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Temporal assessment of groundwater quality in Coimbatore district

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Abstract
Ground water quality evaluation in the developing countries has become a critical issue due to fresh water scarcity. Maintaining the quality of water is very essential in order to utilize the resource effectively. The most noticeable impact of climate change could be fluctuation in surface water level and quality. The study was conducted at Coimbatore district to know the impacts of climate change on ground water quality by (WQI) water quality index technique. WQI is important technique for demarcating groundwater quality and its suitability for drinking purposes. The water quality parameters of study area were analyzed for two decades (1994 to 2003 and 2004 to 2013). The Water quality index of the study area varied from 30.1 to 69.7 during pre-monsoon and 16 to 47.4 during post monsoon in first decade, it varied from 57.5 to 83.4 during pre-monsoon and 12.7 to 76.8 during post monsoon in second decade. The results clearly showed that observed water quality was lower in pre monsoon as compared to post monsoon in both decades. The deterioration of water quality during second decade is mainly due to industrialization and low rainfall of the study area.

Keywords: Climate change, water quality, water quality index

Introduction
Ground water quality evaluation in the developing countries has become a critical issue due to fresh water scarcity. The quality of ground water is equally important as that of quantity. The Judicious management and monitoring of soil and water are essential for sustainable agriculture. Over drafting of ground water and its quality deterioration are the major threats to crop production in arid and semiarid regions. The characterization of irrigation water quality plays a vital role in deciding its management strategies for profitable farming. Ground water aquifer, a main source of water supply in arid and semiarid regions of India is most vulnerable to salinity and sodicity problem resulting in considerable reduction in crop productivity. Ground water in the canal command areas is used by farmers to supplement irrigation in various crops, without considering its impact on soil phyisco-chemical properties as well as on crop production in lean period when there is no canal water supply. Hence, an apprehension exists that the use of marginal or poor quality ground water in farmlands may pose serious threat to the soil health causing low land productivity [8]. The periodic monitoring of ground water quality becomes a need to minimize the risk of soil health deterioration and its detrimental effects on crop production.

Water quality index is one of the most effective tools to communicate information on the quality of water to the concerned citizens and policy makers. It thus becomes an important parameter for the assessment and management of groundwater. WQI is calculated from the point of view of suitability of groundwater for human consumption. This work emphasizes the use of water quality index (WQI) approach in assessment of groundwater quality of Coimbatore district of Tamil Nadu, India

Materials and Methods
Study area
Coimbatore district is geographically located Coimbatore district lies between 10°10′N and 11°30′N latitude and 76°40′E and 77°30′E longitude and cover the area of 7471 Km^2. The mean annual rainfall is 550- 900 mm, Elevation is 411 m above mean sea level m and soil types are Red calcareous soil, Red non-calcareous soil, Black soil, Alluvial and Colluvial soil. Coimbatore city is known for its machine tools, pumps. Major water bearing formations are Weathered & Fractured Granite Gneiss, Granites and Charnockites, Colluvium & Recent alluvium along the river courses.

Data Collection

Water quality Data was collected from the State Ground and Surface Water Resource Data Centre of Taramani. By using the data water quality index is calculated for Coimbatore district from the period of 1994 to 2013.

Water Quality Index Analysis

Water Quality Index, indicating the water quality in terms of a number, offers a useful representation of overall quality of water. Eleven Physico-chemical parameters i.e. pH, Electrical conductivity (EC), Total Dissolved Solids (TDS), Total Hardness (TH), Sulphate (SO42-), Nitrate (NO3-), Calcium (Ca2+), Chloride (Cl-), Magnesium (Mg2+), Bicarbonate (HCO3-), and Fluoride (F-) were used to calculate WQI. Here we used 12 parameters for calculating the water quality index is given in Table 1 WHO standard values

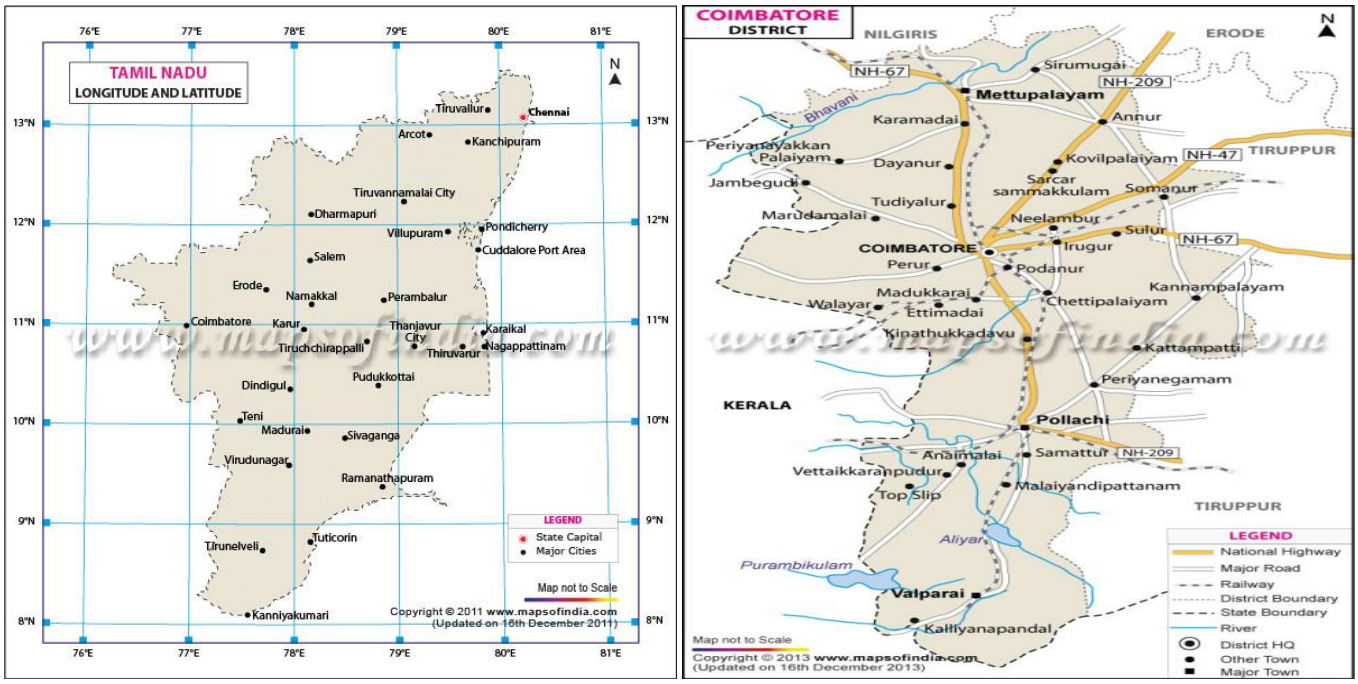

Fig 1: Location map of Coimbatore district

Table 1: Unit Weightage of parameters based on WHO standards

S. No	Water quality parameters	WQ standards values (WHO) (Vs)	Ideal values (Vi)	Assigned Weightage factor (Wi)
1	pH	8.5	7	0.118
2	EC(µmhos/cm)	300	0	0.003
3	TH(mg/L)	300	0	0.003
4	TDS(mg/L)	1000	0	0.002
5	Sulphate(mg/L)	250	0	0.005
6	Nitrate(mg/L)	50	0	0.022
7	Calcium(mg/L)	75	0	0.013
8	Chloride(mg/L)	250	0	0.004
9	Magnesium(mg/L)	30	0	0.033
10	Bicarbonates(mg/L)	244	0	0.004
11	Fluoride(mg/L)	1.5	0	0.784

Calculation of WQI

To determine the suitability of groundwater for human consumption and irrigation purpose, Water Quality Index was computed using Eq. (1).

$$WQI = \sum_{i=1}^{n} q_i W_i / \sum_{i=1}^{n} W_i \text{ ..... (1)}$$

Where, Wi is a Weightage factor. It is the ratio of proportionality constant and standard value of the ith water quality parameter which is computed using Eq. (2).

$$W_i = K / S_i \text{ ------ (2)}$$

Where, Si = Standard value of the ith water quality parameter given in Table 1, K is a proportionality constant, which is taken as 1.0, n is the total number of water quality parameters

Results and Discussion

The results regarding the WQI for two decades of Coimbatore district of Tamil Nadu from the period of 1994 to 2013 (Fig 2) shows that in 60% of the years the area had good water quality and 40% of the years the area was observed poor water quality condition at pre monsoon season from period of 1994 to 2003. It also observed that during post monsoon season, 30 % of the years the area was observed excellent water quality and 70% of the years the area was observed good water quality. During second decade period (2004 to 2013), 70% of the years the area had poor water quality and 30% of the years the area was observed very poor water quality condition at pre monsoon season. During post monsoon seasons, 20 % of the years the area was observed excellent water quality, 10% of the years the area was observed good water quality, 50% of the years the area under poor quality and 20% comes under very poor quality.(Fig 3)

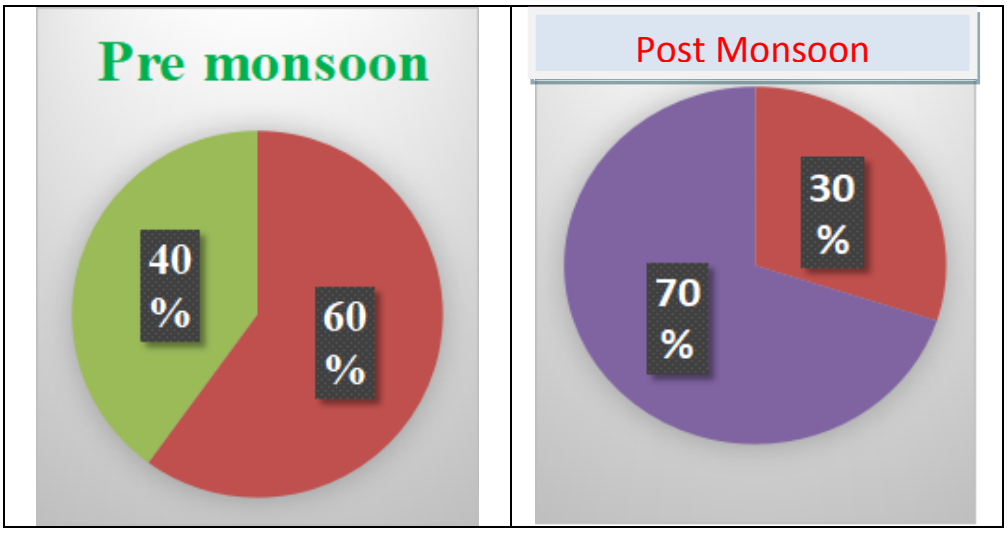

Fig 2: Graphical representation of WQI categories at Pre and Post monsoon season for the period 1994-2003

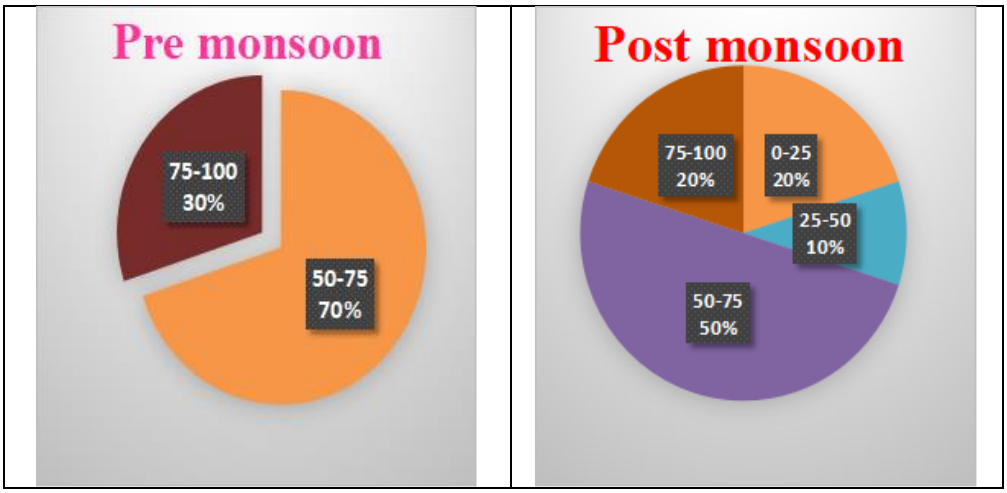

Fig 3: Graphical representation of WQI categories at Pre and Post monsoon season for the period 2004-2013

It was observed water quality was lower in pre-monsoon season as compared to Post monsoon season at both decades. To evaluate the two decades water quality at different monsoon period. In most of the years the area felt in good water quality condition the WQI values range of 27 – 33.5 and only remaining three years (2001, 2002 & 2003) the area have been identified poor water quality condition the WQI values of 52.6 & 59.78 at pre monsoon season of first decade (1994-2003). During post monsoon season of first decade, most of the years the area felt in good water quality condition the WQI values range of 26.8-47.4. The 2001 to 2003 year, the area have been identified excellent water quality condition the WQI value of around 16. But during the second decade, all the year area have been identified very poor water quality and poor quality condition at WQI value ranging from 57.5 to 83.4 during second decade pre monsoon. During post monsoon, only the tear 2004 and 2006, the area was under excellent water quality. The WQI of 30% period of first decade during post monsoon falls under excellent quality whereas in second decade, it was decreased to 20% period.

Table 2: Water quality index scale

Water Quality Classes	
Excellent	0-25
Good	25-50
Poor	50-75
Very Poor	75-100
Unsuitable for Drinking/Irrigation	above 100

The poor water quality condition in second decade due to higher level contamination present in the water. Natural (less rain fall) and the effect of anthropogenic actions (Industrial effluent, fertilizer application and Waste disposal) is the reasons for the high level contamination in water. The observed results are showed that the entire district lies between excellent to poor water quality condition in first decade at both the seasons. But during second decade, the quality lies between excellent to very poor.

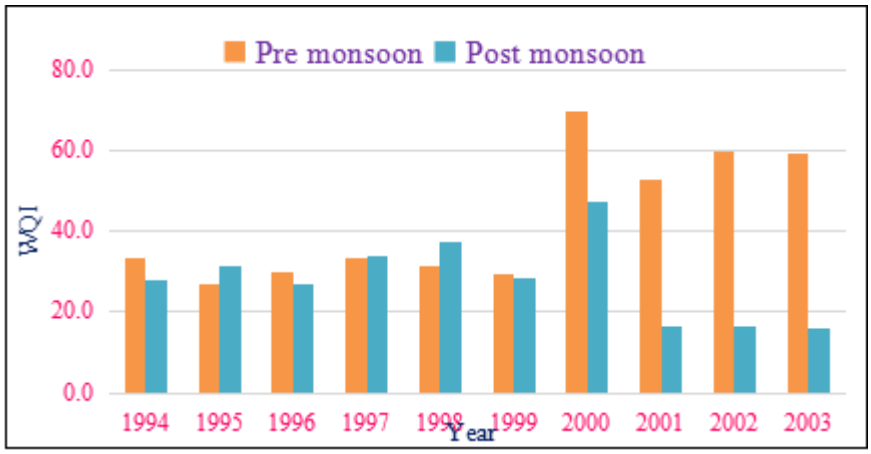

Fig 4: Water quality index –first decade

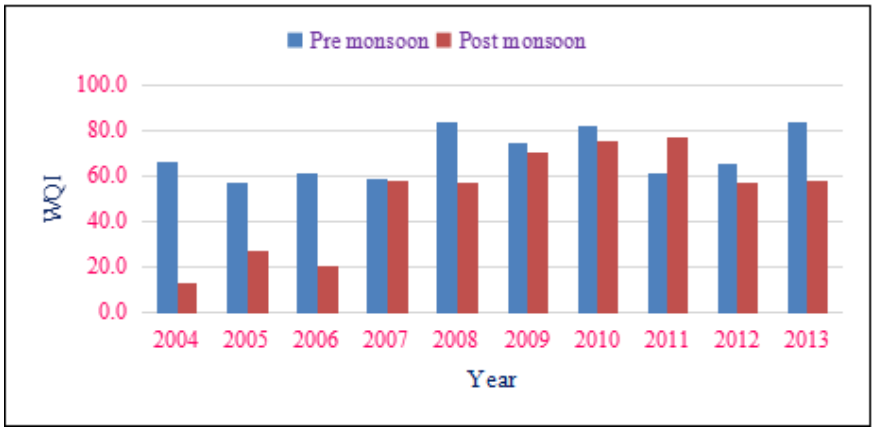

Fig 5: Water quality index –Second decade

Conclusion

The results clearly showed that observed water quality was lower in pre-monsoon as compared to Post-monsoon season at both the decades. The study also showed good water quality condition in first decade and poor water quality condition in second decade because of industrial area more and less rainfall in second decade as compared to the first decade. To improve the water quality condition first we have to monitoring the existing water quality condition for that purpose we used water quality index study. The water quality index was devised to analyze the combined impact of different quality parameters on drinking and irrigation purposes. The WQI developed and proposed in this study provides an easy to use tool that could help analyze the overall quality of ground water.

References

1. Chatterjee PK, Raziuddin M. Studies on the water quality of a water body at Asansol town, West Bengal. Nature, Environment and Pollution Technology. 2007; 6(2):289-292.
2. Dhirendra Mohan Joshi, Alok Kumar, Namita Agrawal. Assessment of the irrigation water quality of river Ganga in Haridwar district. Rasayan J Chem. 2009; 2:285-292.
3. Ganeshkumar B, Jaideep C. Groundwater quality assessment using Water Quality Index (WQI) approach – Case study in a coastal region of Tamil Nadu, India. International Journal of Environmental Sciences and Research. 2011; 1(2):50-55.
4. Jafar Ahamed A, Ananthakrishnan S, Loganathan K, Manikandan K. Assessment of groundwater quality for Irrigation use in Alathur Block, Perambalur District, Tamil Nadu, South India. Appl Water Sci. 2013; 3:763-771.
5. Jain CK, Bandyopadhyay A, Bhadra A. Assessment of ground water quality for irrigation Purpose, district Nainital, Uttarakhand, India. Journal of Indian Water Resources Society. 2012, 32(3-4).
6. WHO. Int. standards for drinking water World Health Organization, Geneva, 1971.