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EFFECT OF CLIMATE FACTORS ON RADIOACTIVE CONTAMINATION OF HEAVY ELEMENTS

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Abstract

The study explained the importance of climatic elements and their effect on the increase of heavy elements in Shatrah city, and their great impact on radiation pollution, where the difference of each element differs from the other. The most important elements are wind, dust storms, temperature, acid rain, air pollution and its role in environmental pollution and its negative impact on the local environment and the urban environment. We noticed the pollution of city streets more than rural streets, open areas and study results. Heavy metal concentration levels were determined using AAS after digestion of dust samples in vitro (Al-Janabi *et al*., 1992). The results showed that the concentration of some heavy metals was high in this study. The differences in the percentage of lead concentration were from (97.3) to (266) ppm. The concentration of cadmium was from (7.3) to (13.9) ppm, the range of Zn from (55) to (104) ppm, while the concentration of copper, Ni and Cu ranged from (13) to (34.1) ppm, (11.7) to (34.2) ppm and (12) to (25.4) ppm, respectively. The variation in coefficients showed that one group of metals was affected. The analysis of the component of the principle of human pollution resulted in two main components PC1 with a high load of Pb, Cd, Zn, the proposed result of industrial activities and PC2 with the contribution of Cu, Cr and Ni due to soil factors, Humanity. The environmental state of the soil was recorded by calculating geochemical loads (GLI) for each mineral. The concentration of heavy metals was significant in each element, which was shown by concentrations of the six elements studied in this study**.**
Key word **:** The AL-Shatrah city, Climate factors, The heavy metals, Environmental pollution

Introduction

Soil is the first future of many radioactive wastes and chemicals used in modern cities, where materials enter the soil and become part of a cycle that affects the lives of organisms of different species. Pollution has led to the loss of many green areas and desertification to many countries of the world. Soil degradation and pollution can result from the accumulation and accumulation of radioactive pollutants from various sources of nature, such as volcanoes, earthquakes and hurricanes, as well as elements of the climate and its effective role, including human use of pesticides and the addition of inorganic fertilizers, the most important of which are inorganic fertilizers, nitrogen fertilizers, Such as cadmium, chromium and lead. Solid waste includes disposal of waste, city waste, factory waste and low-quality, water use for irrigation such as sewage and airborne materials. Heavy metals, especially lead and cadmium, are considered as mineral elements that are not necessary for plant growth because their role is indirect in physiological functions (Ms.Grath, 1993). In some recent studies, street soils have been defined as a product of the interaction of solid, liquid and gaseous substances produced from various sources on the road and can contain unstable nuclear and radiological contaminants such as heavy metals and hazardous organic compounds. The latter is a permanent contact with the population of the cities (Xiangdong *et al*., 2001). Therefore, increased levels of heavy metals in the plant's food medium may stimulate or inhibit the absorption and distribution of the mineral elements needed for plant growth (Shrebsky *et al*., 2008). Heavy metals and other contaminants in the soil surrounding roads can reach the road through rain water. Dry and wet air deposition of vehicles, vehicle fluids, and specific emissions all add to the level of contaminants (Al-Abdullah and Abdullah, 2010; AL-Saif, 2009; Naseem, 1997).

The aim of this study was to determine the average concentrations of six metals (Pb, Cd, Zn, Cu, Ni, Cr) in street dust, which were sampled to generate information on the level of traffic associated with metal pollutants in these areas of Shatrah. Determining the effect of climate factors on radiation pollution from the impact of war, as well as the impact of human activity.

Materials and Methods

Study Area

The Shattrah is located on a branch of the Gharraf River, which descends from the Tigris River in the central Euphrates region of southern Iraq about 350 km south of the capital Baghdad at latitude 31,4175 and latitude 46,1777 and its population is 254,000 according to the statistics of 2014. And follow administratively and geographically to the province of Thi-Qar is located midway between Baghdad and the southern provinces and the Arabian Gulf. The district of Shatrah is the second largest district in Iraq, with an area of 2,384 km^2). It is administratively bordered on the east by Maysan governorate. On the west side is Al-Nasr district. On the north side is the district of Rifai and the south is Nasiriyah (Al-Eidani *et al*., 2011), Figure 1.

The primary and secondary samples (the study area) were collected during two different phases in 2017. The first campaign was in April 2017 and samples were collected from the soil surface of a 5 cm layer excavated in the entire study areas. Phase II was completed in June 2017. Dry samples were stored in PE bags while wet samples were stored after drying under the sun for two days after modeling. The operations were carried out according to the geochemical survey procedures identified by GEOSURV (Benni, 2011). According to the standard standards of the General Company of Geological Mining Survey as follows (Al-Janabi *et al*., 1992)

The Jackson method was used to calculate the concentrations of heavy metals in selected soil samples. After the modeling process was completed, the samples were segmented and about 1 g of each sample was taken in a manner that ensured that the sample was well represented. The sample is then passed through a series of stages for geochemical analysis, atomic absorption. The final analysis was conducted in the laboratory of the Department of Life Sciences at the College of Science / University of Baghdad. The following are the basic stages of sampling and preparation for final analysis according to the Jackson method (Jackson and Watson, 1997). The statistical equation is calculated:-

$$r = \frac{\frac{1}{N}\sum(X_i - \overline{X})(Y_i - \overline{Y})}{(S.D_x)\times(S.D_Y)}$$

r = Pearson's linear correlation coefficient
Xi = The first variable
Yi = the second variable
S.DY, S.DX The standard deviation of the first and second variables, respectively
The average value of the first variable

1. Grind the soil sample using a ceramic mortar after drying in an oven (100 C) for two hours.
2. Conduct the Sieving process of the ground model through sieve (0.063 mm).
3. Weight (1g) of dried sample and put in clean beaker capacity (250 ml) using a sensitive balance.
4. Assemble the sample by adding (15 ml) of HCl acid with (5 ml) of concentrated nitric acid HNO_3
5. The sample shall be placed in a sand bath for (60-45) minutes.
6. Cool the baker to the laboratory heat and add (5ml) of HCl acid and heat in a sand bath to dry and take about (10-5 min).
7. Cool the beaker and add (5 ml) of HCl and (50 ml) of hot distilled water to wash the baker sides of the dissolved sample traces.
8. Heat the mixture to boiling point for 2-3 minutes.
9. Filtration with filter paper (No. 42) Place, located in a volume bottle of capacity (100 ml).
10. Wash the insoluble precipitation with distilled water and add the wash water to the locate and complete the volume too(100ml) and then send it for analysis by Atomic Absorption to determine the concentrations of the elements under study.

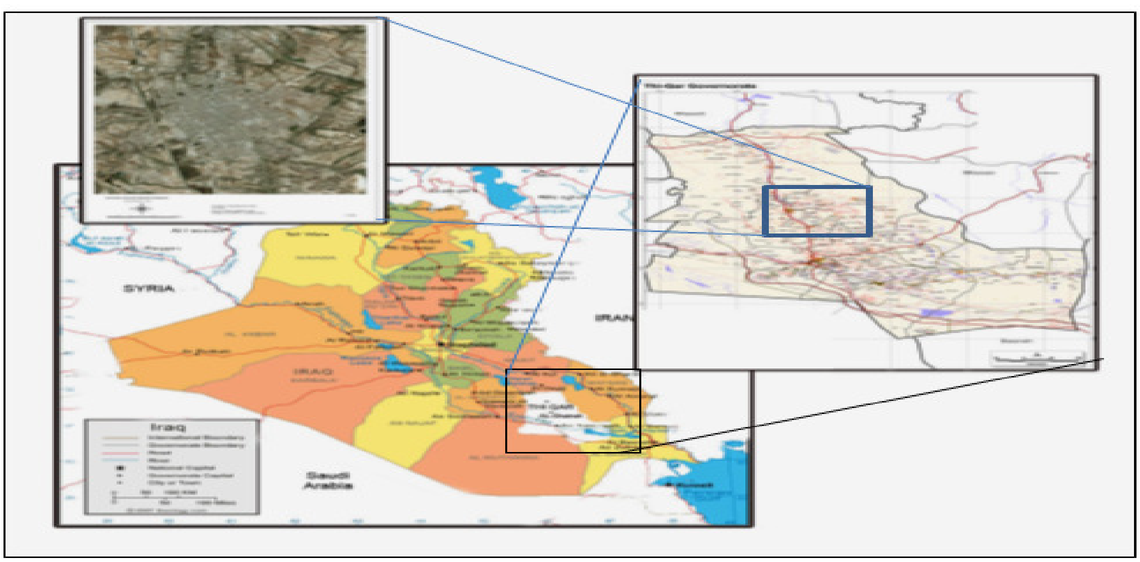

Fig. 1 : Map of the city of Nasiriyah showing a map and aerial picture of the city of Shatrah


Image (1)


Image (2)


Image (3)


Image (4)

Panel shows some area of study

Results and Discussion

The results of geochemical analysis are summarized in the Table 1 Figure 1 shows range concentration of various elements in the study area.

Table 1: concentration levels of heavy metals of dust in study area.

Locations of the study area	Symbol of specimen	The concentrations of heavy metals (ppm)					
		Pb	Cd	Zn	Cu	Ni	Co
Al-Mahkama street	St1	105	9.7	95.2	32	12	14.5
Hay Al-Moalemeen street	St2	97.3	7.3	82	13	18	19.8
Al-shomaly street	St3	102.8	10	83	15	12	12.7
Baghdad garage street	St4	202.5	11.5	90	21.8	11.9	13.9
Al-Moahed street	St5	113.7	11	72	18	17	12
Dubai street	St6	99.8	8	67	17	11.7	15
Industrial street	St7	238	13.2	78	30.4	34.2	25
Akad street	St8	202.2	12.5	98.9	23.7	32.8	21
Beny Zaid street	St9	220	13	95	21	30.1	25.4
Al-Felka street	St10	223	11.9	101.1	22	31.1	24.5
Al-Adel street	St11	200	11	97	18.7	30.7	23.6
Al-Etfaa street	St12	211.3	10	87	17.6	29.7	21.5
Al-Gensia street	St13	198	8.9	96	16	25	20.1
Hay Al-Askary street	St14	215.7	10.1	66.9	19.6	18	18
Education College street	St15	150	7	55	15.4	15.2	14
Al-shealaa street	St16	177.8	8.2	75	14.9	16.7	13.4
Al-Mealaab street	St17	201.6	9.1	67	17	20	20.5
The hospital street	St18	223	9.7	92	21	21.9	17.2
Jaleel Fotheal street	St19	252	13.9	104	32.4	25.1	16.1
Al-Haawy street	St20	266	13.5	103	34.1	26.8	21.3
Average		191.773	10.116	83.227	19.672	21.555	18.54
Lindsay, 1979		10	0.06	50	50	40	8

In this study, different residential areas, including industrial and residential, were distributed in the southern and northern areas of the city, with 20 samples by sample for each region. Six heavy elements were measured in each sample. A short symbolic name was given suitable for the study areas as shown in Table (1) Picture (1). The concentration of lead, cadmium and zinc was measured and was high in most study areas. The concentration of copper and nickel was uneven, but did not exceed the limit for global regulation of contaminated areas. Pollution in areas of the public urban system was observed, with lead and cadmium-contaminated dust falling on the surface of the roads, giving a variety of indicators of urban environmental pollution (Mashal *et al*., 2009; Culloard *et al*., 1988; Lee *et al*., 2005). In this study, high levels of lead concentration were observed in all study areas, as shown in Table 1 and Figure 2

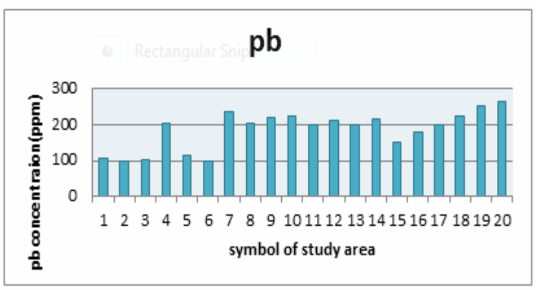

Figure 2: The concentration of lead in the dusty street of study area.

The concentration of cadmium was found in congested streets (8-13.9) ppm (10.116) above the limit (0.06 ppm) (Lindsay, 1979). (5 ppm). (Massadeh *et al*., 2006). The highest value of Cd was in the dust sample (St.19). Table (1) Figs. (3) The concentration of cadmium is increased due to the burning of plastic materials. The element of cadmium in the atmosphere that accumulates in soils close to busy streets (Baird, 2001).

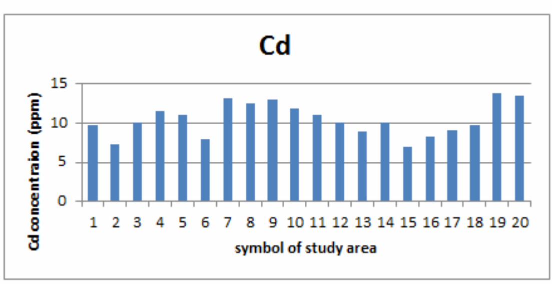

Figure 3: The concentration of cadmium in the dust street of study area.

While zinc values in soil dust (55-104 ppm) were fair (83.227 ppm) according to Table (1). Figure 4, and most zinc values were above soil limits (70 ppm) according to (Lindsay, 1979). The highest value was on the street (St.19) while the lowest value was recorded on the street (St.15). Zinc is strongly correlated with Cd, Cr, Cu, Ni and Pb elements, organic matter and clay ratio. The relationship is positive with these elements due to their origin from the basic igneous rocks, exposure to different sedimentary rocks and the effect of human activities (Al-Saady, 2008).

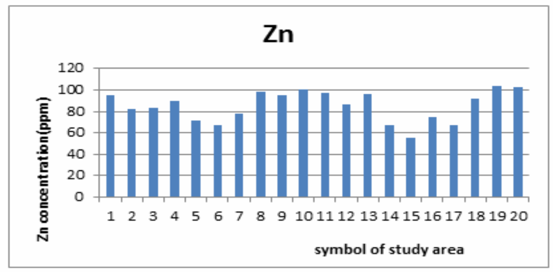

Figure 4: The concentration of Zinc in the dusty street of study area.

The copper concentration in Shattrah Street soil was 13-34.1 ppm at an average of 19.672 ppm. The concentration of copper in this study was less than 50 ppm according to (Lindsay, 1979) in all fields Areas of study and Figure (5). Note the presence of the copper element in the crystalline structure of primary and secondary soil minerals. It has a relationship with organic matter in the soil, and its low percentage in the body leads to osteoporosis and anemia, while its increase leads to copper poisoning (Saeedi *et al*., 2009).

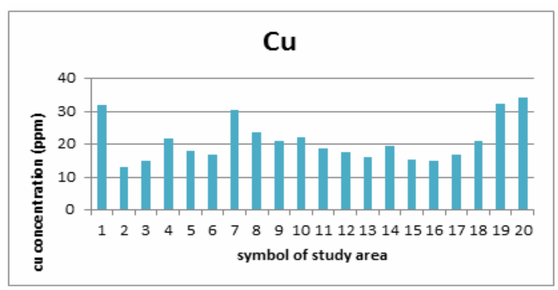

Figure 5: The concentration of copper in the dusty street of study area.

The values of the average element of nickel in this study were 21.555 ppm. These values allowed less than the permissible limits for the contaminated areas of nickel in all soil, soil, dust did not exceed the contaminated soil limits (40 ppm) according to (Lindsay, 1979) Fig. (6). It is known that the causes of pollution resulting from untreated or non-filtered emissions from combustion and burning types will carry different trace metals.

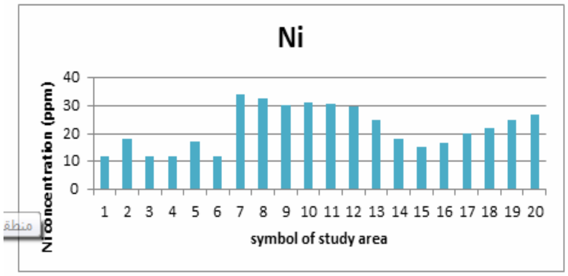

Figure 6: The concentration of Nickel in the dusty street of study area.

From Table (1) and Figure (7), the concentration of the cobalt element recorded a higher than the allowable level of polluted soil (Aubert and Pinta, 1977). The increase in the concentration of cobalt in the soil is due to various reasons, including: soil origin and formation, weathering processes, wastewater and human activities (Al-Maliky, 2005).

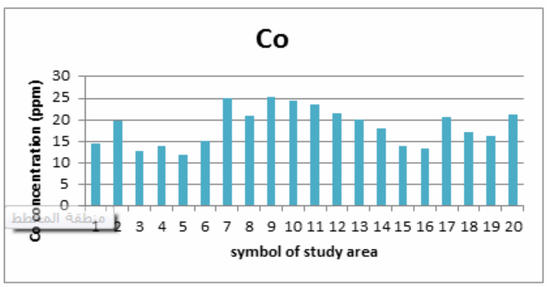

Figure 7: The concentration of Cobalt in the dusty street of study area.

Note from Table (2) that the concentration of heavy metals is higher than the limits allowed for previous studies. The high concentration of street dust in some cities (Aziz, 1995) is due to its values ranging from 97.3 to 266 ppm. In addition to the use of fuel containing lead compounds $(CH_3)_4$ or lead $(C_2H_5)_2$, It even contains lead halides such as $PbBr_2$, Pb (PbOH) Br, or (PbO_2) with Birkel as well as halides of ammonium lead PbBrCl. NH_4CL (Yesilonis *et al*., 2008), from specific studies (Yeimglu and Ercan, 2008)

Table 2 : Global studies of individual Pb, Cu and metals concentration of dust in urban residential areas in major cities and places (Yeimoglu, 2008)

No	Place / city	Cd (ppm)	Cu (ppm)	Pb (ppm)
1	New York	8	355	2582
2	London	6250	61	413
3	Hong Kong	0.01	92	208
4	Madrid	0.01	188	192
5	Amman	2.5	69	219
6	Oslo	1.4	123	180
7	Bahrain	72	0.01	152
8	Lancaster	3.6	75	1090
9	Seoul	3	101	245
10	Taejon ,Korea	0.01	47	60
11	Jordan	0.01	1.8	115

Table 2 shows comparative results for Pb, Cd and Cu levels in ppm of dust in urban areas of major cities. According to the environmental statement. The level of pb concentration of dust in urban residential areas is 5 ppm, however, in Malaysia (Mohamad *et al*., 2011), the level of Pb was recorded at 35 ppm Dust from Main Street and Jordon (Mashal *et al*., 2009). The level of Pb (115 ppm) was recorded and recorded at 400 ppm in the dust of the main street in Europe.

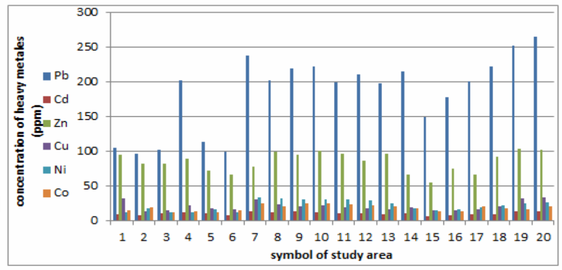

Figure 8: The concentration of heavy metals in the dust street of study area.

In this study Table (1), Fig. 8 shows values of pb concentration levels higher than the EPA standard. This is due to traffic congestion and the large number of cars and workshops nearby on the streets in addition to the lack of vegetation that helps to stabilize the soil and plants absorb some heavy elements of soils as well as the withdrawal of a large amount of carbon dioxide from the atmosphere, which has a role in the formation of acid rain And its impact on soil so it is necessary to take care of the environment from environmental pollution and to human by educating the community about the impact of pollution, the community aspiration to solve this problem mainly through the construction of car garages large distance from the residential areas of the dust Cars and human health Awadamha Taterhaaly and the environment, Dust particles are one of the sources of air pollution in solid particles. They transport dust and dust in the air and thus to land, whether outside or within the areas and green spaces within the city, especially that the city suffers from a lack of green areas and a few trees. The sand dunes are not paved due to the development of new residential cities and summer months are the most frequent months in which the city to the dust storms due to high temperatures and instability of the weather caused by local thermometers which The local wind, which in turn causes soil erosion.

Conclusions

- Soil pollution is due to human activities in addition to the concentration of elements in the soil.
- Climate elements, especially wind, dust storms and high temperatures, are considered to be factors contributing to environmental pollution.

- Pollution of heavy elements in nearby areas in residential areas and areas where traffic is high.

Recommendations

- Set up a green belt around the cities, especially near the car garage and blacksmith workshops to reduce the spread of dust and gases to the atmosphere.
- Educate citizens through the media to know the seriousness of environmental pollution and its most important sources.

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