J. Int. Environnemental Application & Science, Vol. 3 (3): 180-185 (2008)

The level of concentration of lead, zinc, cadmium and nickel in urban soil of 2 Korriku, Kosova

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Received June 2, 2008; Accepted June 24, 2008

Abstract: This study investigated the concentration of heavy metals at "2 Korriku" quarter of Mitrovica, in Kosova. The "2 Korriku" quarter where the studying took place is situated near the Mitrovica Industrial Park and the Zveçani metallurgy landfill (waste disposal place) that comprise the main source of pollution. The studying extracts the level of urban soil pollution with metals of lead, zinc, nickel and cadmium. The determination of heavy metals was executed with the spectrophotometer method of atomic absorption SAA, at Kizhnica laboratory. The results of the analysis confirm that the contamination with heavy metals is enormous. The largest contamination is from lead (4,650mg kg^{-1}) and from zinc (4,700 mg kg^{-1}).

***Key words**: heavy metals, urban soil, pollution, 2 Korriku*

Introduction

Mitrovica is one of the most endangered locations from the heavy metal pollution in Kosova. The largest pollution is within the city itself, where there are situated industrial buildings of the lead and zinc refinery, accumulator (battery) factory and the landfills of industrial waste. The environmental pollution from industrial buildings presents a great danger for Mitrovica, even today that chemical industries are no longer active. Since there are no substantial records from 1999, that present the effects of chemical industry and heavy metals at the urban soil, our study would be a reflection of the current situation of the urban environment in Mitrovica. The studying took place at the "2 Korriku" quarter, which is situated between two landfills of industrial waste, Zveçan landfill and the Industrial Park landfill in Mitrovica. "2 Korriku" quarter covers a surface of 20.4 ha of land, positioned in the central and north-eastern part of Mitrovica city.

Industrial buildings being those abandoned are the source of soil pollution of various substances (Filipoviq,Lipanoviq,1995). The depth of the substance penetration in the soil is usually up to 20 cm. but there are also cases where this depth reaches up to 160 cm (Çullaj, 2005).

The studying includes the sample taking to the depth of 30 cm. at ten points within 20.4 ha of the neighbourhood, in order to determine the part of the surface where the contamination is maximal. A part of this soil is covered with another land stratum carried out by International Military Forces in 2000; therefore, the examination carries also the pollution comparison of both soil surfaces.

Materials and Method

The samples are taken in various depths of the soil to valuate the deposition of contaminated substances in it. During our research every third sample is taken to the depth of 30 cm. The first sample from the surface is taken at the depth of 10 cm, the second from 20 cm and the third one at 30 cm deep. In general there were 16 samples taken in order to analyse the following elements: lead, nickel, cadmium and zinc. Each sample is placed in a plastic bag

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labelled with the sample code. The weather conditions were with humidity and the land was frozen. The following Figure 1 illustrates the place where the samples are taken.

The care for drying the soil samples (Çullaj, 2005) is understandable if we have in mind the development of microbiological activities in them. Often, soils are dried at the room temperature for at least 24 h. In our case the samples are dried in electrical ovens for approximately 4 hours at the temperature of 150 °C. Following the process of drying the samples were ground in order to gain original grains of its components. Before the grinding took place the samples were sieved at the 150 MiC. sieve.

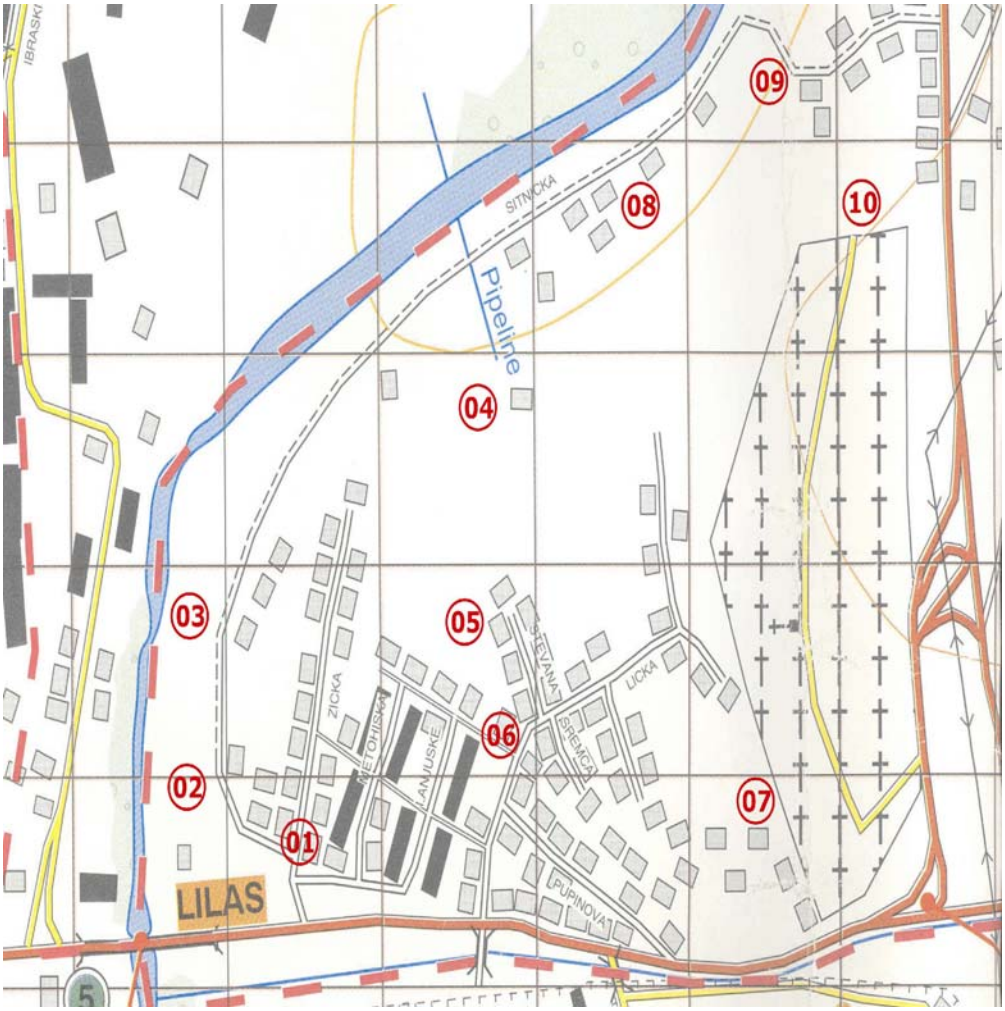

Figure 1. Figurative presentation of the place where the samples are taken in the "2 Korriku" quarter.

Since, the concentration of the contaminated substances is higher in smaller grains than in bigger ones, consequently, the grinding of the sample up to the homogeny material was done for preparing the sub samples for chemical analysis, given that during the grinding and sieving there could be a separation in fractions due to sizes of grains. Because the smaller grains tend to drop underneath the bigger grains, in order to eliminate this problem we have used the standardised method of taking the sub samples through the procedure of repeated quaternion (Çiriq,Vajgan , 1986). After the grinding and homogenising the samples at the analytical scale there were weighed 2 g. of each sample. Next to the weighing this quantity of soil, which was previously cleaned, was placed to Erlenmeyer. We prepared the royal water (HNO_3:HCL=1:3) and we took through cylinder 30 ml. of solution which we added to each of the samples and we placed them at the sand bath up to baking (2-3 hours), so that the previous desegregation would

occur from the added royal water. After the baking there were also added 10 ml of HCl until the samples were dried. Subsequently to these dried samples there was a proceeding with 10 ml HCl and 50 ml of distilled water. Through filters the samples were filtered in bottle flasks and after were levelled with 100 ml of distilled water. This way the samples were prepared for analytical method, Atomic Absorption Spectrometry (Method Manual, ISSME 3-01).

For each element following the optimization of relevant conditions like the wavelength, position of the lamp, position of the burner, the type of flame and the width of spectral crack the weighing of standard solutions absorptions took place and the working curve gradient was built (Institute for Nuclear Science,1981), and also the parameters of lead, zinc, nickel and cadmium were calculated.

Results

Results of heavy metal analyses are given in the following Table 1:

Table 1. Concentration (mg/kg) of heavy metals Pb, Zn, Cd and Ni in soil samples.

Sample	Pb (mg/kg)	Zn (mg/ kg)	Cd (mg/kg)	Ni (mg/kg)
1	1700	2800	200	233
2	700	500	25	103
3/ 01 Depth 10cm	300	600	14	174
3/02 Depth 20cm	400	600	35	179
3/03 Depth 30cm	400	700	28	165
4	700	3300	109	178
5	1500	4700	85	136
6/01 Depth 10cm	4650	2800	38	111
6/ 02 Depth 20cm	200	2900	109	147
6/ 03 Depth 30cm	240	2000	52	116
7	400	4300	57	146
8	500	4382	36	79
9/ 01 Depth 10cm	800	1200	29	107
9/02 Depth 20cm	600	800	19	104
9/03 Depth 30cm	300	600	61	126
10	300	300	42	118

The standard levels of heavy metals in urban soil are as follows: Pb 300 mg/ kg, Cd 39 mg/ kg, Ni 420 mg/ kg, Zn 2800 mg/ kg

Discussion

The Figure 2 illustrates the concentration of lead in mg/kg soil from the taken samples for studying. From the gained results we come to a conclusion that the concentration of the lead in "2 Korriku" quarter is enormous. The largest pollution is noticed at the surface layer. Only at the samples three and six the concentration of the lead at the depth of 20 cm. and 30 cm. varies. The differences amongst values are clearly shown at the diagram presented at Figure 2.

The Figure 3 gives the concentration of zinc in mg/kg soil from the samples. Due to results we establish that the pollution with zinc at the samples 4, 5, 6, 7 and 8 is above the values of allowed standards.

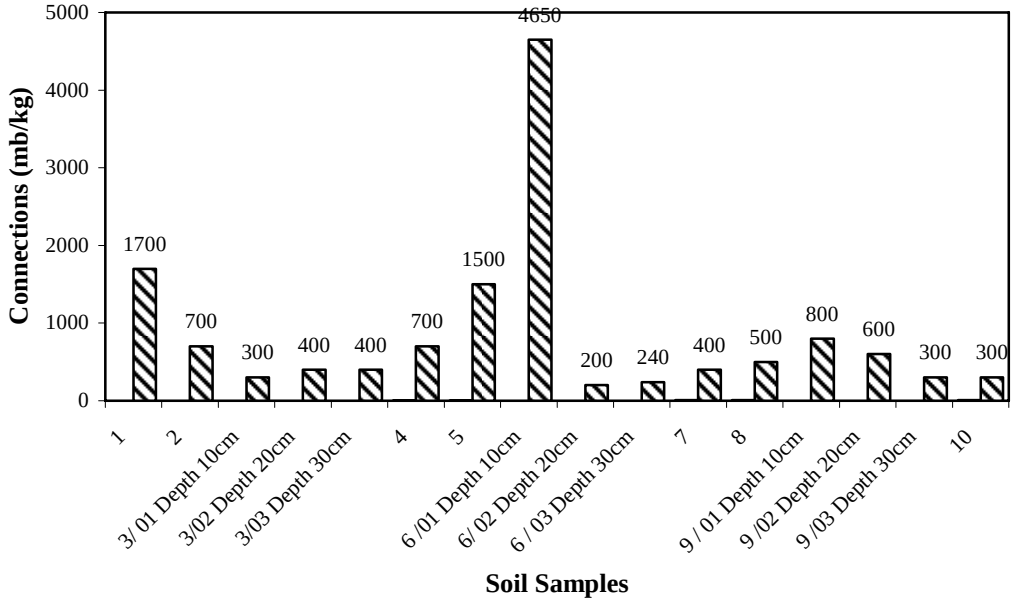

Figure 2. Lead concentration of soil samples

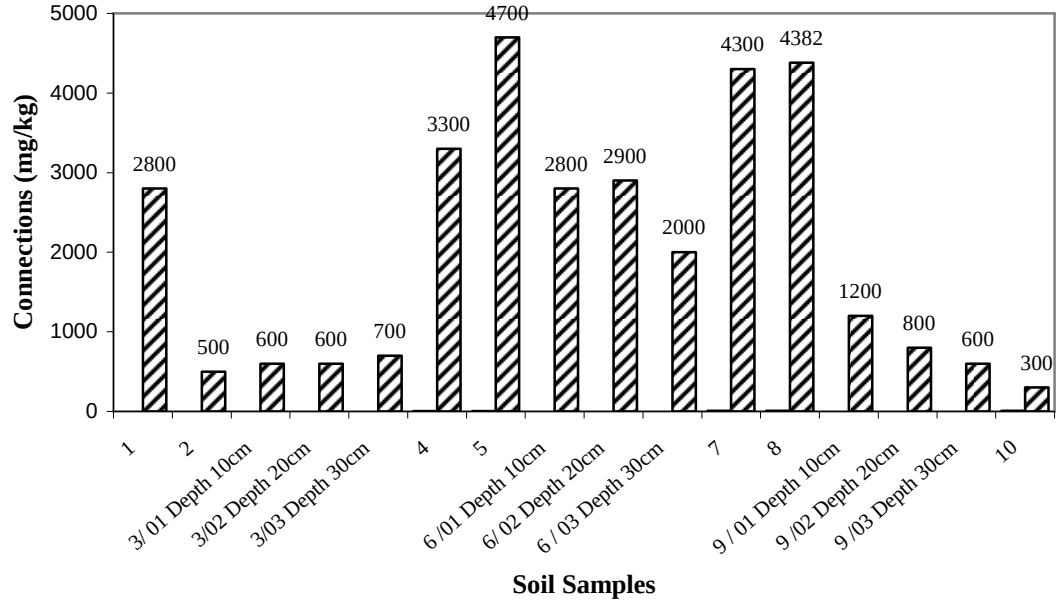

Figure 3. Zinc concentration of soil samples

The Figure 4 gives the concentration of cadmium in mg/kg soil from the samples. Due to results we establish that the pollution with cadmium at the points 1, 4, 5, 6, at the depth 02 and 03,7 and 9 at the depth 03 is above the values of allowed standards.

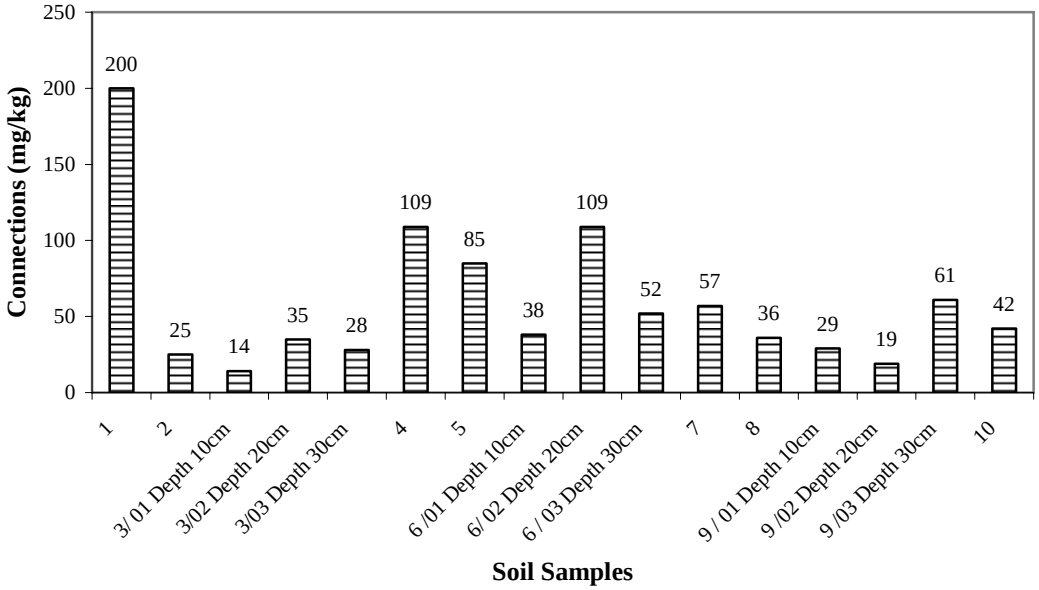

Figure 4. Cadmium concentration of soil samples

The Figure 5 gives the concentration of nickel in taken samples. Due to the results presented at figure 5 we establish that the concentration of the nickel in samples is at the values of allowed.

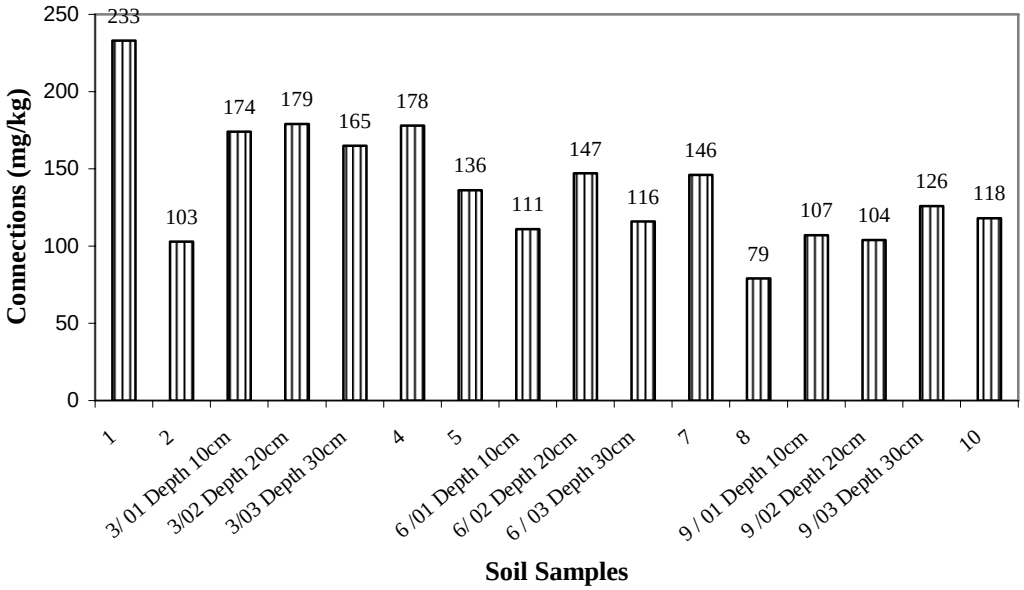

Figure 5. Nickel concentration of soil samples

Conclusion

By finishing the research we conclude that the pollution with heavy metals of lead, zinc, and cadmium in urban soil at "2 Korriku" quarter is huge. The largest concentration of contaminants is on the surface layer of the land and at the part near Prishtina- Mitrovica highway, which is frequented by a large number of vehicles. Another characteristic of the

pollution at this part is also the wind direction that blows at the south- north direction, and carries the dust of metallurgy waste of both depositories of the Industrial Park in Mitrovica and Zveçan.

Because there was no compacting and regular covering of the waste, these landfills continue to be the environmental polluters. The location of this quarter is positioned downwards the river Sitnica that is also thought to be contaminated with heavy metals.

During the research there was a comparison done between the soil layer laid by International Military Forces in the year 2000 and the other layer of the land in this quarter. Due to the results it was concluded that at the surface with the depth of 30 cm there is more contamination than in the surface layer, this comes as a consequence of previous non treatment of the land before covering with a new layer of the soil.

Another problem that deepens the environmental pollution at this part is also the illegal collection and liquefying of metals from the inhabitants of this neighbourhood (mainly lead).
By finalising this study we came to a conclusion that there are several options that in future these polluters would be eliminated or reduced up to the limit of allowed values:

1. Rehabilitation of the land through minimising the dissimilative part of heavy metals (Friberg , Nordberg , Vouk ,1986) like Pb, Zn, Cd and Ni. This method would be realized if the land is treated with CaCo3 to reach the pH-7 or higher.
2. Rehabilitation "in situ" (in depth) of the land through adding the chemical substance solutions during the watering that may extract the heavy metals and remove them through the drainage system.
3. Both industrial landfills to be covered with plastic foils in order to protect the environment from pollution.
4. Covering of the contaminated land with a healthy soil layer up to 1m. thickness. (Lambert, Leven, Gram , 2000)
5. Land vegetation.

References

Çullaj A, (2005)*Chemistry of Environment,* University of Tirana,Pp. 189-200

Filipoviq I, Lipanoviq S, (1995) *Inorganic Chemistry, University of Zagreb.*

Friberg L, Nordberg GF, Vouk VB, (1986)*Handbook on the Toxicology of Metals,* Vol.II: Specific Metals.2nd Edition, Amsterdam.

Lambert M, Leven A, Gram R, (2000) *New Methods of cleaning up Heavy Metals in Soil and Water,* Northeast Hazardous Substance Research Centers, New Yersy.

Institute for Nuclear Science (1981), *Atomic Absorption and Emission Spectrometry , University of Beograd.*

Çiriq J,Vajgan P, (1986) Analytical Manual, RAD-Beograd.

Atomic Absorption Spectrometry, Method Manual, ISSME 3-010101, Thermo electron Corporation, Cambridge, Solar House.