SUMMER INTERNSHIP REPORT

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" E- MICROBIOME (No.) "

UNDER SUPERVISION:

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CENTRE FOR RURAL DEVELOPMENT AND TECHNOLOGY

INDIAN INSTITUTE OF TECHNOLOGY, DELHI

NEW DELHI

SUBMITTED TO:

DEPARTMENT OF REMOTE SENSING

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SUBMITTED BY:

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(Enrol...)

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I would also express my special thanks to IITD for allowing me to pursue my internships and also the access to labs and necessary facilities. I am gratefully to my Parents and Friends for constant motivation and support.

SUPARNA GHOSH

CONTENT

CHAPTER FIRST

LAND SURFACE TEMPERATURE VARIATION BASED ON REMOTE SENSING OF RANIA KHANCHANDPUR, KANPUR DEHAT, UTTAR PRADESH

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ABSTRACT

Land surface temperature (LST) is an important factor in the global change studies, in estimating radiation budgets in heat balance studies, and as a control for climate models. In the study, an attempt has been made to detect land surface temperature change over Akbarpur Tehsil of Kanpur Dehat District of Uttar Pradesh. To detect the change, Landsat-8 OLI satellite data have been collected from the USGS Earth Explorer for the years 2013 and 2022. Both images have been taken for the month of April of respective years. The emissivity per pixel is retrieved directly from satellite data and has been estimated as narrow-band emissivity at the satellite sensor channel to have the least error in the surface temperature estimation. The result of the study shows the minimum temperature in 2013 was 29.54˚C which has increased to 32.26˚C in 2022 whereas there is a negligible difference in maximum temperature. Also, the study reveals that the temperature at a maximum in 2013 was between 40˚C to 48˚C whereas the temperature in 2022 ranged between 42˚C to 48˚C. The output reveals that LST was high in the built-up regions whereas it was low in the vegetative regions. Hence, this study provides valuable insights into the complexity of the temporal variability in LST and its driving factors, which can be used in future studies to analyze the response of the ecosystem to the changing climate.

Keywords: Land surface temperature, Landsat-8, Climate Change, Akbarpur

INTRODUCTION

A more clarified explanation would be how warm it would be to touch the "SURFACE" of the earth in a particular location. The "surface" is everything a satellite observes when it peers through the atmosphere to the earth. It could be snow and ice, grass on a lawn, a building's roof or leaves in a forest canopy. As a result, Land Surface T LST is a basic determinant of the terrestrial thermal behaviour as it controls the effective radiating temperature of the earth's surface. However, due to the extreme heterogeneity of most natural land surface, this parameter is difficult to estimate and validate.

LST is the thermodynamic skin temperature of land surfaces which can be studied by measuring the infrared radiation coming from the surface (Citation). With LST information, urban heat island can be monitored and forest fire can be detected. LST information can be useful to estimate the soil moisture, hence, studies related to many hydrological processes can be explored from LST. It can also help in different climate studies and weather forecast. Changes in LST over time can be related with changes in LULC types. LST is related with all sorts of processes that control the energy and water fluxes over the interfaces between the Earth's surface and the atmosphere. All these applications make the study of LST a crucial parameter to better understand the regional, as well as the global, environment and its changes over time.
emperature (LST) differs from the temperature shown in the daily weather report.

RESEARCH OBJECTIVE

To understand the land surface temperature change over Kanpur Dehat using Landsat 8 OLI & TIRS satellite data.

AREA OF STUDY

The study area comprises the Area of Rania-Khanchandpur of Akbarpur under Kanpur Dehat, Uttar Pradesh. The area is suffering from Chromium waste deposition pollution.

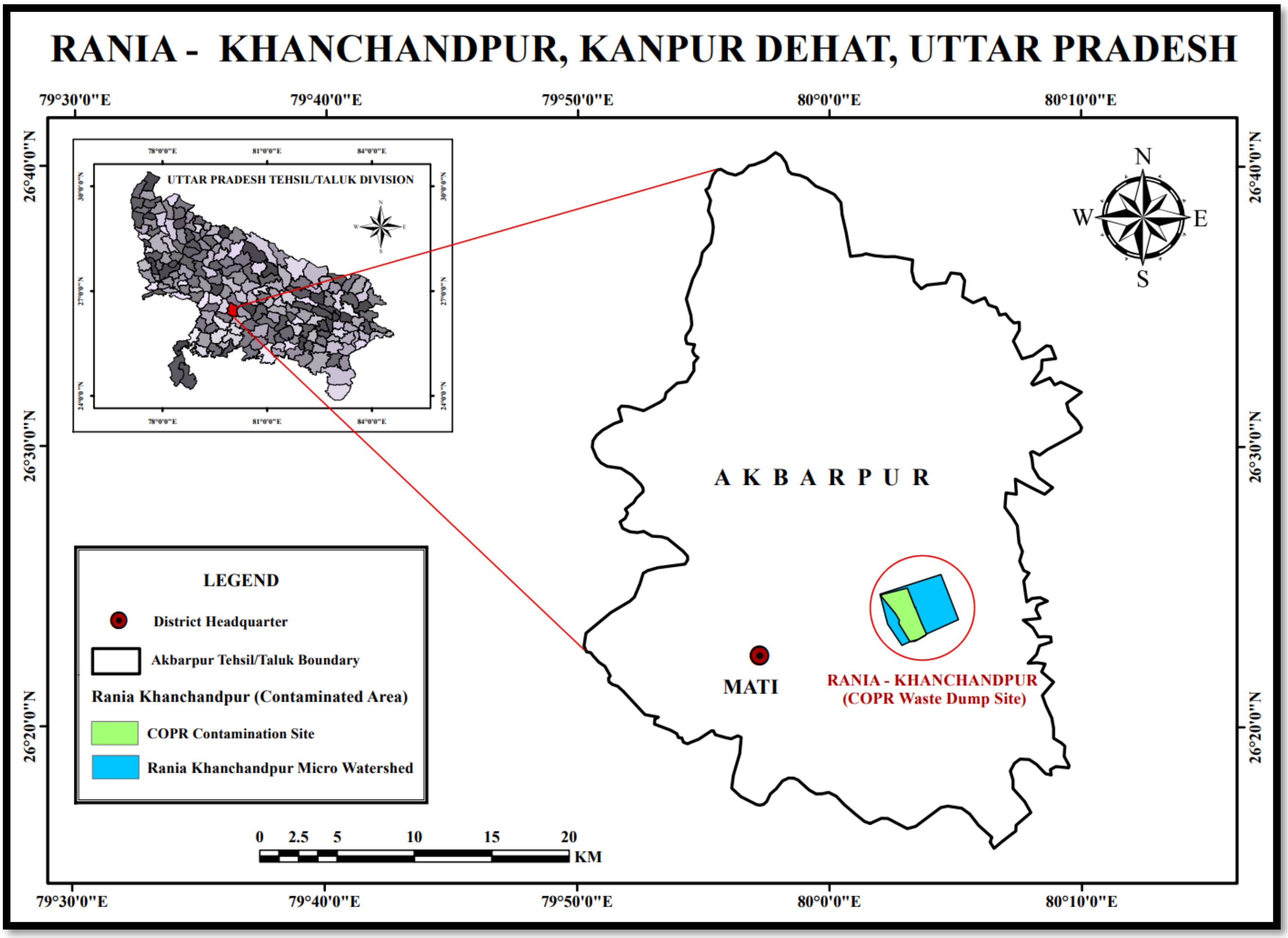


Figure1: Study Area map

SOURCE OF DATA

Satellite Imageries Landsat 8 OLI TIRS, from Earth Explorer USGS, NASA.

Image information:

- **Date of acquisition of selected images:** 29/04/2013 & 30/04/2022
- **Sensors:** OLI TIRS
- **Used Band:** B4 (Red band), B5 (NIR band), B10 (Thermal band).
- **Wavelength Range (in micrometres):** 0.64 – 0.67 (Red), 0.85 – 0.88 (NIR), 10.6 – 11.19 (Thermal Band 10).
- **WRS Path no.:** 144
- **WRS Row no.:** 42
- **Resolution:** 30 meters (Red & NIR), &100 meters (Thermal bands).

METHODOLOGY

Steps for LST calculation:

Step 1: Calculate Top of Atmosphere (TOA) Radiance.

$$\textbf{TOA (L) = ML + Qcal + AL}$$

Where, ML is band specific multiplicative rescaling factor as mention in imagery metadata; Qcal corresponds to band 10; and AL is band specific additive rescaling factor as mention in metadata (radiance_add_band_10)

Step 2: Calculate TOA Brightness Temperature.

$$BT = (K2/(\ln(K1/L)+1)) - 273.15$$

K1 & K2 is band-specific thermal conversion constant of landsat-8 band 10 (mentioned in metadata); L is TOA (L); and -273.15 is added to convert absolute zero (Kelvin) to degree Celsius.

Step 3: Calculate Normalized Difference Vegetation Index (NDVI).

$$NDVI = Float(NIR - R)/ Float (NIR + R)$$

where, R (band 4) is red band (visible region) of landsat-8 satellite; NIR (band 5)is near infrared band of landsat-8 satellite.

Step 4: Calculate Land Surface Emissivity (LSE).

i. Calculation of PV (Proportion of vegetation)

$$PV = square[(NDVI-NDVI\ min) / (NDVI\ max - NDVI\ min)]$$

Where, NDVI min is NDVI lowest value and NDVI max is highest value

ii. Calculation of Land Surface Emissivity

$$\varepsilon = 0.004 * PV + 0.986$$

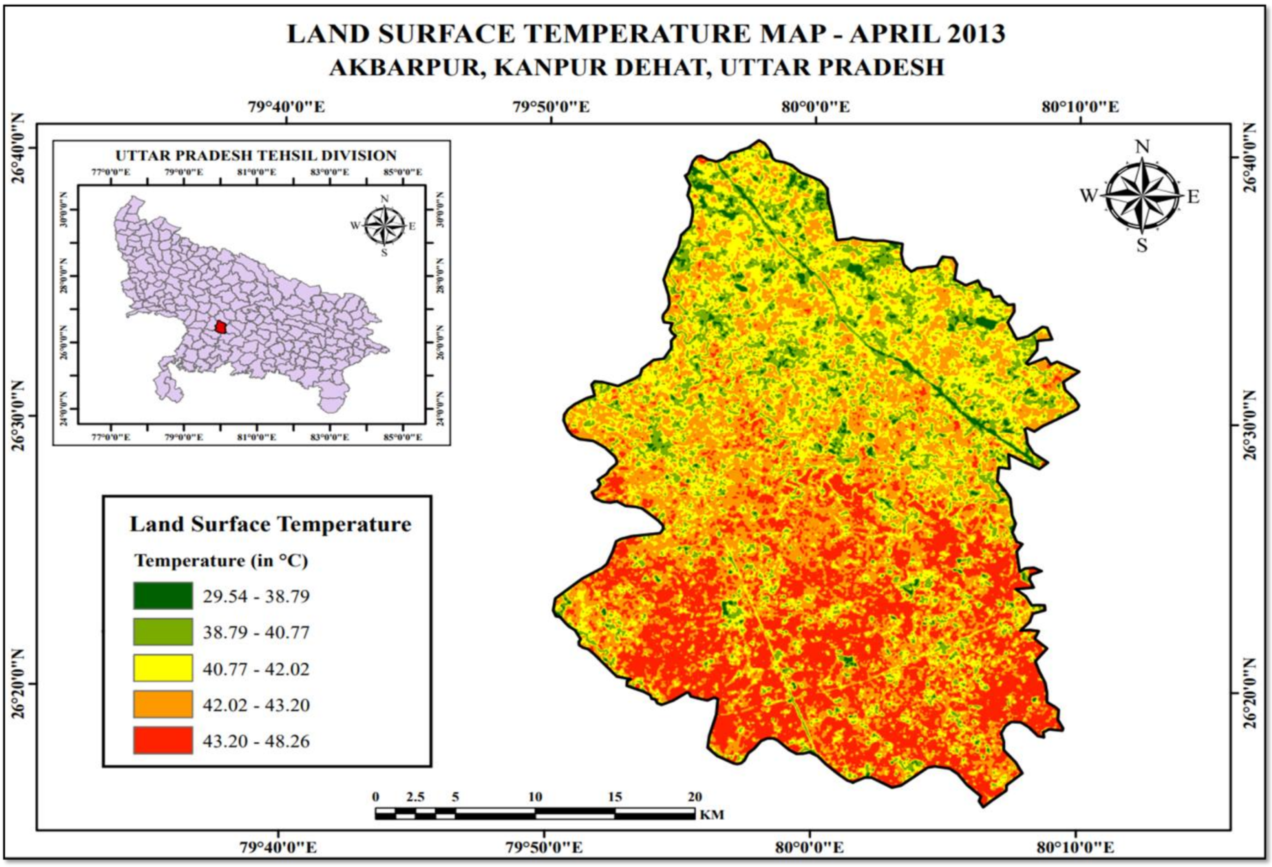
Where, PV is proportion of vegetation; 0.004 is surface roughness constant; 0.986 is emissivity value when NDVI value is more than 0.5.

Step 5: Calculate Land Surface Temperature (LST).

$$LST= (BT/(1+(0.00115*BT/P)*in(e))$$

Where, BT is brightness temperature; ε is emissivity; P= 1.4388

RESULTS AND DISSCUSION



InternshipInternshipGroundwater

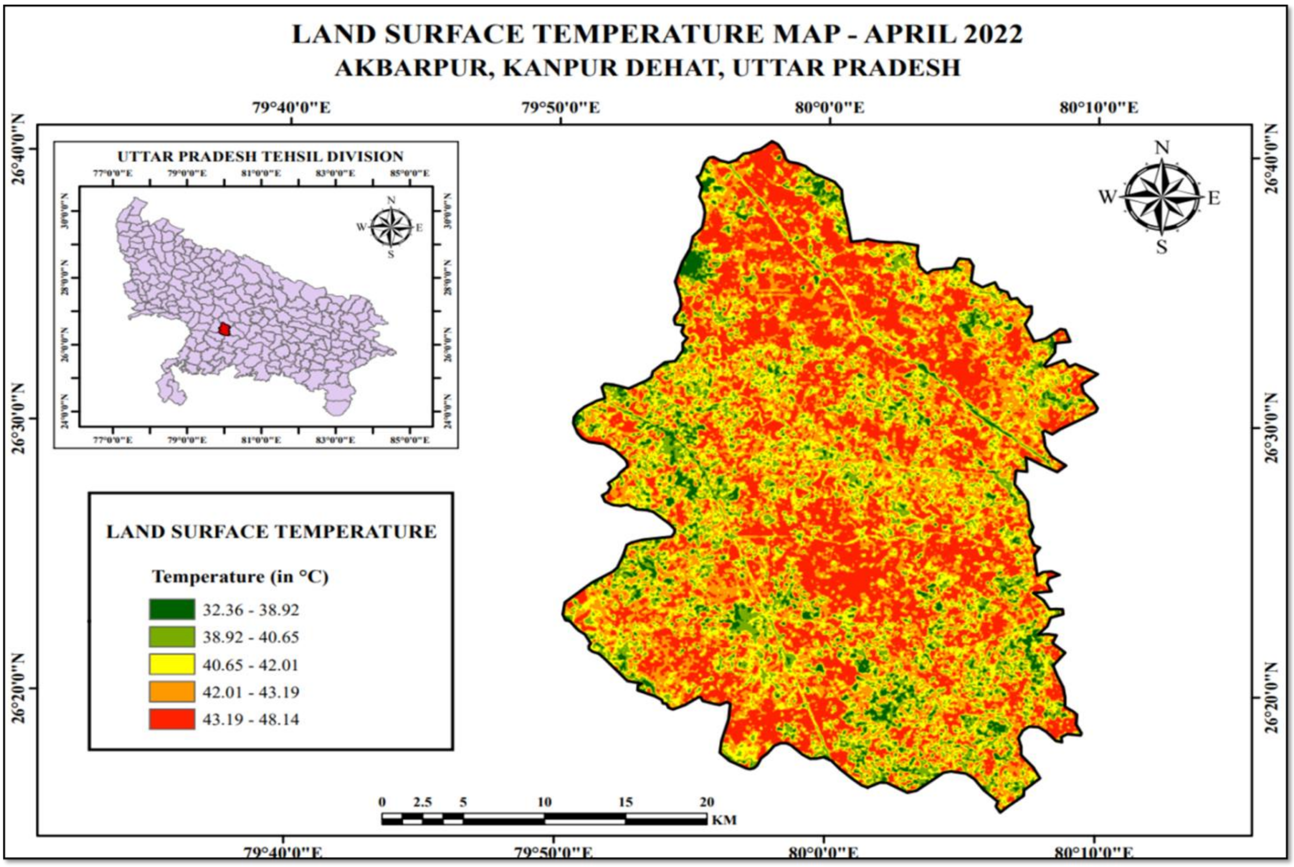


Figure 3: **LST April (2022)**

Land Surface Temperature variation from 2013 to 2022 of some sample points

S No.	Location		Change in Temperature (°C)	
	Latitude	Longitude	2013	2022
Point 1	26°35'49.8"N	80°01'17.4"E	37.9546	43.3977
Point 2	26°32'23.5"N	80°02'31.7"E	39.2387	43.6547
Point 3	26°29'22.5"N	80°00'52.5"E	38.5326	43.5344
Point 4	26°22'34.1"N	79°56'36.1"E	44.5337	36.3869
Point 5	26°18'48.0"N	80°06'33.3"E	44.3413	36.0271
Point 6	26°17'17.8"N	80°02'52.2"E	44.0207	37.1446

Table1: **Comparison between LST of 2013 and 2022**

RESEARCH GAPS

1. **No study has been performed yet to investigate LST in and around contaminated sites in India (Citation)**
2.

INNOVATION & POTENTIAL OF THE WORK

- This is the first attempt to investigate contaminated site and its hydrometeorological conditions with special focus on Land Surface Temperature (LST) changes.
- Linking surface temperature change to the geochemistry, soil moisture and hydrological processes of contaminated sites under varying climatic conditions.

CONCLUSION

There is overall rise in the land surface temperature (LST) from 2013 to 2022. There may be a lot of factor influencing the rise in LST approximately from 29°C up to 48°C.

This will impact the microbial degradation of Cr/pollutants in and around Rania Khanchandpur. Further increasing land surface temperature will create water stress conditions which will ultimately impact the growth of natural vegetation which may be helpful in phyto remediation.

CHAPTER SECOND

MODELLING AND MAPPING OF Ground WATER QUALITY USING REMOTE SENSING & GIS OF RANIA-KHANCHANDPUR MICRO WATERSHED

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MODELLING AND MAPPING OF SOIL WATER QUALITY USING REMOTE SENSING & GIS OF RANIA-KHANCHANDPUR MICRO WATERSHED

1. INTRODUCTION

When dangerous substances (pollutants) get into the groundwater, groundwater pollution happens. These pollutants, which are essentially endless, can include anything from motor oil to chemicals used in agriculture to untreated waste. Groundwater pollution is more difficult to detect and manage than surface water pollution, which could lead to a long-term problem. We can choose better locations for industrial sites if we study aquifers and the water flow in them, a field known as hydrogeology. In order to comprehend how far these pollutants can travel underground, it is also crucial to understand the underlying structures of a region.

In the past ten years, the number of companies in India has increased more than ten times, which has led to an expansion of the environmental pollution problems. Many industries release their waste into the surrounding surface waters or on land, contaminating the soil, surface water, and groundwater. Because of this, some heavy metals in water can be harmful to people's health. Important metals like molybdenum, manganese, cobalt, copper, zinc, and chromium come from the disintegration of rocks, volcanic ejections, metal handling, mining, and agriculture. High levels of toxic metals are released into the water as a result of the disposal of industrial wastes.

Due to the nearby dumping of tonnes of hazardous waste, the groundwater of Rania-Khanchandpur and the other villages has been contaminated with cancer-causing heavy metal (Citation). The water drawn from hand pumps in this region has long been proven to contain hexavalent chromium, also known as Cr VI, a heavy metal that causes cancer. The water colour appears to be a vibrant green. In the Kanpur region, a significant amount of Cr VI, one of the most hazardous by-products of the leather tanning process, is created. Over the last 20 years, numerous tanneries have shut their doors as a result of new environmental laws. But because the industry was unable to operate, the pollutants remained. Large amounts of the hazardous waste from the leather tanning industries have been illegally dumped in rivers, open spaces, and deep boreholes in Kanpur.

Near the village Khanchandpur, one can clearly see a site with dangerous chromium waste. Less than a km distant, polluting the soil and seeping into the water sources. However, during every monsoon season, locals consume cancer-causing water that seeps into the earth from landfills.

Hexavalent ($Cr6+$) and trivalent ($Cr3+$) are the two natural forms of chromium. While $Cr3+$ is stable and naturally harmless, $Cr6+$ is deadly dangerous and readily dissolves in water. Hexavalent chromium has negative health effects because of its oxidising behaviour, high solubility, and mobility. Hexavalent chromium frequently results in health problems like liver damage, vomiting, diarrhoea, and pulmonary congestion. Trivalent Cr, on the other hand, is less toxic and has a low solubility in the natural world.

Research Gaps

Limited groundwater quality works have been done yet….

1.1 OBJECTIVES

- To analyse the soil water quality parameters.
- To quantify and analyse the effect of soil water with the help of satellite imageries and UAV data.
- To integrating Geochemical model with UAV data and mapping.
- To test various parameters of the collected new water samples.

1.2 SCOPE OF THE STUDY

The environmental hazard triggered by chromium contamination, which has an adverse effect on our natural resources and the environment, particularly water and soil, is enormous. Increased levels of accumulation in human as well as animal tissues might result from excessive exposure, which would be dangerous to health. According to several studies, chromium is an extremely dangerous element that impairs plant metabolic processes, hinders crop development and production, and lowers the quality of vegetables and grains. As a result, the agricultural production system, soil, and water must all be monitored. In order to control the amount of chromium in water, soil, and other resources, a variety of beneficial and effective remediation solutions have been developing. To balance nature and the environment, a sustainable remediation strategy must be used.

So for this study we are plotting the water parameters and chemical concentration in ground water of Rania-Khanchandpur to visualize the spatial distribution of contamination over that region contaminated with chromite ore processing residue (COPR) dumping from already collected samples of ground water data with the help of GIS techniques using ArcMap of ArcGIS software to. Also tested and various physic-chemical parameters of newly collected water samples.

2. LITERATURE REVIEW

In order to get accurate information, the CPCB worked with the UPPCB to conduct a groundwater resembling in Khanchandpur in Rania in October 2019. The aforementioned samples were examined at the CPCB lab in October 2019. Following are specifics regarding sample location and analysis outcome:

- Fluoride, total dissolved solids (TDS), and total chromium (trivalent and hexavalent chromium) contents in the sample taken from Khan Chandpur, Rania, and Kanpur district of Uttar Pradesh are exceeding the BIS acceptable limit for drinking water. Iron and sulphate levels that are beyond BIS approve table limits for drinking were also discovered in a few samples.
- Total chromium concentration was determined to be 1.87, 42.2, and 7.48 mg/L at those places, which is much higher than the 0.05 mg/L BIS acceptable limit for drinking. Hexavalent chromium concentrations of 3.37 and 13.95 mg/L were discovered in those samples.
- Hand pumps and bore wells both had coloured water, which is a sign of the presence of hazardous hexavalent chromium.
- The total chromium concentration at the places sampled by the "Justice Arun Tandon Committee" was determined to be 42.2 mg/L, which is higher than the concentration in the Committee's previous samples. A comparative analytical report is shown below. Such variation is related to inadequate preservation and delayed sample submission:

Heavy Metals	BIS (2012) Acceptable limit of Drinking Water	Justice Arun Tondon Committee's samples	Repeat samples collected by CPCB Team
As	0.01	BDL	BDL

Cd	0.003	BDL	BDL
Co	-	BDL	BDL
Cr	**0.05**	**28.34**	**42.2**
Cu	0.05	BDL	BDL
Fe	0.3	0.04	0.78
Mn	0.1	0.1	0.13
Ni	0.02	BDL	BDL
Pb	0.01	BDL	BDL
Se	0.01	BDL	BDL
Sb	-	BDL	BDL
V	-	0.01	0.02
Zn	5	0.44	0.86

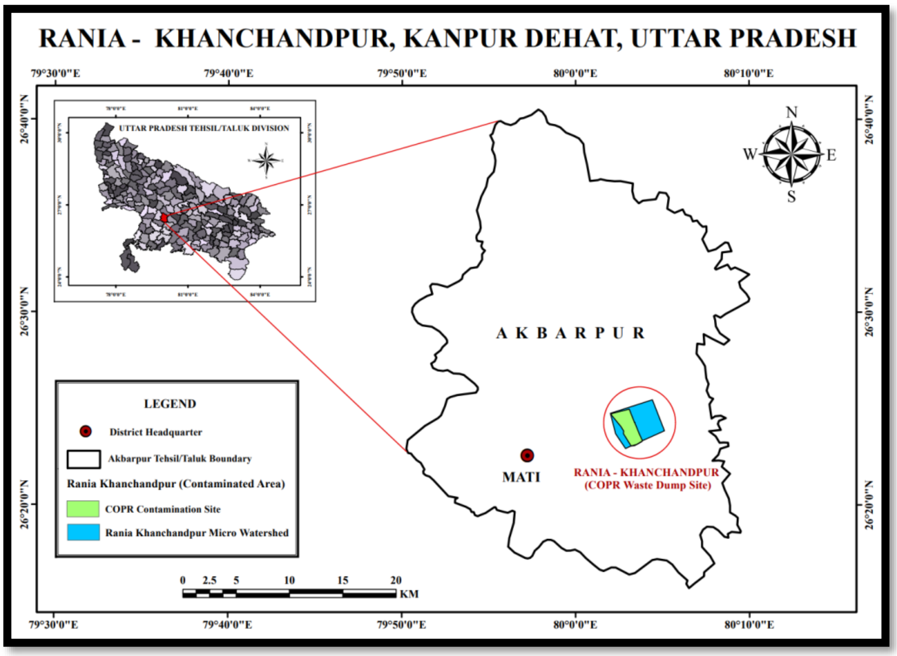
***Table 1:* Comparison table of Samples Collected by Justice Arun Tondon Committee & CPCB Team**

- According to sample analysis performed in Khan Chandpur, Rania, Kanpur, the groundwater at this location indicates hexavalent chromium contamination that is several times higher than the acceptable limits for drinking water. However, the concentration levels reported at other nearby locations are considerably lower than those in Khanchandpur, Rania.
- Contaminated locations in and near Khanchandpur Rania would require groundwater remediation through the use of suitable technology like a pump and treat system. The removal of chromium-bearing debris and polluted soil from dumpsites is necessary before groundwater treatment, though. Regarding the disposal of chromium waste from the dumpsite in accordance with orders already made by the Hon'ble NGT on the issue of OA 200/2014 dated 07/08/2019 and OA 985/2018.

3. STUDY AREA

Rania-Khanchandpur study area are villages that comes under Akbarpur tehsil of Kanpur Dehat district of Uttar Pradesh, India. The GPS coordinates of Akbarpur are

26° 26' 2.9364'' N and 82° 32' 24.7164'' E. Rania village is located at coordinates N 26° 24' 25.6824", E 80° 4' 43.0896".



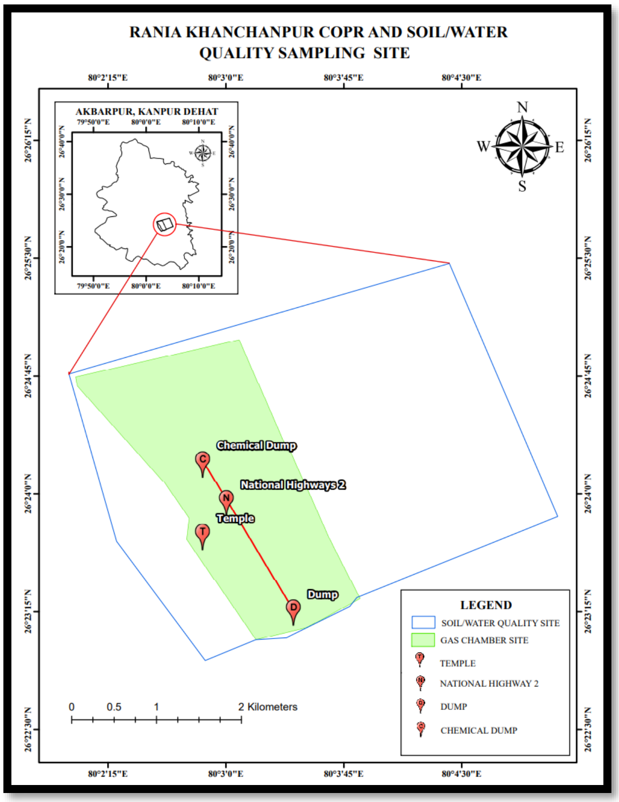


Figure 1 & 2: **Map of study area in Uttar Pradesh & Enlarged depiction of the study area**

3.1 GEOGRAPHY

The Kanpur Dehat district, which covers a total area of 3021 sq. km. and is located between latitudes 26°06'30" and 26°50'15" north and 79°30'00" and 81°10'15" east, is located in the centre of the Indian state of Uttar Pradesh on the eastern bank of the Yamuna River. The district is enclosed on its south and west by the Yamuna River, and on its north and west by the districts of Etawah and Kannauj. The Kanpur Nagar district shares its remaining periphery with the rest of it.

3.2 DEMOGRAPHY

The population of Akbarpur Tehsil in 2023 is 702,917. There are 532,513 people residing in this Tehsil in total, of those 285,036 are men and 247,477 are women, according to the 2011 Indian census. The expected population of Akbarpur in 2022 was 681,617. There are 352,979 persons who are literate, 207,038 of them are male and 145,941 female. There are 189,903 total workers who rely on several talents, of which 147,472 are males and 42,431 are women. A total of 52,663 people depend on agriculture farming, of which 5,535 are women and 47,128 males. In Akbarpur, there are 39,590 individuals who work as agricultural labourers, 31,895 of them are males and 7,695 of whom are women.

3.3 CLIMATE & RAINFALL

The district's sub humid climate is marked by a scorching summer and overall dryness, with the exception of the southwest monsoon, which brings an average annual rainfall of 782.8 mm. The months of June to September get around 90% of the annual precipitation. Surplus water is accessible during the monsoon for groundwater percolation.

The hottest month of the year is May. In May, the average daily maximum temperature is 41.70°C. The daily average minimum temperature is 8.6°C, while the maximum temperature may reach 45°C.

3.4 GEOMORPHOLOGY & SOIL TYPE

A piece of the Gaga-Yamuna doab in the Indo-Gangetic Plain is home to the Kanpur Dehat district. A more or less level terrain with a little inclination to the south-west is present over 90% of the district area. The elevation of the land's surface ranges from 117 metres to 139 metres above mean sea level. The region could be divided into three major geomorphic sections, namely the Older Alluvial Plain, the Older Flood Plain of the rivers Yamuna, Sengar, Rind, and Pandu, and the Active Flood Plain of these rivers.

In the Yamuna subbasin, the majority of the region (approximately 90%) is covered with older alluvial soils, namely "Bhur" or sandy soil occupying high mounds, "Matiyar" or clay rich soil in depressions, and "Domat" or loam in the plains.

4. MATERIAL AND METHODOLOGY

4.1 POTENTIAL HYDROGEN

Intensity of acidity or alkalinity is measured using the PH scale. This applies as a metre for water's H+ ion content. Alkaline water results from a ratio of H+ ions to OH- ions greater than 1. Water with a pH of 7 is considered to be neutral; water with a pH of 7 or below is considered acidic.

Electrometric method of pH measurement:

Use buffer solutions with pH values of 4, 7, and 9.2/10 to calibrate the pH electrode. Following each procedure, clean the electrode with distillate water and a tissue paper wipe. After calibration, dip the electrode in a solution containing 0.01 M HCL solution or KCL solution for storing before to further sample analysis. Using a calibrated electrode, analyse the sample after that. Each sample temperature has to be monitored.

4.2 TOTAL HARDNESS

The concentration of alkaline earth metal cation in water is measured as the total hardness of the water. Hardness is primarily given by calcium and magnesium, two major cations.

Steps for the measurement:

Put 50 ml of the sample in an Erlenmeyer flask. Add 4-5 drops of erichrome black T indicator (reagent B) and 1 ml of ammonium buffer solution (reagent A). Titrate it against the EDTA solution (reagent C) until the solution's wine red colour got blue (the end point).

Calculation:

TOTAL HARDNESS (mg/l, as CaCo3) = T*1000/V;

Where, T=volume of titrant (ml), and V=volume of sample (ml)

4.3 CALCIUM HARDNESS

All-natural water contains significant amounts of calcium. Its source is in the rocks from which it is leached, and the concentration depends on natural water and the basin's character. Mollusks and vertebrates both need an adequate quantity of calcium, a micronutrient. It has an important role in the overall use of water and may impact the standard necessary for home use. However, its increased content in water is bad for domestic use as well as health.

Steps for measurement of calcium hardness:

Take 50ml sample in conical flask. Add 1 ml of reagent A (Sodium Hydroxide solution) and pinch of reagent B (Murexide indicator). Titrate it with reagent B i.e., EDTA solution until pink colour changed to purple (end point).

4.4 ALKALINITY

Water's alkalinity can be defined as its ability to neutralise a strong acid. It is identified by the presence of the hydroxyl ion, which may combine with hydrogen ($H+$) ions. Hydroxides and bicarbonates have both been regarded as significant bases in natural water carbonates. Blue green algae and phytoplankton have always been abundant in naturally alkaline water**.**

Steps for measurement of alkalinity:

Take 100ml of sample and add 3 drops of Methyl Orange indicator and determine the total alkalinity (TA) by continuing the titration to second equivalence point.

4.5 CHLORIDE

The earth's crust contains around 0.05% chloride. Freshwater typically has a chloride content of 1 to 100 ppm (parts per million).

Steps for measurement for the chloride:

Fill the burette with the same after cleaning it with distilled water and rinsing it with a standardized solution of silver nitrate. Carefully pipette 10 ml of the given chloride ion solution into a 100 ml conical flask. Drop 1 ml of the potassium chromate indicator solution into the container (it is best to use a 1 m pipette for this). Make sure the flak is continually stirred and titrate the solution with silver nitrate solution.

As the titration progressed, we noticed that the red colour created by the addition of each drop of silver nitrate started to fade more gradually. As the rate at which silver nitrate was added slowed, the end point was abruptly revealed by the sudden development of a faint but distinct change in colour to reddish-brown. When the titration flask is swirled, this does not dissipate. Perform the action at least three more times, then note the observation.

4.6 STEPS INVOLVED IN GIS PROCESSING

A geographic analyst's tool known as interpolation can estimate values for cells in a raster from a small sample size of data points. It may be used for predicting unknown values for any geographic point data, including elevation, rainfall, chemical concentration, and more. IDW, Kriging, Natural Neighbors, Spline, and Trend.

IDW (Inverse distance weighted) tool interpolates cell values by averaging the values of sample data points in close proximity of each processing cell. A point's effect or weight on the average calculation increases with proximity to the cell's estimated centre.

Input data: 1.Excel sheet sample data

2. Coordinate of Sample Points

Now, for Displaying the Spatial Distribution of Ground & Surface water Chemical pollutant concentration “Interpolation” technique is used.

Go to “**Arc Toolbox**” -> “**Spatial Analyst**”-> “ **Interpolation**”-> “**IDW**” -> Now, Dialog box will appear provide all the require Information.

Creating Map Layout:

Now, click on “**Layout View**” at the bottom left corner of screen -> the layer will be Open in layout form-> click on “**change layout**” option -> choose the size & orientation of you layout page Accordingly (Portrait & Land scape).

One by one add all the necessary elements of map layout.

5. RESULTS

<u>Chemical concentration in Groundwater</u>

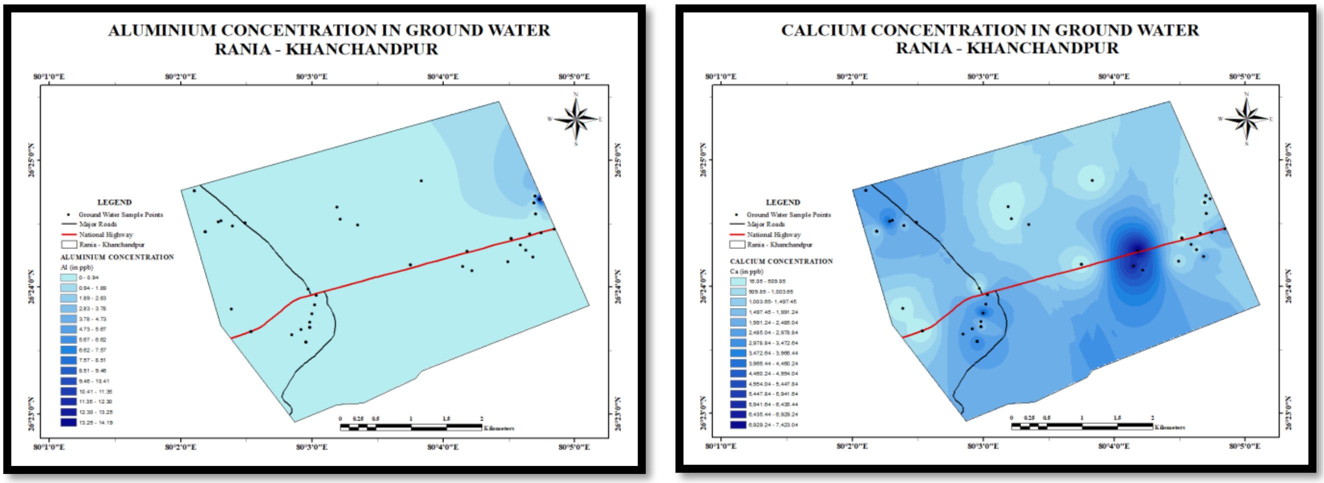


Figure 3 & 4: Concentration of Aluminium (left) & Calcium (right) in Groundwater

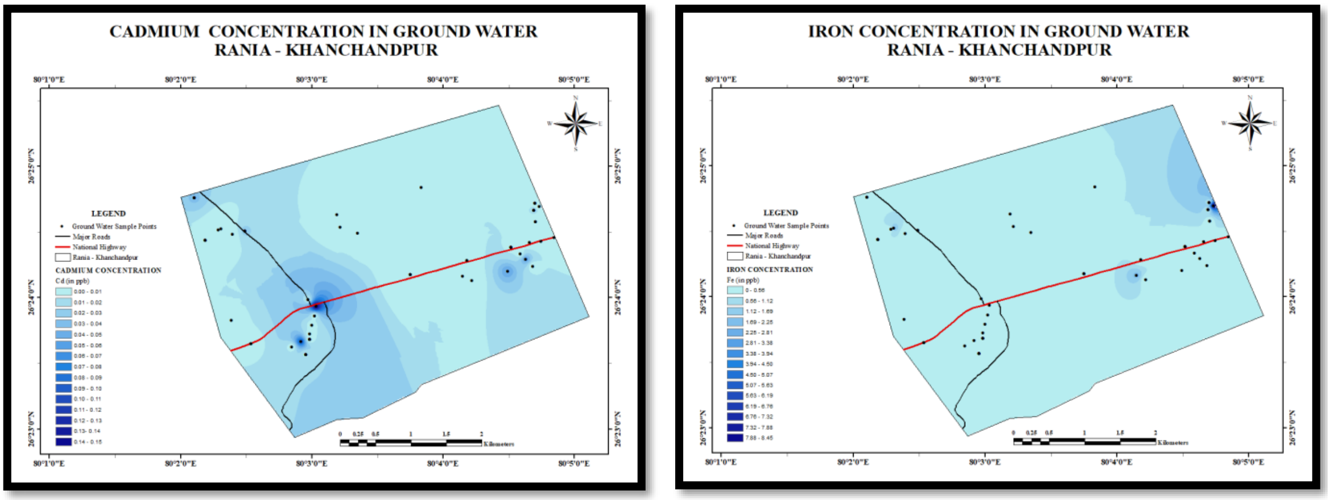
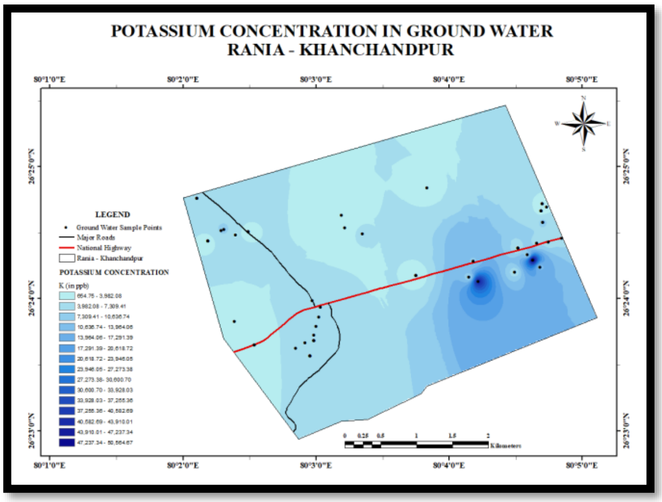


Figure 5 & 6: Concentration of Cadmium (left) & Iron (right) in Groundwater



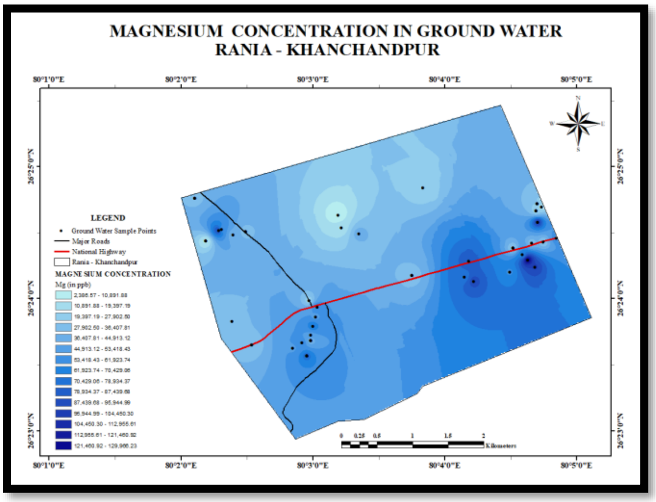
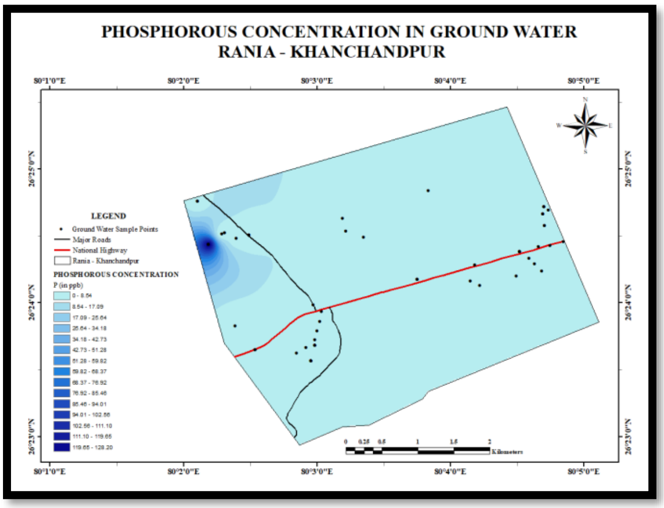


Figure 7 & 8: Concentration of Potassium (left) & Magnesium (right) in Groundwater



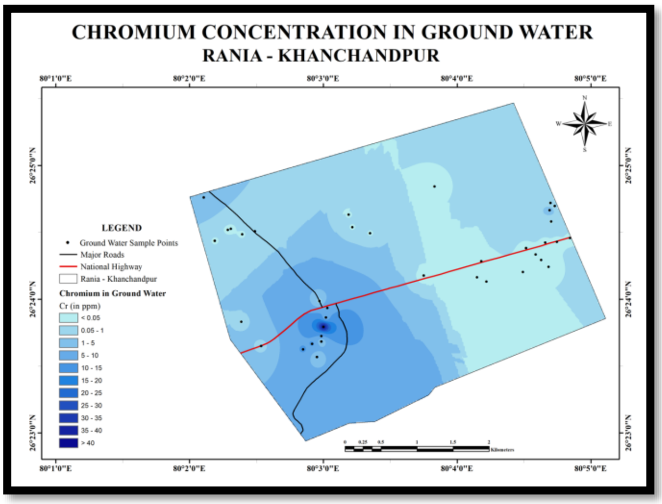
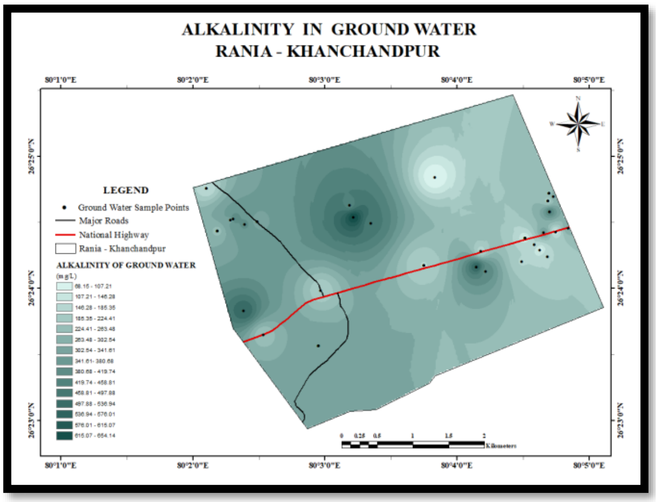


Figure 9 & 10: Concentration of Phosphorous (left) & Chromium (right) in Groundwater

Physico-chemical parameters of Groundwater



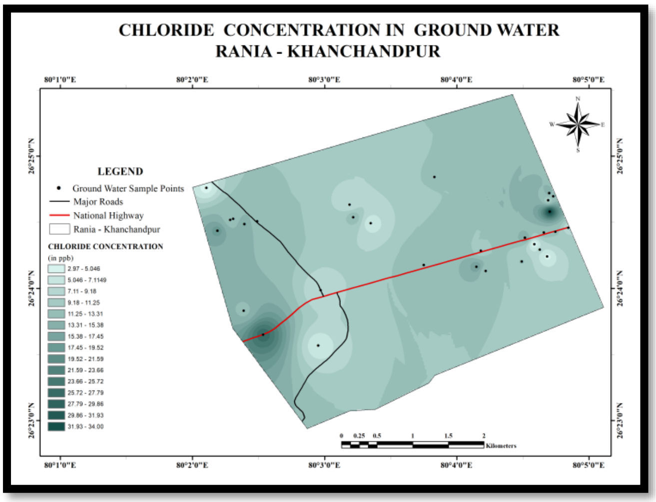
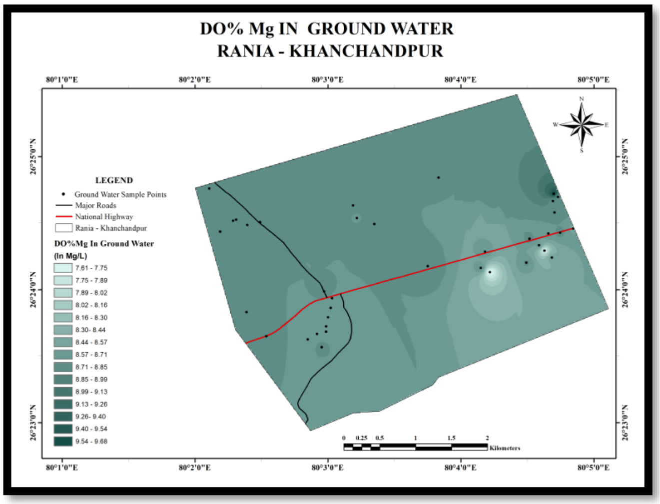


Figure 11 & 12: Alkalinity (left) & Chloride (right) in Groundwater



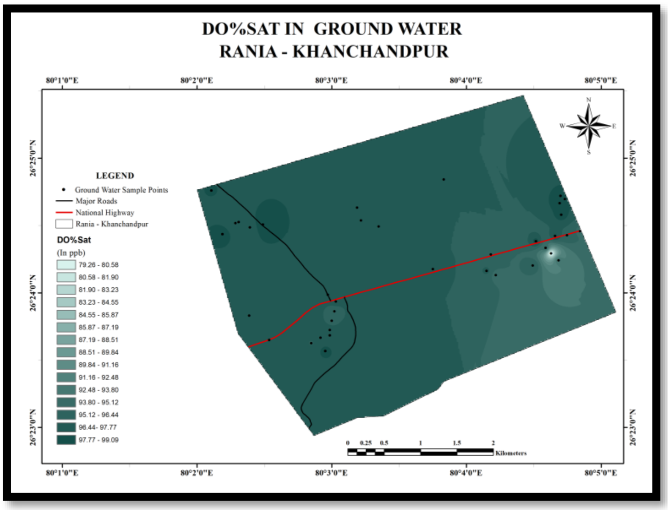
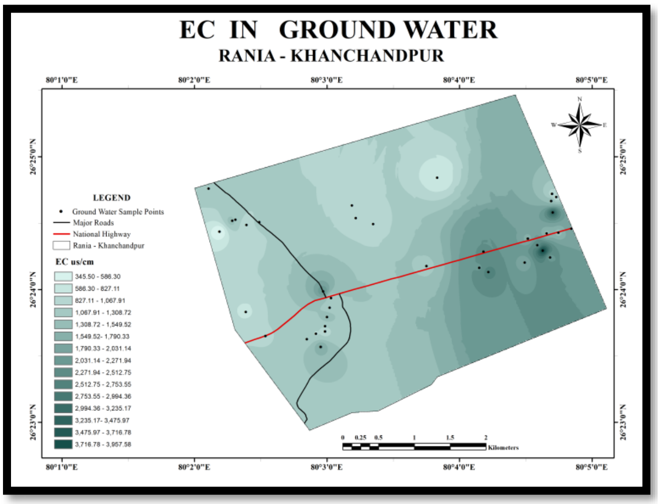


Figure 13 & 14: Dissolved oxygen (left) & Dissolved oxygen SAT (right) in Groundwater



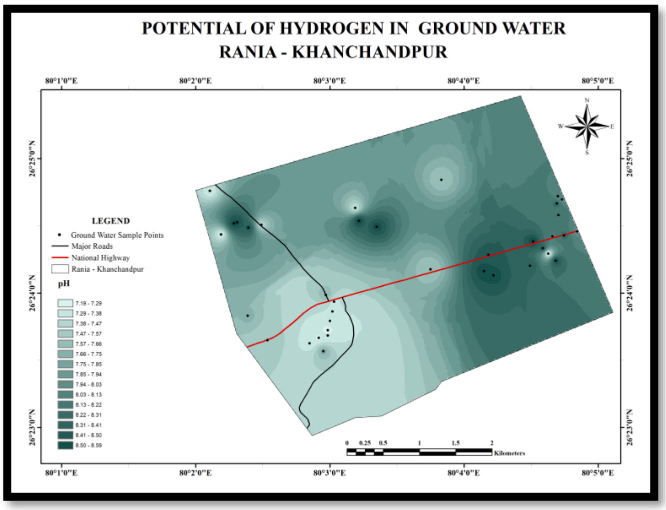
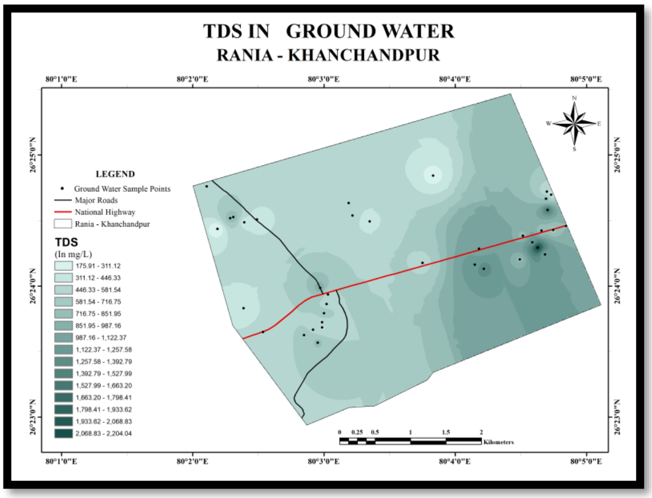


Figure 15 & 16: Electrical Conductivity (left) & Potential Hydrogen (right) in Groundwater



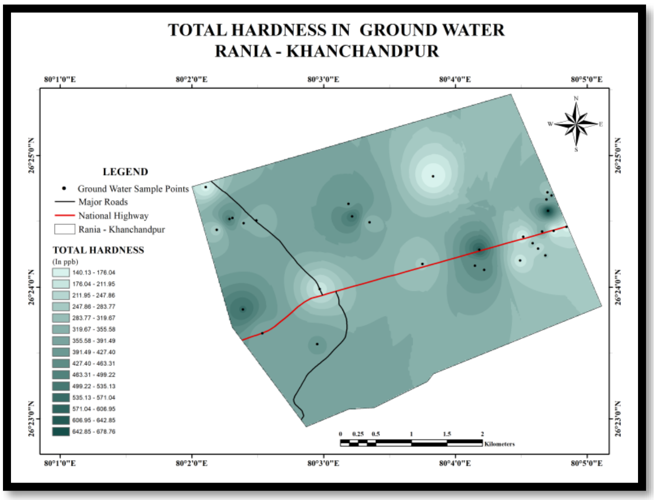


Figure 17 & 18: Total Dissolved Solid (left) & Total Hardness (right) in Groundwater

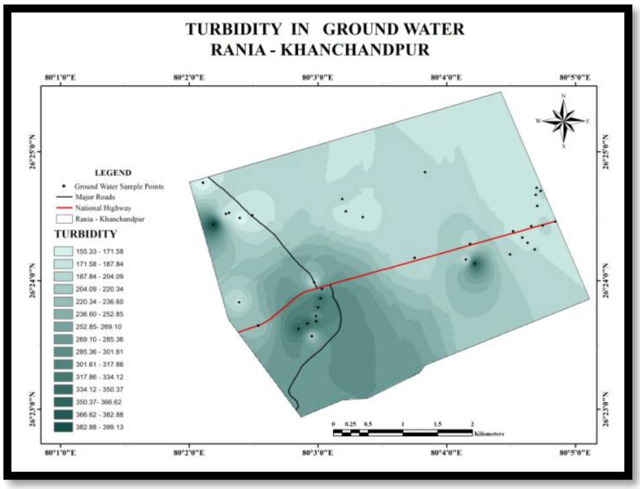


Figure 19: Turbidity in Groundwater

Spatial variation of Water Quality Parameters.

Chromium concentration are expressed in parts per million, Variation in value are represented by the lowest value is less than 0.05 to highest value of more than 40 ppm.

Highest Concentration of chromium in groundwater are collected from south NH2 near Temple site (Main Khanchandpur village line). The deposition Occur due to continuous leaching happens from topsoil and rocks which gradually contaminates the groundwater.

Cadmium concentration in ground water was observed high south of COPR dump site close to NH2. The value range from 0.00 (lowest) and 0.15 (highest).

LAB WORK

Photo 1 & 2: Testing EC (Electrical Conductivity) in Groundwater Samples

Photo 3 & 4: Geotagged images while testing TH (Total Hardness) in Groundwater Samples

Photo 5 & 6: Geotagged image while testing Calcium Hardness in Groundwater Samples

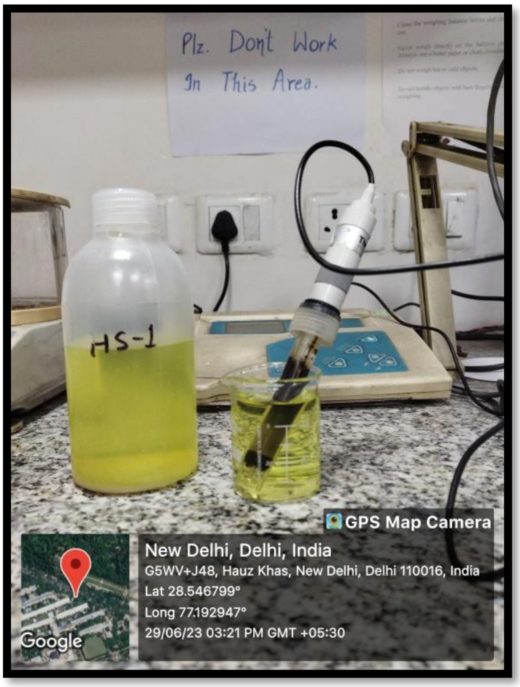


Photo 7 & 8: Geotagged image while testing pH in Groundwater Samples

6. DISCUSSION

In the village of KhanChandpur, which is located in the district of Kanpur Dehat, the committee found a huge accumulation of chromium that was placed about 500 metres distant on the right side of the Kanpur Jhansi highway. Pictures of the accumulation were taken and are included with the report. The committee was informed that the site where the chromium dump is located is either private property or Gram Sabha land. The committee was also informed that the rainwater collected nearby was green in colour.

The neighbourhood residents informed the advisory board that the water from the hand pump/bore well was coloured. It wasn't appropriate for drinking. As a result, the board took samples from several locations within a radius of about 150 metres, both in the direction of the highway away from the dump and in the opposite direction. The analysis discovered that the water samples obtained at all locations were greenish in colour. Even the water from a factory-located bore well that was more than 150 metres deep had the same colour.

The resident of the area informed that there were no sources of fresh water other than ground water. With the analysis of the CPCB report, it was found that the presence of chromium was many times higher beyond the permissible limit in underground water. Use of such water is dangerous for the health of the present resident of the area as well as future residents of the area, so remedial steps need to be taken.

7. CONCLUSION

At the village of Khanchandpur, Kanpur Dehat, there should be a complete prohibition on the extraction of groundwater for drinking purposes. All hand pumps and tube wells / bore wells constructed in the region should also be sealed.

Drinking water storage tanks needs to set up in the village of Khanchandpur in sufficient quantities and location for locals to access. , These tanks must be linked to a supply pipe line from a source of portable water. Until then, the tanks must be daily filled off with drinking water by tankers from other safe locations.

Thus, the village's chromium waste needs to be relocated and limit the present deposition. Residents in Rania-Khanchandpur villages have a basic right to access clean drinking water, and it is the responsibility of the state to meet this demand.

8. REFERENCE

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