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"Water Quality Analysis of Various Dams/Reservoirs of Bhavnagar Region"

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Abstract: Surface water quality assessment is a basic and critical tool for informing sustainabl management of water resources. The aim of this study is to evaluate the dam and reservoir water quality of the Bhavnagar region.. The results will assist water management in the study area for varied future demands including, irrigation, industries, and river conservation. Ecologically important parameters such as dissolved oxygen, chemical oxygen demand, biochemical oxygen demand, physico-chemical parameters (PH, Conductivity, Turbidity, sodium, potassium, lithium, calcium, hardness, solids, chloride, fluoride, sulphate, nitrate, phosphate, metals, Alkalinity) were analyzed. The results were compared with standard permissible limits of BIS and WHO. The differences in various parameters were statistically significant when comparing the pre-monsoon and post-monsoon of dam and reservoir. To identify a good technique for water quality assessment, all of the water quality parameters have been calculated by correlating various parameters and comparing them over two critical seasons with BIS. The Thematic map Map of The Water-quality parameters indicate that Dam/Reservoir Water is safe for Drinking and irrigation Purpose.

Keywords: Dam and reservoir, physico-chemical parameters, correlation parameters, water quality, Bhavnagar region, Thematic Map.

I. INTRODUCTION

Water, around, which civilization developed, is an important to life sustaining substance. It is the most common and yet the most precious resource on earth without which there would be no life on earth. It has a major role in influencing process, which is as varied as shaping the land surface, regulating the climate to govern the distribution of humans and evolving the growth of various civilizations. Chemically, water is a compound consisting of two atoms of hydrogen and one atom of oxygen (H2O) and can exist in the three forms, solid (ice at 0oc), liquid water at normal room temperatures) and gas (water vapor).

Water derives its unique properties of being universal solvent. Today quantity of water on our planate is nearly constant and it keeps circulating through what is called the water or hydrologic cycle.

A. Need of Study

The reasons for the need of presents study are:

1. Major reservoirs are pollute to check water quality. 2. Many Dam/Reservoir water qualities Parameter Not Tasted for Drinking Purpose. 3. Insufficient data available for future Study (physico-chemical parameters) or Research.

B. Objectives of the study

The objectives of the study are,

1.To Check water Quality Parameters of various Dam/Reservoir Primary drinking purpose also irrigation purpose. 2.To Check water Quality Parameters of various Dam/Reservoir to compare standard data of BIS for Drinking Purpose. 3.To Perform Comparative Study of water quality as per BIS for irrigation purpose. 4.To Develop Thematic map indicating actual water quality parameter Using QGIS.

II. STUDY AREA AND DATA COLLECTION

Bhavnagar is a peninsular district of Western Gujarat. Bhavnagar city is the administrative head quarters of the district. It had a population of 2,469,630 of which 37.86% were urban as of 2001. It covers an area of over 9940Km2. There are close to 800 villages in the district.

Bhavnagar Boarders with Ahmedabad and Surendranagar districts of the North, the Gulfof Cambay to the Eastand Southand Amreli and Rajkot district to the west.

Naturally the district is divided in three parts:

1. The part of the district is having leveled land saline soil, which is similarty petot he Amreli district and also similar to the soil of Bhal area. 2. The part of the district is rocky and undulating in which area of Palitana and Shihor Taluka is

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included where as some part is hilly. 3. The costal area of Bhavnagar, Ghoga, Taloaja and Mahuva is flat and sloppy as compared to other part of the district. Shetrunjaya is the highest hill of the district where as district is having 145 km long coastal boundary.

Tabel: Detail of collect sample of Bhavnagar District

Sr. No.	Name of Taluka	Reservoir	Reservoir Level (M)	Reservoir Level (%)
1	Palitana	Shetrunji	55.53	100
2	Palitana	Rajaval	51.9	27.33
3	Palitana	Kharo	53.9	100
4	Umrala	Ranghola	62.5	100
5	Bhavnagar	Lakhanka	37.7	9.51
6	Palitana	Hanol	90.1	100
7	Mahuva	Malan	104.27	100
8	Mahuva	Bagad	59.71	81.31
9	Talaja	Pingali	49.2	83.89
10	Dhari	Khodiyar	202.68	100
11	Gadhada	Kalubhar	59.06	70.37
12	Sihor	Gautmeshver Talav	-	-
13	Valbhipur	Bhikada River	-	-
14	Gadhada	Ghelo River	-	-

There are two data collection pre-monsoon and post-monsoon data collection.

III. METHODOLOGY

Among the various methods available in literature, we selected following method for the analysis of respective parameter.(Below tabel)

Table: Methodology selected for the present study

Parameter	Method Applied for the present work
Color	Visual comparison method
Odor	Threshold odor Test
Temperature	Lab. & Field Method
Taste	Flavour Threshold Test
Turbidity	Nephelometry method
Total Alkalinity	Titration Method
Hardness	EDTA titration Method
Conductivity	Laboratory Method
Solids	Laboratory Method
Metal ions (Zn,Mn,Cd,Pb,As,Al,Fe,Cu,Hg)	Electro analytical Method applied(S.W.,D.P.P. and Stripping)
Calcium	EDTA Titrimetric method
Lithium	Flame Emission Photometric Method
Magnesium	Calculation Method
Potassium	Flame Emission Photometric Method
Sodium	Flame Emission Photometric Method
Anions ($Cl, NO_2, NO_3, PO_4, SO_4, F, NH_4$)	Method Applied Ion Chromatography, I.S.E.
Dissolved Oxygen	Iodometry, and Ion selective electrode
Bio-chemical Oxygen Demand	5-Day BOD Test
Chemical Oxygen Demand	Closed Reflux Titrimetric Method
Total Organic Carbon	Combustion IR Method
Pesticides	GC-ECD, GC-MS, LC-Fluorescence

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A. Experimental Procedure

Method of analysis plays very important and significant role in the interpretation of the data. Normal variations in process described for the analytical method in the texts, variations in the equipment from laboratory to laboratory, and human practice may have some effect on analytical results. New analytical methods bases on instrumentation are described in many texts and literatures supplied by the manufactures of the instruments. Many on line or automatic instruments are now available, that can analyzes several parameters at a time using very small quantity of sample within very small duration of time. Very high claims are made for the accuracy and precision even for very small quantities of component to be analyzed for such instruments, but these instruments are very costly not easily available in most laboratories.

Analytical methods selected for various parameters are selected from APHA[50], AWWA[51] and Water Environment Federation-USA[52]. Because we have adopted standard methods of analysis, the experimental details are deliberately not included as text but summarized[53-77] in table-4.1. More over the data are ascertained by another analytical method as and when found required. The data on ICP,GC-MS and LC-MS are generated by other well reputed sophisticated instrument laboratories (CS&MCRI- Bhavnagar, Excel Crop Care laboratory-Mumbai).

IV. RESULT AND DESCSSION

A.Overview on analytical results:

The analysis results water samples from the dams/Reservoir, located in the Bhavnagar district are presented and discussed in this chapter. The samples are collected from all Talukas. The samples were collected in two seasons i.e. Pre-monsoon and Post-monsoon and over a period of two consecutive years. For Accurate Observation To Data sample that i.e Pre-monsoon and Post-monsoon Collected for Testing Purpose in Present study.

The Below Grapha shows Varation Of Water Quality Parameters Between Pre-monsoon And Post-monsoon Water sample With refrence to BIS Standard. In Presented Grapha Orange Color Indicated BIS Standard, Green Color Indicated Pre-monsoon, Red Indicated Post-monsoon Testing Result.

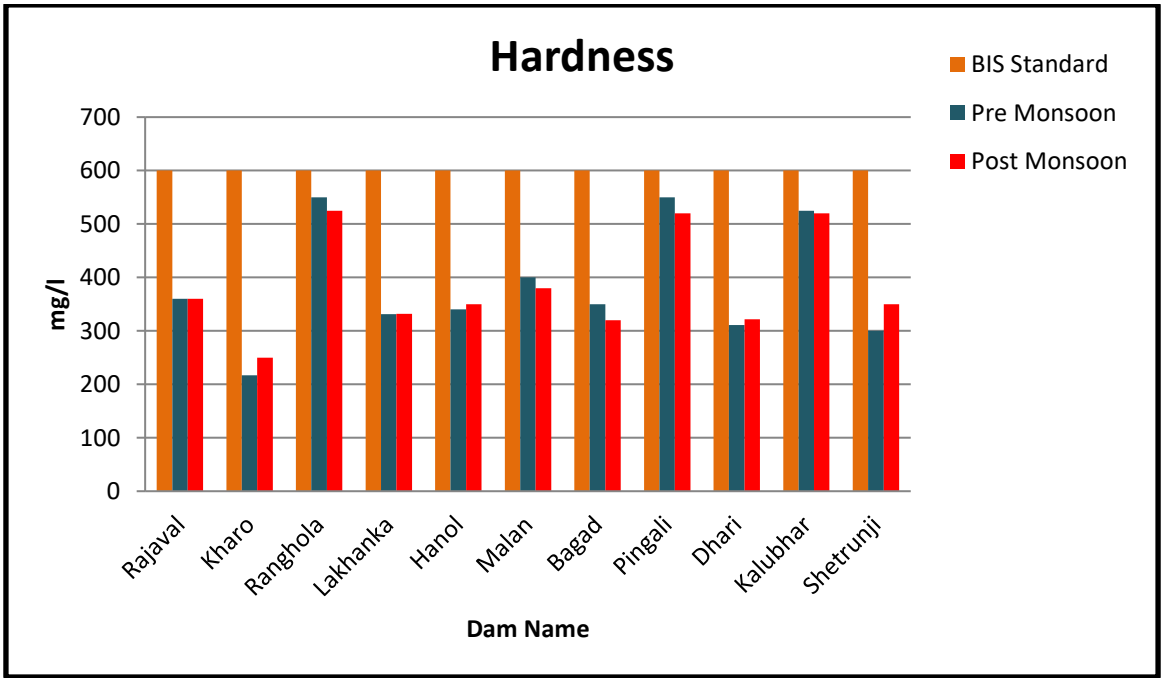

Fig. Hardness Impact In All Dam

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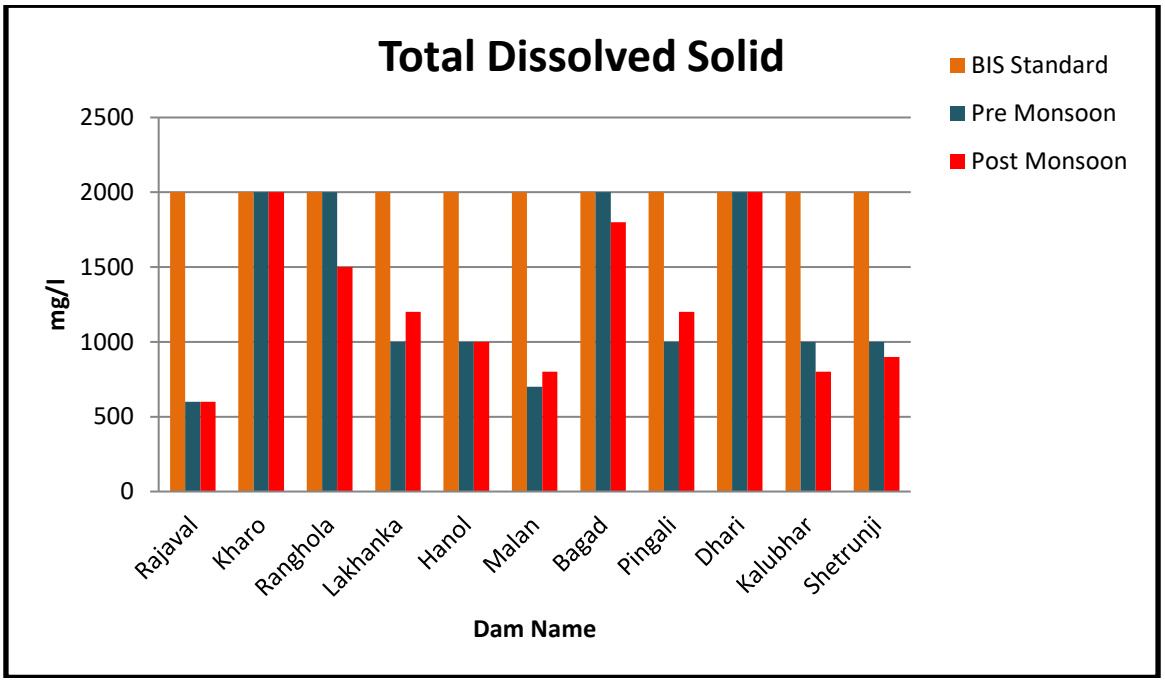

Fig. Total Dissolved Solid in all Dam

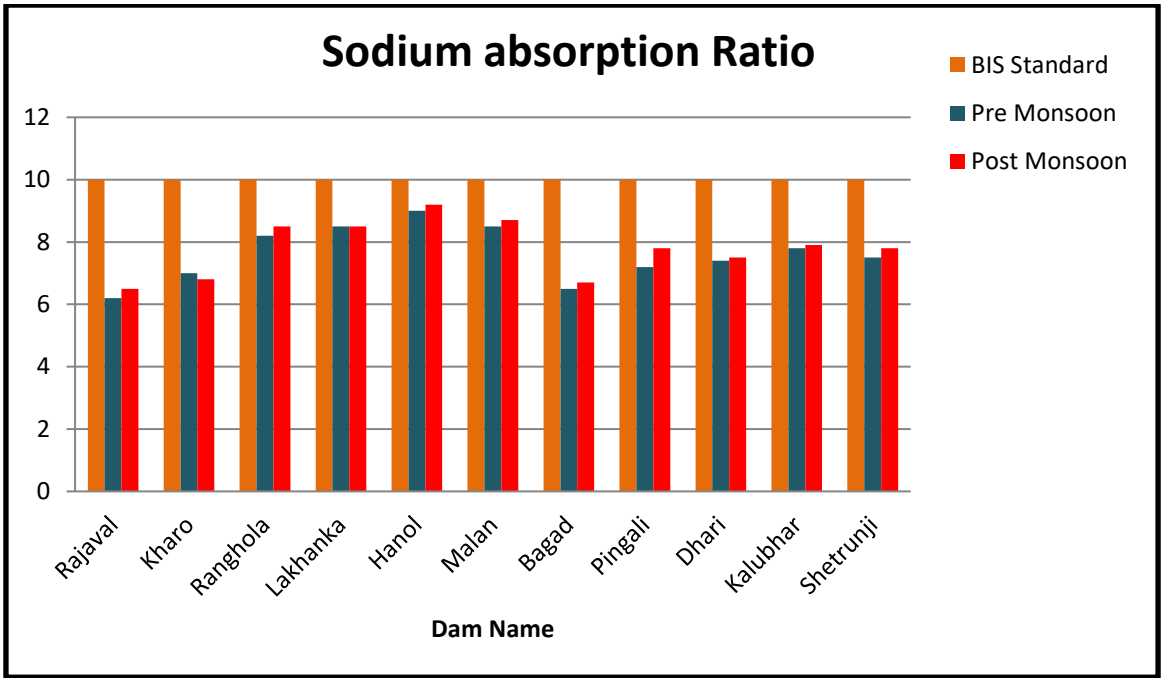

Fig. Sodium Absorption Ratio in all Dam

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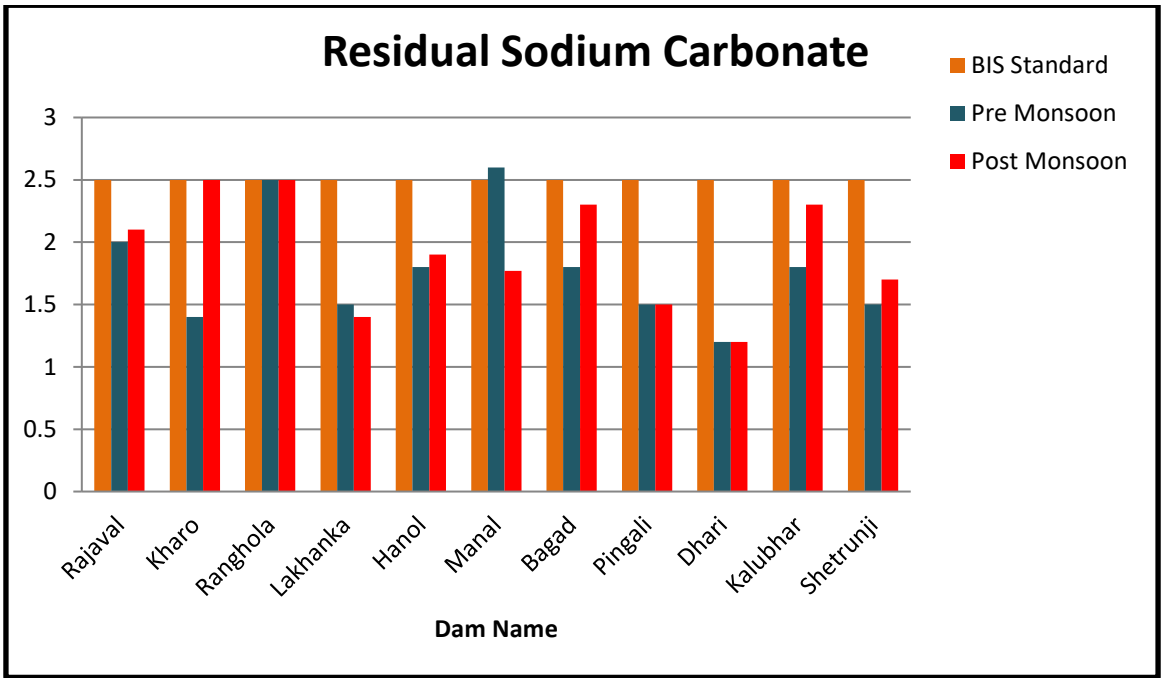

Fig. Residual Sodium Carbonate in all Dam

B. The overall scenario in the Bhavnagar District with respect to common water quality parameters:

The Water Quality Parameter Consider in present Study For Drinking Purpose Such as PH, T.D.S, Nitrate, Chloride, Fluoride, and color. And SAR, RSC, Salinity And Boron Consider For Irrigation Purpose.

The above Bar chart of PH Water sample Variation For Pre-monsoon And Post-monsoon Shows Accurate Result As per BIS Standard.

For Hardness, it observed that Hardness Parameter Varied Between Desirabal And Permissible Limit in Collected Sample.

As the Trend Differ Form Pre-monsoon to Post-monsoon, T.D.S Also Differ Under Desirable limit.

In Malan and Kalubhar Dam Sulphate Content Is Higher in Pre-monsoon And Under Desirable Limit in Post-monsoon. According To BIS Sulphate Content IS little More in Malan and Kalubhar dam except Other.

Flouride Content It Observe That Somr Dam Water Sample Under Desirable Limit And Other is Below Detectable limit. Shown in

Chloride Content Is in Desirable Limit And It Gives Accurate Result In Both Pre-monsoon And Post-monsoon. As Trend Differ The Chloride Content Has not Higher Variation and it is negligible.

Ranghola and Kalubhar dam Water Sample Present A Little More Than BIS Limit For Magnesium. And other dam is in Desirable Limit.

Color And Boron Parameters For Various Dam is Under Limit And Result Present Accuracy.

Salinity is critical parameter for Water Use in Irrigation Purpose Result Indicate the Salinity Content Varied Between Desirable And Permissible Limit. As time Differ salinity Content Typically Decreasing In Reservoir Except Shetrunji dam.

SAR And RSC Observed That Typically Accurate according To BIS.

All Water Sample Result Indicate Suitability For Irrigation and Drinking Purpose Except Ranghola and Kalubhar Dam Due To Magnesium and Sulphate Due To Magnesium Sulphate Content Is Detoriate In Particular.

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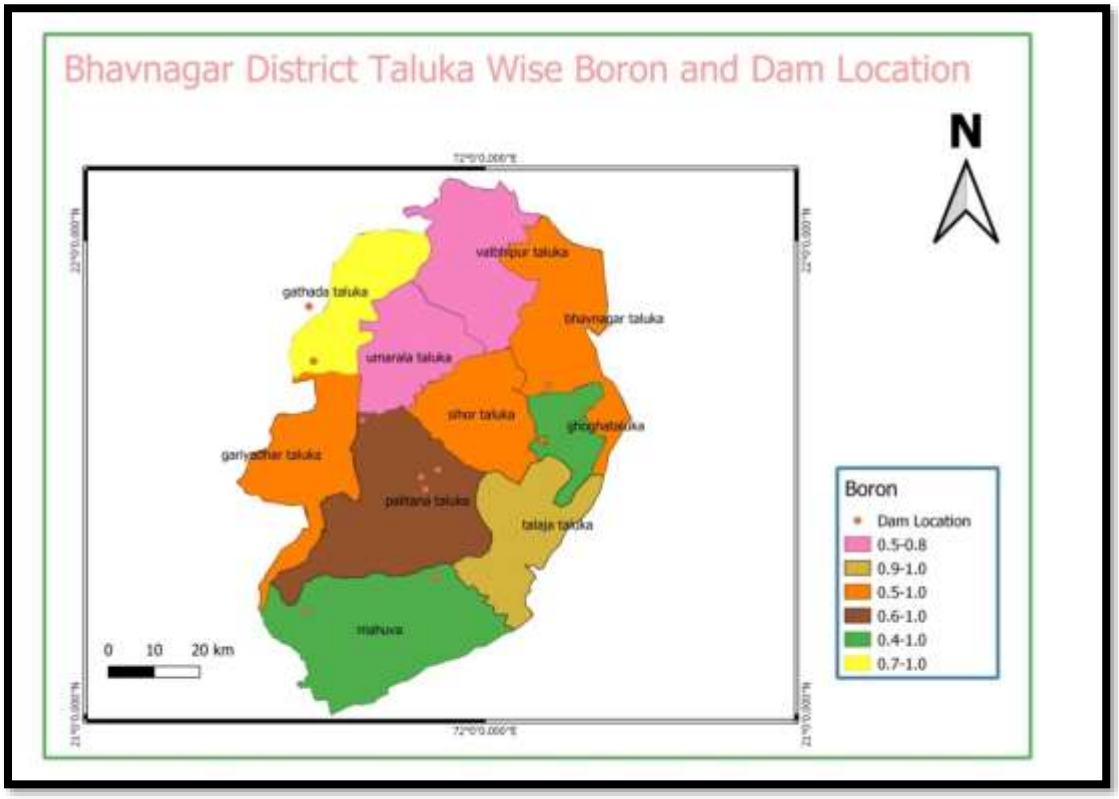

Fig. Boron Concentration In Bhavnagar Region

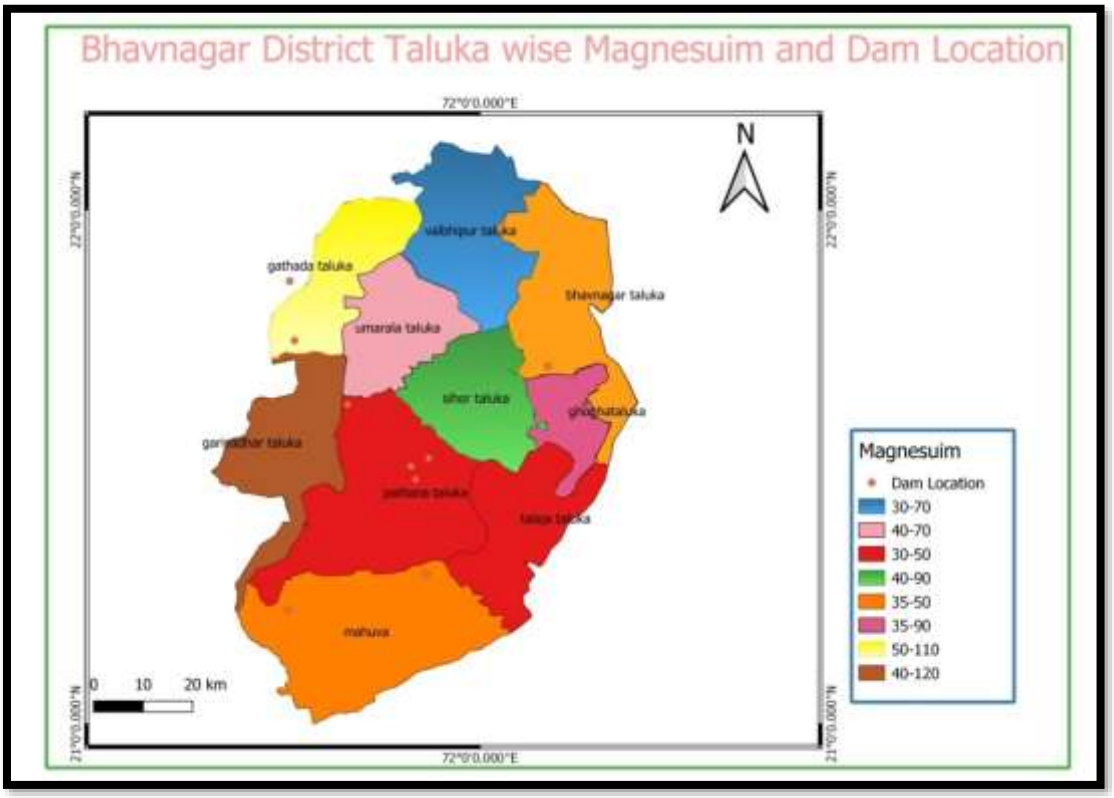

Fig. Magnesium Concentration in Bhavnagar Region

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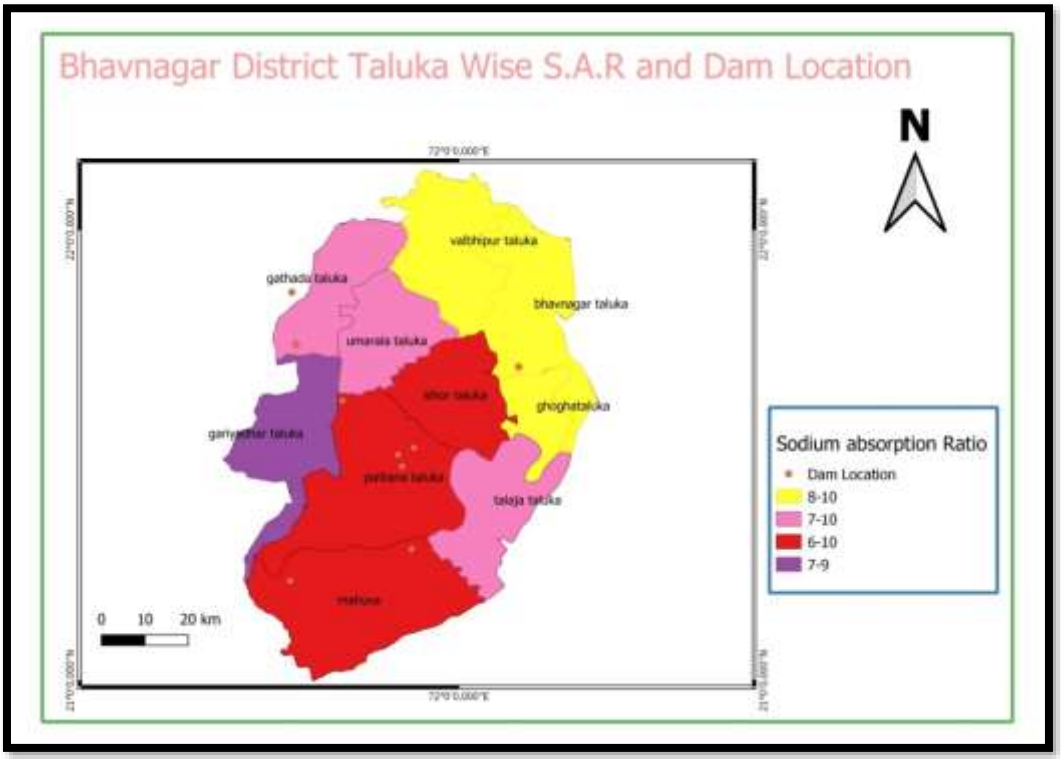

Fig. Sodium Absorption Ratio Concentration in Bhavnagar Region

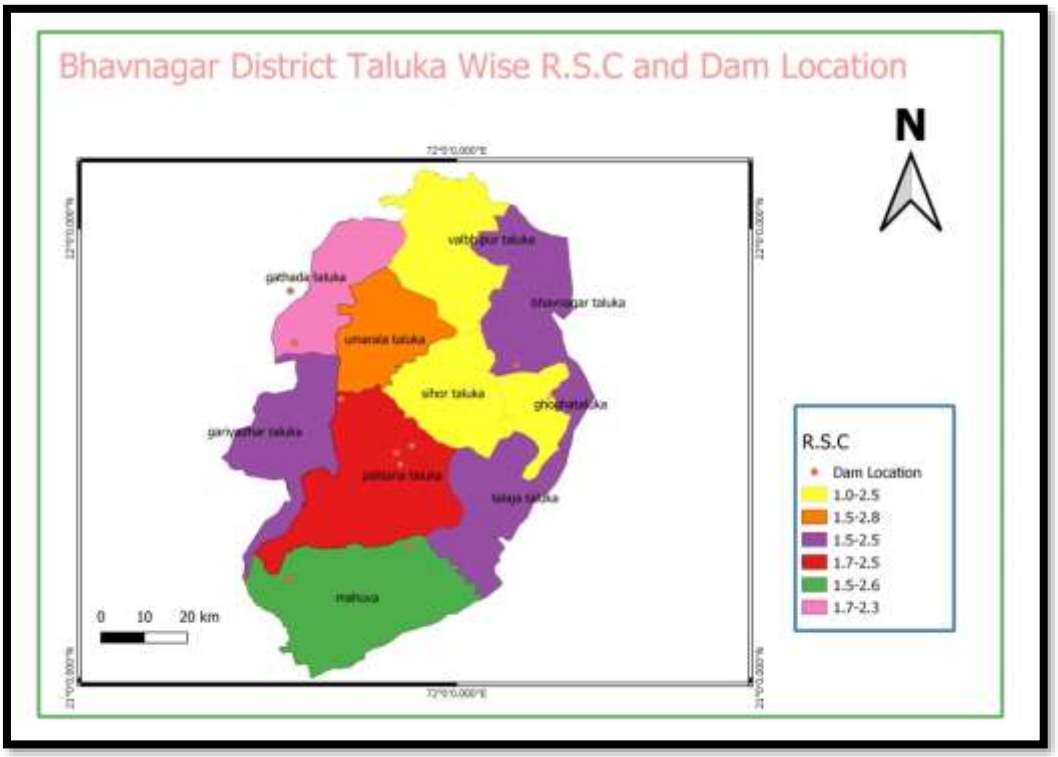

Fig. Residual Sodium Carbonate Concentration in all Dam

C. Graphical Representation

A Thematic Map is a type of map that portrays the geographic pattern of a particular subject matter in a geographic area. This usually involves the use of map symbols to visualize selected properties of geographic features that are not naturally visible, such as a sulphate, chloride, boron etc. The main objective of thematic map is to portrays the geographic distribution of one or more water chemical parameter. Thematical map is different way for presenting

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data for particular region. The use of present thematical map is easy to find out particular water quality parameter range for selected region. In presented thematical map particular color visualization indicate that range of particular water quality parameter. for boron the range of variation is similar for gariyadhar, sihor and Bhavnagar taluka There are many water quality parameters but in present study the critical parameter such as boron, calcium, magnesium, hardness, R.S.C, PH, S.A.R, salinity, T.D.S and sulphate prested in thematic map.

V. CONCLUSION

A.Conclusion

In present study two water quality analysis carried out that is pre-monsoon and post-monsoon and then result from water quality analysis compare with BIS standard based on comparative analysis following conclusion are drawn: **1.**Magnesium content is little more in rangola and kalubhar dam which leads to not adequate quality for human consumption. The high level of magnesium people get vomiting and diarrhea and also muscle slackening, nerve problems, depression and personality Change. **2**.Sulphate content is little more in malan and kalubhar dam but in desirable specified by BIS standards. The high level of sulphate to human health effect form get diarrhea and dehydration form drinking the water. **3.**Salinity is important water quality parameters for agriculture purpose. As trend changes from pre-monsoon to post-monsoon salinity content decreasing in selected Dam under desirable limit. **4.**In pre-monsoon season water quality is quite adequate for irrigation purpose. & In pos-tmonsoon water quality differ with inflow in particular dam. **5.**The thematic map is shows large data and every person directness to understand. Future Study and research to available for informative data. And thematic map always have something fascinating to share. **6.**The above information on the water-quality parameters of All Dams / Reservoir in the investigation territory obviously indicated that Dams / Reservoir water was ok for drinking water supply and irrigation purposes, as the majority of the parameters are found inside the BIS desirable limit. **7.**Sodium adsorption ratio and Residual sodium chloride content is irrigation water quality parameters. It conclude that typically accurate with reference to BIS standards. **8.**based on presente research work which shows satisfactory conclusion and all objective are fullfil.

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