

Hydro-Geo chemistry of Pallecheruvu Lake

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Abstract—Groundwater samples were collected from the surrounding regions of Pallecheruvu Lake. Pallecheruvu lake is located in the southern part of the Hyderabad city ,between latitudes 17°20' N and 17°30'N and longitudes 78°27'30"E and 78°30'E , covering an area of about 16.8 hectares. 15 Groundwater samples from selected bore wells and 4 surface water samples were analysed for important physico-chemical attributes by adopting APHA standard methods. The study aims to understand the distribution of groundwater quality in aforesaid region. The following objectives of the study are to determine groundwater quality parameters such as pH, Chlorides (mg/l), Acidity, Alkalinity, Total dissolved Solids, Electrical Conductivity, Turbidity and to create a database and create various thematic maps and map the spatial distribution of groundwater quality in the study area. Inverse Distance Weighted (IDW) interpolation method was used to create various raster maps which show the spatial distribution. Iso concentration map are prepared by using QGIS software. Iso-concentration maps are very useful for predicting the quality of water and to know the concentrations of different elements at different places.

Key Words- GIS, Interpolation, Spatial Analysis, Water quality, GPS.

I. INTRODUCTION

Water quality is very important in view for all water development projects as it affects different categories of water use-for humans, for animals, for crops, and even for industry. The weathering of soil and rock minerals creates soluble organic ions in all natural waters. The weathered products of the rock-forming minerals are released and transported by the action of the geological agent called water. Hence the type and

concentration of an ion in water depends upon the nature of rock-forming mineral, its solubility, and its ability to resist weathering in fresh water or carbonated water (due to dissolution of atmospheric CO₂ in rain water), climate and local topography. Apart from aforementioned causes, solubility of minerals is affected by pH, particularly of iron and manganese hydroxides that decrease, and aluminum hydroxide which increase with the increase of pH. Acid-base reactions are important in groundwater because of their influence on pH that is a master variable in controlling chemical systems. pH

determines the distribution of carbonate. Describing the concentration or relative abundance of major and minor constituents and the pattern of variability is part of many water investigations which happens to be the part of study here. The objectives of the study are-

1. To determine groundwater quality parameters such as pH, Alkalinity, Electrical conductivity, Cl-,Acidity, Turbidity, Total dissolved solids.
2. To map the spatial distribution of groundwater quality in the study area by using Quantum GIS based on Inverse distance Weight (IDW) interpolation techniques.

The procedure used to predict the values of cells at locations that lack sampled points is called interpolation. IDW is a deterministic interpolaton technique which develops surfaces based on measured points and extent of similarity of cells. A iso-concentration map is obtained by interpolating point data. In order to understand the spatial nature of groundwater quality in the study area, Isoconcentration maps are prepared by using QGIS software for different water quality parameters.

II. STUDY AREA

Pallecheruvu Lake is situated in the southern part of the city along Inner ring road, covering an area of about 10.6 hectares. The study area lies between the latitude of 17°20', 17°30' and longitude 78°27'30", 78°30' in the South Hyderabad (Figure 1). Rock type in study area is unclassified older granite and Granitic Gneiss.

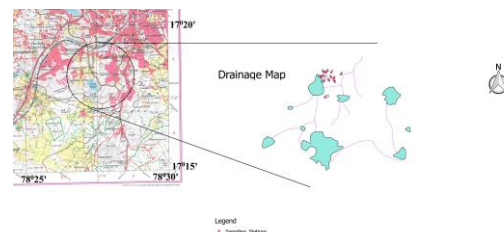


Fig.1.Location Map

III. MATERIALS AND METHODS

The present study was carried out in near residential-cum-commercial area of South Hyderabad. A total of 19 water samples were collected and each sample was given ID such as S1 to S19. The locations of the samples are collected by using handheld GPS (Table 1). Four water samples were collected from surface of the lake and 15 from bore wells.

For the surface water analysis, the lake water was sampled at the following points: Inlet, Centre 1, Centre 2 and Outlet. Existing bore wells of the study area were considered as the points to draw the samples. Fifteen borewells were selected as the sampling points lying within 1-2 kms radius of Pallecheruvu Lake to collect the groundwater samples. The points selected were distributed in the entire area to represent true representative about the quality of groundwater. The locations of the sampling points are shown in the Figure 1 and table 1.

TABLE I
SAMPLE LOCATIONS WITH THEIR GPS VALUES

Sample	Type	Lat	long	Station
S1	Bore well	17°18.966'	78°27.372'	Ambedkar statue
S2	Bore well	17°18.952'	78°27.402'	pride OS function hall
S3	Bore well	17°18.929'	78°27.621'	White palace
S4	Bore well	17°18.868'	78°27.518'	Evergreen function hall
S5	Bore well	17°18.885'	78°27.485'	Modern Motors
S6	Bore well	17°18.968'	78°27.422'	Kailash Dal industry
S7	Bore well	17°18.958'	78°27.485'	GMR parking
S8	Bore well	17°18.840'	78°27.523'	Amar Boys Hostel
S9	Bore well	17°18.854'	78°27.442'	Rose garden
S10	Bore well	17°18.915'	78°27.366'	ZAS motors
S11	Bore well	17°18.897'	78°27.345'	Resident building-1
S12	Bore well	17°18.881'	78°27.342'	Resident Building-2
S13	Bore well	17°18.895'	78°27.334'	Resident building-3
S14	Bore well	17°18.844'	78°27.386'	Pallecheruvu Temple
S15	Bore well	17°18.600'	78°27.397'	Aurora College
S16	Surface water	17°18.788'	78°27.387'	Pallecheruvu centre
S17	Surface water	17°18.703'	78°27.409'	Pallecheuvu corner
S18	Surface water	17°18.844'	78°27.386'	Pallecheuvu corner
S19	Surface water	17°18.307'	78°27.200'	Pallechuruvu corner

These samples were analyzed for different parameters by following standard methods (APHA, 1998). Therefore the aim is to study the Physico-chemical characteristics in order to understand the quality of water. The detailed methods are given in the flowchart (Figure 2). Groundwater samples were collected from selected borewells as per the standard procedure. Two litre precleaned PVC (polyvinyl chloride) cans thoroughly rinsed with distilled water were used for collection of samples. The borewell water was released for 3 to 5 minutes before collecting samples into the cans, so as to wash out the local impurities and to empty the water standing in the service pipe. The containers are labeled describing the date of collection, time of collection, sampling location, and conditions under which sampling is done. The collected samples were carried to laboratory and were analysed. The samples were analysed within 24 hours of the collection.

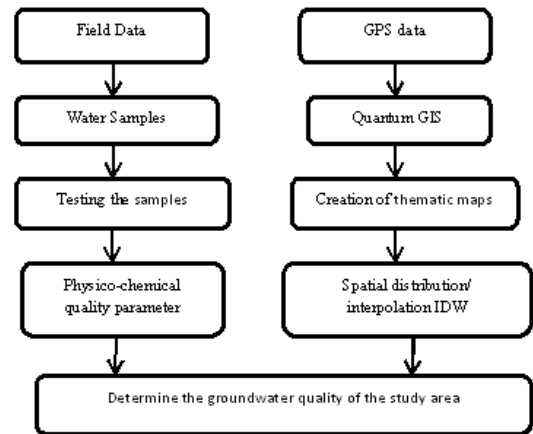


Fig.2. Methodology flow chart showing various steps of study

IV. RESULTS AND DISCUSSION

The spatial quality of ground water for various parameters is shown in the figure 3 to figure 9.

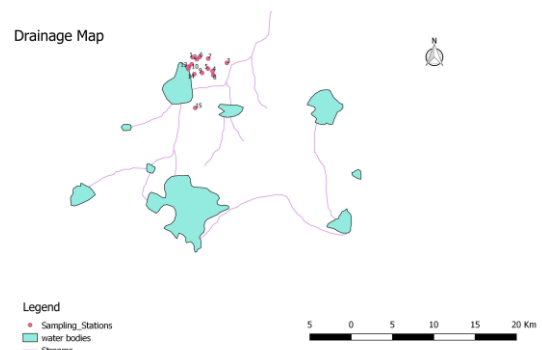


Fig.3. Drainage Map Of The Study Area

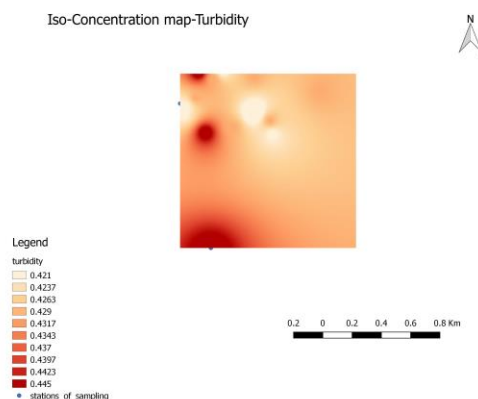


Fig.4. Iso Concentration Map- Turbidity

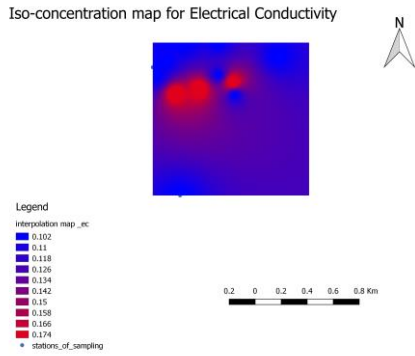


Fig.5. Iso Concentration Map -Electrical Conductivity

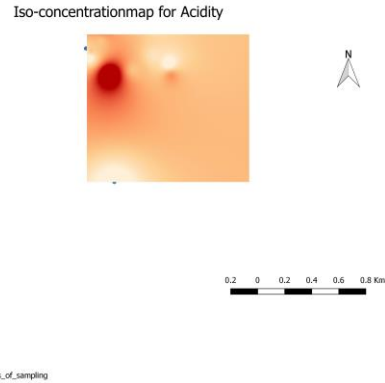


Fig.8.Iso-Concentration Map-Acidity

The analysis results were compared with drinking water standards (IS 10500 –1991) to assess the quality of groundwater in the study area (table 2).

TABLE II
ANALYTICAL REPORT

S.no.	Parameters with Units	Range in samples	Mean	IS standard
1	pH	6.98-7.83	7.12	6.5-8.5
2	TDS(mg/l)	140.32-700.76	383.1	500
3	Turbidity(NTU)	0.18-0.45	0.38	1
4	Chloride(mg/l)	152-162	155.11	250
5	Electrical Conductivity(s/cm)	100-200	136.84	300
6	Alkalinity(mg/l)	910-927	915.63	200
7	Acidity(mg/l)	900-915	904.63	200

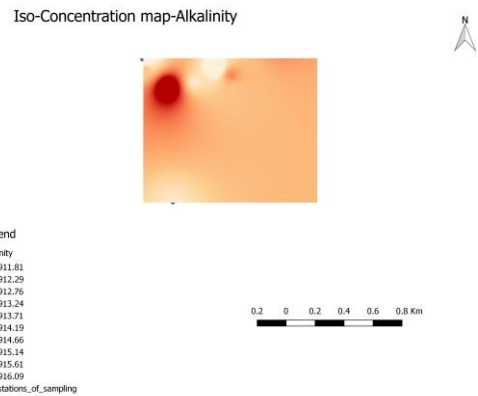


Fig.9.Iso Concentration Map-Alkalinity

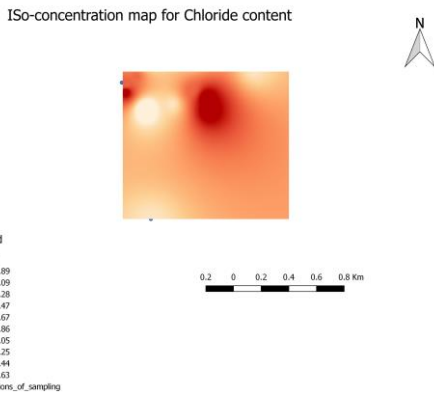


Fig.6. ISO Concentration Map – Chloride Content

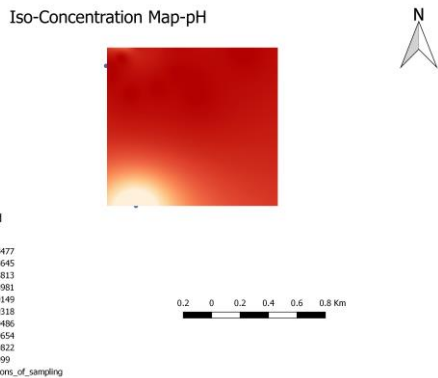


Fig.7.ISO Concentration Map -pH

V. CONCLUSIONS

The quality of groundwater collected from the study area was studied by analysis of the Physico-chemical parameters. The main purpose of this study was to create a database, map and assess the groundwater quality in study area. From the study it is inferred that the pH in most of the wells in the area is acidic and alkaline in nature. However in most of locations the groundwater is suitable for drinking.

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