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## Assessment of Ground Water Quality of Adjoining Area of the Neemrana Industrial Area (Alwar), Rajasthan, India.

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### ABSTRACT

Ground water quality parameters of adjoining area of Neemrana industrial area, (Alwar) Rajasthan, India were assessed in this study. Ground water samples were collected from different sources of adjoining area of Neemrana industrial area and analysis of parameters such as P<sup>H</sup>, colour, odour, turbidity, TDS, total hardness, calcium hardness, fluoride, chloride were carried out. Finding parameters were compared with the WHO and Indian Standard water quality parameters. It was found that some of the area under study falls in polluted zone. The results shown that the areas which near to industries have polluted ground water than others.

**Keywords:** Ground water, physicochemical parameters, contamination, permissible limit, polluted area.

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### INTRODUCTION

The accelerated technological advancement especially in the field of mineral and metal processing industry is giving rise to industrial pollution, arising from the growth of industry. The industrial waste water contains toxic metal ions which increases the risk of affecting the quality of water reservoir of the area due to percolation of these hazardous substances through the porous soil of the land to the ground water. [3,4,6,8] Drinking water used for human consumption should be potable and palatable a large number of industries coming up day to day and are releasing polluting effluent, toxic metals, inorganic and organic substances in to the natural water. [7,9]

### Study Area

Neemrana is an ancient historical town in Alwar district of Rajasthan, India, situated at 122 km from Delhi and 150 km from Jaipur on the Delhi-Jaipur highway in Neemrana tehsil. It is situated in between Behror and Shahajahanpur town. RIICO has set up 280 industrial areas in Rajasthan. Neemrana industrial area is one of them. It is established in 1977. It has gained the prestige of "PRIDE OF RAJASTHAN" and "FLAGSHIP OF RIICO". Interestingly, even though Neemrana tends to go unnoticed in the map of National Capital Region, it is very much a part of the national capital territory region. Neemrana is fastly developing industrial area with fertilizers, arsenic, fluoride, and electroplating, photographic waste industries. This sleepy township has grown into a bustling industrial city supplemented by all the modern amenities and a very high standard industrial infrastructure. The area is a developing industrial hub. The Rajasthan government, through Rajasthan Industrial Cooperation (RIICO), has developed industrial zones in various stages in Neemrana in Alwar district in the past several years. Companies from India and abroad have set up their units in these industrial areas and many more new industries are arriving which is not only adding a new dimension to the industrial progress of Rajasthan but also creating new employment opportunities. The Japanese industrial zone developed by RIICO is an extension of previously existing industrial zone. The Korean Zone is also coming up silver Wood Township. The present study was planned by selecting Neemrana industrial area (figure 1) and ten ground water samples were collected from selected area as per standard procedure. The literature survey showed that no groundwater studies were made in these localities so far. Hence, the present study was undertaken by authors. This paper highlights the various physio-chemical parameters of ground water from various sources of adjoining area of Neemrana industrial area, which will help us to formulate the strategy for mitigating the physio- chemical parameter of ground water.

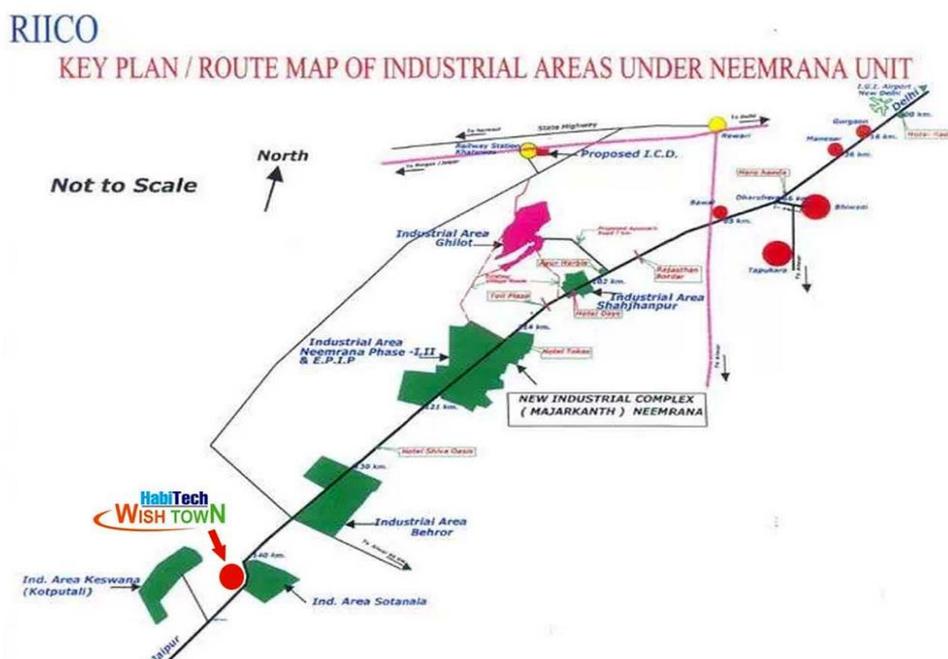


Figure 1: Map of Neemrana Industrial area

**Collection of Ground Water Samples:** The ground water samples were collected in precleaned one-liter plastic bottles from Bore-wells, hand pumps and open wells located adjoining Neemrana industrial area. Bottles were cleaned with hydrochloric acid then washed with tap water and then rinsed with distilled water twice and again rinsed with the water sample to be collected and field up one-liter bottles with the water samples. [1,2,12]

**Analysis of ground water samples:** The physio-chemical parameters such as P<sup>H</sup>, colour, Odour, Turbidity, TDS, Total hardness, Calcium hardness, Fluoride, Chloride were determined using standard Methods. [2,5,13] Specific reagents were used for the analysis and double distilled water was used for preparation of solutions.

## RESULT AND DISCUSSION

**P<sup>H</sup>:** The results obtained are consolidated and mean value for each sample was calculated. It is a measure of the intensity of acidity or alkalinity and the concentration of hydrogen ion in water. P<sup>H</sup> value below 4 produces sour taste and a higher value above 8.5 give alkaline taste. In the present study, the P<sup>H</sup> values of water samples varied between 7.02 to 8.9 (Table 2), four samples showed higher value than acceptable limits as compare to Indian Standard and WHO ( Table 1). Determination of P<sup>H</sup> is one of the important objectives for the treatment of waste. Significant changes in P<sup>H</sup> occur due to the disposal of industrial waste and acid mine drainage.

**Total Dissolved Solids (TDS):** Water containing more than 500 mg/l of TDS is considered acceptable for drinking according to all standards viz APHA, IS and WHO. [2,10] In present study the TDS value varies from 705 to 1580 mg/l in the ground water samples Results shown that ground water sample of same area Neemrana industrial contain three times more TDS than acceptable limits. It was noticed that all seven-water sample have more TDS as compare to WHO acceptable limits.

**Total Hardness (TH):** Hardness in water is due to the natural accumulation of salts from contact with soil and geological formations or it may enter from direct pollution by industrial effluents<sup>4</sup>. Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. In the present study, total hardness varied from 93.9 mg/L to 306.4 mg/L. Ground water samples of area near to Ginni International Pvt. Ltd., Mohalidiya village, near Anneusor Busch Inveb Ltd., Kalyanpura village, Government water supply and local tube well have more total hardness value as compare to standard.

**Chloride (Cl<sup>-</sup>):** The most important source of chlorides in the waters is the discharge of industries sewage. [13] The chloride value in the study area varies from 113.2 to 377.5 mg/l. A limit of 250 mg/l chloride has been recommended as acceptable limit and 1000 mg/l as maximum allowable limit for drinking water. Mohalidiya village, Anneusor Busch Inveb Ltd. and Kalyanpura village ground water samples have more chloride concentrations as compare to WHO acceptable limits.

**Fluoride (F<sup>-</sup>):** The fluoride concentration in the study area varies from 0.42 to 0.77 mg/l. Only one sample crossed the acceptable limit of 0.9mg/l. If the fluoride in drinking water is less than 0.5mg/l, the incidence of dental disease in children is likely to be high. [11,13] However, when present in much greater quantities they can cause endemic cumulative fluorosis resulting skeletal damage. Result shown that the ground water sample of Anneusor Busch Inveb Ltd. contain more fluoride concentrations then acceptable limit.

## CONCLUSION AND SUGGESTIONS

In view of the above it has been observed that, the samples of all the sites are slightly polluted and not suitable for direct consumption for drinking. But directly can be used for irrigation purposes. After the treatment like reverse osmosis, electrophoresis, ion exchange and solar distillation etc. it can be used for drinking purposes. So, our investigations are useful for government authorities, for taking care and reducing ground water pollution.

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**Table-1: - Standards of water quality parameters**

Parameter	International Standard (APHA 1993)		Indian Standard (BIS, 1993)		W.H.O (1971)	
	Max. Acceptable	Max. Allowable	Max. Acceptable	Max. Allowable	Max. Acceptable	Max. Allowable
<b>Colour</b>	5 Units	25 Units	5 Units	25 Units	5 Units	25 Units
<b>Odor</b>	Unobjectable	—	Unobjectable	—	Unobjectable	—
<b>Taste</b>	Agreeable	—	Agreeable	—	Agreeable	—
<b>Turbidity</b>	2.5 NTU	10 NTU	5 NTU	10 NTU	2.5 NTU	10 NTU
<b>pH</b>	7.0 to 8.5	6.5 to 9.2	6.5 to 8.5		7.0 to 8.0	6.5 to 9.2
<b>TH</b>	100	500	300	600	100	500
<b>TDS</b>	500	1500	500	2000	500	1500
<b>Calcium Hardness</b>	75	200	75	200	75	200
<b>Fluoride</b>	0.7	1.5	0.7	1.5	0.9	1.7
<b>Chloride</b>	200	600	250	1000	200	600

TH = Total hardness

**Table 2: Ground Water Quality of Adjoining Area of the Neemrana Industrial Area (Alwar), Rajasthan**

Area	pH	Odour	Turbidity	Colour	TDS	Total hardness	Calcium Hardness	Fluoride	Chloride
Richter India Pvt. Ltd. Neemrana	8.3	Agreeable	<1	<1	894	93.9	13.8	0.49	151
Ginni International Pvt. Ltd. Neemrana	7.64	Agreeable	<1	<1	1290	271.8	39.5	0.68	264.2
Mohalidiya village	8.04	Agreeable	<1	<1	1580	227.4	43.4	0.56	377.5
Annesor Busch Inveb Ltd. Neemrana	7.84	Agreeable	<1	<1	1190	306.4	45.4	0.77	314.6
Kalayanpura village	7.02	Agreeable	<1	<1	801	148.3	31.6	0.42	213.9
Government water supply Neemrana	8.5	Agreeable	<1	<1	991	291.6	31.6	0.62	176.1
Local tube well Neemrana	8.9	Agreeable	<1	<1	705	113.7	41.5	0.47	113.2

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