SPATIAL DISTRIBUTION OF URANIUM AND ITS ASSOCIATED WATER QUALITY PARAMETERS IN RAMTEK TALUKA.

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Abstract - - *Uranium is a heavy naturally occurring chemical element on earth. Uranium is dangerous to human health and the environment due to its high radioactivity and chemical toxicity. A limit set by WHO and AERB (Atomic Energy Regulatory Board) for Uranium concentration in drinking water is 30 µg/L and 60 µg/L(ppb). Concentration of uranium in ground water varies from ≤ 0.2 to 6.6 ppb. Nowadays uranium concentration increases in the ground water due to various types of industries, fertilizers used in agriculture, improper disposal of uriniferous waste uranium mine area .An investigation will be done near Mansar Mine, Beldongri Mine, Khindsi Lake, Nearby Village Boring Sample (Vaitola, Kandri Mine), Nagardhan which is surrounded by Ramtek Taluka , District Nagpur, to identify the uranium concentration in water sample is done by an instrument LED FLUORIMETER LF-2a and other parameters such as pH, TDS, EC, DO, Temperature, Total hardness, Total alkalify, etc. by using an instrument Hanna Multiparameter Instrument (HI98194).*

Index Terms - Uranium, Hardness, Ramtek, Led Fluorimeter

1. INTRODUCTION

India is the largest user of groundwater in the world. In India, approximately 80% of rural and urban population drinking needs are met by groundwater only. It extracts about 25% of groundwater extracted globally annually, more than the China & United States.

Recently, groundwater sampling has shown elevated levels of Uranium in some areas in a few states. Uranium is a naturally occurring chemical element of radioactive nature that occurs in low concentrations in nature. Uranium is a naturally occurring radionuclide present in the earth's crust. It is distributed throughout the crust in trace quantities and can be found in almost every rock. The average concentration of Uranium in the earth crust is around 2.7ppm and it is one of the densest metals (19.07 g/cm3) known. It is reported that 65% of global water requirements are fulfilled by groundwater. Excessive limit of uranium in drinking water can cause several health effects.

1.1 Objectives

- To determine the quantity of uranium in the ground water from the Ramtek taluka district Nagpur of Maharashtra.
- To determine the water quality parameters such as pH, TDS, DO, ORP, conductivity, temperature, salinity and resistivity.
- To establish the baseline data on naturally occurring uranium levels and water quality parameters of ground water resources in the region of Maharashtra.
- The study will establish a map of the uranium and associated water quality parameters in the water of the study area. The data will be used
- for intake and dose assessment to members of the public residing in the study area.
- To identify interrelationship between uranium and associated water quality parameters of Ramtek taluka.
- To check whether the water quality is in compliance with the standards, and hence, suitable or not for the designated use.
- To identify the causes of water pollution and to offer suitable remedies.

2. Sampling and Study Area

Ramtek is a taluka of Nagpur District. This town is situated at 50 km North-East of Nagpur. It is connected by South Eastern Railway branch from kanhan junction on Nagpur Howrah main line. Ramtek taluka is situated on 21° 23' N and 79° 19' E.
Necessity of Water Supply Scheme.
Considering the above, the Nagar Panchayat and hon. MLA of Ramtek has demanded a new augmentation scheme with compete new distribution system for the town with 531 lcd supply. On the Onset, the present Nagar Panchayat has appointed Maharashtra Jeevan Pradhikaran for preparation of Detailed Project Report of new augmentation water supply scheme as PMC. The scheme as proposed to be implemented under NAGAROTTHAN programme of Govt. of Maharashtra.

There is a rain gauge section nearby established in Nagpur. Record collected is as under.
a) maximum rainfall 2082.50mm
b) minimum rainfall 731.20mm
c) average rainfall 1262.50mm
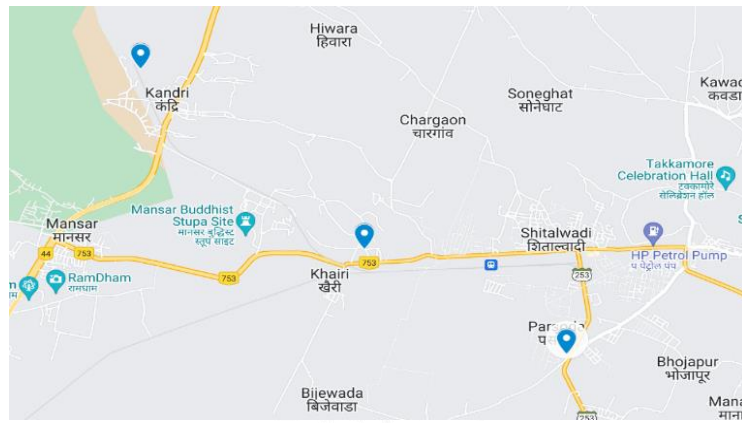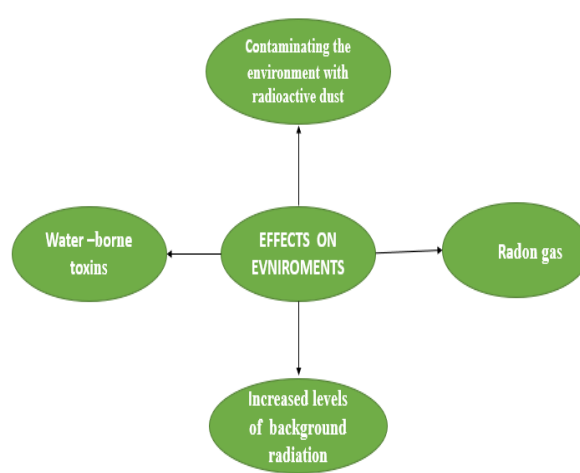
3. Uranium in Environment and its Health Effects
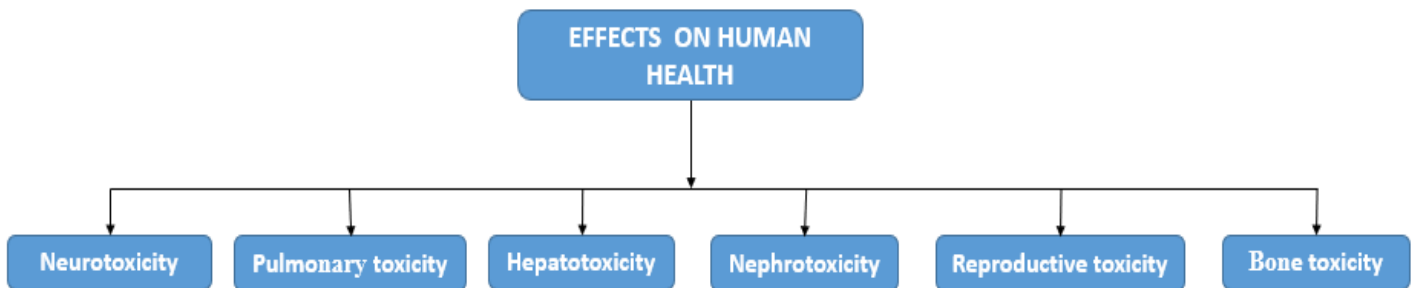

Fig-2: Effects on Environment

Fig-3: Health Ricks of uranium

However, several studies indicate that long term intake of groundwater containing>200ng/ml may induce internal exposure to radiation as well as the effects of chemical toxicity.

Medical experts say that, natural uranium present in anyone's normal diet, so some amount of uranium present in every one body.

LITERATURE SURVEY

B. S Selvi, B Vijayakumar, B. K Rana, PM Ravi Health Physics Division, Bhabha Atomic Research Centre, Mumbai, Maharashtra, India: A systematic study was carried out to estimate the uranium concentration in the ground water around Kudankulam in Southern Tamil Nadu. The uranium concentration in ground water varies from 0.2 to 6.6 μg/l, with a mean value of 2.0 μg/l. The Quantalase uranium analyzer was used to measure the uranium concentration. These groundwater samples were analyzed for the water quality parameters such as pH, conductance, total dissolved solids (TDS), salinity, chloride, and sulfate. An attempt has been made to correlate the uranium concentration with the water quality parameters. It is observed that conductance, TDS, salinity, chloride, and sulfate show positive correlation with uranium concentration.

Naresh Tanwer, Sunil Sahoo, Y. P. Gautam (January 2023) This studies were performed in Dist. Panchkula, Haryana. Studied in area of 898 km² and collected 36 sample in hilly area due to high possibility in acid treated polyethylene bottles using LED fluorimeter.

4. Result

| LOCATION PARAMETERS	Kandri	Mansar	KITS, Ramtek	Jain Mandir	Ambala	Nagardhan	Manapur	Beldongri	Hiwra
Uranium (ppb)	10.408	6.295	18.129	7.107	1.0812	11.427	23.065	-19.02	-12.69
TDS (ppm)	387	529	624.75	410	735	665	665	316.66	396
pH	6.83	6.9	6.86	6.64	6.15	6.43	6.43	6.65	6.46
Salinity (psµ)	0.37	0.52	0.62	0.396	0.73	0.66	0.66	0.30	0.38
ORP (mv)	-59.16	-59.1	-63.95	-71.2	-17.4	-50.9	-50.9	-47.16	-27.2
Conductivity(µs/cm)	824.66	1148	1340	928	1466	1498	1498	743	941
Temperature (°C)	28.4	29.44	28.82	31.88	31.88	31.67	31.67	34.13	34.95
DO Saturation (%)	1.13	1.5	0.93	2	1.7	1.5	1.5	5.53	4.76
Resistivity (mΩcm)	0.0013	0.0009	0.008	0.0012	0.0007	0.0007	0.0007	0.0016	0.0012
Atmospheric Pressure	97.21	97.33	97.30	97.14	96.99	96.97	96.97	96.88	96.94
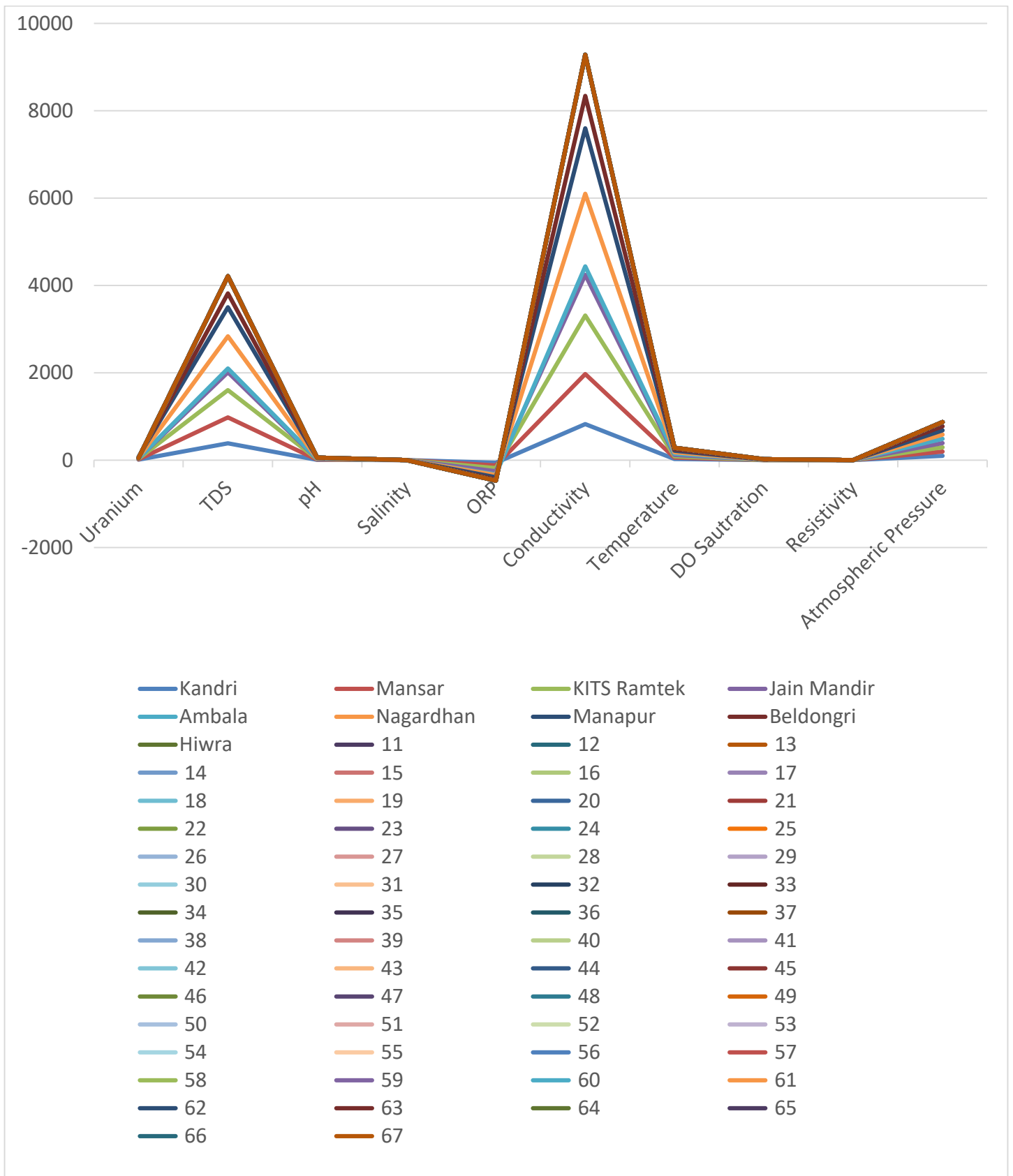
Fig-4: Graph

5. Methodology

Hanna Multiparameter Instrument (HI98194).

- To check ground water parameters such as pH, TDS, EC, DO, Temperature,

- Total hardness, Total alkalinity, etc. by using this instrument.

    By using this method to detect ground

Fig-5: Hanna Multiparameter

LED FLUORIMETER LF-2a

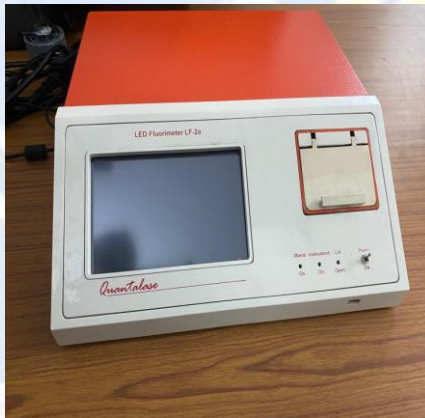- Measurement of uranium concentration in water sample is done by using this instrument

Fig -6: LED Fluorimeter

6. Conclusion

The Uranium concentration in groundwater samples" is below the permissible limit of WHO, AERB. The concentration of Uranium in groundwater is varying in the different locals are in the range of 6.29 to 18-124 ppb in the pre-monsoon with a mean value of 11.47ppb. Coming on pH, the value of pH is very nearer to neutral ranges from 6.89 – 720. The findings shows that the parameter ORP shows negative results while other parameters, TDS, salinity, conductivity, temperature are positively co- related with the Uranium concentration which might be due to salts being found from rocks. The premonsoon data value For Calcium, Magnesium totals alkalinity, hardness was significant. The result of carcinogenic data for the population were in good condition with the standards set by WHO, AERB etc.

India is the one of the largest dependents on groundwater. Therefore, this study of health effect due to intake of Uranium from groundwater directly or indirectly is considered to be risk-benefit outlook for future. This finding will be helpful in exploring the hotspot areas for Uranium in groundwater. They will also be helpful in long term planning and initialize the formulation of Future guidelines on Uranium.

Some Pictures:

Reference:

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