

SPATIAL ANALYSIS OF WATER QUALITY ASSESSMENT USING REMOTE SENSING AND GIS IN A PART OF LOWER VAIGAI BASIN

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Abstract - Abstract - The administration of waterway water quality is a noteworthy ecological test. Checking distinctive wellsprings of poison stack commitment to the stream bowl is a significant troublesome, difficult and costly process which in some cases prompts systematic blunders too. Because of human and modern exercises the ground water and its quality is defiled that over endeavor and contaminate the water assets. This is the significant issue now days. Therefore the examination of the water quality is imperative to protect and regent the common eco framework. The investigation zone we chose is in bring down Vaigai stream bowl from Vaigai camp, Arapalayam to Viraganoor dam, gathering water tests at 8 distinct areas. In particular, the destinations of the investigation are incorporated: to discover the Hydro-geochemistry of surface water and adjacent bore well water in bring down Vaigai waterway bowl were done and analyzed. The parameters tried were utilized to survey the nature of water for deciding its reasonableness for drinking and other domestical purposes. The general motivation behind this investigation is to discover the water quality patterns at introduce situation, some moderating measures for enhancing water nature of Vaigai stream and to recognize the underlying driver for illnesses in our examination territory and change measures in the examination area. The investigation of hydro-geochemical and organic attributes of the water tests proposes that the assessment of water quality parameters and also water quality administration practices ought to be completed intermittently to secure the water assets. In our investigation zone, TDS is seen more in Viraganoor dam area in bore well water. From this examination, it is derived that the waterway water is for the most part consumable after the required water treatment measures.

key. GIS[2] encourages information catch and preparing as well as fill in as effective computational apparatuses that encourage multimap reconciliations. In this venture ground water quality investigation was completed for southern lower vaigai bowl, water tests were gathered up and down the stream and parallel bore water, the deliberately broke down outcomes are exhibited in a GIS[2]based water quality mapping. Covering the tremendous topographical region of 329 million hectares, Indian streams have been a vital explanation behind the country thriving of India. In numerous areas groundwater convergences of aggregate broke up salts, fluoride, arsenic, and so forth., may likewise normally surpass most extreme permissible fixations (MAC). Particulate issue (PM) is a key factor in water quality, managing adsorption-desorption forms.

1.1 Study area

Vaigai stream bowl is one among them which streams in Theni, Andipatti and Madurai. The Vaigai River is 258 kilometers (160 mi) long, with a waste bowl 7,031 square kilometers (2,715 sq mi) vast. The water tests were taken from Vaigai camp, Arapalayam to Viragnoor dam. The Vaigai channels a zone of 7,741 Sq.Km, which completely lies in the territory of Tamil Nadu. The scope and longitude expansion of the investigation zone is 9°50'00" to 10°0'00" N scope and 78° 60' to 78° 120" E longitude separately and is height is around 131.00 m above MSL.

KeyWords: Hydro geochemical, Remote Sensing and GIS, and Mitigation measures

1. INTRODUCTION

Water is the fundamental prerequisites of all life on Earth. The expansion in populace and urbanization and urbanization requires development in the horticultural and mechanical divisions which interest for all the more crisp water. The likelihood of ground water sullyng is because of the stirring up of harmful chemicals, composts, squander arranged site and mechanical locales. Thus observing of ground water quality has turned out to be

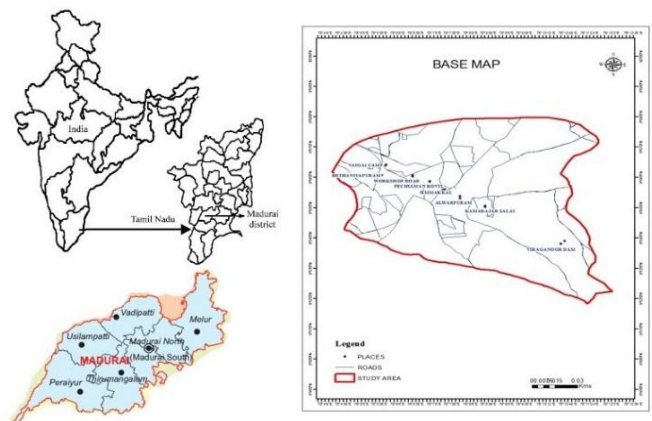


Fig: 1 Study area

1.2 Graphical examination and Interpretation

The water quality guide was set up based on the strategy for the present year. For approval of the 15 areas of water test. 20 parameters were tried for 1 area and results were plotted as graphical and GIS was utilized for making the guide. Water tests have been efficiently gathered from 8 areas, for both surface stream and bore well water, from the current water in bring down vaigai bowl in February 2018 and March 2018.

Every one of the examples have been investigated for real cations and anions through. EC, pH, TDS, NO₃, Cl, shading, turbidity and so forth utilizing the standard strategy endorsed by APHA-AWWA and WPCF (1984). The consequences of the concoction examination of water in Lower Vaigai River bowl for both surface and bore well water have been given.

The physical parameters of the surface water are vital for a superior comprehension of the geochemistry of the investigation zone. Dissimilar to surface water, groundwater is for the most part spotless, dull and unscented with next to zero suspended issue and at generally steady temperature. It is important to evaluate the physical nature of water notwithstanding the synthetic quality.

2. STRATEGY AND TECHNIQUE

The water nature of the zone arranged by the understanding of 20 parameters delineate examined and geo-referenced. The areas were differentiated by utilizing of point information in Arc GIS programming by approving it with the field visits and reviews. This examination coordinates different factors, for example, water quality list, contaminated region zone, poor water quality and so on for finding the water quality record of area in bring down vaigai waterway bowl.

3. PREPARATION OF THEMATIC MAPS

3.1 pH Map

pH is the figure communicating the sharpness or alkalinity of an answer on a logarithmic scale on which 7 is nonpartisan, bring down qualities are more corrosive and higher esteems more soluble. The prerequisite alluring farthest point of pH is 6.5 to 8.5. The parameters of pH are compact water, passable water and non consumable water. In our investigation region, the esteem ranges from 7.5 to 8.8

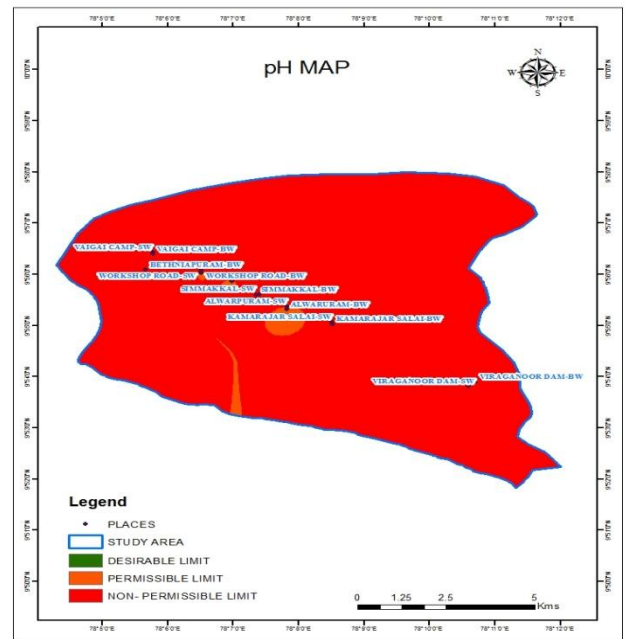


Fig: 2 pH map of the water sample

3.2 Electrical Conductivity Map

The proportion of the present thickness in the material to the electric field which causes the stream of current. Conductivity is a measure of the capacity of water to pass an electrical flow. In our examination zone, the esteem got is 230 to 297 umho/cm.

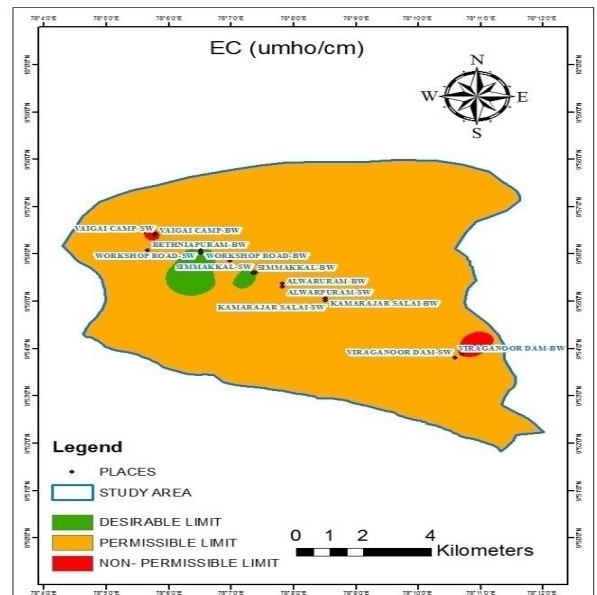


Fig: 3 Electrical Conductivity map of the study area

3.3 Total Dissolved Solids Map

TDS is a measure of consolidated substance of all inorganic and natural substances contained in a fluid sub-atomic, ionized or small scale granular suspended frame. The EPA Secondary Regulations prompt a most extreme tainting level (MCL) of 500mg/liter (500 sections for each million (ppm)) for TDS. At the point when TDS levels surpass 1000mg/L it is for the most part thought to be unfit for human utilization. In our examination territory, the esteem ranges from 134to1595mg/L.

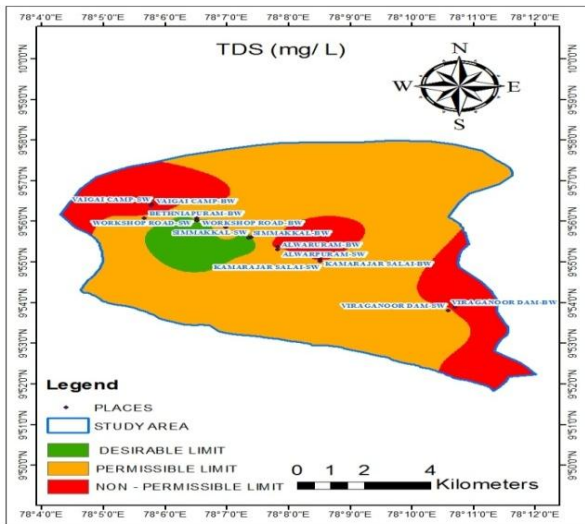


Fig: 4Total dissolved solids map of the study area

3.4 Nitrate Map

Nitrate is a salt of ester of nitric corrosive, containing the anion NO₃. The measure of nitrate content in the previous decade has not changed and is consistent i.e. 45mg/L and it is extendable upto 100 mg/L. In our investigation region, it is 2 to 49 mg/L.

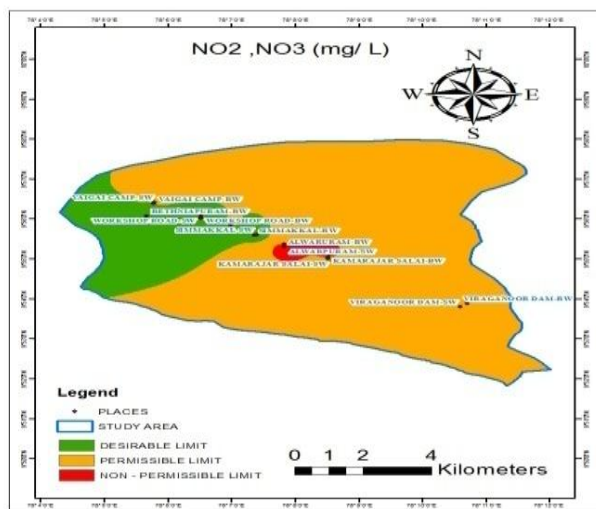


Fig: 5 Nitrate map of the study area

3.5 Color Map

The shade of the water is generally estimated as Hazen units. The prerequisite alluring breaking point of water according to IS standard is 5 and allowable farthest point is taken as 25 without substitute source. In our investigation zone, the esteem got is 1 and 7(1-Light dark colored and 7-Clear).

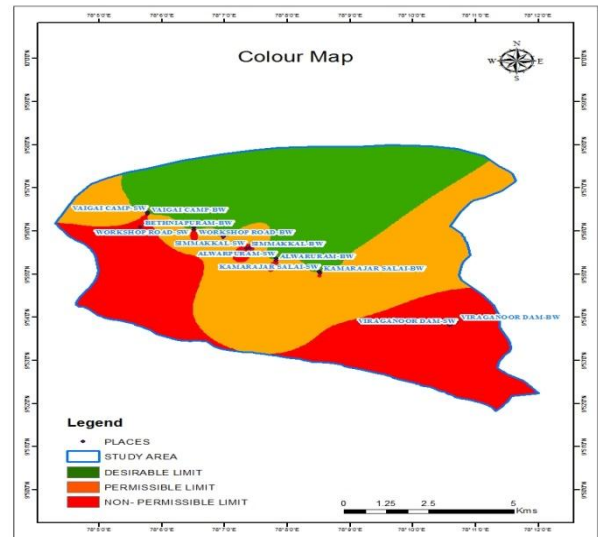


Fig: 6 Color map of the study area

3.6 Odour Map

Smell taste according to IS code is viewed as unobjectionable. The scent esteems recorded in our examination territory, as takes after: 1-Odor free, 2-unsavory and 3-fishy smell.

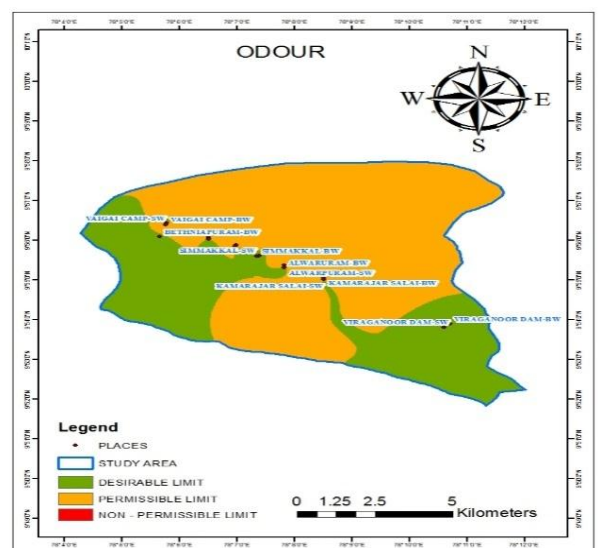


Fig: 7 Odour map of the study area

3.7 Alkalinity Map

It is the ability of water to kill corrosive. This is extremely a declaration of buffering limit. Alkalinity is the quality of a cushion arrangement made out of frail acids and their conjugate bases. There are 2 test led in alkalinity. Phenol test and aggregate alkalinity test are finished. The alluring and passable breaking point for phenol test is 4 to 9 mg CaCO₃/L and for add up to alkalinity test is 250 to 420 mg CaCO₃/L.

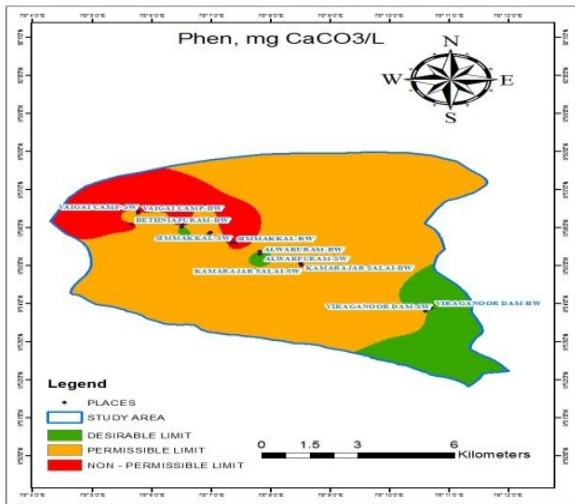


Fig: 8 Alkalinity map of the study area

3.8 Total Hardness Map

As far as possible for add up to hardness is 300 mg/L and can be extendable to 600 mg/L. The esteem if acquired surpassing as far as possible causes encrustation in water supply structure and unfavorable impacts on domestical utilize. The esteem got in our investigation territory is 95 to 930 mg/L.

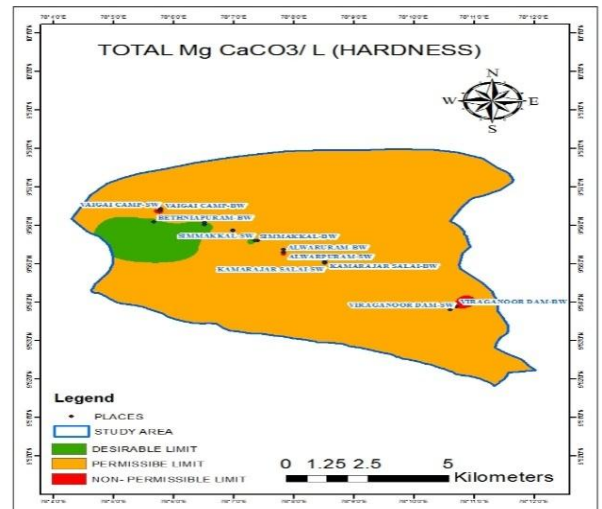


Fig: 9 Total hardness map of the study area

3.9 Calcium Hardness Map:

The calcium hardness ought to be kept up in the vicinity of 150 and 1000 ppm as CaCO₃ (200 – 400 ppm). Since calcium particles can't be easily expelled from pool water, it is critical to know the calcium substance of the source. In our investigation zone, the esteem ranges from 20 to 350 mg CaCO₃.

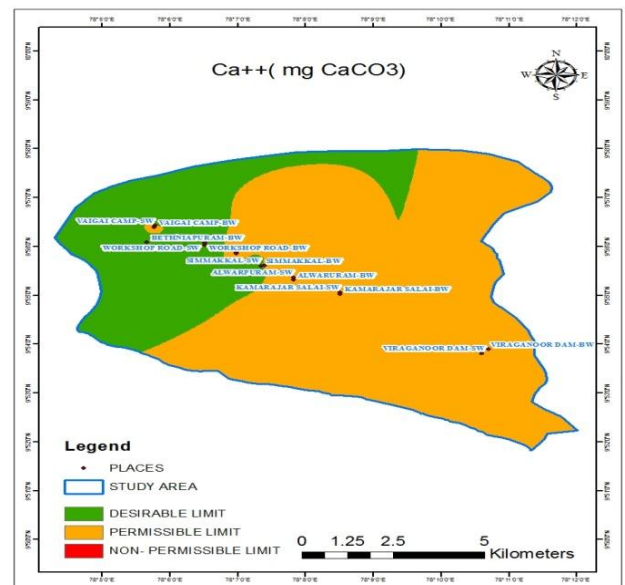
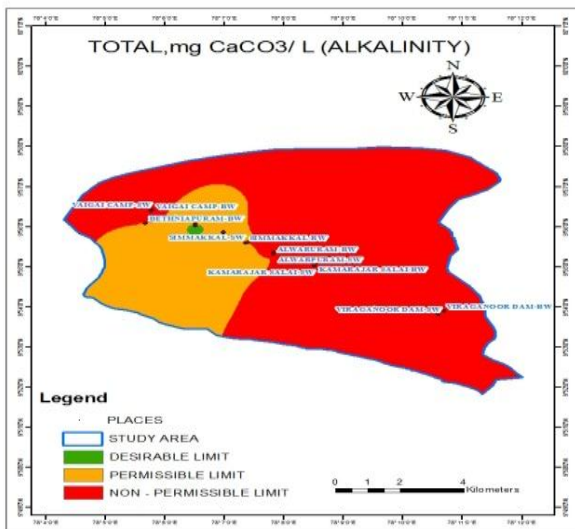


Fig: 10 Calcium hardness map of the study area

3.10 Calcium ion map

As far as possible for Ca⁺ particle is 75 mg/L and can be extendable to 200 mg/L. The esteem if acquired surpassing as far as possible causes encrustation in water supply structure and unfriendly impacts on domestical

utilize. The esteem got in our examination region is 8 to 140 mg/L.

be available in water for residential purposes. The esteem acquired in our examination zone is 10 to 414 mg/L.

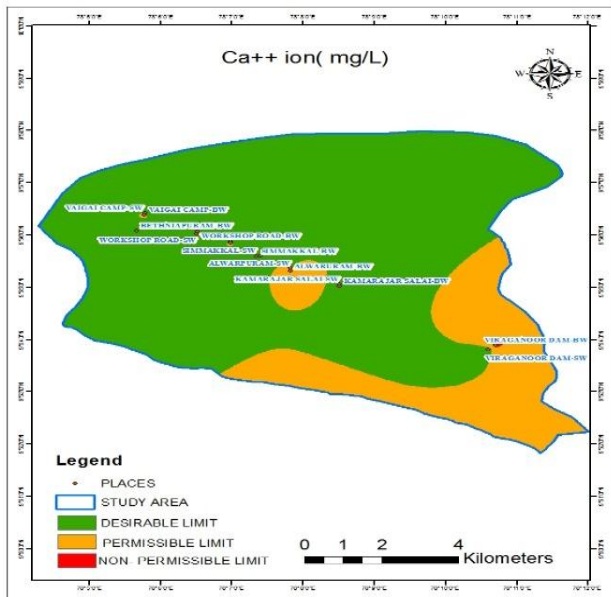


Fig: 11 Calcium ion map of the study area

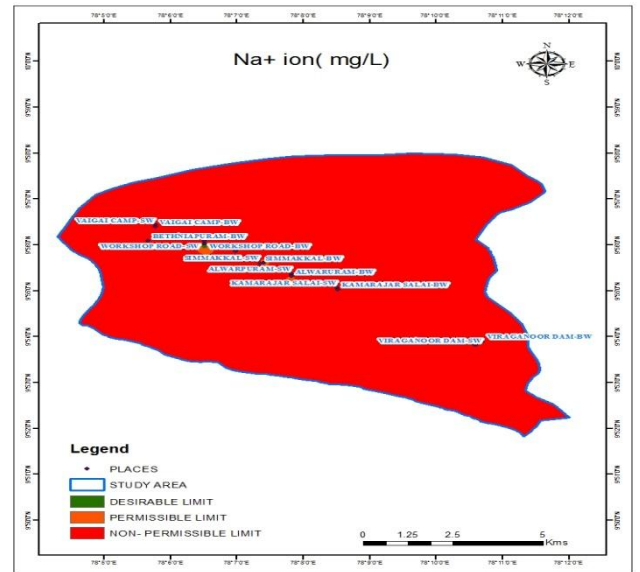


Fig: 13 Sodium ion map of the study area

3.11 Magnesium ion map

As far as possible for Mg+ particle is 30 mg/L and can be extendable to 100 mg/L. The esteem got in our investigation region is 7 to 163 mg/L.

3.13 Potassium ion map

Potassium by and large seems, by all accounts, to be inside 10 mg/l in water (Todd 1980). The fixation in 0.04% of groundwater tests is surpassing the alluring furthest reaches of 12 mg/l (WHO 2004). The esteem got in our examination territory is 4 to 45 mg/L

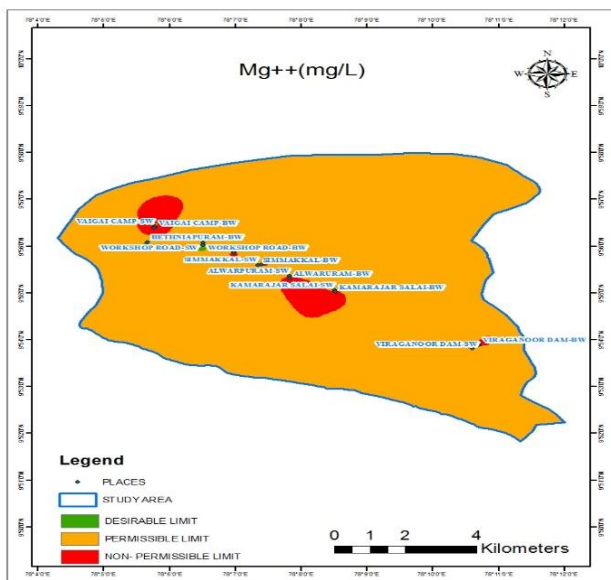


Fig: 12 Magnesium ion map of the study area

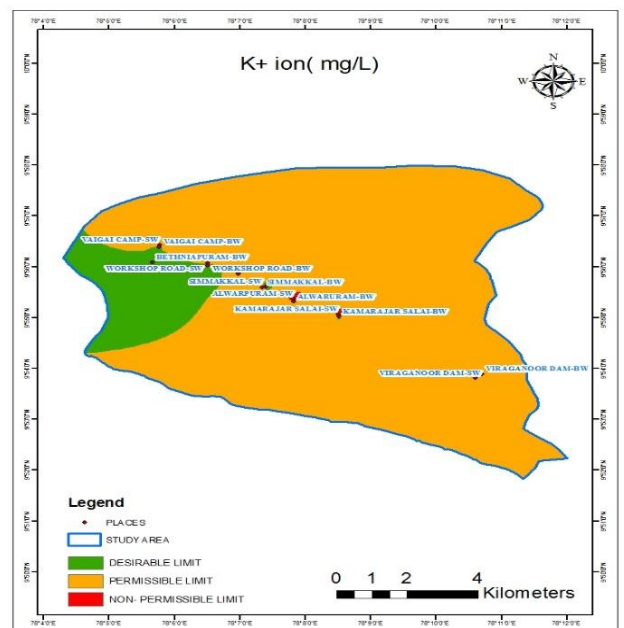


Fig: 14 Potassium ion map of the study area

3.12 Sodium ion map

Sodium normally happens in water up to 200 mg/l (Todd 1980) and the WHO (2004) has additionally prescribed this as admissible breaking point of sodium to

3.14 Chloride ion map

Chloride in the groundwater tests of the investigation region changes from 16 to 558 mg/l and the most extreme bearable point of confinement of chloride in drinking water is 1000 mg/l (BIS 2004), past which it bestows a salty taste to the water. The esteem acquired in our investigation territory is 28 to 610 mg/L.

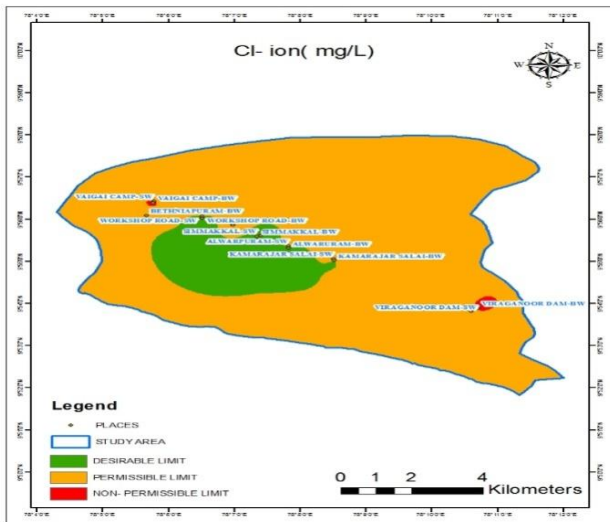


Fig: 15 Chloride ion map of the study area

3.15 Sulphate ion map

The most extreme attractive point of confinement for sulfate in water for local utilize is 400 mg/l. Beyond this causes gastro purposeful aggravation when magnesium or sodium are available. As far as possible is 400 mg/L. The esteem acquired in our examination territory is 6 to 137 mg/L.

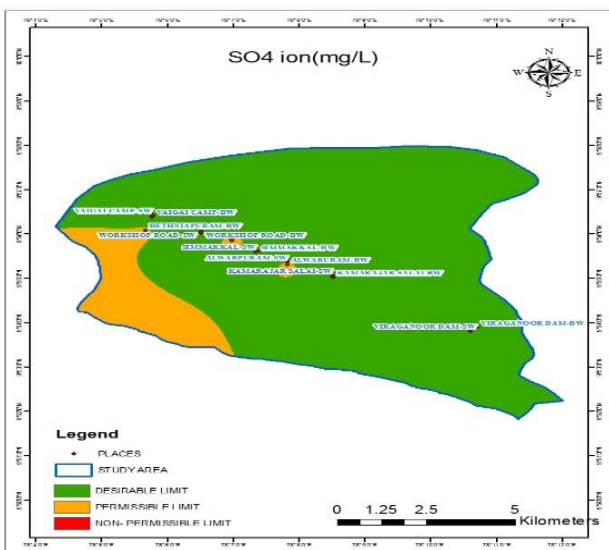


Fig: 16 Sulphate ion map of the study area

3.16 Carbonate ion map

It is a salt of carbonic corrosive described by the nearness of carbonate particle. The carbonate particle is modestly solid base; it is characterized as a Lewis base as it pulls in protons in fluid arrangement. The qualities recorded in our investigation region are 0, 6, 12 and 18 mg/L.

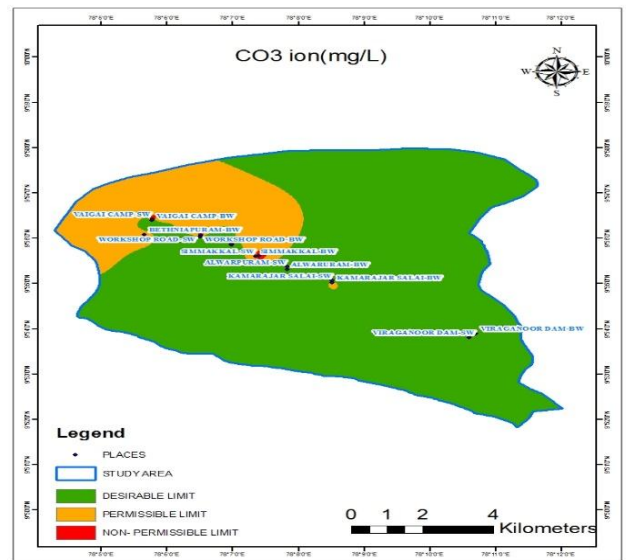


Fig: 17 Carbonate ion map of the study area

3.17 Bicarbonate ion map

According to WHO standard is 600 mg/L. On the off chance that surpassed upon the farthest point causes scaling impact in channels of water supply. The esteem got in our examination zone is 79 to 714 mg/L.

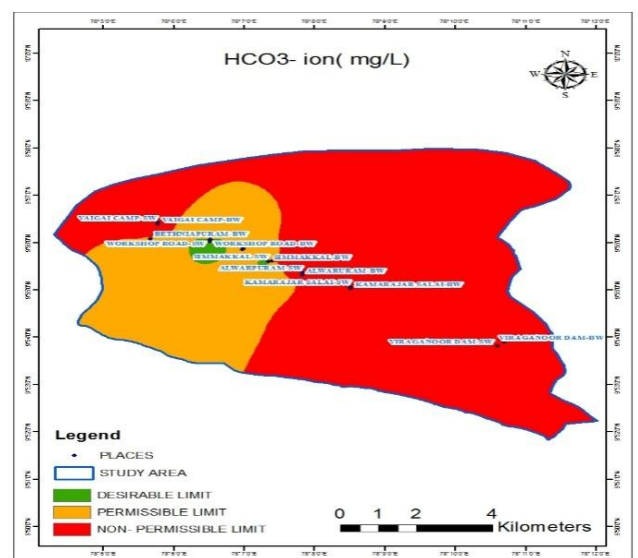


Fig: 18 Bicarbonate ion map of the study area

3.18 Fluoride ion map

According to IS code is 1.0 mg/L, Fluoride might be kept as low as could reasonably be expected. High fluoride may cause fluorosis. As far as possible is 1.5 mg/L. In our general vicinity, the esteem ranges from 0.47 to 1.81 mg/L.

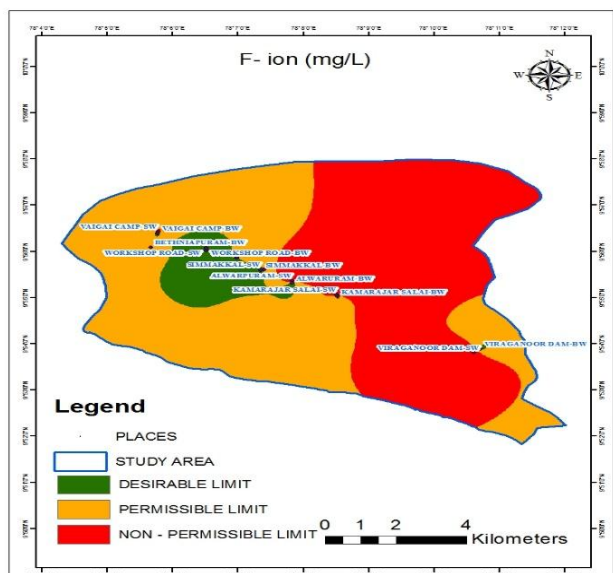


Fig: 19 Fluoride ion map of the study area

3.19 Turbidity

Concurring to WHO, the drinking water ought to not be more than 5 NTU (Nephelometric Turbidity Unit) and it ought to be in a perfect world underneath 1 NTU. It is a cloudiness of a liquid caused by number of individual particles that are by and large imperceptible to the bare eye. It is a key test of water quality. In our study zone, there is nil turbidity esteem.

3.20 Suspended solids

It refers to little solids particles which stay in suspension in water as a colloid or due to the movement of the water. It is utilized as one of the source of water quality. The most exact strategy of deciding the TSS is by filtering and weighing the water sample. In our study area, the surface water of the Vaigai camp zone records the most elevated esteem of 28.0 mg/L and the most lowest esteem value is recorded in bore well water of Simmakkal 2. zone with 6.0 mg/L.

4. RESULTS AND DISCUSSION

The spatial information incorporate Arc View shape records basically speaking to the 15 estimated purposes of the Lower Vaigai River bowl. The quality information depict the highlights of the spots (15 test focuses), that is, centralization of TDS, EC, Cl-, F, Nitrate, Color, Odor, pH, Total hardness and so on.

15 tests were gathered and examined for hydro geochemical parameters (20 parameters) to get to the water quality in the examination territory. The test outcomes were transported in as exceed expectations sheet into the ARC GIS 10, individual spatial maps were made. At that point, all the spatial maps were overlaid by utilizing the method of Overlay weight age. The maps were named 1, 5, and 9: 1-alluring cutoff, 5-passable point of confinement and 9-non allowable breaking point. The maps were overlaid and delegated per projection data framework. WGIS 1984 is taken and set under Northern side of the equator (44N). What's more, gathered into 3 zones: alluring region, allowable zone and non-admissible territory.

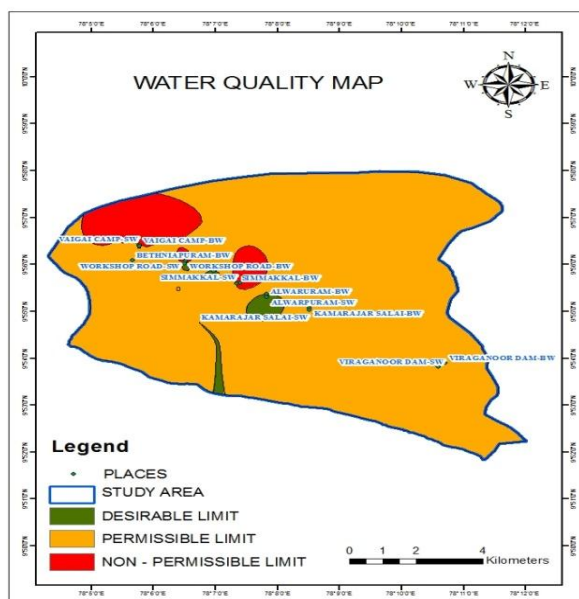


Fig 21: Water quality guide of the investigation zone

1. The elucidation of hydro-geochemical investigation uncovers that the surface water in Lower Vaigai River bowl is to be yellowish dark colored shading in nature with the exception of Simmakkal and Viraganoor dam region, which isn't useful for drinking and rural reason. The drag well water in all the 8 areas is observed to be clear and smell free aside from in Vaigai camp region (obnoxious scent). In Kamarajar salai region the scent is to be of fishy smell.
3. Generally the pH of the water has a little variety because of buffering activity of water with Carbon-dioxide. Concerning Lower Vaigai bowl the pH esteem extend exists in as far as possible just in bore well water of Alwarpuram and Pechiaman Kovil with estimation of 7.8. The non-allowable region is Vaigai camp area and Simmakkal zone with high pH estimation of 8.8. This might be because of Calcium carbonate bearing rock arrangements.

4. The Chloride fixations in all the water tests of this bowl are observed to be inside as far as possible aside from in 2 bore well water test surpassing 500 mg/L. The 2 areas are Vaigai camp and Viraganoor dam zone with an estimation of 610 mg/L and 596 mg/l. At the point when the salt fixation is expanded, it is troublesome for plants to extricate water. Chlorides are more dangerous to a few plants.
5. The convergences of Nitrate in the vast majority of the examples are inside the greatest admissible cutoff, with the exception of in zones like Alwarpuram and Kamarajar salai. Alternate zones are considered as allowable zone. The expanded convergence of Nitrate might be because of inordinate use of nitrogen composts or rot of plants and creatures' buildup or transfer of modern wastewater or sewage or by expanded development of leguminous plants.
6. The centralization of Fluoride is observed to be inside as far as possible in the greater part of the territories. The esteem is surpassed in 3 areas specifically in surface water of Alwarpuram, Kamarajar salai and Viraganoor dam. At the point when the admission of Fluoride is over as far as possible, it prompts skeletal addental fluorosis. The Fluoride sullying is these pockets might be because of the nearness of fluoride rich minerals like fluorite and hunger.
7. The aggregate hardness esteem if got surpassing as far as possible causes encrustation in water supply structure and unfavorable consequences for domestical utilize. The most elevated estimation of 930 mg/L and 680 mg/L are gotten in bore well water of Vaigai camp and Viraganoor dam zone.
8. The bicarbonate particles esteem if surpassed upon the point of confinement cause scaling impact in funnels of water supply. The most astounding worth is recorded in bore well water of Vaigai camp region with 714 mg/L.
9. From the water quality patterns think about utilizing the surface and bore well water quality parameters, it is seen that the bowl is getting dirtied with time. Since significant ventures are absent in the bowl or other contamination sources, the common geochemistry of the bowl is the explanation behind the more elevated amount of Hardness which increments with time.
10. The WQI ponder on this bowl demonstrates that a large portion of the water (90 % of the water sources) can be utilized for various purposes. The Chloride, TDS, Bicarbonate and Nitrates are the significant contaminations which cause the staying 10% of the water sources unfit for consumable purposes.
11. Decision creators and waterway bowl directors related with Lower Vaigai River bowl will do well to utilize the discoveries of this proposal as a choice help instrument. It might be inferred that Lower Vaigai bowl isn't yet contaminated with mechanical effluents contrasted with close-by stream bowls. The essential variables adding to the current circumstance are nearness of modest number of ventures and relocation of populace from this stream bowl to urban regions and dispose of waste along the waterway stream bowl.

REMEDIAL MEASURES

The accompanying measures can be proposed subsequent to examining the different information and furthermore by thinking about the substances of the surface conditions:

- Water protection structures and capacity tank can be advanced particularly in the focal zone of the bowl. Less water expending yields can be inundated in the late spring time frame and in the low precipitation time frame. Wise usage of water assets is the prime need of great importance in the whole bowl zone.
- Improving the execution of existing water system framework by appropriate auxiliary measures.
- Conjunctive utilization of surface and groundwater wherever conceivable.
- Renovating old tanks and lakes, desalting of supply channels and building water stockpiling structures to enhance domestical potential.
- Planning for water reaping and sparing surface water, which is let into ocean amid surges.
- Groundwater extraction can be confined in order to settle the pull of engine inside a coveted breaking point wherever the zones to be over-extraction regions.
- Prioritization ought to be given in the over-separated territories in the bowl to preserve the water and for arranging suitable capacity structures to be put without hesitation.
- Construction of insurance hindrances along the stream bowl to evade the sullying of waterway water.
- Popularize the mindfulness programs among the general population, particularly individuals living close to stream and utilization of water without knowing suitable breaking points to expend at different levels, which ought to be made powerful in order to achieve independence in the feasible water assets improvement.

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BIOGRAPHIES

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