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# ASSESSMENT OF HEAVY METAL CONTENT IN GROUND WATER OF AGRO BASED INDUSTRIAL AREA, DIST. NASHIK OF MAHARASHTRA, INDIA

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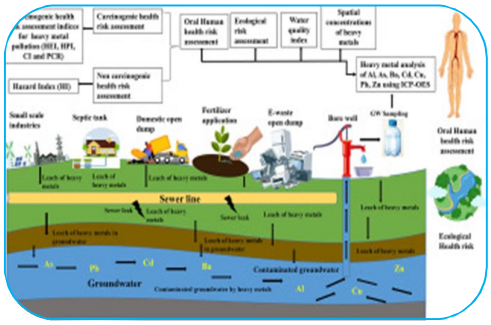
## ABSTRACT




*Water is very precious and important asset for human being. But due to Industrial effluents the surface as well as ground water get polluted due to heavy load of pollutants. The contamination of surface water as well as ground water is serious problem among the nation. Various studies have been pointed out that the adjoining areas of Industries contaminating the ground water resources. In the present study some heavy metal concentrations like chromium, zinc, lead, Copper, nickel and cadmium etc. from ground water of Materwadi (Rajaram nagar) Village near Dindor factor were studies during the period of September 2025 to April 2026. The investigation showed that the concentration of heavy metals such as copper and nickel exceeded the permissible limit due to spraying of pesticides, insecticides, using heavy doses of fertilizers as well as industrial processing units and discharge of effluent in the catchments of Sugar Industrial area.*

**KEYWORDS:** *Ground Water, Heavy Metals, Water Pollutants.*

## INTRODUCTION:

Ground Water is used for domestic, industrial and agricultural purposes. Due to rapid urbanization especially in developing countries like India, has affected the availability and quality of ground water due to its over exploitation and improper waste disposal especially in urban areas. (Mohrir, et. al, 2002). According to WHO organization about 80% of all the diseases in human beings are caused by polluted water. Industrialization is the index of modernization which leads to alteration in the physical, chemical and biological properties of the environment. Assessment of water resource quality of the river is an important aspect for the development activities of the region, because it is the sum of water supply of domestic, industrial, agricultural and aquaculture practices (Jain and Seethapati 1996; Jakher and Rawat 2003). Wastewater from industries or other sources carries an appreciable amount of toxic heavy metals which create a problem for safe rational utilization of agricultural soil (Chen, et al. 2005; Singh, et al. 2004;Yadav,et al. 2002). Heavy metal contamination in the environment is becoming a serious problem from the human point of view. In the present study an attempt had been made to investigate degree of the water pollution due to continuous discharge from the industrial zone of the Materwadi region.

## MATERIAL AND METHODS:

**Study area and Sampling-**

The Nashik district of Maharashtra, stretches between latitude; 19°58'0" N (deg min sec), 19-9667° (decimal); 1558.00 N (LORAN) longitude 73° 49' 0" E (deg, min, sec), 73° 8167° (decimal);

0.7349.00 E (LORAN). The study region consists of the Materwadi, (Rajarama nagar) village Near Dindori Factory Nashik District. The Samples were were collected during the period of September 2025 to April 2026 About 08 readings were made throughout analysis for the Heavy metals such as Chromium, Zinc, Lead, Copper, Nickel, Cadmium etc were determined from the samples as per the analytical methods adopted in standard procedures [APHA, AWWA 1998., Trivedi and Goel 1986; De, 1998).

## RESULTS AND DISCUSSION:

The result of analysis of various sample of Agro based industrial area Materwadi is given Table No. 1

**Table – 1 Heavy metal concentration in water (ppb) from Materwadi area (September 2025 to April 2026)**

| Months | Chromium ppb | Zinc Ppb | Lead Ppb | Copper Ppb | Nickel Ppb | Cadmium Ppb |
|---|---|---|---|---|---|---|
| September | 3.21 | 185 | 6.28 | 60.01 | 00 | 0.83 |
| October | 2.10 | 208 | 14.02 | 58.0 | 00 | 0.94 |
| November | 2.18 | 390 | 2.03 | 74.30 | 00 | 0.36 |
| December | 1.19 | 117 | 7.44 | 13.12 | 00 | 0.75 |
| January | 0.96 | 212 | 6.1 | 0.12 | 0.16 | 0.55 |
| February | 0.87 | 119 | 8.2 | 33.06 | 00 | 0.79 |
| March | 0.98 | 110 | 5.23 | 33.12 | 00 | 0.26 |
| April | 1.69 | 106 | 6.11 | 18.12 | 0.23 | 0.11 |

**Table – 2 Standard limits of heavy metals (in ppb) as per BIS10500:91.**

| Limits | Copper | Chromium | Zinc | Lead | Cadmium | Nickel |
|---|---|---|---|---|---|---|
| Desirable | 50 | 50 | 5000 | 50 | 10 | - |
| Maximum Permissible | 1500 | 50 | 15000 | 1500 | 10 | - |

### i. Chromium-

The highest concentration of Chromium was recorded in the month of Sept. (3.21 ppb) in the monsoon season and lowest concentration was recorded in the month of March (0.78ppb) in post post winter. Rainfall and the subsequent leaching of organic matter and minerals influence the concentration of chromium in river water. The maximum concentration of chromium was observed in the monsoon season, and the minimum in winter and summer season respectively (Minaxi.et al.2008).

### ii. Zinc-

The highest concentration of zinc was recorded in the month of November (390 ppb) in winter season and lowest concentration was recorded in the month of April (106 ppb) i.e. in post winter. The presence of zinc increases cadmium toxicity and accumulation in aquatic plants. The highest mortality with cadmium was found when Zn: Cu ratio was one, it has been studied by giving a sub-lethal chronic load of zinc to fish by uptake from water (Vediya and Shrivastava, 2008). Rainfall and the subsequent leaching of organic matter and minerals influence the concentration of zinc in river water. The maximum concentration of zinc was observed in the winter season, and the minimum in post winter and summer season respectively (Minaxi.et al.2008).

### iii. Lead-

The highest concentration of lead was recorded in the month of October (14.02 ppb) in post monsoon season and lowest concentration was recorded in the month of November (2.03 ppb) in winter season. Lead is carcinogenic and is harmful even in small amounts [Khan et al. 2006). Rainfall and the subsequent leaching of organic matter and minerals influence the concentration of lead in river

water. The maximum concentration of lead was observed in the monsoon season, and the minimum in winter and summer season respectively (Minaxi.et al.2008).

**iv. Copper-**

The highest concentration of copper was recorded in the month of November (74.30 ppb) in post monsoon season and lowest was recorded in the month of December (13.12 ppb) in the winter season. High level can cause harmful effect such as irritation of nose, mouth and eyes, nausea, vomiting, diarrhea, lesions in Gastro Intestinal Tract (GIT). In the study area in the months of monsoon the victims of above diseases have been examined in the primary health centers [P.H.C. Report 2008]. It is reported that High level of Cu and low level of Cr is correlated most conspicuously with high death rate (Vediya and Shrivastava, 2008). The Sugar manufacturing industries constantly releases the contaminated effluents. These samples collected at the distance 1300 to 1650 meters shows high values. Rainfall and the subsequent leaching of organic matter and minerals influence the concentration of copper in river water. The maximum concentration of copper was observed in the post monsoon season, and the minimum in winter and summer season respectively (Minaxi. et al.2008).

**v. Nickel-**

The Nickel concentration was recorded only in the month of January (0.16 ppb) & April (0.23) and in the other months its concentration is nil or not detected. The pollution of water with nickel and chromium arises from industrial sources or agricultural activities. It is regarded as essential trace metal but toxic in large amount to human health. It is considered carcinogenic to human (Obasohan et al. 2006). It is also reported that high dose of nickel in rats and dogs significantly decrease their body weights. Rainfall and the subsequent leaching of organic matter and minerals influence the concentration of nickel in river water. The maximum concentration of nickel was observed in the month of January in winter season only (Minaxi.et al.2008).

**Vi. Cadmium-**

The concentration of cadmium is highest in the month of Feb. (0.94ppb) in winter season and is lowest in the month of May (0.11 ppb) in summer. The free cadmium ions are highly toxic to most plants and animals. The cadmium poisoning is associated with hypertension and prostate cancer in man. Similar concentration of Cd has been reported in Umtata River (Nayak and Sawant 1994). The higher levels of Cd obtained in the sample might be due to contribution from other sources such as agricultural runoff (where fertilizers are used), leaching of Ni-Cd based batteries and other wastes as suggested by Obasohan et al. (2006).

Rainfall and the subsequent leaching of organic matter and minerals influence the concentration of cadmium in river water. The maximum concentration of cadmium was observed in the winter season, and the minimum in summer season respectively (Minaxi.et al.2008).

## CONCLUSION:

From the present investigation it is reported that in Materwadi Area significant fluctuation in the heavy metal was observed. The concentration of Lead (Pb), Chromium (Cr) and Copper (Cu) in the water sample is more in monsoon than winter and summer season. The increase in Zinc (Zn), Chromium (Cr) and Nickel (Ni) concentration in winter season may be due to the input by way of runoffs from industrial sludge's and solid waste dumps in the catchments. Studies related to industrial wastes, agricultural and human activities that have released hazardous and toxic materials in the water bodies and there by lead to the contamination of drinking water in these areas. The main reason for increasing concentration of all heavy metals along the ground water is discharge of wastewaters to the Materwadi area. Studies reveals that the concentration of heavy metal content in the Materwadi area is increasing over a period of time. All the values obtained for heavy metal are within the maximum permissible limit set by the Bureau of Indian Standard (BIS) except Nickel and Copper, but there is serious threat in future[ BIS 10500-91].

However proper control measures, check on effluent treatment plants is essential to prevent further degradation of water and load on the water treatment process.

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