Heavy Metals (Cu,Zn,Ni,Cr) Determination in Top Soil

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***Abstract*— The purpose of this study is to investigate the current status of heavy metal soil pollution in one of the cradles of industry in India, the Rakhial Industrial area in the city of Ahmedabad, Twenty-five soil samples were collected from the top 5 cm of the soil layer and were analyzed for heavy metal concentrations of Cu, Ni, Zn and Cr. The data reveal a remarkable variation in heavy metal concentration among the sampled soils; the mean concentrations of Cu, Ni, Zn and Cr were compared with the standards of different countries like Canada, Australia, Norway, Taiwan etc. for Maximum allowable limits of heavy metals in soil. Soil samples were also analyzed to determine fixed metals present in soils if any and results showed that all metals were fixed solids and do not get carried away with rain water. GIS Mapping of study area for each metal will be done to demonstrate the distribution of heavy metals concentration. References and Author's Profile must be in Font Size 8, Hanging 0.25 with single line spacing.**

***Index Terms*—Pollution Assesment, Soil Contamination, Heavy Metals, Industrial Area**

I. INTRODUCTION

Due to the continuous industrialization in many parts of the world, pollutants are emitted into the terrestrial environment and pose a great threat on human health.Soil Contamination can seriously affect soil's ability to perform some of its key functions in the ecosystem. Soil is a living resource, but once contamination exceeds a certain threshold, the soil may be considered 'functionally dead'. Pollution by heavy metals and many organic contaminants is practically irreversible.
Rakhial area of Ahmedabad is hub for matterlurgical industry and thus selected for Heavy Metals assessment in soil to investigate soil pollution.

II. METHODOLOGY

A. Study Area

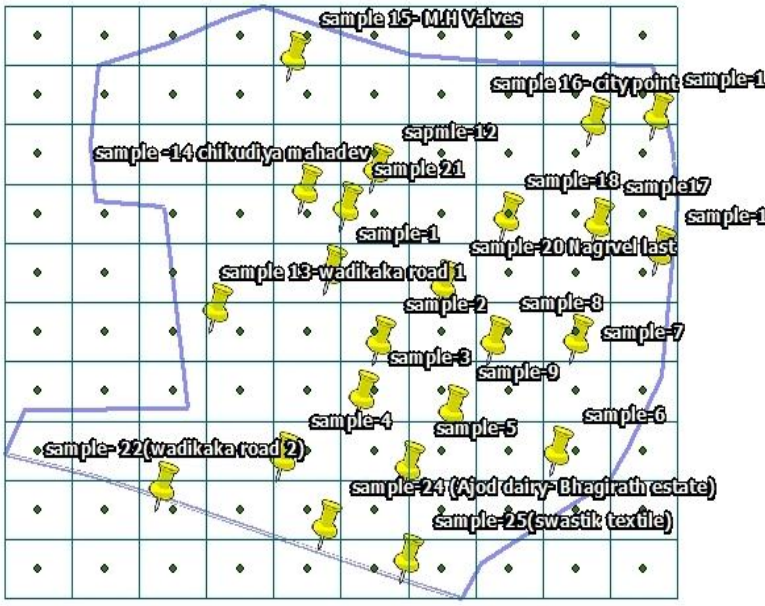
Covering area of 1.36 sq. km and being hub of metallurgical industry, Rakhial industrial area was selected to find possible contamination in top soil of the area. Rakhial Industrial area having Latitude:23° 1'18.35"N and Longitude: 72°37'41.30" was divided into Grids of 180 m by 180 m and 25 samples

were collected from the area. Figure 1. Demonstrates the area categorization for sample collection.

B. Sampling and Analysis

Top-soil samples of 5 cm were collected from the industrial area and obtained by compositing surroundings topsoil into a polythene bag with aid of a plastic scooping trowel. Auger was used for collecting sample and Sample location were recorded through GPS.
Samples were analyzed by USEPA-3050B method for assessing heavy metal concentration using FAAS. Soil samples were digested with both Acid and Neutral pH buffer solution to determine fixed metals and washing away with rain water.

Figure.1- Study Area Categorization



III. RESULTS AND DISCUSSION

On analyzing soils for Cu,Ni,Cr and Zn, results obtained for 25 location are compared with standards of different countries for Maximum allowable concentration of Heavy metals in Soil. Standards compared here includes Canadian, Australia, Norway, Taiwan and Netherland.

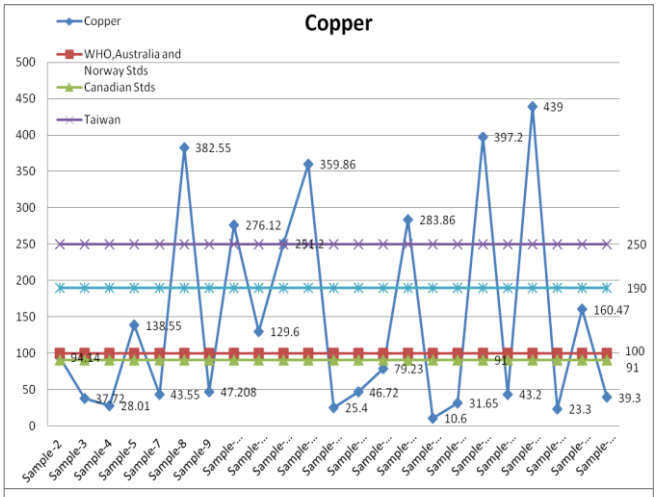
A. Data Interpretation

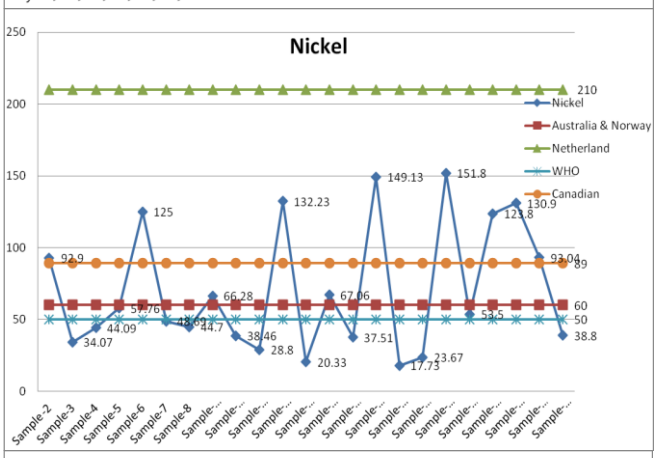
Results of all 25 samples, four metal concentration values for each sample are interpreted by finding Maximum, Minimum, Mean, Median and Standard deviation of all the values to understand the range of distribution of values..

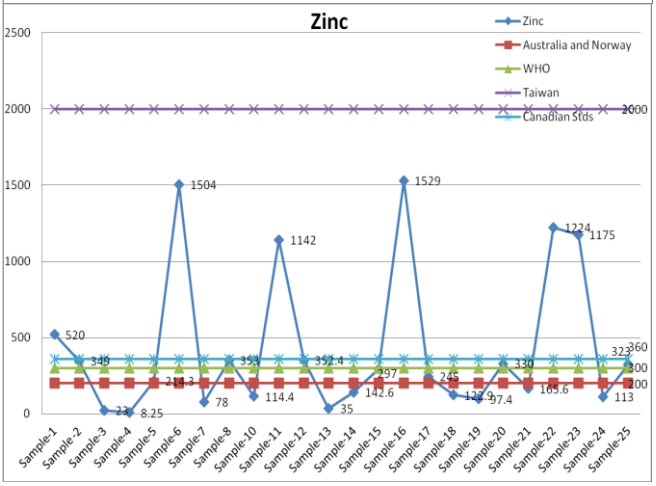
TABLE I: Statistic

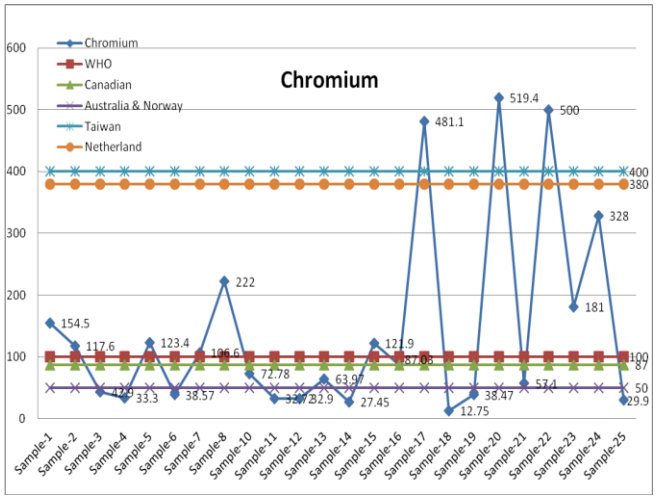
Sr. No	Metal Conc.	Maximum	Minimum	Mean	Median	Std. Deviation
1.	Copper(Cu)	11995	10.6	664.7784	359.86	2336.157
2.	Nickel(Ni)	590	17.73	101.200385	132.23	123.634771
3.	Zinc(Zn)	4520	8.25	586.6404	35	927.2629
4.	Chromium(Cr)	1695	12.75	199.1746	63.97	340.2996

B. Graphical Representation of Results:









Following results are highest and excluded from graph so it doesn't suppress the values in range
Sample-1, Cu- 1756 mg/kg & Ni-590mg/kg
Sample 6, Cu- 11995 mg/kg,
Sample 9 Zn- 4520 & Cr-1695 mg/kg
Sample 12- Ni- 375 mg/kg

C. Findings:

On comparing different standards with the results of Cu, Ni, Zn and Cr concentrations, the numbers of samples exceeding the standards found are as mentioned in Table.2

Analysis done with Neutral pH buffer solution did not detect any metal extraction when measured on FASS.

Table 2: Findings

Sr. No	Heavy Metal Parameter	Total no of Samples exceeding Lowest Standards
1	Copper	Total 13 samples are found above prescribed standard of Copper Concentration.
2	Nickel	Total 15 samples are found above prescribed standard of Nickel Concentration.
3	Zinc	Total 15 samples are found above prescribed standard of Zinc Concentration.
4	Chromium	Total 16 Samples are found above prescribed standard of Chromium concentration.

IV. CONCLUSION

As mentioned in above table, half of the results obtained are above prescribed limits, thus it can be interpreted that Soil of Rakhial industrial area is contaminated with high concentrations of heavy metals

No metals were extracted with buffer solution thus it can be concluded that all present metals are fixed metals and do not get washed away with rain water.

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