

KODAGU DISTRICT

FIG.18 KODAGU DISTRICT

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1. Location

Kodagu district is located in the southern extremes of Karnataka State and has a geographical area of 4,102 sq. km. It is bounded by Hassan district on the northern side, Dakshina Kannada district on the northwestern side, Kerala State on the western and southern side and Mysore district on the eastern and southeastern side. It lies between 75° 22' to 76° 12' E Longitude and 11° 55' to 12° 50' N Latitude.

2. Demography

According to the 1991 census, Kodagu district has a total population of 488,455. There are 573 villages / habitations in the district. Madikeri is the district Headquarters. Kodagu district has three taluks viz., Madikeri, Somvarpet and Virajpet.

3. Climate, Drainage and Soil

Kodagu district falls under Western Ghats and Malnad region, which includes mountains and forested area. Generally, Kodagu district experiences humid climate with temperature varying between 16.5° to 24.1°C. After Agumbe, the other region of the state, which receives very heavy rainfall, is the western half of Kodagu (Bhagamandala-Pullingotath-Mukut-Karike areas) district and here the rainfall is more than 5000 mm. The highest rainfall in the area is 6032mm recorded at Bhagamandala, very near to the location where Cauvery River originates. Rainfall in Kodagu district decreases rapidly as one passes from the hilly areas to the plains; for example, while Bhagamandala receives 6032 mm, Fraserpet, about 30 miles east of it, receives 1120mm, which works out to a rainfall gradient of 164 mm per mile of horizontal distance. The district is drained by two major rivers, Cauvery (originating at Talacauvery) and Lakshmanathirtha; both of which drain into K.R.S. The annual average rainfall in the district is 2725.5 mm (Ref: Climate of Karnataka State, Published by India Meteorological Department, 1984). Kodagu district is covered by red and black soils and is grouped under hilly zone of ten fold Agro-Climatic classification of Karnataka.

4. Geology and Groundwater occurrence

Kodagu district consists of vast expanse of gneisses grouped under Peninsular Gneissic Complex (PGC) covering majority of the aerial extent. A small patch of differentiated coarse-grained granitic body occurs near the southeastern border. From the groundwater point of view, these rocks are classified as crystalline formations. The fracture / fissure system developed along with joints and faults traversing the rocks facilitate groundwater circulation and hold moderate quantity of water. The quality of groundwater is governed by the mineralogical composition of the rocks. The quartzite, quartz chlorite schist and bands of iron formation are also exposed. Groundwater normally occurs in the water table conditions in the

weathered and decomposed mantle and also under semi-confined conditions in the deeper fractures.

5. Groundwater quality characterization

To understand and gather information on groundwater quality, 1185 samples collected from 215 villages/habitations in Kodagu district have been analysed by RDED.

The water samples have been analysed for only 14 parameters such as Turbidity, Colour, Conductivity, Hydrogen ion concentration (pH), Total Dissolved Salts (TDS), Total Hardness (TH), Calcium Hardness (CaH), Chloride (Cl), Sulphate (SO₄), Fluoride (F), Nitrate (NO₃), Alkalinity (Alk), Iron (Fe) and Bacteria and the data is presented in the Table.

5.1 Physical Characters

Turbidity

There are 412 samples from 80 villages reporting higher turbidity ranging between 10.1-687 JTU. The maximum samples showing higher turbidity are from Virajpet (278 out of 620 samples) taluk, followed by Madikeri (133 out of 385 samples) and Somvarpet (lone sample out of 180 samples) taluks. The water with highest turbidity of 687 JTU is reported from Belagunda village in Virajpet taluk.

Colour

Colour parameter has not been reported for the entire district.

Electrical Conductivity (EC)

In Kodagu District, EC values range from 10 to 2500 m mhos/cm. The range of EC values noted in the other taluks are Madikeri 10 to 2500 m mhos/cm, Somvarpet 10 -1480 m mhos/cm, and Virajpet 20 to 1420 m mhos/cm.

Hydrogen ion concentration (pH)

In all, 213 samples from 53 villages have reported pH values in the range of 5.1 to 9.1. Of the 213 samples, 212 samples are acidic in nature and range between 5.1 to 6.4 and remaining lone sample is basic in nature, with pH value of 9.1, reported from Kademallur village of Virajpet taluk. The pH values in different taluks are Madikeri (104 samples from 90 villages with pH value 5.1 to 6.4), Somvarpet (5 samples from 4 villages with pH value of 6.2 to 6.4) and Virajpet (104 samples from 30 villages with pH value of 5.1 to 9.1).

5.2 Chemical Characters

Total Dissolved Salts (TDS)

In the entire district, none of the analysed samples (1185) covering 215 villages have reported higher concentration of TDS.

Total Hardness (TH)

Only 23 samples from 15 villages of Virajpet taluk have reported higher TH content in the range of 684 to 1068 ppm. No abnormal TH content has been reported from Madikeri and Somvarpet taluks.

Calcium Hardness (CaH)

There are 82 samples spread across 64 villages having CaH above the standard limit ranging from 201.2-890 ppm. The abnormal samples are from Virajpet (51 samples with CaH 202 to 890 ppm), Somvarpet (27 samples with CaH 201.2 to 340 ppm) and Madikeri (14 samples with CaH 202.8 to 412.7 ppm) taluks.

Chloride (Cl)

No abnormal chloride content is reported in the entire district.

Sulphate (SO₄)

All the analysed samples in the entire district have Sulphate content within the permissible limit of 400 ppm.

Fluoride (F)

None of the sample in the entire district has indicated Fluoride content more than the permissible limit of 1.5 ppm.

Nitrate (NO₃)

No abnormal nitrate content is reported in the entire district.

Alkalinity (Alk)

Only 34 samples from 29 villages have reported higher Alkalinity content ranging between 610 and 820 ppm and the samples are from Madikeri (2 samples with Alkalinity content of 620 and 650 ppm), Somvarpet (7 samples with Alkalinity content of 620 to 800 ppm) and Virajpet (25 samples with Alkalinity of 610 to 820 ppm). Highest Alkalinity content of 820 ppm is reported from Badaga Bananagala village in Virajpet taluk.

Iron (Fe)

In the district, 126 samples from 63 villages have analysed Iron content in excess in the range of 1.2 to 5 ppm. These are from Madikeri (31 samples from 17 villages with Fe content of 1.2 to 5 ppm), Somvarpet (6 samples from 6 villages with Fe content of 1.2 to 5 ppm) and Virajpet (89 samples from 40 villages with Fe content of 1.2 to 5 ppm).

Bacteria (*E.coli*)

Quite a good number, 622 samples covering 191 villages/habitations have shown the presence of the bacteria *E.coli* in drinking water. These abnormal samples are from Virajpet (262 samples), Madikeri (208 samples) and Somvarpet (152 samples). The Bacterial count in these samples cannot be given since in the analytical data the numerical values are not mentioned.

5.3 Spatial Variation**Bacteria (*E.coli*)**

A perusal of the bacterial incidence map indicates that, the bacterial incidence is a common phenomenon in the sampled villages. The bacterial incidence can be point specific and may be due to local contamination and is spread throughout the district.

Fluoride (F)

The isoconcentration map (Fig. 18A) reveals that, the entire district is having Fluoride content within the permissible limit.

Total Dissolved Salts (TDS)

The isoconcentration map (Fig.18B) shows that, none of the samples in the entire district have reported higher average TDS content than the permissible limit of 2000 ppm.

Total Hardness (TH)

Total hardness on the isoconcentration map (Fig.18C) indicates that, except for a lone patch in the southeastern portion, major portion of the district is having TH content within the permissible range.

Iron (Fe)

Isoconcentration map (Fig.18D) shows that, except for six isolated patches in the northern portion, a lone patch in the central portion and two isolated patches in the central and southeastern portion, rest of the district is having iron content within the permissible limit.

6. Conclusion

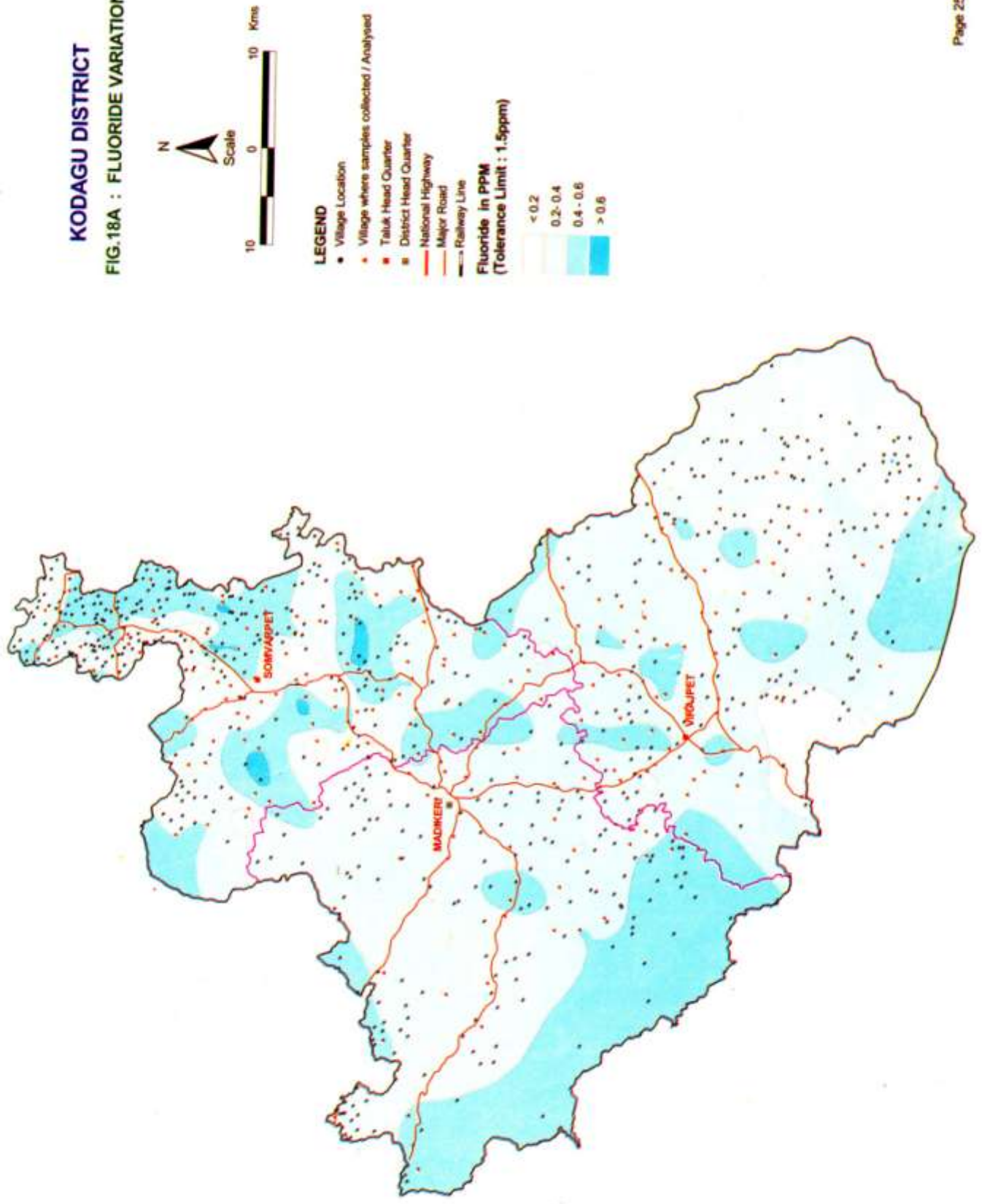
The water quality data of Kodagu district has reflected the presence of excess Turbidity, higher concentration of Fe and the Bacterial contamination. Turbidity can be reduced to a maximum extent by simple filtration. The iron content can be reduced by proper development of the source, usage of galvanized iron or PVC pipes and proper casing. The most important component, which is much more harmful, is the presence of Bacteria viz., *E. coli* in drinking water. The consumption of such water may cause the diseases such as Malaria, Diarrhea etc. Probably, the organisms might have been introduced into the groundwater regime by anthropogenic activities. This clearly indicates non-hygienic / poor sanitation condition prevailing at village levels. To overcome this both the user and the administrator must be trained properly and awareness has to be created regarding hygienic aspects.

Table : Comprehensive analysis of water quality data of Kodagu District

Sl. NO.	Name of the taluks	Number of villages/ habitations	Number of samples villages	Number of samples analysed	Water quality scenario	Bact (c/100 ml)-0	Tur (10 JTU)	Cond- mmhos /cm	pH (6.5-8.5)	TDS (2000) ppm	TH (600) ppm	CaH (200) ppm	Cl (1000) ppm	SO ₄ (400) ppm	F (1.5) ppm	NO ₃ (100) ppm	Alk (600) ppm	Fe (1) ppm	As (0.05) ppm
1	Madhère	203	34	385	No. of samples beyond permissible limit	208	133	-	104	-	-	14	-	-	-	-	2	31	-
					No. of villages affected	30	24	-	90	-	-	12	-	-	-	-	-	-	-
					Range	Present	10.1-165.2	10.2500	5.1-6.4	-	-	202.8-412.7	-	-	-	-	620-650	1.2-5	-
					No. of samples beyond permissible limit	152	1	-	5	-	-	27	-	-	-	-	-	-	-
2	Somvaret	377	116	180	No. of villages affected	105	1	-	4	-	-	25	-	-	-	-	7	6	-
					Range	Present	47.4	10.1-148.6	5.2-6.4	-	-	201.2-340	-	-	-	-	-	-	-
					No. of samples beyond permissible limit	262	278	-	104	-	23	51	-	-	-	-	25	89	-
					No. of villages affected	56	55	-	30	-	15	27	-	-	-	-	-	-	-
3	Virajpet	272	65	620	Range	Present	10.1-687	20.1-420	5.1-9.1	-	684-1068	202-890	-	-	-	-	610-820	1.2-5	-
					No. of samples beyond permissible limit	622	412	-	213	-	23	82	-	-	-	-	-	-	34
	Total	852	215	1185	No. of villages affected	191	80	-	53	-	15	64	-	-	-	-	29	63	-
					Range	Present	10.1-687	10.2500	5.1-9.1	-	684-1068	201.2-890	-	-	-	-	-	-	610-820

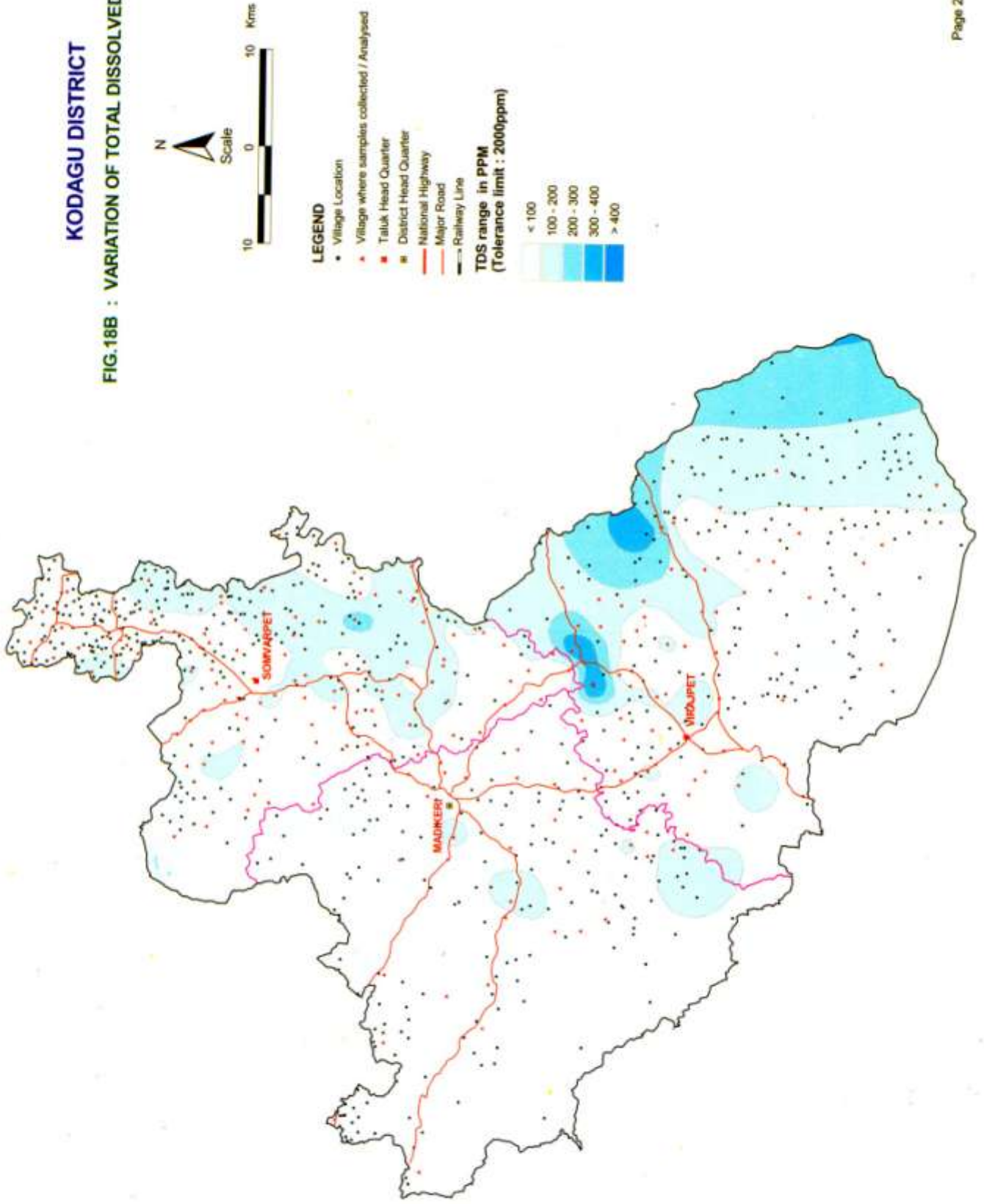
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FIG.18A : FLUORIDE VARIATION



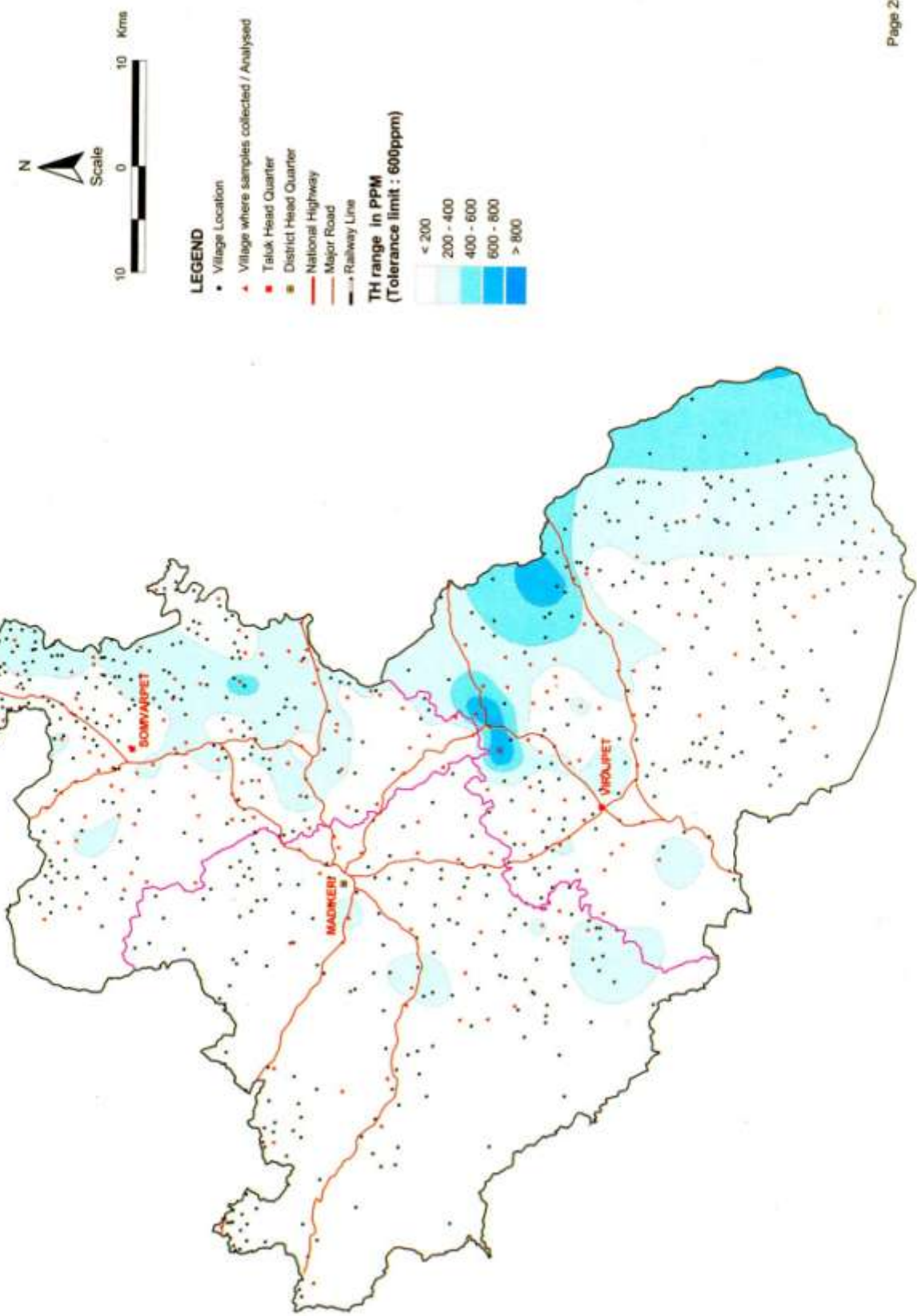
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FIG.18B : VARIATION OF TOTAL DISSOLVED SALTS (TDS)



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FIG.18C : VARIATION OF TOTAL HARDNESS (TH)



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FIG.18D : IRON VARIATION

