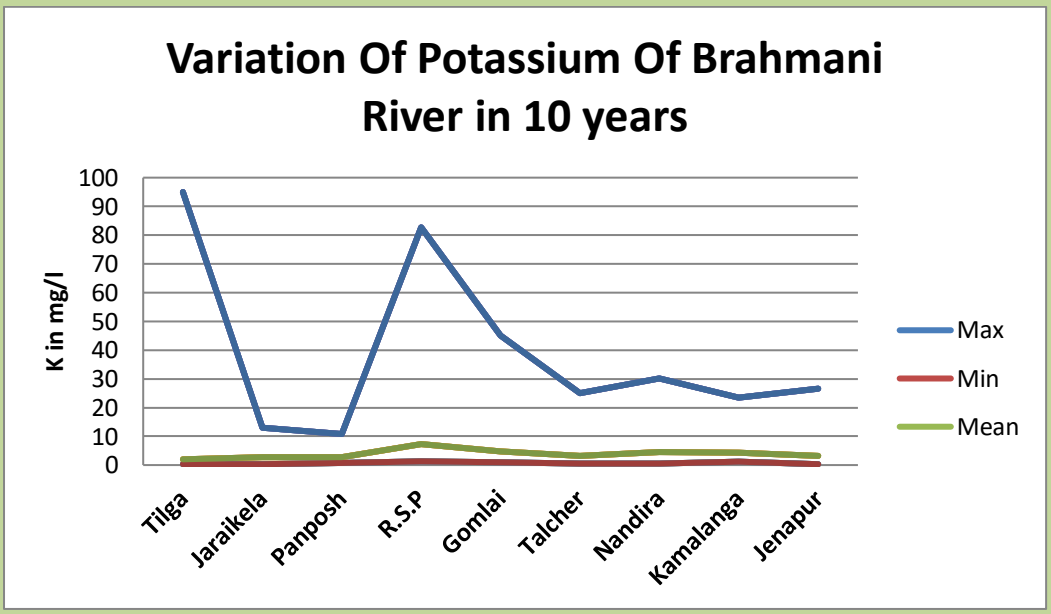

Fig-X (variation of Potassium of Brahmani River in 10 years)

(Tolerance limit Of potassium-no limit). (As per BIS Surface water Standard for Class-A Surface water)

Name of the Sampling Station	D.O in mg/L			B.O.D in mg/L		
	Max	Min	Mean	Max	Min	Mean
Tilga-S_1	13.5	3.6	7.1	5.3	0.2	0.9
Jareikela-S_2	12.3	3.3	6.8	5.2	0.2	0.9
Panposh-S_3	11.1	2.5	6.5	3.8	0.2	1.1
R.S.P.-S_4	10.7	1.0	4.9	7.9	0.2	4.3
Gomlai-S_5	11.3	3.4	6.8	7.1	0.2	1.0
Talcher-S_6	12.1	4.0	7.3	4.0	0.2	1.0
Nandira-S_7	10.7	1.8	6.8	8.3	0.2	1.3
Kamalanga-S_8	11.1	0.8	6.9	3.2	0.1	1.1
Jenapur-S_9	11.5	3.8	7.0	4.0	0.2	1.0

TABLE-6:(10 year average data of DO and BOD at different sampling stations of Brahmani river)

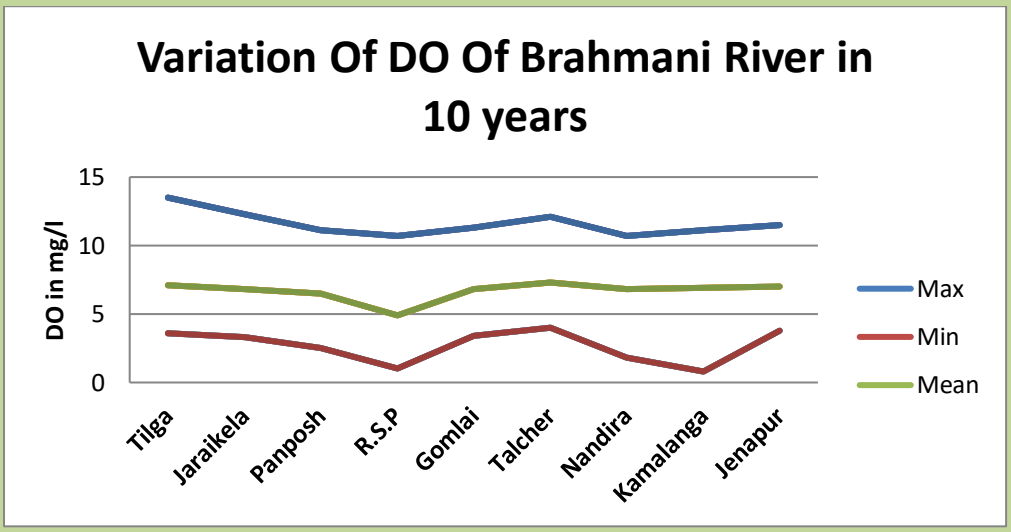

Fig-XI (variation of DO of Brahmani River in 10 years)

(Tolerance limit OF DO->6mg/l.)(As per BIS Surface water Standard for Class-A Surface water)

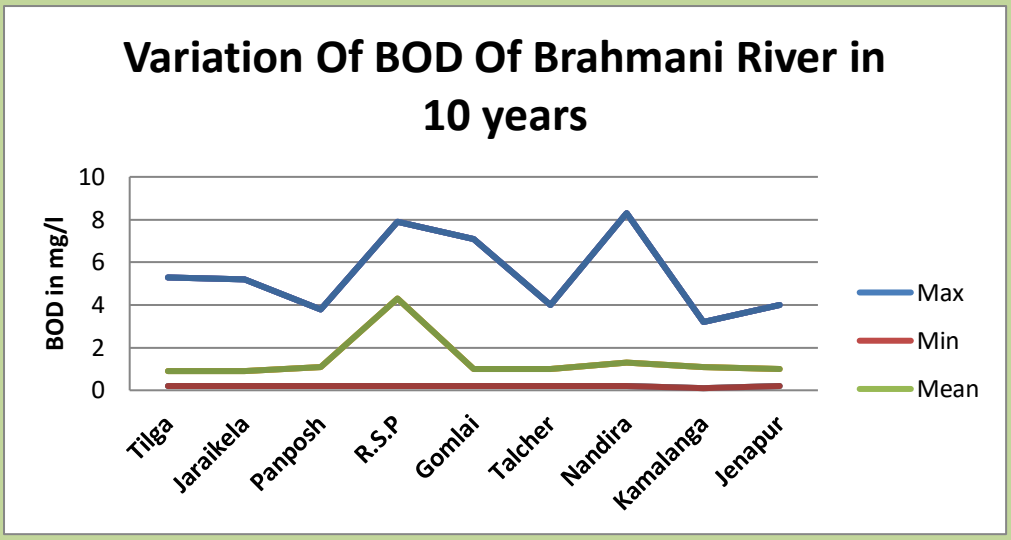

Fig-XII (variation of BOD of Brahmani River in 10 years)

(Tolerance limit OF BOD-<2mg/l). (As per BIS Surface water Standard for Class-A Surface water)

IV. Conclusion

The present study reveals that the water quality of Brahmani river is quite safe at the sites stated above from the physico-chemical parameters point of view..Further it is stated that since the river is passing through the industrial belt of Odisha, where major industries like SAIL,Rourkela Steel Plant,Bhushan Steel plant and NALCO at Angul etc passes their industrial effluents at certain parts of the river and due to increased human activities along its bank a constant monitoring of the water quality of the river is necessary to ascertain health of the river.

I. Applications

The present study is useful in ascertaining the water quality of Brahmani river along its entire stretch for its portability for industrial, agricultural and domestic use.

II. References

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7. BIS(ISI) Water Quality Standards for Classifying Surface Water Sources.
8. Water Quality analysis Data of ERWQL,ERD,CWC,Bhubaneswar.

TREND ANALYSIS OF WATER QUALITY OF BHAGIRATHI & MAHANANDA RIVER

[KALNA (EBB), KALNA (FLOW) AND ENGLISH-BAZAR SITES]

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- **INTRODUCTION:**

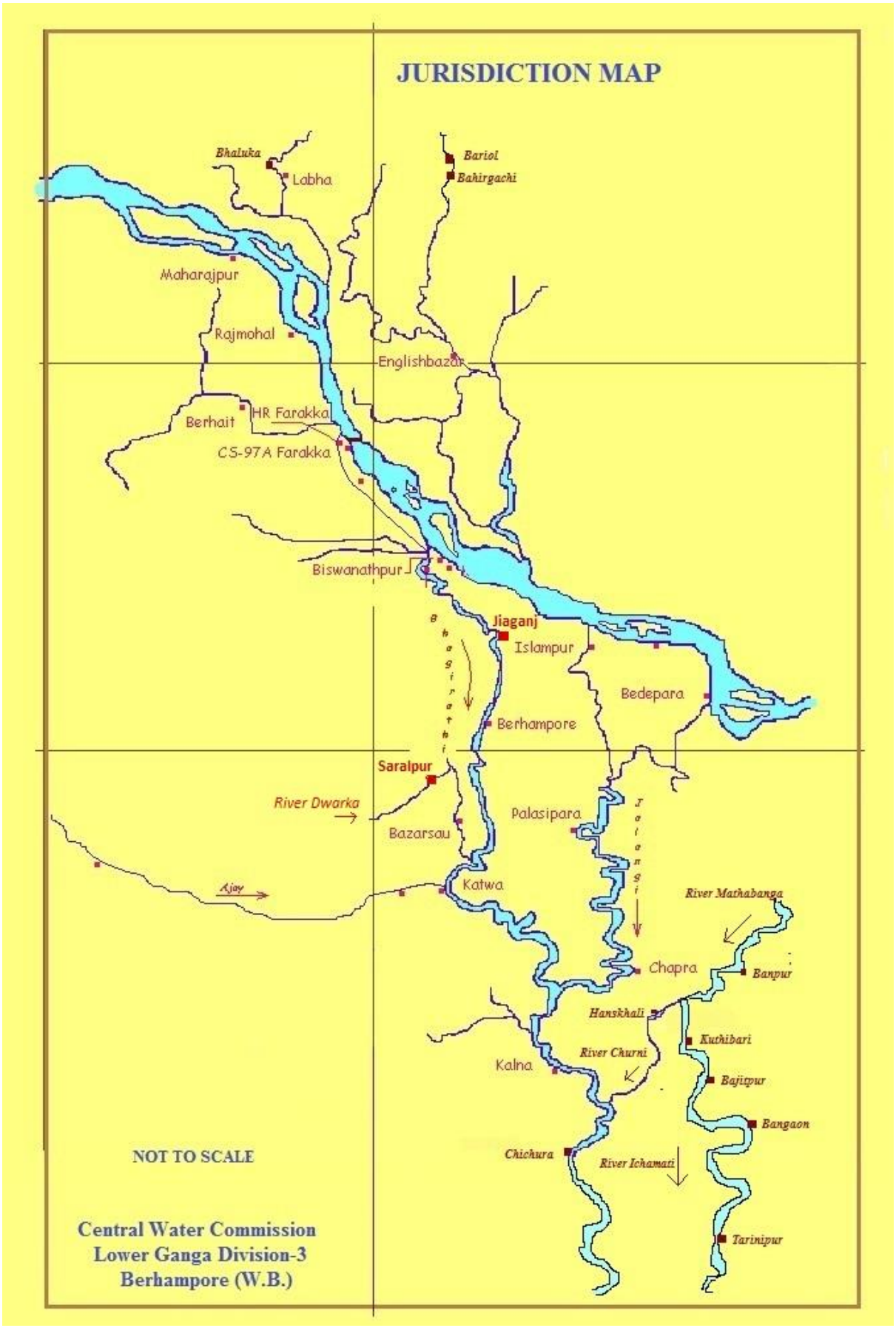
The water quality from the rivers has a considerable importance for the reason that these water resources are generally used for multiple matters such as: drinking domestic and residential water supplies, agriculture (irrigation), hydroelectric power plants, transportation and infrastructure, tourism, recreation, and other human or economic ways to use water. So river water quality is of key concern for maintaining the ecological balance. Surface water is more prone to be affected by both anthropogenic activities and natural processes. Natural processes influencing water quality include precipitation rate, weathering processes and sediment transport, whereas anthropogenic activities include urban development and expansion, and industrial and agricultural practices. These activities often result in the degradation of water quality, physical habitat, and biological integrity of the ecosystem. In view of the limited stock of freshwater worldwide and the role that anthropogenic activities play in the deterioration of water quality, the protection of these water resources has been given topmost priority in the 21st century. There is a great range of water quality parameters that can be used to characterise waters. Largely the water quality measurement objectives and the previous history of the water body will determine selection of parameters. It is true, however, that some parameters are of special importance and deserve frequent attention.

- **STUDY AREA:**

Kalna(Ebb) and Kalna(Flow) are located on the west bank of the Bhagirathi River, a distributary fo the Ganges. The latitude and longitude of Kalna are 23°13’28”(N) and 88°22’26”(E).It comes under Bhagirathi Jalangi Sub-Division Under Lower Ganga Division (III), Berhampore. Total Drainage area of Kalna is 25830 sqkm. The river usually likes around 240 meter at Kalna site. The both sides {Kalna (Ebb) and Kalna(Flow)} are tide effected and it is the last side of Bhagarathi River before it flows into sea.

English Bazar site located at right Bank of Mahanadi River. The latitude and longitude of English-Bazar site are 25°09’37” and 88°05’54” respectively. Total Catchment area 12820 sq km.

JURISDICTION MAP



Results and Discussions:

Based on the Data Available for the period(2010-2019), seven physico-chemical parameters i.e. pH, Temperature, Chloride, Calcium, Magnesium, Carbonate, Bi-Carbonate are considered for preparing the report.

Analytical Method:

Standard analytical methods are followed for measuring the above said seven Physico-Chemical Parameters.

Tolerance Limit:

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfections	**A**	1. Total Coliforms Organisms MPN/100 ml shall be 50 or less. 2. pH between 6.5 and 8.5 3. Dissolved oxygen 6 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20^{0}C 2mg/l or less.
Outdoor bathing (Organized)	**B**	1. Total Coliforms Organisms MPN/100 ml shall be 500 or less. 2. pH between 6.5 and 8.5 3. Dissolved oxygen 5 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20^{0}C 3 mg/l or less.
Drinking Water Source after conventional treatment and disinfection	**C**	1. Total Coliforms Organisms MPN/100 ml shall be 5000 or less. 2. pH between 6 and 9 3. Dissolved oxygen 4 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20^{0}C 3 mg/l or less.
Propagation of Wild life and Fisheries	**D**	1. pH between 6.5 and 8.5 2. Dissolved oxygen 4 mg/l or more. 3. Free ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste Disposal	**E**	1. pH between 6.5 and 8.5 2. Electrical conductivity at 25^{0}C micromhos/cm Max. 2250 3. Sodium absorption ratio Max. 26 4. Boron Max 2mg/l.
	Below **E**	Not meeting **A**, **B**, **C**, **D** and **E** criteria.

- **Temperature:**

  Temperature is an important factor to influence the physico-chemical parameters and the biological reaction in water. It is one of the most important fundamental variables in river Ecology. Higher value of Temperature reduces the solubility of gases and dissolves oxygen by increasing molecular Activity.

The yearly average value of Temperature (°C) of Kalna (Ebb) side of River Bhagirathi is varying between 30.7 to 34 in Monsoon season and 24.23 to 27.04 in nonmonsoon season from 2010 to 2019.The yearly average value of Temperature(°C) of Kalna (Flow) side of River Bhagirathi is varying between 27.85 to 32.6 in Monsoon season and 22.5 to 28.71 in nonmonsoon season from 2010 to 2019.

Also for side English-Bazar of River Mahanadi, The yearly average value of Temperature is varying between 26.78 to 31.4 in monsoon season and 23.33 to 28.41 in nonmonsoon season from 2010 to 2019.

Kalna(Ebb)

Temperature(°C):

Table-1

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	32.9	32.4	34	31.5	31.5	31.8	32.8	31.12	30.7	30.7
Non Moonsoon	26.13	25.95	27.46	26.41	26.96	24.23	27.04	26.36	26.47	24.98

Kalna(Flow):

Temperature(°C):

Table-2

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	32.4	32.44	32.6	31.2	27.85	32.3	32.1	30.6	30.3	30.3
Non Moonsoon	25.66	25.41	26.10	25.16	22.5	27.58	28.71	29	25.75	24.5

English-Bazar

Temperature (°C):

Table-3

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	31	30.8	30.4	29.2	26.78	27.8	30.8	31.4	30.8	30.8
Non Moonsoon	24.96	24.87	24.83	23.33	24.58	24.87	28.41	27.66	25.37	24.71

Kalna(Ebb):

Graph-1

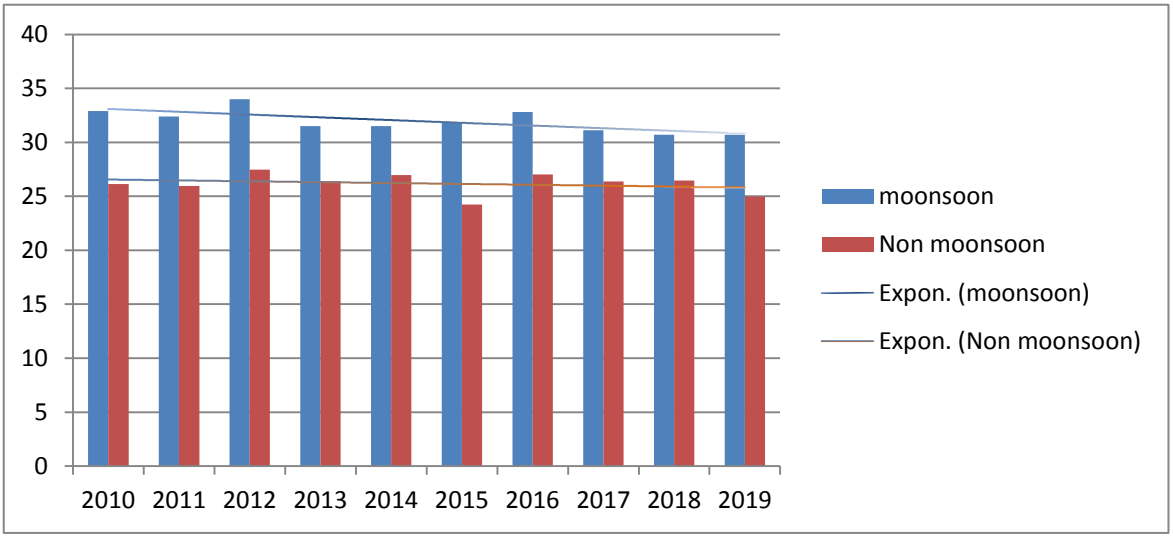


Fig. 1: Trend in Temperature(°C) of Bhagirathi River of Kalna(Ebb) site(WB)

Kalna(Flow):

Graph-2

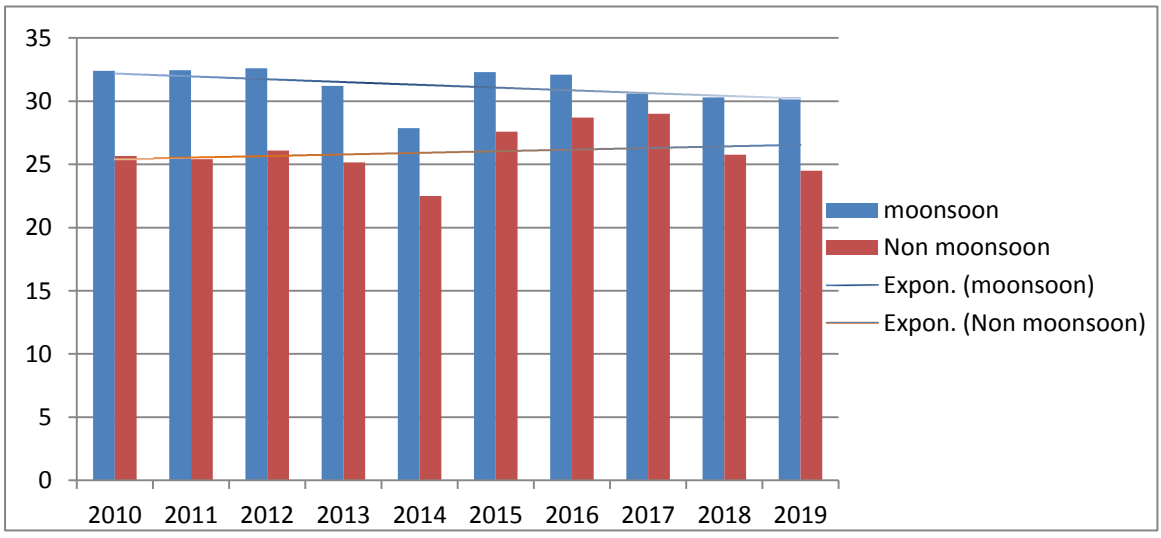


Fig. 2: Trend in Temperature (°C) of Bhagirathi River of Kalna(Flow) site(WB).

English-Bazar:

Graph-3

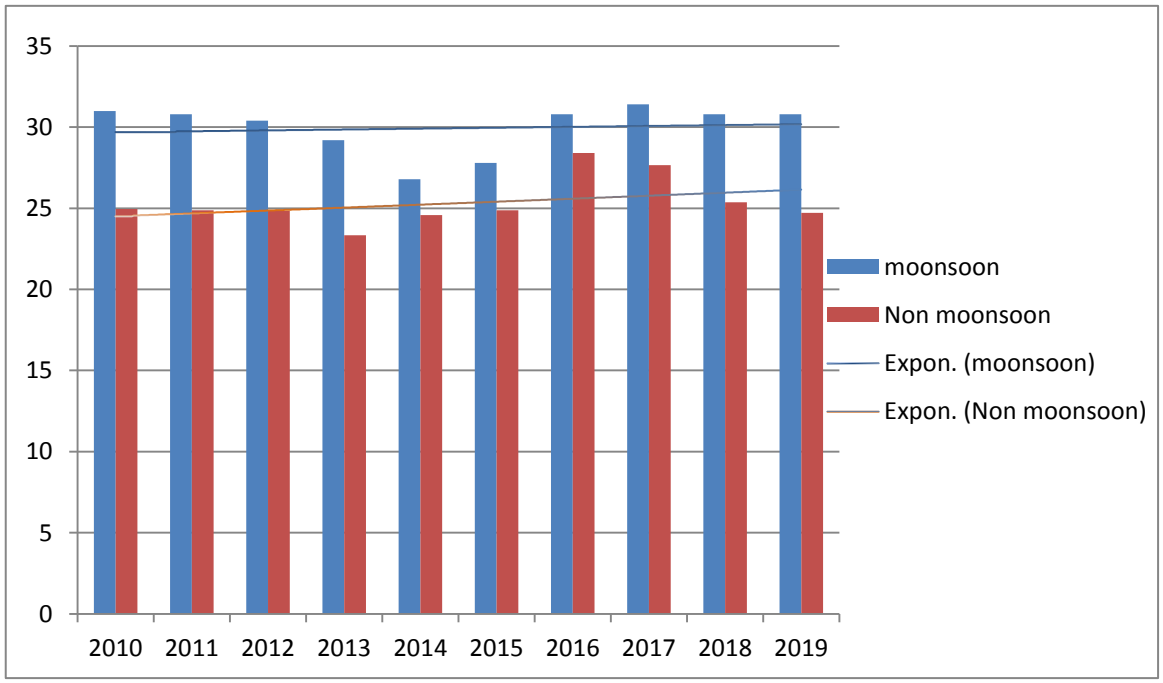


Fig. 3: Trend in Temperature (°C) of Mahanadi River of English-Bazar side(WB).

- **P^H:** The hydrogen ion concentration in water is expressed in terms of P^H. It is defined as the logarithm of inverse of hydrogen ion concentration in moles/L. The pH value of natural waters mostly depends on free carbon dioxide, bicarbonates and carbonate ions. Low pH values indicate acidic water having corrosive properties. The higher values of pH represent that there is high chloride, bicarbonate, carbonate etc. that means the water is alkaline. The pH value in between 6.5-8.5 is considered acceptable. However, no health-based guideline value has been proposed for P^H.

The yearly average value of P^H in Kalna(ebb) site of River Bhagirathi is varying between 7.6 to 8.28 in monsoon season and 6.63 to 8.33 in nonmonsoon season from 2010 to 2019. Whereas the yearly average value of P^H in Kalna(Flow) site of River Bhagirathi is varying between 7.42 to 8.28 in monsoon season and 7.85 to 8.35 in nonmonsoon season from 2010 to 2019.

Also for site English-Bazar of River Mahanadi,The yearly average value of P^H is varying between 7.38 to 7.88. in monsoon season and 7.50 to 7.87 in nonmonsoon season from 2010 to 2019 **(Table is given below)**

Kalna(Ebb):

Table-1

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	8.28	7.68	7.9	7.7	7.56	7.6	8.28	8.25	7.92	7.92
Non Moonsoon	8.31	8.08	6.63	7.84	8.02	8.06	8.34	8.14	7.97	8.33

Kalna(Flow):

Table-2

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	8.28	7.76	7.6	7.8	7.85	7.42	8.2	8.22	8.04	8.04
Non Moonsoon	8.35	8.01	7.85	7.92	8.00	8.02	8.37	8.29	8.25	8.32

English-Bazar:

Table-3

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	7.6	7.38	7.58	7.48	7.88	7.54	7.74	7.84	7.7	7.7
Non Moonsoon	7.73	7.76	7.50	7.87	7.56	7.82	7.84	7.84	7.82	7.85

Kalna(Ebb):

Graph-1

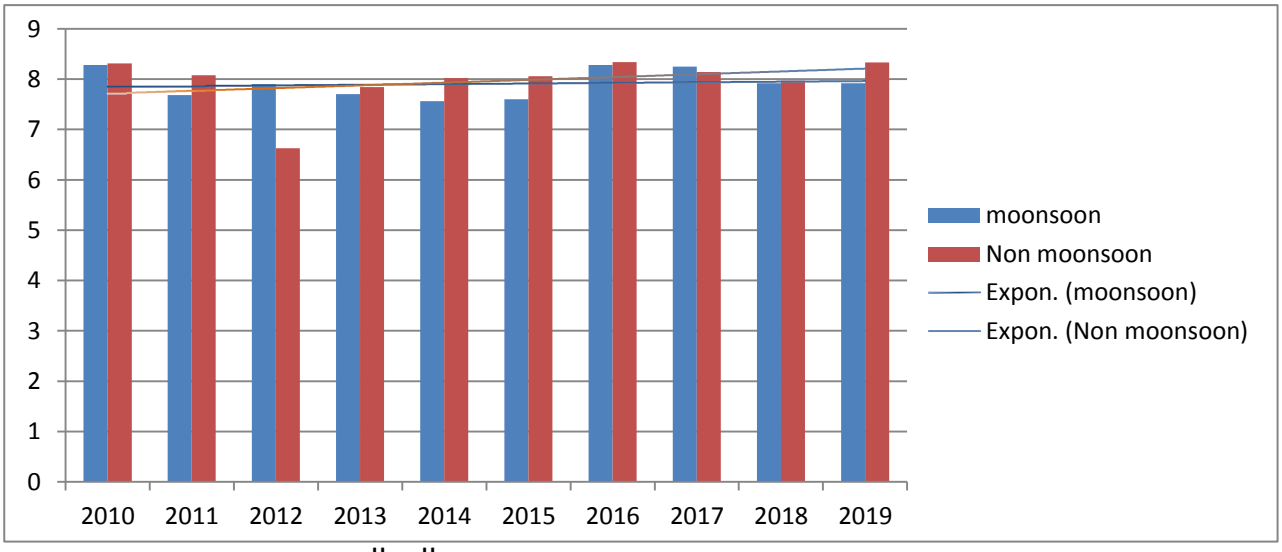


Fig. 1: Trend in P^H (P^H Unit) of Bhagirathi River of Kalna(Ebb) site(WB)

Kalna(Flow):

Graph-2

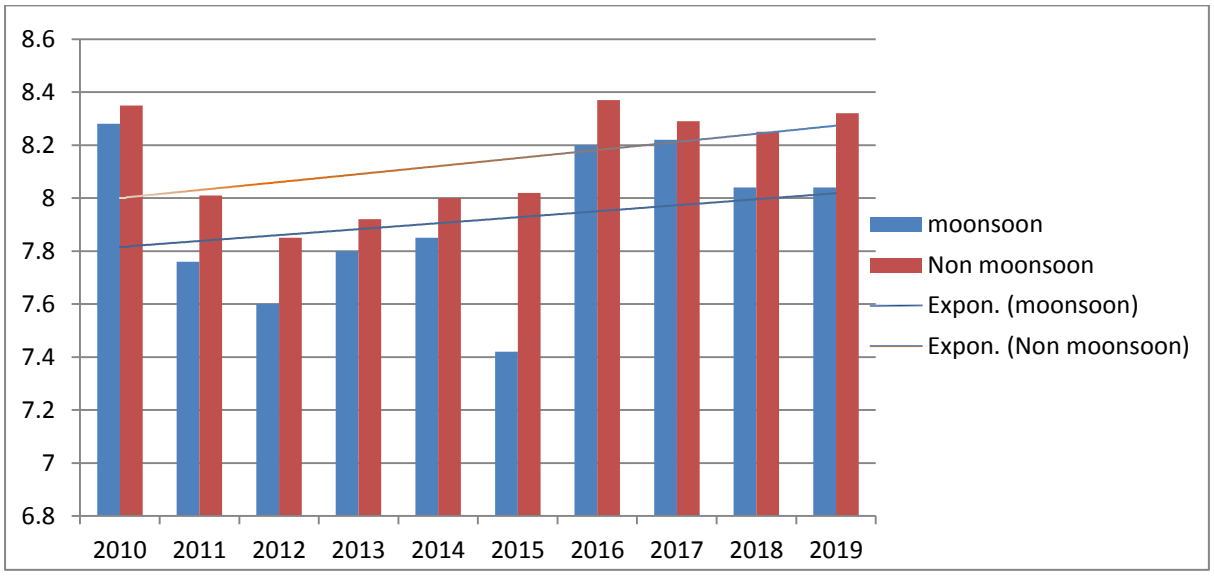


Fig. 2: Trend in P^H(P^H Unit) of Bhagirathi River of Kalna(Flow) site(WB)

English-Bazar:

Graph-3

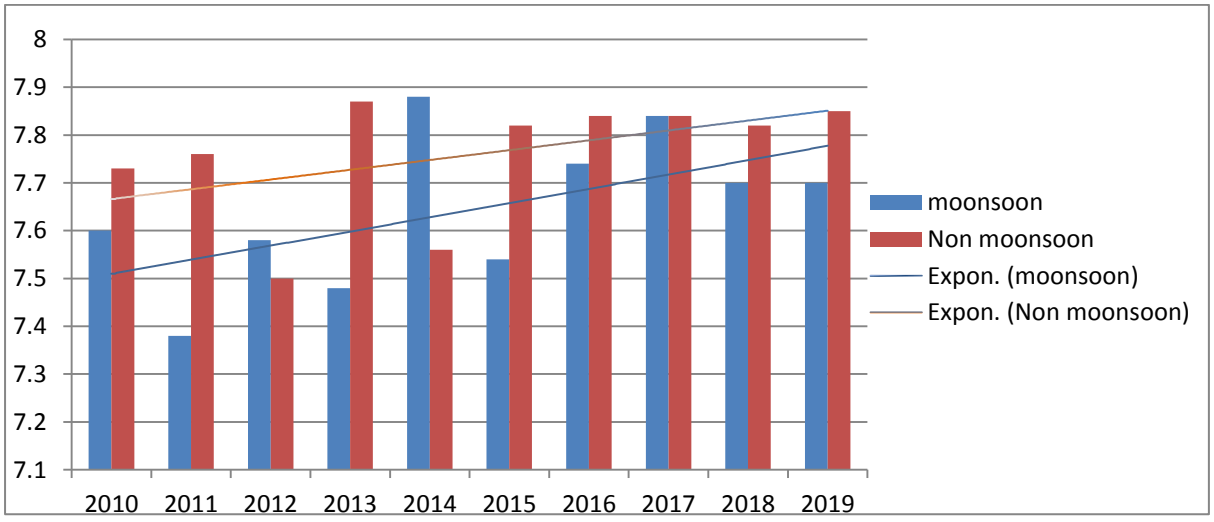


Fig. 3: Trend in P^H(P^H Unit) of Mahanadi River of English-Bazar site(WB).

Major Ions:

Chloride : Chlorides are salts resulting from the combination of the gas chlorine with a metal. Some common chlorides include sodium chloride (NaCl) and magnesium chloride (MgCl2). Chlorine alone as Cl2 is highly toxic and it is often used as a disinfectant. In combination with a metal such as sodium it becomes essential for life. Small amounts of chlorides are required for normal cell functions in plant and animal life. Chlorides can contaminate fresh water streams and lakes. Fish and aquatic communities cannot survive in high levels of chlorides.

The yearly average value of Chloride in Kalna (Ebb) site of River Bhagirathi is varying between 12.03 to 43.51 in monsoon season and 10.23 to 20.48 in nonmonsoon season from 2010 to 2019. Whereas the yearly average value of Chloride in Kalna(Flow) site of River Bhagirathi is varying between 11.05 to 15.56 in monsoon season and 12.88 to 20.47 in non monsoon season from 2010 to 2019.

Also for site English-Bazar of River Mahanadi , The yearly average value of chloride is varying between 11.31 to 15.39 in monsoon season and 10.73 to 20.47 in non-monsoon season from 2010 to 2019. **(Table is given below).**

Kalna(Ebb):

Table-1:

Year	2010	2011	2012	2013	2014	2015	5016	2017	2018	2019	2010
Moonsoon	43.51	13.92	19.17	13.92	14.84	16.38	14.53	14.03	12.03	12.03	43.51
Non Moonsoon	18.33	18.78	20.48	15.39	20.11	18.18	17.23	19.22	10.23	14	18.33

Kalna(Flow)

Table-2:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	14.91	14.52	11.72	13.63	14.56	11.95	15.19	15.56	11.05	11.05
Non Moonsoon	18.76	20.32	18.95	20.47	18.58	18.37	17.26	12.88	12.88	14.37

English-Bazar:

Table-3:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	11.93	12.71	11.79	13.42	14	15.39	12.95	13	11.31	11.31
Non Moonsoon	11.93	16.27	20.47	19.17	19.36	18.54	16.53	14.42	10.73	14.86

Kalna(Ebb):

Graph-1

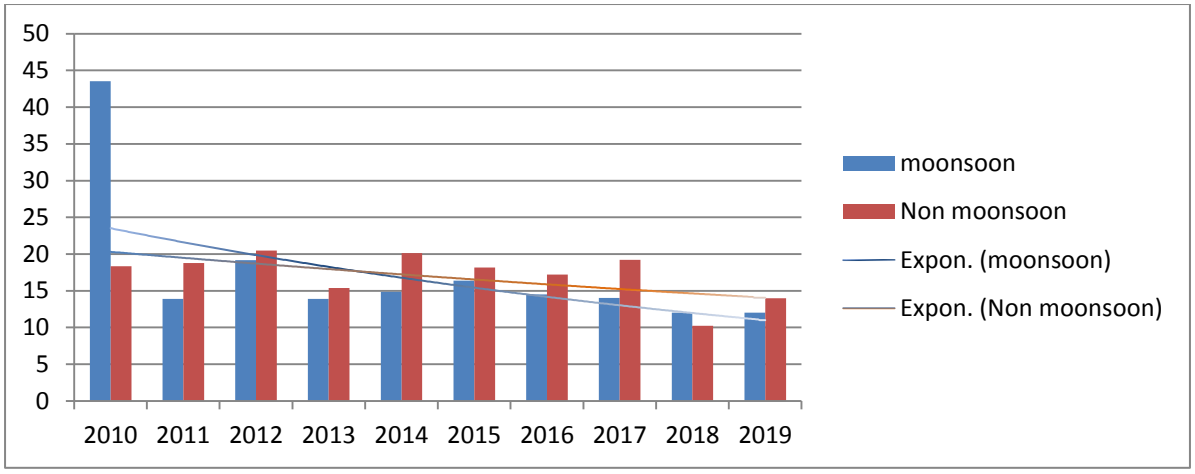


Fig. 1: Trend in Cl^- (mg/L) of Bhagirathi River of Kalna(Ebb) site(WB)

Kalna(Flow):

Graph-2

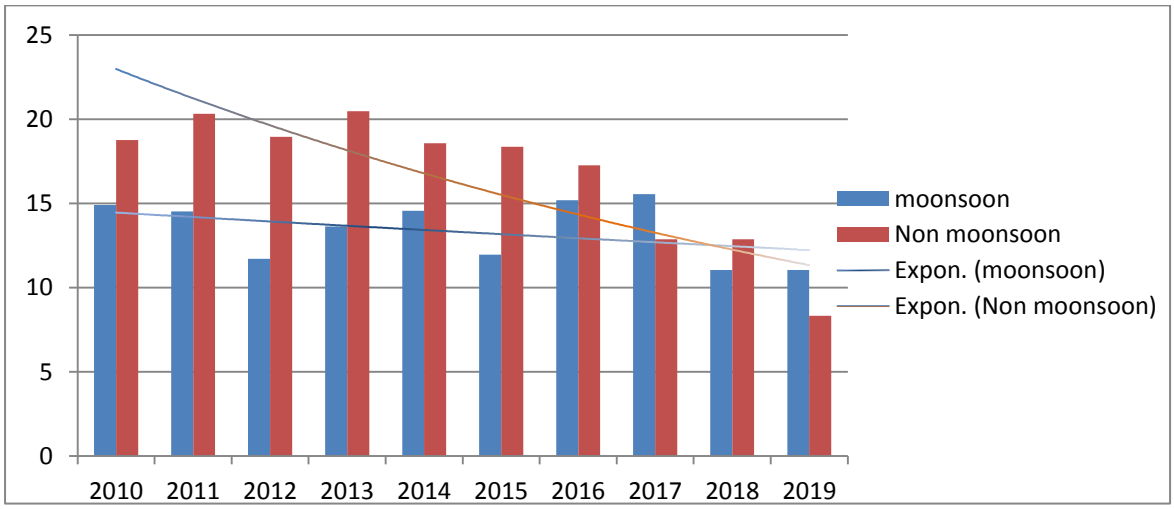


Fig. 2: Trend in Cl^-(mg/LUnit) of Bhagirathi River of Kalna(Flow) site(WB)

English-Bazar:

Graph-3

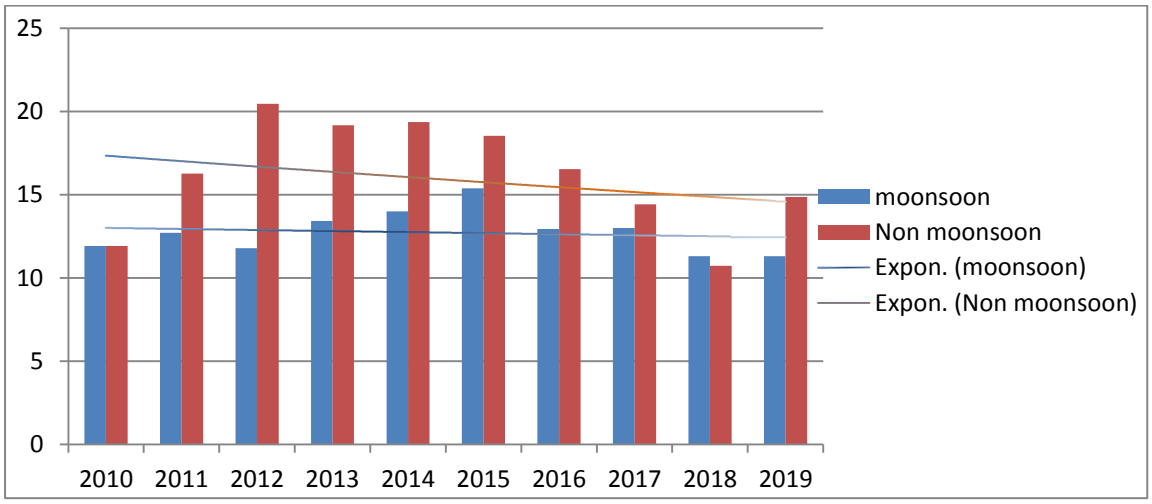


Fig. 3: Trend in Cl^-(mg/L) of Mahanadi River of English-Bazar site(WB).

Calcium(Ca^{+2}): Calcium salts and calcium ions are among the most commonly occurring in nature. Calcium is usually one of the most important contributors to hardness. Even though the human body requires approximately 0.7 to 2.0 grams of calcium per day as a food element. Calcium also serves an important role in the health of bodies of water. In natural water it is known to reduce the toxicity of many chemical compounds on fish and other aquatic life.

The yearly average value of Calcium in Kalna (Ebb) site of River Bhagirathi is varying between 24.17 to 39 in monsoon season and 27.34 to 44.69 in nonmonsoon season from 2010 to 2019. Whereas the yearly average value of Calcium in Kalna(Flow) site of River Bhagirathi is varying between 25.12 to 35.44 in monsoon season and 29.49 to 44.41 in non-monsoon season from 2010 to 2019.

Also for site English-Bazar of River Mahanadi , The yearly average value of Calcium is varying between 14.48 to 35.93 in monsoon season and 22.28 to 62.27 in nonmonsoon season from 2010 to 2019. **(Table is given below).**

Kalna(Ebb):

Table-1:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	30.24	29.92	39	28.92	30.96	29.92	30.28	31.12	24.17	24.17
Non Moonsoon	37.16	36.33	37.68	40.23	34.83	37.12	38.31	39.15	27.34	44.69

Kalna(Flow):

Table-2

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	33.03	28.52	25.92	29.24	32.07	25.12	35.44	31.78	27.56	27.56
Non Moonsoon	39.04	39.41	35.94	39.98	36.15	33.8	38.04	37.57	29.49	44.41

English-Bazar:

Table-3

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	14.48	17.24	16.84	35.93	31.64	35.4	15.52	20.85	14.88	14.88
Non Moonsoon	62.27	30.24	36.58	61.84	45.62	35.11	31.85	36.89	22.28	34.19

Kalna(Ebb):

Graph-1

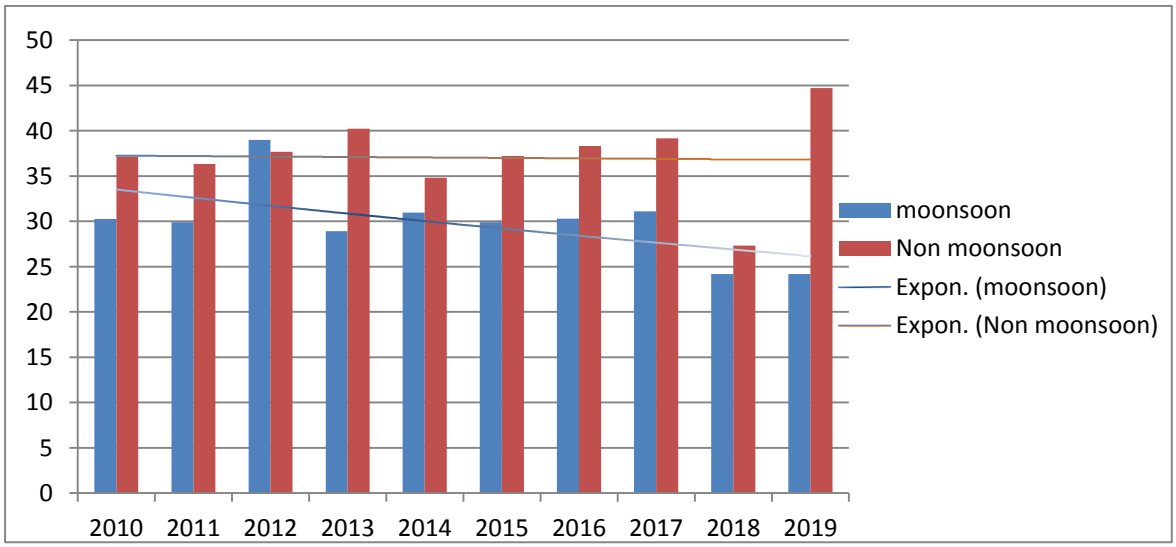


Fig. 1: Trend in Ca^{+2} (mg/L) of Bhagirathi River of Kalna(Ebb) site(WB)

Kalna(Flow):

Graph-2

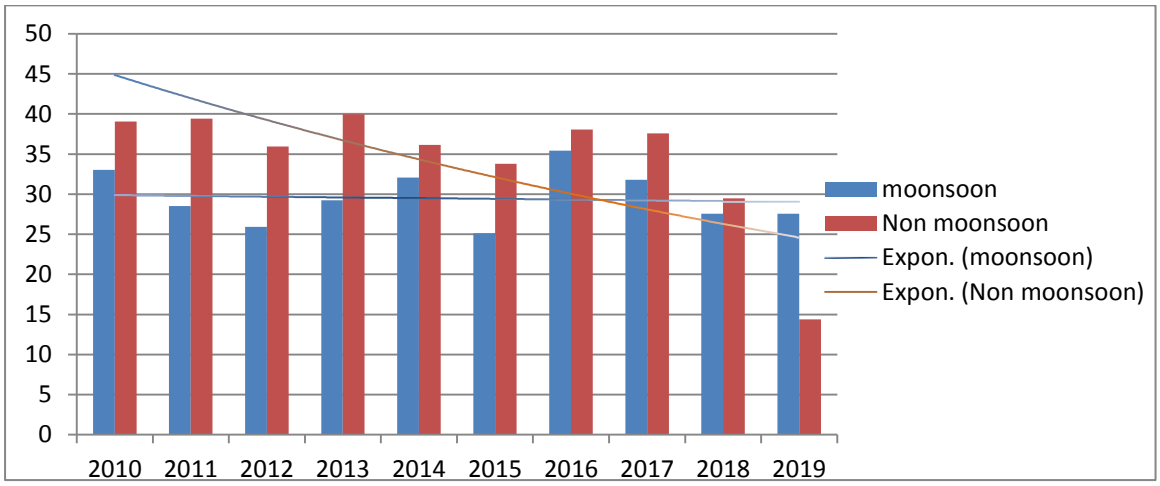


Fig. 2: Trend in Ca^{+2} (mg/L) of Bhagirathi River of Kalna(Flow) site(WB).

English-Bazar:

Graph-3

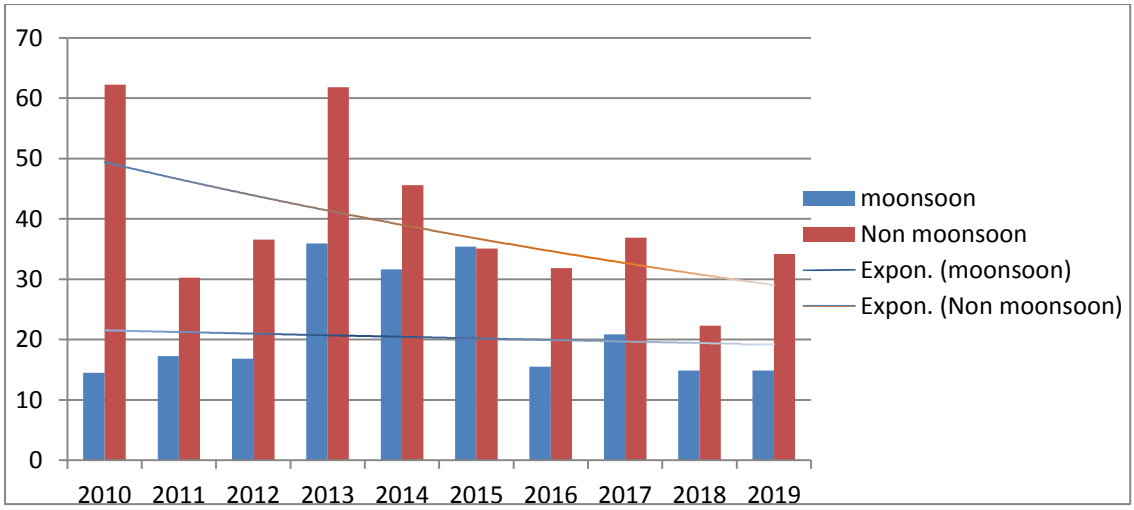


Fig. 3: Trend in Ca^{+2}(mg/L) of Mahanadi River of English-Bazar site (WB).

Magnesium(Mg^{+2}): Magnesium is widely distributed in ores and minerals. It is also very chemically active; therefore it is not found in the elemental state in nature. Magnesium ions are of particular importance in water pollution. They may contribute to water hardness. Concentrations of magnesium and calcium in water may also be a factor in the distribution of certain crustaceans, fish and other organisms in streams.

The yearly average value of Magnesium in Kalna (Ebb) site of River Bhagirathi is varying between 7.3 to 16.08 in monsoon season and 10.96 to 18.62 in nonmonsoon season from 2010 to 2019. Whereas the yearly average value of Magnesium in Kalna(Flow) site of River Bhagirathi is varying between 6.19 to 16.31 in monsoon season and 11.62 to 21.24 in nonmonsoon season from 2010 to 2019.

Also for site English-Bazar of River Mahanadi, The yearly average value of Magnesium is varying between 3.94 to 13.76 in monsoon season and 7.04 to 21.08 in nonmonsoon season from 2010 to 2019. **(Table is given below).**

Kalna(Ebb):

Table-1:

Year	2010	2011	2012	2013	2014	2015	5016	2017	2018	2019
Moonsoon	7.82	13.63	16.08	6.38	9.34	11.33	11.54	10.77	7.3	7.3
Non Moonsoon	12.86	16.19	13.12	21.34	15.48	13.25	14.86	18.14	10.96	18.62

Kalna(Flow):

Table-2

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	6.19	10.97	12.79	16.31	9.84	9.91	7.42	9.58	8.52	8.52
Non Moonsoon	11.68	13.48	12.78	20.29	13.62	12.88	12.51	13.28	11.62	21.24

English-Bazar

Table:3

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	3.94	6.6	6.58	13.42	4.75	13.76	3.94	7.27	12.53	12.53
Non Moonsoon	21.08	9.68	11.88	26.73	18.11	18.29	13.56	13.78	7.04	12.96

Kalna(Ebb):

Graph-1:

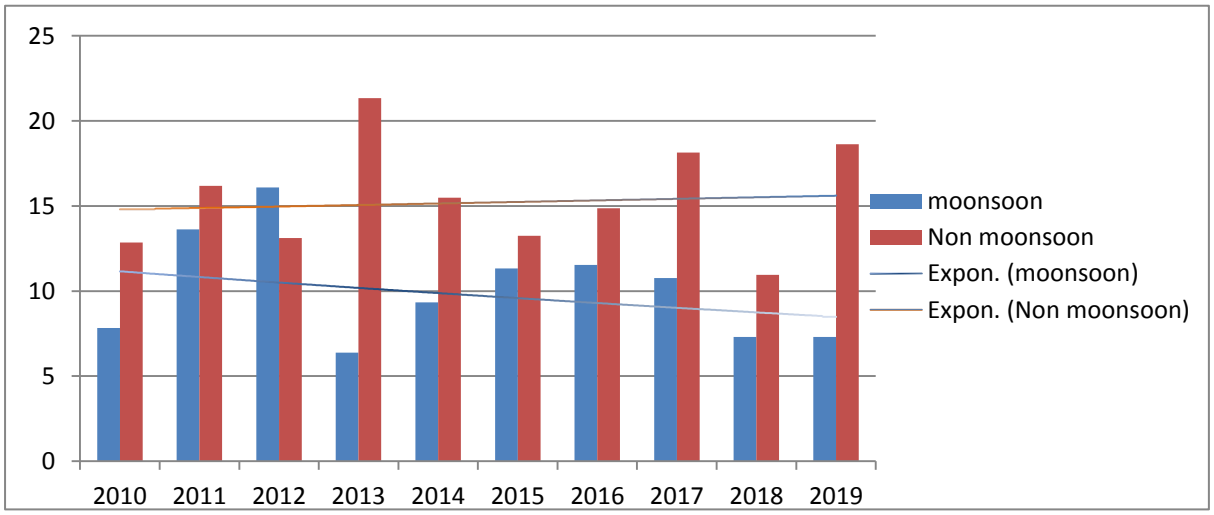


Fig. 1: Trend in Mg^{+2} (mg/L) of Bhagirathi River of Kalna(Ebb) site(WB).

Kalna(Flow):

Graph-2

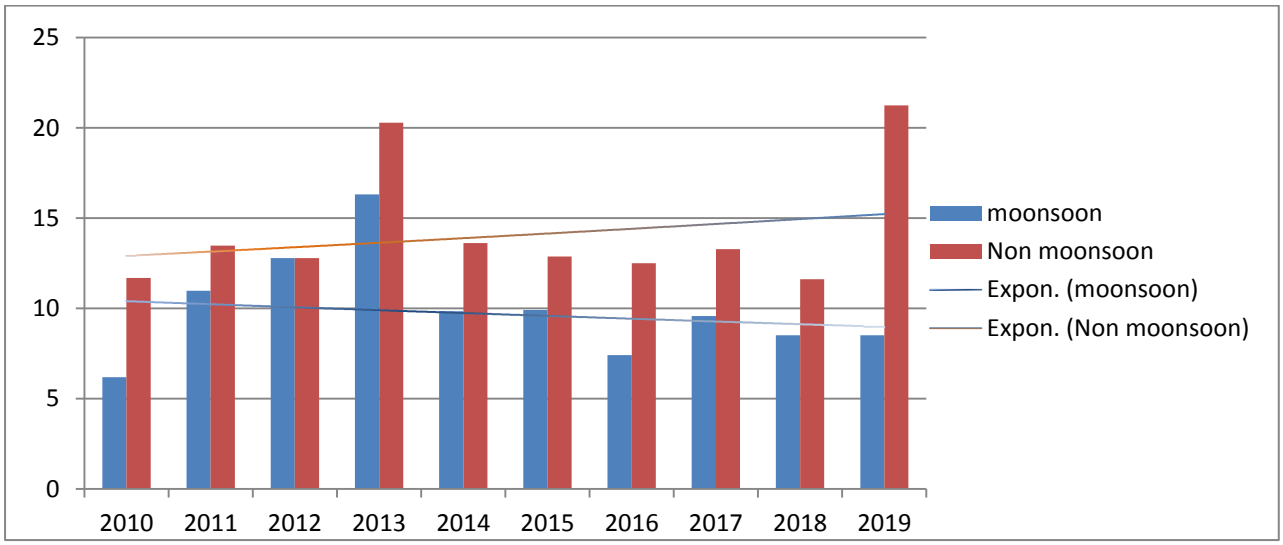


Fig. 2: Trend in Mg^{+2} (mg/L) of Bhagirathi River of Kalna(Flow) site(WB).

English-Bazar:

Graph-3

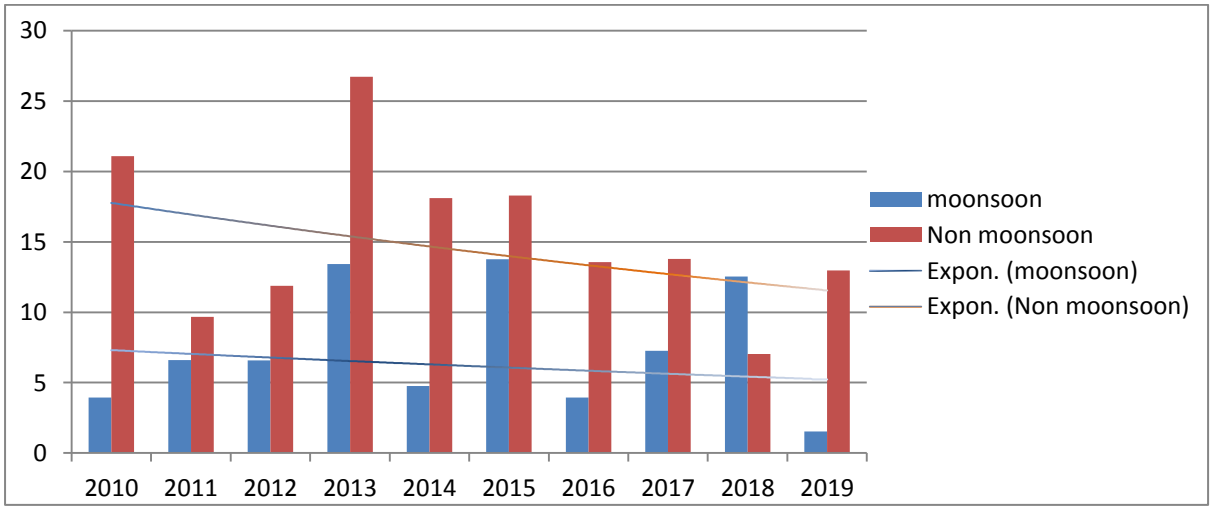


Fig. 3: Trend in Mg^{+2}(mg/L) of Mahanadi River of English-Bazar site (WB).

Carbonate:(Co_3^{-2}): Carbonate ion is the simplest oxocarbon anion. It consists of one carbon atom surrounded by three oxygen atoms, in a trigonal planar arrangement. Carbonate ions are of particular importance of water acidification. Concentrations of Calcium in water may also be a factor in the distribution of certain crustaceans, fish and other organisms in streams.

The yearly average value of Carbonate in Kalna (Ebb) site of River Bhagirathi is varying between 0.02 to 7.42 in monsoon season and 2.45 to 23.95 in nonmonsoon season from 2010 to 2019. Whereas the yearly average value of Carbonate in Kalna(Flow) site of River Bhagirathi is varying between 6.19 to 16.31 in monsoon season and 11.62 to 21.24 in nonmonsoon season from 2010 to 2019.

Also for site English-Bazar of River Mahanadi, The yearly average value of Magnesium is varying between 3.94 to 13.42 in monsoon season and 7.04 to 21.08 in nonmonsoon season from 2010 to 2019. **(Table is given below).**

Kalna(Ebb):

Table-1:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	7.42	6.74	4.8	9.56	0.34	0.02	5.44	5.48	3.24	3.24
Non Moonsoon	8.6	23.95	8.67	2.45	0.025	4.02	3.98	3.87	4.36	9.4

Kalna(Flow):

Table-2:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	6.7	11.4	1.52	2.04	0.1	0.1	3.98	8.36	4.58	4.58
Non Moonsoon	11.26	37.8	9.26	0.12	1.22	0.34	3.36	5.75	2.85	8.26

English-Bazar:

Table-3

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	1.18	8.86	4.42	0	0.28	0.02	1.48	1.32	2.46	2.46
Non Moonsoon	0.85	2.55	14.44	3.65	6.84	5.85	2.14	5.14	4.88	2.1

Kalna(Ebb):

Graph-1:

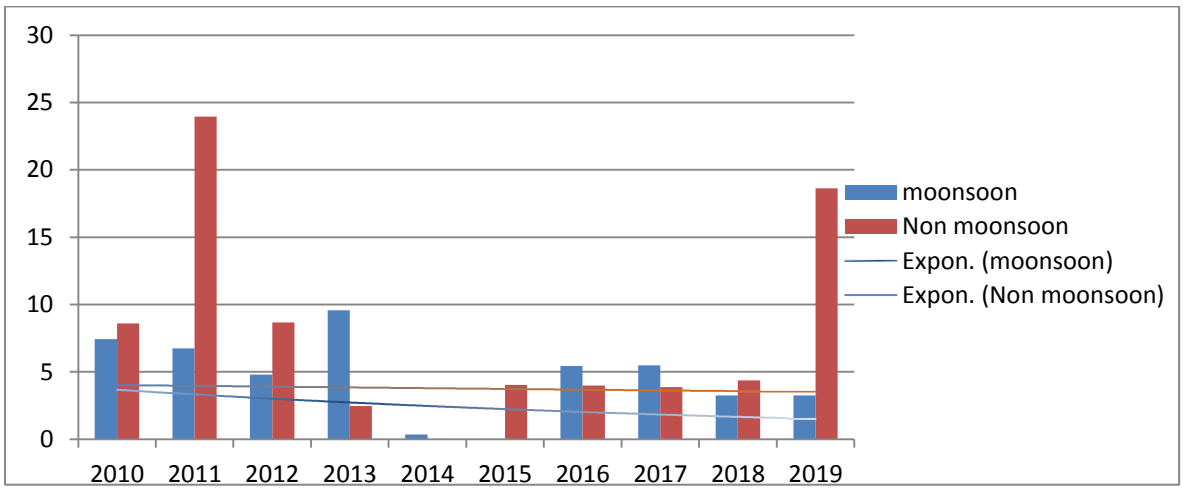


Fig. 1: Trend in Co_3^{-2} (mg/L) of Bhagirathi River of Kalna(Ebb)site(WB).

Kalna(Flow):

Graph-2

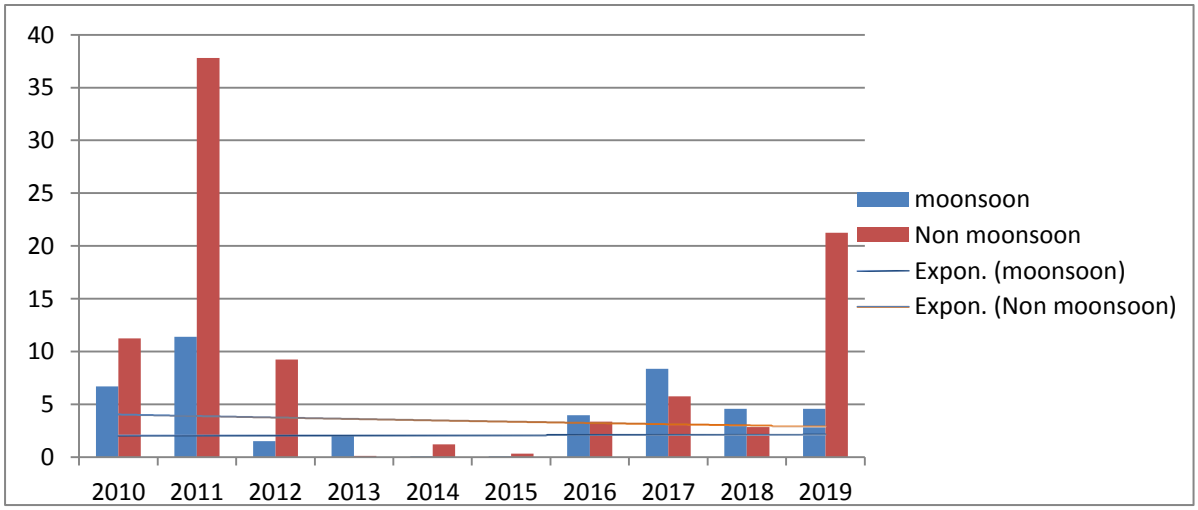


Fig. 2: Trend in Co_3^{-2} (mg/L) of Bhagirathi River of Kalna(Flow) site(WB).

English-Bazar:

Graph-3

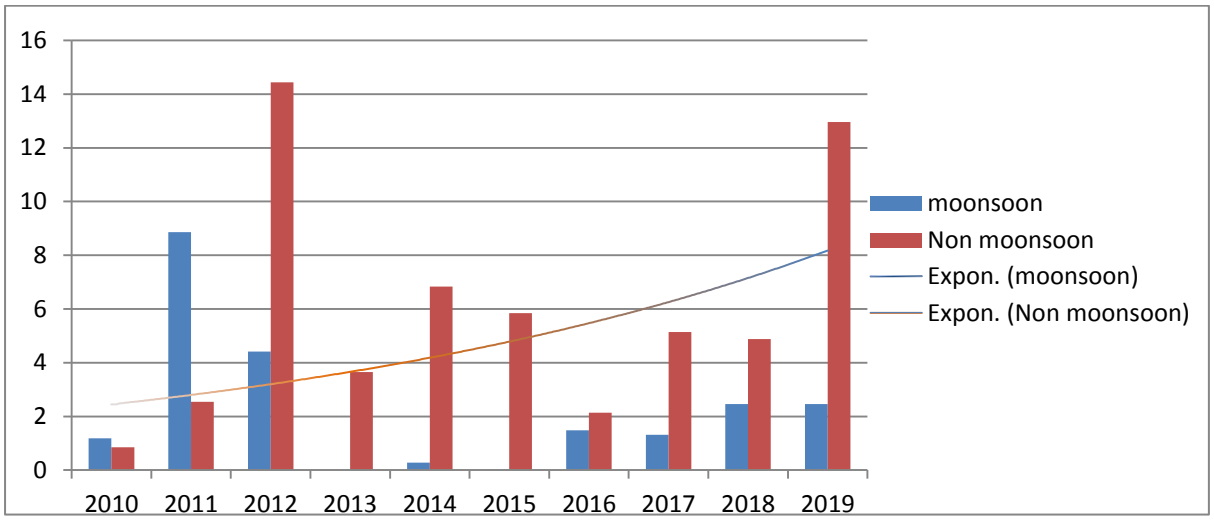


Fig. 3: Trend in Co_3^{-2}(mg/L) of Mahanadi River of English-Bazar site (WB).

Bi-Carbonate(HCO_3^-): Bicarbonate, also known as HCO3,In natural water most Alkalinity cause due to CO_2. The free CO_2 Dissolve in water to form to form carbonic acid, which further dissociates into H^+ and HCO_3^-.

The yearly average value of Bi-Carbonate in Kalna (Ebb) site of River Bhagirathi is varying between 2.44 to 72.6 in monsoon season and 2.4 to 151.68 in nonmonsoon season from 2010 to 2019. Whereas the yearly average value of Bi-Carbonate in Kalna(Flow) site of River Bhagirathi is varying between 2.28 to 72.66 in monsoon season and 2.94 to 156.59 in nonmonsoon season from 2010 to 2019.

Also for site English-Bazar of River Mahanadi, The yearly average value of Bi-Carbonate is varying between 3.1 to 57.66 in monsoon season and 5.35 to 166.97 in nonmonsoon season from 2010 to 2019. **(Table is given below).**

Kalna(Ebb):

Table-1

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	57.8	72.6	15.68	2.44	3.26	1.96	59.56	53.71	43.36	43.36
Non Moonsoon	80.34	105.59	55.06	2.4	4.44	4.39	33.29	31.41	79.49	151.68

Kalna(Flow):

Table-2

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	59.18	72.66	29.3	3.02	2.28	2.46	43.8	62.49	38.7	38.7
Non Moonsoon	89.79	104.70	94.37	2.94	4.65	4.27	49.27	45.24	82.79	156.59

English-Bazar:

Table-3

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Moonsoon	31.06	57.66	20.88	4	3.1	3.8	37.78	39.98	34.79	34.79
Non Moonsoon	166.97	78.23	67.60	8.71	8.84	5.35	12.1	69.36	116.94	165.24

Kalna(Ebb):

Graph-1

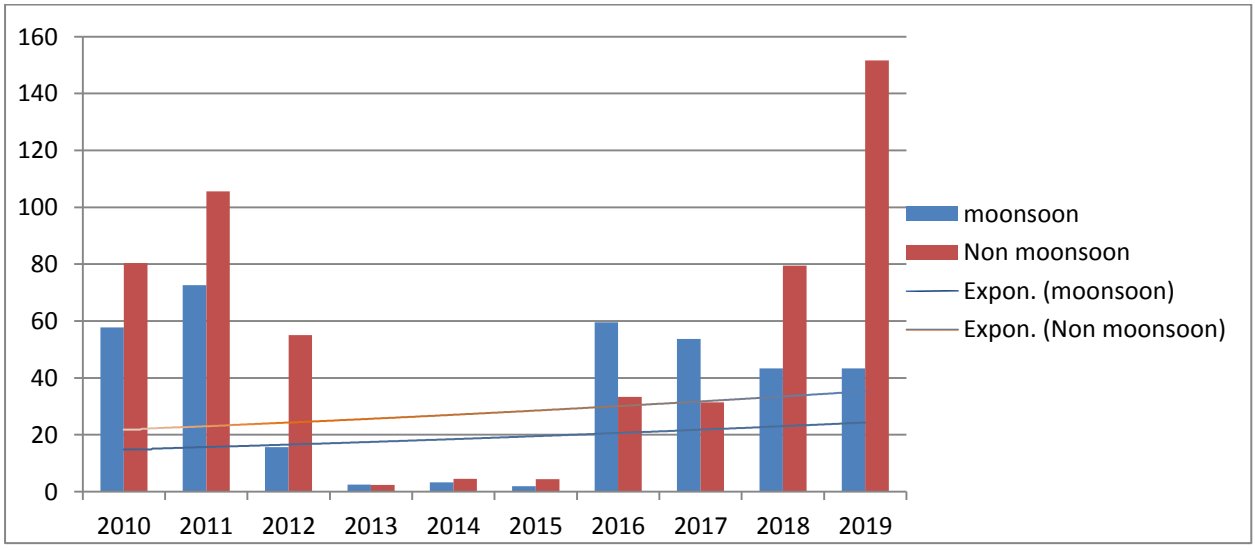


Fig. 1: Trend in HCO_3^- (mg/L) of Bhagirathi River of Kalna(Ebb)site(WB).

Kalna(Flow)

Graph-2

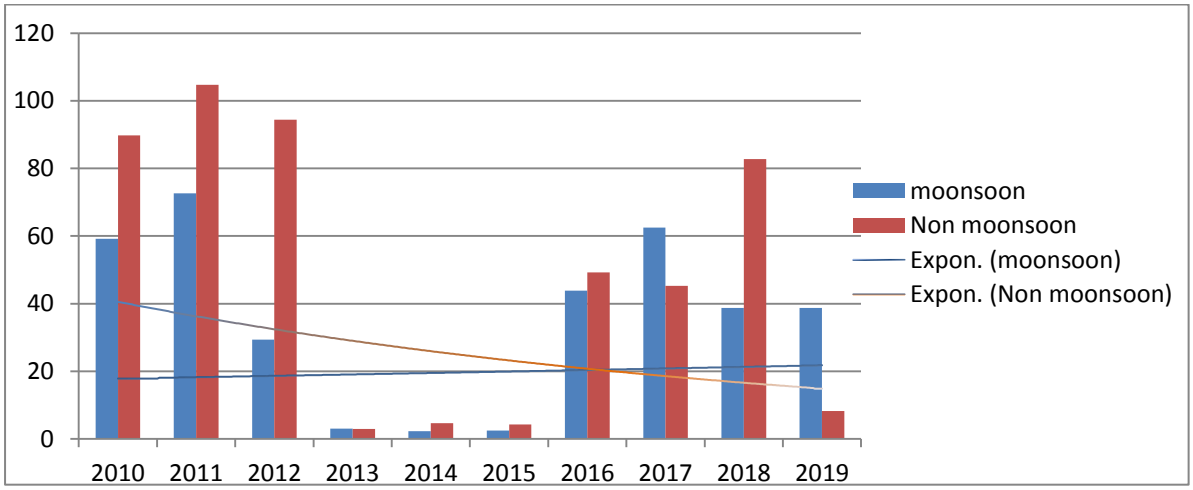


Fig. 2: Trend in $HCO3^-$ (mg/L) of Bhagirathi River of Kalna(Flow) site(WB).

English-Bazar:

Graph-3

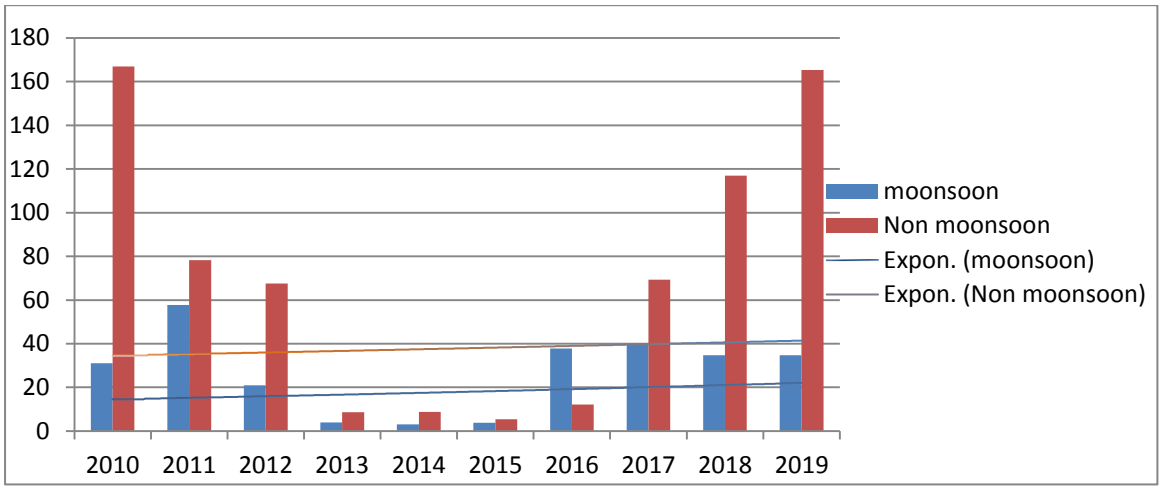


Fig. 3: Trend in HCO_3^-(mg/L) of Mahanadi River of English-Bazar site (WB).