

Environmental Impact Assessment of Soil Pollution in Al-Karama Industry

MazinNazarFadhel¹, Ayça ERDEM ÜNŞAR², SalimRabeeaZnad³,
ORCID ID: 0000-0002-7823-1111

¹College of Environmental Sciences and Technology, Depart. Of Environmental Sciences, University of Mosul.

²Faculty of Engineering. Department of Environmental Engineering. Akdeniz University.

³College of Environmental Sciences and Technology, Depart. Of Environmental Sciences, University of Mosul.

*** Author for correspondence: E-mail: salim.znad@yahoo.com**

Background

The rise in Heavy metals concentrations is a serious problem for the environment and human health. Industrial zones are one of the largest sources that Emission heavy metals to the environment, and that the same time they are considered an indispensable source of development. Therefore, the environmental impact must be assessed for the safety of its workers and the safety of the environment.

Objectives

The current field study aims to determine the level of heavy metal contamination in the al-Karama industry of Mosul City, northern Iraq.

Methods

5 samples collected for two season and analyzed from the soil areas, the soil was at depth (0-15) cm and (15-30) cm and analyzed by the X-ray Fluorescence for 5 metals included (Se , Mn , Hg, Co, Sb).

Results

The results indicated that the element (Mn, Hg) were higher than the global Average of soils and this indicates the pollution of the Region for this element. When making t- test between the two depths and during the two seasons- the statistical program was used where the results indicated that significant differences between the two seasons (winter, summer) and for two depth (0-15) cm, (15-30) cm, which indicates a change in the level concentration of the element.

Conclusions

these areas are already contaminated with (Mn, Hg) metals that have Exceeded the Limited values because of The industrial waste dumped into the environment, which contains ratios of manganese and mercury, such as car batteries, industrial oils and greases.

Keywords: Heavy metals, Al-Karama Industry, X-ray Fluorescence.

Introduction

The problem of pollution is one of the most pressing environmental problems that are beginning to take on serious environmental dimensions, especially after the Industrial Revolution, technological progress and the use of modern methods in industry.¹³

The industrial development and expansion of use chemical compounds in various industrial areas leads to the spreading of heavy elements in the environment.⁴

Pollution of the natural environment by heavy metals is a global problem because these elements are unbreakable and most of them have adverse effects on human health and other organisms when their levels exceed the limits of these elements, where the levels of accumulation of these heavy metals are normally exceeded, such as: Volcanoes, hurricanes, and weathering rocks, or through human intervention, such as: use of pesticides (agriculture and its poles).¹¹

These chemical elements have been linked to a number of health issues faces the human. for example, a person with a liver disease, the continued exposure to these elements rises the harmful to this organ. The effect of the heavy metals is to interfere with the conformation of the protein in the body and with enzymes functions.¹³

The increased concentration of heavy metals in various sources is given much attention of interest, especially as many industries are offering their own the container on heavy elements is untreated.^{1,10}

The gravity of these heavy metals lies in their accumulation, high stability, unlimited survival and long-distance transport from their areas of origin and can be doubled in their accumulation during the food chain, as some animals and plants become and because they contain high-grade concentration of some of these dangerous elements, is a source of poisoning and a significant health risk.⁵

as a result of human activities such as waste disposal, industrial activities, which increase levels of hazardous materials, including heavy elements.³

Heavy metals are among the most dangerous non-organic pollutants on the environment Health because it cannot be physiologically immoral.⁷

It was reported that, recently as the world economy developed and the activities caused to humanity, both the type and content of heavy metals in the soil had increased steadily, resulting in environmental degradation and thus negatively affecting human health Human beings and the rest of living things.²

Soil contamination occurs when chemicals are released by spillage or underground leakage, with heavy metals being the most important soil pollutants, including herbicides, hydrocarbons, chemicals, salts, and radioactive substances, having adverse effects on plant growth, animal health, and human health.⁹

Researchers such as¹⁴ (Environmental Impact Assessment of Soil Pollution in Industrial Zones), in their study of the pollution of soils in industrial areas with heavy metals They confirmed their results compared with the WHO, 2003 and these areas are

already contaminated with (Ni, Cr, As) metals that have Exceeded the specified values. In addition, Pb and Cd elements are within the allowed values.

¹⁵ also indicated in their study (the vital accumulation of some heavy metals in the blood serum of industrial zone workers in mosul city) about measuring the concentrations of heavy metals (Pb, Ni, Co, Fe Cu, Zn) in serum blood comparison of The industrial workers with the control group (employees of the University of Mosul) who are far from industrial activity, as the results showed that there are high significant increase of $P < 0.001$ in the serum of the workers who are in the industrial areas compared with the control group .

⁶also indicated in their study (assessment of heavy metal pollution of old city zones in mosul city).about determine the level of heavy metal contamination in the Old City Zones of Mosul City, northern Iraq. where 5 samples collected for two season and analyzed from the soil areas, the soil was at depth (0-15) cm and (15-30) cm and analyzed by the X-ray Fluorescence for 8 metals included (Pb , Cd , Ni, As, Zn, Co, Cr, Cu). The results indicated that the element (Cd, Ni, Cr, Zn, Cu) were higher than the global Average of soils and this indicates the pollution of the zone for this element.

It was therefore necessary to carry out an assessment of the pollution in Industry Region and to know the extent of the threat to the environment.

Methods

The study area is the city of Mosul, which is located in the north-western part of Iraq, between the longitude of $41^{\circ} - 44^{\circ}$ and the latitude of $35^{\circ} - 37^{\circ}$. In particular, the Al-Karama Industry of the Mosul city (Figure 1).

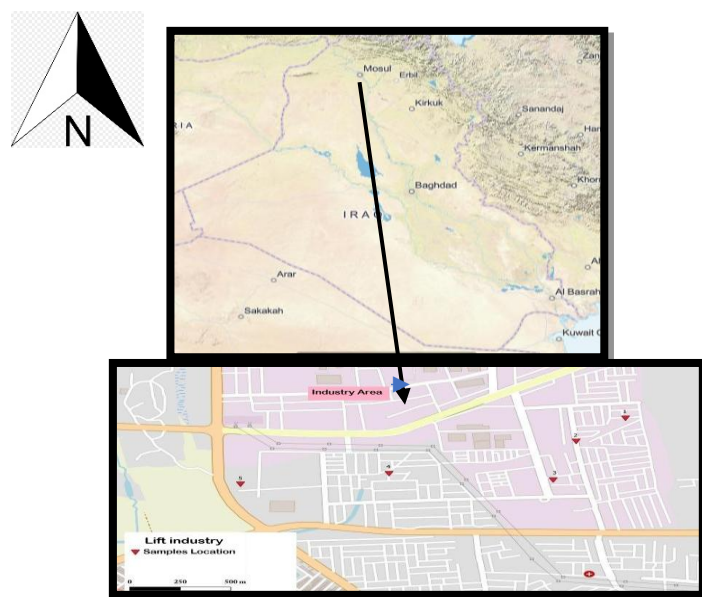


Fig 1: Location of Study Area.

Sampling

Only soil samples had been collected with depth (0-15) cm (15-30) cm by using a homemade soil sampler. A total of 5 surface had been collected at industrial zone. Samples was carried in October 2019 and Febuary2020 . First of all, samples were air-dried in natural condition, and the debris of animals and plants had been cleaning by hands. Samples grind and pass through a sieve (2mm), so they ready to measure.

Analysis of samples

after collecting samples they analyzed by X-Ray Fluorescence, SPECTRO XEPOS from AMETEK. (XRF) method was great used for monitoring the concentration of metals.

Result

Table (1) shows the heavy metals of the AL-Karama industry and at a depth of (0-15) cm and (15-30) cm in Summer Season.

The results obtained were compared with the the global average and The Elements (Mn, Hg) was Exceeded the Limited Value for the same postion for both depth [8].

Table (2) shows this compared with the the global average at winter Season. the Results Showed that the elements (Mn, Hg) was Exceeded the Limited Value .

Table 1: Heavy metals of soil samples the area of Al-Karama Industry at Summer Season in unit (ppm).

Elements	Mean		Standard Deviation		Min		Max		Global Average
	0-15c	15-30c	0-15c	15-30c	0-15c	15-30c	0-15c	15-30c	
Se	1.05	0.36	0.97	0.24	0.26	0.11	2.70	0.91	10
Hg	0.30	0.07	0.44	0.07	0.09	0.03	1.10	0.10	0.06
Sb	6.94	3.92	6.68	3.92	0	1	18.30	9.67	10
Co	7.79	5.28	1.22	5.28	6.21	1.99	9.03	7.11	8
Mn	84.10	63.33	78.50	63.3	20.56	2.78	209.64	237.99	30

Table 2: Heavy metals of soil samples the area of Al-Karama Industry at Winter Season in unit (ppm).

Elements	Mean		Standard Deviation		Min		Max		Global Average
	0-15c	15-30c	0-15c	15-30c	0-15c	15-30c	0-15c	15-30c	
Se	0.52	0.45	0.38	0.26	0.20	0.19	1.16	0.99	10
Hg	0.07	0.09	0.02	0.02	0.04	0.03	0.11	0.13	0.06
Sb	5.60	4.34	5.63	3.62	0	0.25	15	10.22	10

Co	6.80	6.01	1.30	1.95	5	2.23	8	8	8
Mn	81.80	64.07	77.84	73.43	18	3.33	206	238	30

When making the t-test by using the program SPSS Statistical for the Heavy element at two seasons in both depth. the Result Showed high Significant in two death were

We noticed a decrease in the concentration of the heavy metals indicate and on the depth (0-15) cm during the winter season due the washing of the soil compared to the summer season for the same depth . In contrast, result for heavy metals appeared that depth (15-30) cm in winter are high compared to the result same depth in summer. The table (3) shows the test results.

Table (3) T-test significant for Heavy metals

Elements	Mean				Standard Deviation				t		df		sig	
	summer	winter	summer	winter	summer	winter	summer	winter						
	0-15c	0-15c	15-30c	15-30c	0-15c	0-15c	15-30c	15-30c	0-15c	15-30c	0-15c	15-30c	0-15c	15-30c
Se	1.05	0.52	0.36	0.45	0.97	0.38	0.24	0.26	6.000	4.493	4	4	0.004	0.002
Hg	0.30	0.07	0.07	0.09	0.44	0.02	0.07	0.02	5.477	5.041	4	4	0.005	0.001
Sb	6.94	5.60	3.92	4.34	6.68	5.63	3.92	3.62	3.325	3.701	4	4	0.029	0.005
Co	7.79	6.80	5.28	6.01	1.22	1.30	5.28	1.95	8.772	5.220	4	4	0.001	0.001
Mn	84.10	81.80	63.33	64.07	78.50	77.84	63.3	73.43	6.030	4.555	4	4	0.004	0.001

Conclusions

The results obtained for heavy metals and compared to the Global average show that these areas are already contaminated with (Mn, Hg) metals that have Exceeded the Limited values because of The industrial waste dumped into the environment, which contains ratios of manganese and mercury, such as car batteries, industrial oils and greases.

REFERENCES

1. AbdolhosseinParazanganeh, PooyaHajisoltani, AbbasaliZamani, 2010, Assessment of heavy metal pollution in surficial soils surrounding Zinc Industrial Complex in Zanjan – Iran, Faculty of Science, Zanjan University.

2. Drever J. I., (1997), Water – Wells in implementation maintenance, Habib, R. Habib and others, 2012. Toxic Heavy Metals in Soil and Some Plants in Baghdad, Iraq, Journal of Al-Nahrain University, Science, Vol.15 (2), June, pp.1-16.
3. Faisal NN.(2014). The use of cluster analysis to classify cancer by species and situations in Iraq for the period (1998–2006). J Kirkuk Uni Admin Econ Sci;4(1):269–91.
4. Goyer R.A., (1995). Toxic effects of metals. In: Klassen CD, ed. Casarette and Doull's Toxicology. The basic science of poison, 5th ed. New York: McGraw Hill, pp 634-736.
5. Hussain, I. and Khan L . (2010)." Comparative study on heavy metal contents in Taraxacum officinale Int. J. Pharmacognosy and Phytochemical Res. 2(1): 15-18
6. Ibrahim, Mohammed Zuhair and Fathi, Riyadh Abdullah (2020). Assessment of heavy metal pollution of old city zones in Mosul city.. Plant Archive journal volume 20. No. 2 , 2020 .pp 7857- 7860 .
7. Jean-Philippe, S.R., Labbé, N, Franklin, J.A., Johnson, A.(2012). "Detection of mercury and other metals in mercury contaminated soils using mid-infrared spectroscopy," Proceedings of the International Academy of Ecology and Environmental Sciences, 2(3), 139-149.
8. Lindsay, W.L., (1979). Chemical equilibrium of soils . John Wiley and sons , p. 449 .
9. Lone, I. M. ;Stoffella, J. P. and Yang, X (2008)." Phytoremediation of Heavy Metal Polluted Soils and Water", Progresses and Perspectives. Journal of Zhejiang University Science, 9(3): 210-220
10. Noli, F. and Tsamos, P. (2016). " Concentration of heavy metals and trace elements in soils, waters and vegetables and assessment of health risk in the vicinity of a lignite-fired power plant", J.Science of The Total Environment.; 563–564, 377–385.
11. Sayadi MH, Rezaei MR, (2014) Impact of land use on the distribution of toxic metals in surface soils in Birjand city, Iran. Proceedings of the International Academy of Ecology and Environmental Sciences, 4, 18-29.
12. Serbula, S. M., T. S., Kalinovic, A. A., Ilic, J. V., Kalinovic, and M. M. Steharnik.(2013). Assessment of airborne heavy metal pollution using Pinus spp. and Tilia spp. Aerosol and Air Quality Research, 13, 563-573.
13. Tamara J., Mariea and George L. Carlo (2007). Wireless Radiation in the Etiology and Treatment of Autism :Clinical Observations and Mechanisms.J.AustcollNutr. &Env.MedVol .26 No.2 3-7.
14. Znad, SalimRabee, and Fadhel, MazinNazar (2020). "Environmental Impact Assessment of Soil Pollution in Industrial Zones. International Journal of Environmental Monitoring and Analysis. Special Issue: Environmental Impact Assessment of Pollution. Volume.8, No. 6, 2020, pp193-201. Doi: 10.11648/ijema. 20200806.13.
15. Znad, SalimRabee. and Al-Sinjary, MazinNazar (2020). The vital Accumulation of some Heavy metals in the blood serum of industrial zone workers in Mosul city. Plant Archive journal volume 20. Supplement 1 , 2020 .pp 3194- 3200 .