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ASSESSMENT OF GROUND WATER QUALITY STUDIES AT KALBADEVI ESTUARY AND ADJOINING AREA OF RATNAGIRI TAHSIL, MAHARASHTRA.

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Abstract:

The present work is aimed at assessing the ground water quality near adjoining area of Kalbadevi estuary at 20 sampling location and analyzed for physical and chemical parameters. Groundwater in the coastal areas is relatively vulnerable to the contamination of seawater intrusion, which makes it unsuitable for drinking proposes. The present study reveals that there is intrusion of seawater in groundwater adjoining Kalbadevi estuary as parameters like chlorides, hardness and dissolved solids are high level.

Keywords: *Groundwater, coastal area, intrusion, parameters, Kalbadevi estuary.*

Introduction:

The groundwater quality in an area depends on the physical and chemical parameters that are greatly influenced by geological formations and anthropogenic activities. The principal natural chemicals found in groundwater are dissolved salts, iron & manganese, fluoride, arsenic, radionudides & trace metals. Both geologic & climatic conditions influence mineral composition changes in water quality resulting from withdrawal of groundwater are often viewed as natural contamination.

Increasing population in coastal areas, and rising levels of sea caused by global warming are increasing stress on freshwater supplies in coastal aquifers worldwide (IPCC, 2007)

Richter and Kreitler (1993) opined that Intrusion of seawater is generally identified through chemical analyses of groundwater. Groundwater levels below sea level indicate an opportunity for seawater insertion, but the actual seawater intrusion is indicated by various chemical changes in groundwater. No single analysis definitively identifies seawater intrusion, however by looking at various analyses we can ascertain when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. This is due to the natural variation in fresh water chemistry at chloride concentrations below 1,000 milligrams per liter (mg/L)

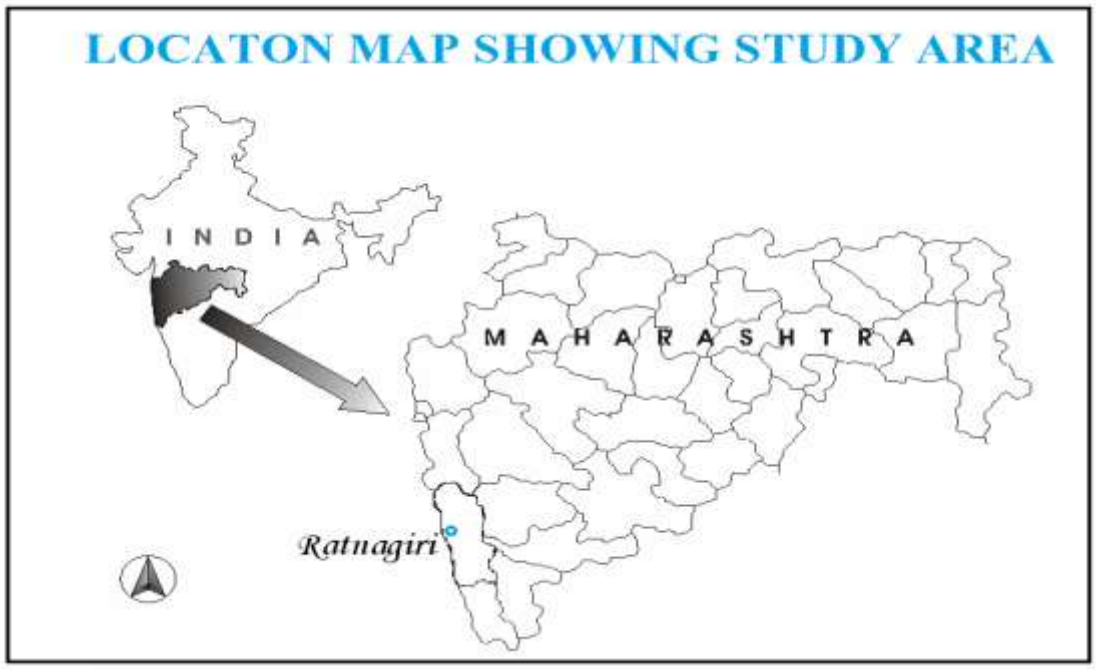
Salt water intrusion is the entry of saline water into fresh ground water regions in coastal aquifer. It has been studied extensively for well over a century. An exhaustive review on this topic provided by Bear et.al (1999). Also Socioeconomical and environmental impacts caused by seawater intrusion have claimed the attention of the scientists worldwide during the last decades.Different approaches have been developed to assess the problem (Bear 1999; Sherif MM 1999; ISARM 2001; Khouri 1996; Elhassadi 2008; Sedegsa 2008; World bank 2007; Pulido Bosch 1999; Cheng 2003).

The aim of the study undertaken is to find changes in water quality at Kalbadevi in Ratnagiri district. Groundwater contamination commonly results from human activities where, pollutants, susceptible to percolation are stored & spread on or beneath the land surface. Dispersion of a contaminant is influenced both physically by soil porosity and hydrologically by the rate of water movement.

Study Area:

Ratnagiri district is located in the south western part of Maharashtra state on the Arabian Sea coast. The surrounding area is bordered by the sahyadri hills on the East and Arabian Sea on the West. It forms as part of the greater tract known as kokan. The present study area falls in Kalbadevi estuary.

Fig.No. : 1 Study Area



The map of Ratnagiri district has been shown in following map rainfall conditions of the region.

Material and Methods :-

The qualitative characteristics of groundwater from study area have been determined to check whether, the water is contaminated or not. The other characteristics are also determined for suitability of water for drinking and irrigation purposes. Water quality parameters analyzed by using standerd methods.

Table No:1.1 Methods and Limits of water quality parameters

Sr. No.	Parameter	Method	Water Sample	Acceptable Limit	Permissible Limit
01	Temperature	Thermometer	Temp.		
02	Electrical	Conductivity	pH	6.5	8.5

	Conductivity	meter			
03	Turbidity	Turbidity meter	Tur.	1 NTU	5NTU
04	Total Dissolved solids	Evaporation method	D.O	5 mg/L	5mg/L
05	Dissolve Oxygen	Winkler Method	Cond.	300 µmhos/cm	
06	Alkalinity	Titration method	Alk.	200mg/L	600mg/L
07	Total Hardness	Titration method	T.D.S	500mg/L	2000mg/L
08	pH	pH meter	Cl	250mg/L	1000mg/L
09	Chlorides	Aregntrometric method	Hard.	200mg/L	600mg/L

Table No:02- Observation Table:

Water Sample	Temp.	pH	Turbidity.	D.O	Cond. 300 µmhos/cm	Alk.	T.D.S	Cl	Hardness
S 1	25	9.1	3.9	6.5	692	650	900	677	460
S 2	27	9.0	3.4	5.2	730	645	930	587	568
S 3	25	9.0	3.2	6.4	676	600	1000	779	692
S 4	25	9.0	2.3	5.7	543	615	1500	893	636
S 5	27	9.0	3.7	8.2	587	610	800	987	724
S 6	26	9.0	3.9	7.4	492	690	990	478	792
S 7	26	9.0	4.0	6.2	734	660	1110	587	760
S 8	26	9.0	3.9	7.2	386	650	1400	876	668
S 9	26	6.7	3.5	8.1	893	260	1550	776	648
S 10	27	6.7	4.0	9.8	1004	275	1900	1076	648
S 11	27	6.5	3.6	7.1	745	200	850	871	756
S 12	27	6.8	4.2	7.3	1129	278	2050	1111	800
S 13	25	6.0	4.0	7.3	398	275	1460	756	692
S 14	27	7.8	3.9	8.2	693	385	1620	865	896
S 15	26	7.8	3.8	9.1	864	375	1100	842	728
S 16	27	6.0	3.5	7.3	543	255	980	773	636
S 17	26	6.0	2.8	8.2	560	245	790	854	640
S 18	27	6.1	3.6	9.1	476	220	700	564	640
S 19	27	6.1	3.7	7.8	576	215	810	654	536
S 20	26	6.1	3.2	8.8	387	210	740	755	592

Results and Discussion

pH:

The desirable limit for pH is 6.5-8.5, the pH in study area is within limit but some sites having above permissible limit i.e. S1-S8.

Turbidity:

The acceptable limit of Turbidity is 1 NTU and permissible limit is 5 NTU. In study area all samples having below permissible limit but above acceptable limit.

Conductivity:

The conductivity is very important parameters as it indicates ionic concentration. Conductivity for the normal water was 300 µohms/cm but the all samples having the high values of conductivity. Due to presence of the salts it shows high values.

Alkalinity:

The alkalinity of samples where above permissible limit i.e. S1 to S8 and remaining samples have alkalinity values are just above acceptable limit. Therefore the water is not suitable for drinking purpose.

Total Dissolved Solids:

Total dissolved solids values of all sampling sites are above acceptable limit. It indicates the intrusion of sea water.

Chlorides:

The acceptable limit of chlorides is 250mg/lit. , in study area all samples shows values above 250mg/lit.

Hardness:

The acceptable limit of hardness is 200mg/L, only 4 sampling sites i.e S1, S2, S19&S20 above this limit. However all other sites are above the permissible limit.

Conclusion:

The present study reveals that there is intrusion of seawater in groundwater adjoining Kalbadevi estuary as parameters like chlorides, hardness and dissolved solids are high level as well as the other parameters are also having values near/above acceptable limit of IS: 10500. Seawater intrusion in adjoining groundwater, which makes it unsuitable for drinking proposes.Seawater intrusion results in the contamination of coastal aquifers and, therefore a reduction in the available water for human consumption and agriculture. The withdrawalof gr oundwater by public supply wells and numerous irrigation wells has resulted in the increased intrusion (encroachment) of seawater inland. The United States Environmental Protection Agency (USEPA) standards for Total Dissolved Solids (TDS) and chlorides are 500 milligrams per liter (mg/L) and 250 mg/L, respectively.

References:

1)Bear J, Cheng AH-D, Sorek S, Ouazar D, Herrera I. Seawater intrusion in coastal aquifers – concepts, methods and practices. The Netherlands: Kluwer Acad. Pub. 1999; p. 625.

2) IPCC, 2007: Climate Change 2007: The physical science basis. Contribution of working group I to the fourth assessment report of the intergovernmental panel on climate change fourth assessment report.

3)Richter, B.C., and C.W. Kreitler, 1993. Geochemical techniques for identifying sourcesof ground-water salinization, Boca Raton, Fla., C.K. Smoley (CRC Press, Inc.), 258 p.

4) Sherif MM. The Nile Delta aquifer in Egypt, chap 17. In: Bear J, Cheng A, Sorek S, Ouazar D, Herrera A. Eds. Theory and application of transport in porous media, book series. The Netherlands: Kluwer Acad. Pub. 1999; pp. 559-90.

5) ISARM. Internationally shared (transboundary) aquifer resources management. IHP-VI, IHP Non Serial Publications in Hydrology. November, Paris: UNESCO 2001.

6) Khouri J. Water resources of the Zarka River basin, Jordan.Water Resources Management and Desertification Problems and Challenges. Geneva: WMO 1996; pp. 84-96.

7) Elhassadi A. Seawater intrusion in Derna located in the Green Mountain region, Libya: a threatening recurrent phenomenon calling for desalination. Desalination 2008; 220:189-93

8) Sadeg SA, Karahanoglu N. Numerical assessment of seawater intrusion in the Tripoli region, Libya. Environ Geol 2008; 40: 1151-68.

9) World Bank. People's Democratic republic of Algeria: a public expenditure review. Assuring High Quality Public Investment. Report No. 36270. Washington, DC: World Bank 2007.

10) Djabri L, Laouar R, Hani A, Mania J, Mudry J. The origin of water salinity on the Annaba coast (NE Algeria). Proceedings of symposium HSO2a held during IUGG2003 at Sapporo; 2003 July; IAHS Publ. No 280; 2003; pp. 229-35.

11) Pulido-Bosch A, Tahiri A, Vallejos A. Hydrogeochemical characteristics of processes in the Temara Aquifer in Northwestern Morocco. Water Air Soil Pollut 1999; 114: 323-37.

12) Cheng AHD, Ouazar D. Coastal aquifer management: monitoring,modeling, and case studies. London: Lewis Publishers 2003.