

# Chemical Analysis Fluoride in Groundwater of Hanamsagar Village using GIS

Megha M<sup>1</sup>, Dr. G.P. Desai<sup>2</sup>

<sup>1</sup>Post Graduate in Environmental Engineering, BIET College, Davanagere-577004, India

<sup>2</sup>HOD, M. Tech Environmental Engineering, BIET College, Davanagere

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**Abstract:** Major problems are being faced in the rural area due to presence of excess ions in groundwater. Fluoride is essential for normal bone growth, but its higher concentration in the drinking water poses great health problems and fluoride-rich water is well known in granitic aquifer in India and in the world. Hydro-geochemical study of groundwater was carried out in Hanamsagar village Kustagi taluk of Koppal district. Thirty one groundwater samples were collected from the study area and analyzed for chemical parameters like fluoride, chloride, TDS, hardness, pH. The results of these analyses were used to identify the geochemical parameters mainly fluoride concentration in this region. And by using those results the GIS mapping is carried out. GIS technologies have great potential in groundwater hydrology. GIS is a powerful tool for handling spatial data and decision making in several areas, including geological and environmental fields.

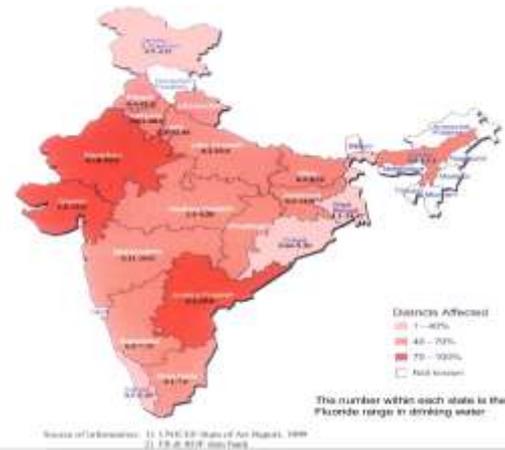
**Key Words:** fluoride, chloride, TDS, hardness, pH.

## 1. INTRODUCTION

Ground Water is frequently most significant Water assets for drinking, Water system, to meet developing nourishment, fiber needs, for enterprises control age, route and diversion. Early individuals perceived significance of Water from a superiority view point. Acknowledgment of significance of Water superiority grew all more gradually. Early people could pass judgment on Water superiority just through physical feeling of sight, taste and smell. There was no organic, concoction and medicinal science created and there were no strategies accessible to quantify Water superiority and to decide its effect on human wellbeing and prosperity. Because of rising interest for clean drinking Water, board of groundWater superiority, particularly in creating nations. It has been accounted for that around 33% of total populace use groundWater for drinking. Thus, complex observing of nature of such assets would assume a key job in accomplishing all inclusive economical improvement in not so distant future.

India is among numerous nations on planet where About 62 million individuals plus 6 million youngsters are influenced with skeletal, non-skeletal and dental fluorosis. Conditions of Bihar, Haryana, Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh amid West Bengal be influenced by overabundance fluoride defilement in Water. It includes

around 9000 towns influencing 30 million individuals. It must be noticed that issue of abundance fluoride in drinking Water is of late birthplace in many parts and appropriation is appeared in figure 1.1.



**Fig 1: Shows Fluorosis Prevent States in India**

GroundWater is significant wellspring of savoring Water provincial territories of creating countries of world. GroundWater has properties of dissolving and conveying arrangement, an assortment of concoction and different materials. Changes in groundWater superiority are because of shake Water connection and oxidation-decrease responses amid permeation of Water through aquifers. Fluoride is broadly dispersed in soil, Water, vegetation, rural items and ocean sustenance's. GroundWater sources, for example, burrowed wells, shallow and profound hand siphons may contain abundance fluoride where reserves resembling fluorite, cryolite, biotites and fluoroapatite are available in rocks. Fluoride, one of significant mineral present as disintegrated state in Water in various fixations in human body. Wellspring of fluoride in groundWater is for most part because of fluoride bearing minerals and is insoluble in Water. It is useful if its fixation is inside range 0.5 to 1.5 mg/l have a gainful impact, diminishing caries advancement, focus beneath 0. mg/l causes dental caries, particularly in kids. Fixation above 1.5 mg/l prompts dental and skeletal fluorosis. In this way, fluoride focus in drinking Water is a like two-edged blade; two its higher and lower fixation isn't sheltered. Concerning 96% of fluoride in corpse is originate in skeleton and teeth.

**2. METHODOLOGY**

Effort was conceded out in three stage namely

- Data collection
- Wet Superiority Examination
- GIS based interpretation of data

**2.1 Information compilation**

Here we are select borewell point at diverse spaces in learn region, to place borewell point latitude and longitudes are taken for GIS Chartping reason. Sample from borewell Wet are collected in syntic bottles. Se bottles were rinse thrice with basis damp earlier than example were collected. Bore well is pumped and allowed to run Wet, after 5 minutes bottles are filled in order to flush out stationary Wet. Wet exampleare evaluate for element consideration.

Thislearn dealing with geochemical examination for fluoride in ground Wet of some areas of Hanamsagar village kustagi Taluk and composed Sample from different bore wells. latitude and longitude of particular bore wells are noted in table 4.1.

**Table no.1 Bore well Points at different locations**

SL.NO	BORE WELL POINT LOCATION	LATITUDE	LONGITUE
1	Kurbar school	15° 52' 14.34"	76° 2' 15.04"
2	Dyamanna bingé's house	15° 52' 15.71"	76° 2' 22.38"
3	Kumbar street	15° 52' 23.27"	76° 2' 24.65"
4	Banashankari street	15° 52' 18.37"	76° 2' 29.11"
5	Ambabhavani temple	15° 52' 12.9"	76° 2' 29.44"
6	Kalloni street	15° 52' 26.72"	76° 2' 33.94"
7	Muchageri street near Gandhi circle	15° 52' 24.82"	76° 2' 48.34"
8	Check post	15° 52' 29.14"	76° 2' 59.50"
9	BCM hostel	15° 52' 36.08"	76° 2' 59.53"
10	Gandhi circle	15° 52' 25.14 "	76° 2' 45.96"
11	Ambedkar nagar behind durga temple	15° 52' 24.13"	76° 2' 46.5 "

12	Sanna durgappa's house	15° 52' 23.88"	76° 2' 47.54"
13	Venkatesh girani	15° 52' 23.88"	76° 2' 42.86"
14	Garadimani	15° 52' 25.21"	76° 2' 40.92 "
15	Gadadar vaaka	15° 52' 20.71"	76° 2' 39.88"
16	Electric pole near pond	15° 52' 29.1"	76° 2' 35.7"
17	Near to Kalloni school	15° 52' 27.08"	76° 2' 36.85"
18	Dalayát's street	15° 52' 27.62"	76° 2' 39.19"
19	Wind fan	15° 52' 30.54"	76° 2' 41.75"
20	Venkateshwar temple	15° 52' 30.97"	76° 2' 43.01"
21	Neem tree near lake	15° 52' 34.79"	76° 2' 39.37"
22	Karisiddeshwar math	15° 52' 23.92"	76° 2' 33"
23	Basavanna temple	15° 52' 20.42"	76° 2' 36.92"
24	Noorsab adde	15° 52' 17"	76° 2' 35.59"
25	Patils street 7th ward	15° 52' 14.12"	76° 2' 35.02"
26	Kurabageri school	15° 52' 16.28"	76° 2' 27.28"
27	Sante bazar school Nalad bhabi 1	15° 52' 17.47"	76° 2' 27.13"
28	Nalad bhavi 1	15° 51' 58.07"	76° 2' 48.41"
29	Nalad bhavi 2	15° 51' 57.42"	76° 2' 48.37"
30	Kannur plot 1	15° 52' 8.94"	76° 3' 8.35"
31	Kannur plot 2 bazar school jayanagar	15° 52' 7.9"	76° 3' 7.45"

**2.2 Wet superiority examination**

It is significant to identify wher Wet is well for person efficacy or not and it can be resolute by analyze substance property of Wet. In laboratory learn Wet example are .analysed for five chemical parametres. Chemical limit is:

- pH
- Fluoride
- full stability
- full dissolve solid
- Chloride

By criterion method of example and examination for Wet example are adopt for analyzing advantage limit, as below.

## 2.3 Chemical Examination

### 2.3.1 Chloride

Chloride, ionized type of chlorine, is a standout amongst most plentiful inorganic particles in common Wet and wasteWet. In spite of fact that most pervasive in ocean Wet at focuses averaging 35000 ppm, Chloride saturates streams, lakes and or crisp Wet frameworks. In ordinary surface crisp Wet, Chloride focuses are typically under 10 ppm, however frequently under 1 ppm. In Wet planned for human utilization, greatest reasonable breaking point of Chloride is normally close to 250 ppm, as an outstandingly salty taste rises at higher fixations. Wet with Chloride focus more noteworthy than 250 ppm is additionally known to strenn erosion impacts in Wet transportation frameworks.

#### Reagents

- ✓ Potassium chromate.
- ✓ Standard silver Nitrate solution 0.028N.

#### Procedure

Take 25ml of sample and add 0.50 ml of potassium chromate ( $K_2Cr_2O_4$ ) indicator.

Titrate example with  $AgNO_3$  answer till paint change from yellow to brick red.

Repeat above procedure 2-3 times to get consistent result.

### 2.3.2 Total Hardness

Rigidity of Wet is not exact ingredient but it is erratic compound mixture of cat ions. Principle Hardness caby ions are calcium and magnesium. However iron, strontium, barium and manganese also contribute to Hardness. Degree of Hardness of drinking Wet has been classified in terms of magnesium and equivalent of  $CaCO_3$  attention as follows.

Soft: 0-60 mg/L

Medium: 60- 120 mg/L

Hard: 120- 180 mg/L

Very hard: > 180 mg/L as  $CaCO_3$

Magnesium attention s of less than 50mg/L are desirable in potable Wets. Although many public health problems arise

if attention s exceed 50 mg/L. Intact Wet is apparently beneficial to human cardiovascular system.

#### Reagents

- Ammonia buffer solution.
- Standard EDTA solution 0.01 N.
- Erichrome black- T indicator.
- NaOH as buffer solution 0.02N.
- Mureoxide Indicator

#### Procedure

1. Take 25 or 50mL very much blended example in porcelain dish or cone shaped cup.
2. Add 1 to 2 mL of cradle arrangement pursued by 1 mL inhibitor.
3. add a spot of EBT and titrate with standard EDTA(0.01N) till wine red shading changes to blue, note down volume of EDTA required (A).
4. Run a reagent clear, Note volume of EDTA (B).
5. Calculate volume of EDTA required by test,  $C = (A-B)$ .
6. For regular Wet of low hardness, take a bigger example volume, i.e., 100 to 1000 mL for titration and include proportionately bigger measures of cushion, inhibitor and marker. Include standard EDTA titrant gradually from a miniaturized scale burette and run a clear by redistilled, belittled Wet of a similar volume as test. apply clear rectifications for registering outcomes.

### 2.3.3 pH

pH is a speech term worn universally to articulate strength of acids or alkalinity condition of a solution. It is a way of expressing hydrogen ion activity pH is defined as negative logarithm of  $H^+$  ions. pH of most raw Wet source lies within range of 6.5 to 8.5. It is somewhat crucial since of bicarbonates of alkaline earth resources. pH is measured by meter which consists of potentiometer, a glass electrode and reference electrode and temperature compensating device. A balance circuit is completed through potentiometer where electrodes are immersed in test solution many pH meters are capable of measuring both pH in milli volts.

#### Procedure

1. Connect electrode to pH meter and keep buffer solution of pH 4.7 and 9.2.
2. Wash electrode with distilled Wet and dry with tissue paper.

Dip electrode in buffer solution of pH 7 and keep temperature knob of pH meter  $25^{\circ}C$ .

pH meter will show reading which is near to 7 hence correct it to exactly 7 with help of adjusting knob.

Remove buffer solution (pH 7) wash and dry electrode as instructor earlier.

To measure pH of a given sample immerse electrode into a solution and directly read its pH value.

### 2.3.4 Total Dissolved Solids

Expression, "Total Dissolved Solids (TDS)", refers to total amount of all inorganic and organic substances – including minerals, salts, metal, cat ions or anions – that are dispersed within a volume of Wet. By definition, solids must be small enough to be filtered through a sieve measuring 2 micrometers. TDS attention s are used to evaluate superiority of freshWet systems. TDS attention s are equal to sum of positively charged ions (cat ions) and negatively charged ions (anions) in Wet. Sources for TDS include agricultural run-off, urban run-off, industrial wasteWet, sewage, and natural sources such as leaves, silt, plankton, and rocks. Piping or plumbing may also release metal into Wet.

#### Procedure

1. Take 25 ml of Wet sample in a beaker.
2. Switch on digital TDS meter.
3. Immerse digital TDS meter into Wet sample.
4. Note down reading which appear on digital TDS meter screen.

### 2.3.5 Fluoride Attention

Fluoride is a concoction component that has appeared to cause huge impacts on human wellbeing, through drinking Wet. Various types of Fluoride presentation are of significant and have appeared to influence body's Fluoride substance and along these lines expanding danger of Fluoride-inclined sicknesses. Fluoride has gainful impact on teeth at low centralization of 0.5mg/L by counteracting and lessening danger of tooth rot. Focus lower than 0.5 mg/L of fluoride in any case, it has appeared to strengthen danger of tooth rot. Fluoride can likewise be very impeding at higher focus surpassing 1.5 to 2 mg/L of Wet. High centralization of fluoride represents a danger of dental fluorosis just as skeletal fluorosis.

#### Reagents

- a) Stock fluoride solution
- b) Standard fluoride solution
- c) Total ionic strength adjustment buffer (TISAB)

#### Procedure

1. Take 50 ml of each 1 ppm & 10 ppm fluoride standard. Add 50ml TISAB (or 5ml if conic. TISAB used) and calibrate instrument.
2. Transfer 50 to 100 ml of test to a 150ml plastic measuring glass. Include TISAB

3. Rinse cathode, smudge dry and spot in test. Mix completely and note down consistent perusing on meter.

4. Recalibrate each 1 or 2 hours.

5. Direct estimation is a basic strategy for estimating countless. Temperature of test and standard ought to be same and ionic quality of standard and Sample ought to be made same by expansion of TISAB to all arrangements.

6. Direct estimation results can be confirmed by a known expansion methodology. Known option technique includes including a standard of known fixation to an example arrangement. From change in cathode potential when expansion

### 2.4 GIS Chartping

systems encourage incorporate and conjunctive examination of extensive volumes of multidisciplinary information both Spatial and non-spatial inside same geo-reference. Spatial examination expansion of GIS permits addition of Wet prevalence parameter at obscure region from realized qualities to make a ceaseless surface which will assist us with understanding situations of Wet predominance parameter of learn region. Re are different introduction procedures, for example, Inverse Distance Weighted (IDW), Spline, Trend surface Examination and Kriging accessible in QGIS Spatial Examination expansion. In present examination IDW procedure received to make spatial distribution Charts of Wet prevalence parameter. Spatial and attribute database generated are integrated for generation of spatial allocation Chart of all Wet superiority parameter. Wet superiority data (attribute) is linked to sampling location through GPS and Charts showing spatial allocation were prepared by QGIS software.

#### 2.4.1 Functionality

QGIS works as geographic data framework (GIS) programming, enabling clients to examine and alter spatial data, notwithstanding forming and sending out graphical Charts. QGIS underpins both raster and vector layers; vector information is put away as eir point, line, or polygon highlights. Different arrangements of raster pictures are bolstered, and programming can georeference pictures. QGIS supports shapefiles, coverage's, personal geodatabases, dxf, ChartInfo, PostGIS, and or formats. Web services, including Web\_Chart\_Service and Web\_Feature\_Service, are also supported to allow use of data from external sources.

Many public and private organizations have adopted QGIS, including Austrian state of Vorarlberg, and Swiss cantons of Glarus and Solothurn.

### 2.5 Standards for Drinking Wet

Potable Wet must be free of anything that would degrade human performance. Also, it should not damage materials

used in its transportation and storage. Potable Water must be suitable for maintaining human health. Water superiority standards give a basis for selecting or rejecting Water intended for human use.

These principles offer smallest traditional ideals for protection human strength. Table 4.2 shows BIS for drinking Water.

### 1) Fluoride

#### **Fig.no 2 Interpolated Chart of Fluoride**

Fluoride is significant constraint, which determine aptness of Water for diverse purpose. In learn region Fluoride point of Water vary from 1.2 and 1.531 and is in attractive limit i.e., 1.0 to 1.5 as specific by BIS.

Figure 2 show that spatial portion of fluoride in learn region.

### 2) Chloride

#### **Fig.no 2 Interpolated Chart of Chloride**

Chloride is mainly significant constraint in assess Water dominance and elevated absorption of chloride indicate upper degree of crude pollution. According to BIS allowable boundary of chloride in consumption Water is 250 mg/L. Figure 2 Spatial portion of chloride in learn region and it is variable in amid 57 to 738 mg/L. elevated attention of chloride was experiential as 738 mg/L.

### 3) TDS

#### **Fig.no 2 Interpolated Chart of overall dissolve**

#### Solids

TDS in groundWater can besides due to usual source such as dirt, city runoff and trade waste. According to BIS attractive boundary of TDS is 500 mg/L. If TDS price is additional than 500 mg/L, it might root gastro intestinal annoyance. Figure 2 show spatial portion of TDS in learn region, which is variable amid 161 to 1236 mg/L.

### 4) Rigidity

#### **Fig.no 2 Interpolated Chart of Rigidity**

Boundary of whole rigidity worth for consumption Water is inside 300 mg/L of  $\text{CaCO}_3$ . Figure 2 show spatial portion of Rigidity. Spatial portion of Rigidity in learn region and it is variable in amid 604 to 824 mg/L. elevated attention of chloride was practical as 824 mg/L.

### 5) pH

#### **Fig.no2 Interpolated Chart of pH**

pH is significant limit, which determine aptness of Water for diverse purpose. In learn region pH point of Water varies from 6.4 and 7.9 and is in pleasing bound i.e., 6.5 to 8.5 as specific by BIS. Figure 2 show that spatial portion of pH in learn region

### 3. CONCLUSIONS

1. Fluoride attention s of ground Water out of 31 bore well Sample 25 bore well points in learn region are originate to be beyond standard limit.
2. Ion- substitute inside learn region and to several degree vanishing is main causal factors of fluoride corruption in learn area.
3. GroundWater superiority parameter Charts are generated by by QGIS.
4. GIS data base also help in choice creation procedure by identify mainly receptive zone that want instant notice. And in this learn regionre are about 25 sensitive zones due to high fluoride attention.

### 5. SUGGESTIONS BASED ON EXAMINATION

- De-fluoridation tank should be install in such region have elevated attention of fluoride in earth Water resource.
- Fluoride attention can be dilute by remind earth Water restore system, i.e., building of percolation tank,
- flooding of earth Water by addition exterior Water by promote drizzle Water harvest.
- monetary hold by rule is complete to fit Water cleansing units in fluoridise aristocratic area.
- potential of bring secure Water from near village can also be deliberate by civic and village panchayat establishment.

### 6. SCOPE OF FUTURE EFFORT

- Accepting both spatial and temporal change in earth Water dominance in learn area.
- fluoride content variation in learn regioncan be carried out.
- fluoride content determination can be carried out throughout district by by GIS.

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#### BIOGRAPHIES



MEGHA M  
Post Graduate Student  
Dept. of Civil Engineering  
BIET College Davanagere



Dr. G. P. Desai  
HOD of Chemical Engineering  
BIET College Davanagere