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Evaluating Of Water And Sediments Pollution With Heavy Metals In Huwaiza Marsh Southern Iraq.

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ABSTRACT

This study was conducted to evaluate the pollution potential that could be occurring in the marshland area of Huwaiza in both soils and sediments of this study. Twenty-one samples were taken from soils adjacent to the marshland water body and twenty-five samples were taken from sediments of the marshland bed of Huwaiza. Results showed that there was a contamination in some heavy metals in soils adjacent to marshlands besides, there was more contamination in sediment of marshland beds. Sediments were more contaminated because of the continuous addition of these heavy metals imported from discharges of wastes to the river Tigris that ends up to this marshland water surface. Thus, it confirms that there is a potential contamination of heavy metals especially in sediments rather than soils. These concentrations needs to pay more attention and considerations to either keep the low level of heavy metals or keep them even lower.
Keywords: water, sediment, pollution, heavy methals

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INTRODUCTION

Huwaiza marsh is considered as the biggest inland marsh in the south of Iraq, it busies 3000 Km2 during flood and rainfall season, while this area shrinkage to 650 Km2 in dry seasons (Brasington 2002, Al-Handal and Abdullah 2010). The biggest part of this marsh is located to the east cost of Tigris in Umara province and to the north of Basrah province and it is considered as a part of RAMSAR international site (Naff and Hanna 2003, Stevens 2007). Marshlands in Mesopotamia is considered as a natural habitat and reserve for broad spectrum of biota (Alhilli et al 2009, Richardson et al. 2005, Richardson and Hussain 2006).

Soil anywhere on this globe is the natural habitat of urban and suburban environments in different human activities (Goudie and Viles 2013). And at any rate, soil management is the key of soil quality in these environments (Doran and Parkin 1994). Technical procedures that reveal these activities and explain the degradation of soil were put by different methodologist (Ingram et al. 2010, Okoro et al. 2012).

Activities of human beings could across to a positive management of soil that guarantees agricultural land protection other than the urban lands, and that would protect the multiple functions of society from being sabotaged due to the wrong application of soil management practices (Young et al. 2005, Henle et al. 2008). Human being activities might discharge heavy metals with wastes to the natural resources in the ecosystem (Zhou at al. 2008, Dixit et al. 2015).

Water contamination is defined as any direct or indirect physical or chemical change in water quality that affect the biological activities and water uses (McDonnelle and Pickett 1990, Vorosmatry et al. 2004).

Chemical pollution of water resources has a severe impact on human health that faces the human societies (Gleick 1998). These effects could across the toxicity of heavy elements that could be classified into dissoluble and accumulative in soil, plant, and human body (Wuana and Okieimen 2011, Raikwar at al. 2008).

Contamination with heavy metals could be resulted from different reasons. Soil management practices can be one of these reasons such as applications of pesticides and herbicides, fertilizers, and some other specific practices such as application of amendments and enhancers to soil (Arias-Estevez et al 2008, Tan et al. 1993)

In another hand, source of contamination in soil and water by heavy metal could be related to the parent rocks and raw materials that soils formed from (Alloway 2013, Chen et al. 2005). Therefore we can relate sources of pollution to biosphere, lithosphere, atmosphere, and hydrosphere (Brower et al. 1998, Meybeck 1983).

Pollution then is considered as one of the most complicated environmental problems, and once it happens, solutions will be very difficult to reveal the problem (Edwards 2013).

The goal of this study is to evaluate the condition of heavy metal levels in sediments and water of marshland area namely Huwaiza marshes and to see if any contamination in these metals might occur.

MATERIAL AND METHODS

Location of samples:

Twenty one soil samples and other twenty five more sediment samples taken from the marshbed were taken from the area of Huwaiza in Umara and Basra south of Iraq as shown in fig (1).

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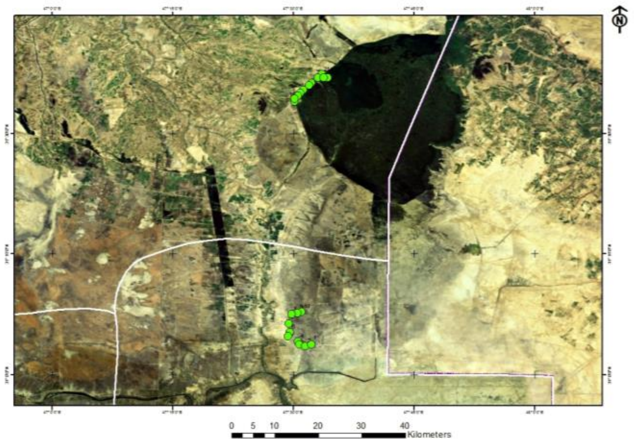

Fig 1: soil and sediments samples, Huwaiza marshland

These sa mples were collected from the soils surrounding and adjacent to the marshlands and from the ground of the marsh itself as they are soaked all the time with the water of the marsh.

Laboratory works:

Laboratory works included measuring heavy metals in the collected samples where these metals are: Lead (Pb), Cobalt (Co), Nickle (Ni), Cupper (Cu), Cadmium (Cd), and Zink (Zn). These elements were determined according to Hesse 1971.

RESULTS AND DISCUSSION

Table (1) shows the results of heavy metals analysis (ppm) of soils taken from areas surrounding Huwaiza marshland in Umara and Basrah provinces south of Iraq.

Table 1: heavy metals concentration (ppm) in soils adjacent to marshlands

Soil Sample num.	Soil Sample location/ coordinates	Pb	Cd	Ni	Co	Zn
		PPM				
Huwaiza/ Basrah Province						
So.1	N: E:	85.49	2.575	U.D.L	17.655	44.46
So.2	N: E:	63.61	1.72	U.D.L	U.D.L	45.58
So.3	N: E:	85.12	2.70	U.D.L	U.D.L	56.66
So.4	N: E:	78.98	3.995	U.D.L	10.705	45.40
So.5	N: E:	69.22	0.87	U.D.L	16.76	104.2
So.6	N: E:	84.22	1.60	U.D.L	7.81	40.09
So.7	N: E:	52.14	3.955	U.D.L	17.54	69.28
So.8	N: E:	64.88	2.16	U.D.L	U.D.L	133.2

So.9	**N:** **E:**	**17.16**	**1.48**	**U.D.L**	**4.45**	**81.03**
So.10	**N:** **E:**	**68.68**	**3.315**	**U.D.L**	**10.275**	**69.64**
Huwaiza/ Umara Province						
So.11	**N:** **E:**	**49.16**	**4.78**	**U.D.L**	**23.515**	**71.07**
So.12	**N:** **E:**	**47.53**	**0.58**	**U.D.L**	**U.D.L**	**114.6**
So.13	**N:** **E:**	**35.78**	**1.59**	**19.18**	**3.91**	**73.55**
So.14	**N:** **E:**	**70.215**	**2.00**	**U.D.L**	**22.425**	**70.14**
So.15	**N:** **E:**	**88.74**	**2.22**	**43.37**	**U.D.L**	**122.2**
So.16	**N:** **E:**	**44.19**	**4.44**	**U.D.L**	**32.425**	**95.63**
So.17	**N:** **E:**	**49.70**	**1.94**	**85.49**	**16.95**	**104.7**
So.18	**N:** **E:**	**11.38**	**1.35**	**55.89**	**U.D.L**	**48.09**
So.19	**N:** **E:**	**61.44**	**1.16**	**U.D.L**	**4.22**	**95.55**
So.20	**N:** **E:**	**83.14**	**1.655**	**U.D.L**	**28.83**	**88.47**
So.21	**N:** **E:**	**61.26**	**U.D.L**	**8.51**	**1.17**	**90.30**
WHO 2003		**300-50**	**5**	**75-30**	**10**	**300-150**

Levels of lead concentration were ranging from 17.16-85.49 ppm in the soil samples taken from Basrah, while it ranged from 11.38-88.74 ppm in soil samples taken from Umara. These levels referred that they are exceeding the minimum level of allowed concentration of lead in soil according to WHO 2003 which it should be between 50-300 ppm, although they were considered as being the allowed range of lead concentration with no potential of contamination in that element where they should exceed 600 ppm to be considered contaminated (WHO 2003, and Medhavan et al 1989).

Levels of Cadmium concentration were ranging from 0.87-3.995 ppm in the soils samples taken from Basrah, while they were ranging from 0.58-4.78 ppm in soil samples taken from Umara. These levels were considered low when compared to the allowed levels of WHO 2003 which is 5 ppm in soil, although these levels refer to a potential of contamination with that element (Cd) (WHO 2003, De Vries et al. 2007).

Nickle concentration in soil samples were ranging from UDL- 85.49 ppm, where it exceeded the limits of allowed concentration in soil according to WHO 2003 which is 30-75, and soil will be contaminated when this element is above 100 ppm. Thus, soils is not considered contaminated, but they are under a pressure of potential contamination to this heavy metal which needs some protection procedures to prevent that to occur (Hutchinson and Whitby 1974, Holmgren et al. 1993). The possible increase of that element in soil could be related to some human activities the certain locations because this element did not show exceeded concentration in all locations (Zhang et al. 2009).

Cobalt showed some contamination in soil samples, where levels of this element were ranging from UDL-17.655 ppm in soil samples taken from Basrah and from UDL-32.425 ppm in soil samples taken from Umara. The allowed level of this element is 10 ppm according to WHO 2003. That confirms that some of these samples are over contaminated with this heavy metal. The source of this metal in soil could be related to the origin of parent material, weathering processes, and most likely to human activities such as wastes and drains (Alloway 2013, Krishna and Govil 2005).

Zink levels in soil samples collected from Basrah was ranging from 40.09-133.2 ppm while it was ranging from 48.00-122.2 ppm from samples of soils taken from Umara. The allowed level of this element is ranging from 150-300 according to WHO 2003, and that refer to no contamination status in these samples.

Cupper was showing under level of determination concentration, that's why it was not mentioned in table (1), and that refers to no contamination in samples.

Sediments were also tested for the same content of heavy metals (ppm) and table (2) shows the results of them in both locations Umara and Basrah.

Table 2: heavy metals concentration (ppm) in sedimentsofmarshbed

Sediment sample num	Sediment sample location/ Coordinates	Ni	Co	Cd	Cu	Pb	Zn
		PPM					
Huwaiza/ Basrah Province							
Sed.1	N 31 03 49.8 E 47 32 12.6	66.5	15	U.D.L	17.5	4	78.79
Sed.2	N 31 03 31.1 E 47 31 28.0	62	12.5	U.D.L	15.5	U.D.L	115.12
Sed.3	N 31 03 52.2 E 47 30 40.3	62.5	15	U.D.L	14.5	U.D.L	62.95
Sed.4	N 31 04 4.1 E 47 30 35.8	65	14.5	U.D.L	13	U.D.L	231.35
Sed.5	N 31 04 43.1 E 47 29 24.6	112	21.5	U.D.L	23.5	1.5	85.7
Sed.6	N 31 05 14.6 E 47 29 33.5	82.5	16.5	U.D.L	15	U.D.L	41.92
Sed.7	N 31 06 23.7 E 47 29 25.3	93.5	16.5	U.D.L	17	U.D.L	71.44
Sed.8	N 31 07 27.9 E 47 29 48.1	89.5	18	U.D.L	18.5	U.D.L	50.12
Sed.9	N 31 07 39.3 E 47 30 31.1	92.5	18.5	U.D.L	24	U.D.L	126.02
Sed.10	N 31 07 45.3 E 47 31 01.8	90	18.5	U.D.L	19	U.D.L	62.21
Huwaiza/ Umara Province							
Sed.11	N 31 36 54.8 E 47 34 26.1	165.5	34	U.D.L	38	9	42.09
Sed.12	N 31 37 01.4 E 47 35 07.6	43.5	9.5	U.D.L	26	U.D.L	44.55
Sed.13	N 31 37 18.2 E 47 36 37.4	33	9.5	U.D.L	11	U.D.L	16.89
Sed.14	N 31 37 18.2 E 47 39 20.5	39	8	U.D.L	15	U.D.L	26.08
Sed.15	N 31 37 04.8 E 47 39 53.4	41	10.5	U.D.L	10	U.D.L	40.23
Sed.16	N 31 36 50.8 E 47 40 22.1	23.5	5	U.D.L	7.5	U.D.L	66.76
Sed.17	N 31 36 44.8	87.5	19	U.D.L	28	1.5	100.21

	E 47 40 35.3						
Sed.18	N 31 35 25.2 E 47 31 16.3	89	18	U.D.L	27	3	62.93
Sed.19	N 31 34 44.1 E 47 30 38.2	110	22.5	U.D.L	35	7.5	146.65
Sed.20	N 31 34 08.4 E 47 30 08.7	105.5	21	U.D.L	32.5	3	147.03
Sed.21	N 31 33 58.4 E 47 30 05.8	113.5	23	U.D.L	30.5	5	107.13
Sed.22	N 31 33 51.8 E 47 31 09.2	75	16.5	U.D.L	19	U.D.L	112.68
Sed.23	N 31 32 04.2 E 47 33 32.5	56.5	12.5	U.D.L	19	U.D.L	109.95
Sed.24	N 31 32 43.3 E 47 35 33.1	92	18	U.D.L	18	1.5	137.84
Sed.25	N 31 32 44.5 E 47 36 03.7	54.5	10	U.D.L	14.5	U.D.L	46.92
WHO 2003		75-30	10	5	50-140	300-50	300-150

This table (2) shows that some of the heavy metals concentrations were higher than in soil, such as (Ni, and Zn) and that increase could be related originally to their increase in marsh waters the matter that they appeared more in marsh bed sediments. Where heavy metals increase could be related to the human activity occurring in the area as an industrial and agricultural waste discharged to river water bodies that's ending up to these water bodies. Also, bioactivity represented by plants, algae, and microorganisms, remove heavy metals through uptaking them to their bodies the matter that results in increasing these elements concentrations in marsh bed sediments (Oliver 1973, Huang and Lin2003). Cobalt showed some increase above the allowed limits of this element levels (WHO 2003) which is considered as contaminated sediments with Co.Also, Cupper showed more concentrations in sediments that in soil samples although it showed no contamination due to the WHO 2003.

The changes in sedimentation conditions of this marshland.It is considered as low level water body and had faced in the past a fast process of drying the matter that could affect the content of most elements distribution in sediments.Besides the water scarcity problem that is facing the whole area, all these factors could be affecting the marsh system including total elements distribution (Gambrell 1994, Masscheleyn and Patrick 1998).

Figure (1) shows the distribution of heavy metals in soil samples taken from Huwaiza marshland. Zink, lead, and cobalt showed highest concentrations in soil samples, while Nickel and Cadmium showed less concentrations.

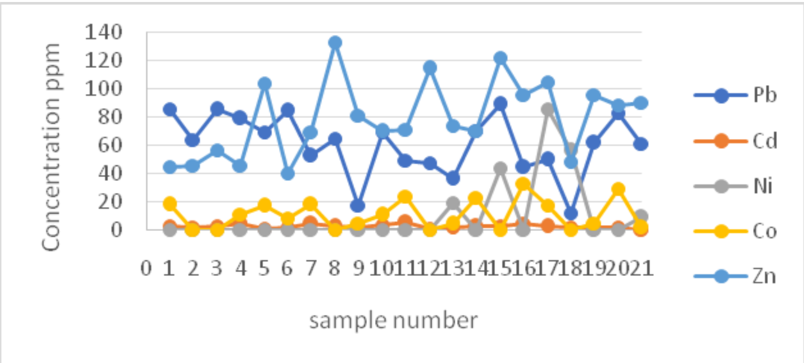

Figure 1: concentrations of heavy metals in soil samples

Figure (2) shows concentrations of heavy metals in sediment samples collected from marshland bed.

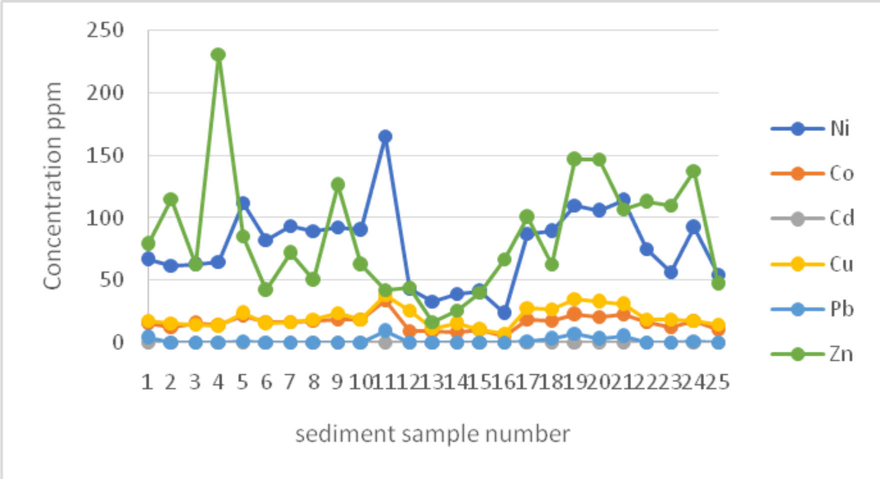

Figure 2: heavy metals concentration in sediments

This figure (2) also shows that zinc and nickel concentration in sediments was the highest followed by copper and cobalt then lead and cadmium. Both figures 1 and 2 shows that there was a differences in concentration of heavy metals in soil and sediments samples.

CONCLUSIONS

Results showed that there was a contamination in some heavy metals in soils adjacent to marshlands besides, there was more contamination in sediment of marshland beds. Sediments were more contaminated because of the continuous addition of these heavy metals imported from discharges of wastes to the river Tigris that ends up to this marshland water surface. Thus,it confirms that there is a potential contamination of heavy metals especially in sediments rather than soils. These concentrations needs to pay more attention and considerations to either keep the low level of heavy metals or keep them even lower.

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