DETERMINING THE WATER QUALITY INDEX FOR GROUND WATER IN A REGION OF AMARAVATHI RIVER AT KARUR (DT) AND USING THE APPLICATION OF GIS

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1. ABSTRACT

Groundwater, the most indispensable resource required for drinking. The resource cannot be optimally used and sustained unless the quality is assessed. Water Quality Index is one of the most effective tool for demarcating groundwater quality in region of karur district is derived using the WQI and GIS techniques. The karur Watershed covering an area of 373 km² forms a part of amaravathi river watershed falling in drought effected village in karur district of the state. It is bound by north latitudes 10º63' and 11º14'and east longitudes 77º90'and 78º61'forming part of the toposheets.In the present study water samples from 4 areas are obtained in karur district. To determine the physicochemical parameter of groundwater samples namely Ec, TDS, pH, Ca, Mg, Na, K, SO4, HCO3 and Cl. Based on the founded physicochemical parameters, the water quality index has been computed for each river location. The spatial variations of water quality index are generated from the sample water location point layer by using spatial interpolation techniques of GIS environment. The examination of WQI for the amaravathi watershed indicates a range from the range unsuitable to good categories. On further examination, it is observed that the WQI for 2014and 2015 have deteriorated quality compared to 2016 and 2017. So the ground water needs treatment for the drinking and agriculture. The ground water in a region of river water will automatically purified when river is under the running state. But nowadays there is no water in river so the region of river it need a basic treatment for future usage of water.

Keywords: Groundwater, Waterquality, GIS,

Physiochemicalparameter

2. INTRODUCTION

Water is the basic requirements of all life on Earth. The origin of life has been attributed is water along with other basic elements water the source of life is passionate. Too passionate to manage excess of, it leads to flood and lack of its results in drought and famine. It must be remembered that any natural or manmade activity on the surface of the earth will have it's for most impact on the quality and quantity of water this will be taken into the biosphere systems and ultimately lead to hydrological extremes. The increase in population and urbanization and urbanization necessitates growth in the agricultural and industrial sectors which demand for more fresh

water. When surface water is the non-available mode the alternative is to depend on ground water. The dependability on ground water has reached an all-time high in recent decades due to reasons such as unreliable supplies from surface water due to vagaries of monsoon, increase in demand for domestic, agricultural and industrial purposes. This has resulted in over exploitation all over the country and in certain places it has reached critical levels like drying up of aquifers.

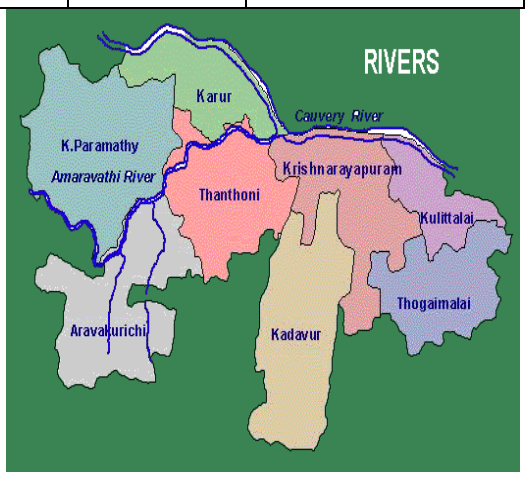
3. NEED FOR THE STUDY

- Now a day's water scarcity increases rapidly due to decrease of ground water.
- The ground water is also polluted due to various artificial man-made activities.
- Due to this, quality of the water is reduced. This will produce various adverse impact human beings, animals and plants. Therefore, it is necessary to monitor the water quality.

4. STUDY AREA

Karur district lies between 10º63'and11º14'north latitude and 77 º 90' and78 º 61' east longitude. Karur towns are located on the bank of Amaravathi River. Due to discharge of effluent by the textile bleaching and dyeing units, the river and the ground water are polluted. The water collected are Puthambur,Sukaliur,Pasupathipalayam,Thirumukkudalur .

4.1 Karur river map



5.TEST RESULTS

Table No: 5.1 Physical-Chemical Parameters Test Result

Tests	Standard Value	Puthambur Observed Values	Sukaliur Observed Values	Pasuvai Observed Values	Thirumukkudalur Observed Values
Turbidity(NTU)	8-10	11.7	3.1	2.9	6.3
Alkalinity(mg/l)	35-38	77	88	88	90
PH	5.5-9	7.5	7.5	7.54	7.6
Hardness(mg/l)	20-25	34	38	40	45
Sulphate(mg/l)	2-5	23.30	22.60	22.38	22.48
Nitrate(mg/l)	5-8	0.32	0.34	0.36	0.39
BOD(mg/l)	5	1.8	1.85	2	2
COD (mg/l)	5	3	2.3	3.3	3
Ammonia Nitrogen(mg/l)	100	168	156.8	151.2	145.6
Potassium(mg/l)	4	0.14	0.18	0.22	0.27

6. WATER QUALITY CALCULATION

The calculation and formulation of the WQI involved in the following

1) In the first step, each of the ten parameters has been assigned a weight (*AWi*) ranging from 1 to 4 depending

On the collective expert opinions taken from different previous studies. The mean values for the weights each parameter along with the references used. However, a relative weight of 1 was considered as the least significant and 4 as the most significant.

2) In the second step, the relative weight (*RW*) was calculated by using the following equation

$$Rw=AWi/\sum AWi \quad (1)$$

where, *RW* = the relative weight, *AW* = the assigned weight of each parameter

n = the number of parameters.

The calculated relative weight (*RW*) values of each parameter**.** In the third step, a quality rating scale (*Qi*) for all the parameter except pH and DO was assigned by dividing its concentration in each water sample by its respectivestandard according to the drinking water guideline recommended by the [32], or the Iraqi drinking water standards [33], the result was then multiplied 100.

6.1CALCULATION OF WATER QUALITY INDEX

$$Qi=(Ci/Si)\times 100$$

Quality rating for PH was calculated on the basis of

$$Qi=(Ci-Vi)/Si-Vi)\times 100$$

where, *Qi* = the quality rating, *Ci* = value of the waterquality parameter obtained from the laboratory analysis,*Si* = value of the water quality parameter obtained fromrecommended WHO or Iraqi standard of correspondingparameter, *Vi* = the ideal value which is considered as 7.0for pH and 14.6 for DO.

Equations (2) and (3) ensures that *Qi* = 0 when a pollutantis totally absent in the water sample and *Qi* = 100

when the value of this parameter is just equal to its permissibmore polluted is the water [40].

4) Finally, for computing the WQI, the sub indices (*SIi*) were first calculated for each parameter, and then used to compute the WQI as in the following equations:

$$SIi=RW\times Qi$$

$$WQI=\sum_{i=1}^{n} SIi$$

Table No: 6.1 WQI Calculation

Parameters	**Standard water quality values**	**Assigned values(AW)**	**Relative Weight(RW)**	**Quality Rating(Qi)**	**Si= RW Qi**
PH(pH unit)	6.5-8.5	2.1	0.095023	11.9	11.30
Turbidity(NTU)	5.0	2.4	0.180995	76.00	13.75
Hardness(mg/l)	100	1.1	0.049774	55.00	8.73
Alkalinity(mg/l)	100	1.6	0.072398	48.33	5.4
BOD(mg/l)	5.0	3.0	0.04529	133.33	6.03
NO3(mg/l)	50.0	2.2	0.135747	93.33	32.6
WQI= $\sum_{i=1}^{n}$ **SIi=67.8**					

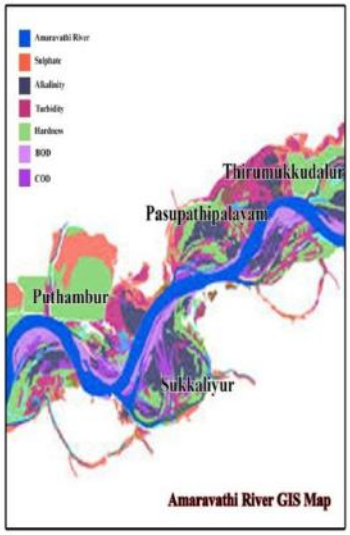
Tables No:6.2 WQI Range Values

WQI Value	**Water Quality**
< 50	Excellent
50 – 100	Good
100 – 200	Poor

200 – 300	Very Poor
> 300	Unsuitable Drinking Purpose

The cultivated water quality index=67.8. It is good range for drinking purpose

7.AMARAVATHI RIVER GIS MAP



8.CONCLUSION

The groundwater samples were taken at the river of Amaravathi on both sides of each station. The water samples were subjected to physic- chemical analysis. The results of the above work show that most of the physic-chemical parameters like Pb, TDS, TH, Cl, HCO3, SO4, BOD, and COD are well above the permissible limit. The results show that most of the groundwater sampling stations near the river are much polluted by the intrusion of river water, dumping of waste, and percolation of domestic sewage by inhabitants. Some of the groundwater stations far away from the river are also polluted. The ground and river water samples are much polluted in the urban area than rural area. This may be due to the heavy pollution load, domestic sewage, and other waste by thickly populated inhabitants. The above results confirm that the groundwater quality is affected by Amaravathi river water. The cultivated water quality index=67.8. It is good range for drinking purpose. . Hence, dumping of waste polluted material should be avoided and they should not be let into the river. The mentioned pollution control measures should be taken properly to protect the ground and river water sources.

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