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Monitoring of Some Heavy Metals Transboundary Air Pollution

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Abstract: After the restoration process in Southern Iraq a few studies have applied Marshland to investigate heavy metals in this study had taken place during The study was conducted during December 2017 in six mainly stations from Iraqi Marshlands to assess these elements 'TSP' and heavy metals such as zinc, copper, iron, cadmium, lead, nickel, mercury and manganese are of the most serious problems facing humanity and other life forms, results had been variations concentrations in air samples, so that, the region free from major industrial sources of air pollution as well as lower daily use of the vehicles. As for the remaining minutes were not more than half the permissible limits within the national determinants of Iraq. Released to the weather environment from a range of natural sources and trans boundary long term air pollution due to of their potential for global atmospheric and persistence, transfer and evaluates the potential health risks in Iraqi Marshland in region surrounding it. It has been evaluating a number of elements in the air and the possibility of how to release it to the environment and determine the proximity to these elements to humans and the possibility of health risks and the potential impact on human.

Key words: Iraqi Marsh, monitoring, heavy metals, air pollution, environment, proximity

INTRODUCTION

Marshes are transitional districts between terrestrial and aquatic systems where water table near or above the land surface have many of the important functions that benefit human and wildlife and plants (Anonymous, 2002; Richardson and Hussain, 2006). Iraqi marshes considered as a filter and store water on ecosystems, collected flood waters beside places of beauty and many recreational activities also plants found in wetlands to help control water erosion once covered an area (20,000 km^2) and it extends between the three Iraqi cities of Amarah in the North, Basra in the South, Naseriyah in the West. AL-Huweizah Marshlands are located in Southeastern Iraq but also extend across the border into Iran. It lies to the east of the Tigris River (Anonymous, 2016).

Most of the water that supply the marshlands coming from the Tigris and Euphrates Rivers with some input from Al-Huweizah Marsh (Anonymous, 2002). Heavy metals are natural constituents of all environments in which heavy's of all heavy metals are found in fresh water, sea water, aquatic and marine organisms and sediments (Wind-Mulder *et al*., 1996). Heavy metals input may derive from a number of natural and anthropogenic sources. Among anthropogenic sources for several potentially toxic heavy metals such as lead and cadmium are sewage, waste water effluent, power plants water discharge, auto emission, petroleum and petrochemical industry wastes, storm drain outfalls and solid waste landfills (Partow, 2001). Heavy metals are a general collective term which applies to the group of metals and metalloids with an atomic density greater than 4 or 5 g/cm^3. Although, it is a loosely defined term (Lasat, 2000; Duffus, 2002).The heavy metals which are included in APIS are cadmium, chromium, copper, mercury, lead, zinc, arsenic, boron and the platinum group metals which comprises platinum, palladium, rhodium, ruthenium, osmium and iridium. Unlike almost all organic pollutants, such as organ chlorines, heavy metals are elements which occur naturally in the earth's crust (Bradl, 2005). Air quality monitoring has typically by elements to provide an accurate description of the total concentration of all pollutants for these reasons used to assist in air quality monitoring of wetland areas. The geographic information system has many advantages of monitoring air quality on a citywide scale. The major sources of air pollution and distribution pattern to assist and determine the effort should be focused to decrease and increase level of pollution and determine any relationship between the city features and air pollution distribution (Wan *et al*., 2016a, b; Dehghan, *et al*., 2018). The factor that signifies whether a city has an advanced to understanding of the importance of air quality monitoring is if it has passed regulations to help mitigate pollution levels and observations can ensure that these regulations are necessary. Effective assist in the timely enforcement of these regulations and help in creating public awareness and participation (Anonymous, 2002). Another advantage

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of it can monitor many pollutants simultaneously, it has the capability to in near real-time and provides continuously rapid monitoring.

Geographic information systems are information systems from the rest of the data analysis strongly associated with geographical location and the correct spatial relationships among them as it demonstrated the power of analysis in geographic information systems to store information in more than one layer it contains the features of each layer have the same classification, so to overcome the technical problems related to the processing of large amounts of information at once as this method gives the best analytical capacity (Foreman, 1998).

Therefore the aim of this study observations are restricted to ranges wavelength of air pollution by elements with other atmospheric conditions, any pollutant with a low concentration will not be detected to evaluate the geographic information system distribution of air pollutants and concentration for monitoring and mapping air pollution in the lower troposphere in two basic stations were chosen in this study in Missan Governorate Marshes (Al-Auda Marsh, Al- Battat Marsh).

MATERIALS AND METHODS

Study area and sample collection: Six basic stations were chosen in this study in the Maysan Governorate Marshes (Al-Auda Marsh, Al- Battat Marsh). It was chosen three main sites of the (start, middle and end) of each region for the purpose of study and labeled it depending coordinates.

This study was conducted the samples were collected from the study sites in December (Winter) at 2017; the air samples were collected from air sampler was collected by using the low volume sampler (Sniffer). In this field the total suspended particles were measured to determinate the heavy metals (Anonymous, 1995) as following (Fig. 1); the sampler instrument must be on high one meter to prevent the dust dispersion from the earth. Putting the filters before started the sampling in oven under 60°C to 1 O'clock time to removal from the humidity and weighting it. The TSP were measured in the air by applying the equation below this:

$$W2-W1 = WT$$

$$WT \times 106 = WT\ \mu g$$

Where:

W1 = Weight of filter before the flow air
W2 = Weight of filter after the flow air
WT = Weight of filter with suspended particles (µg)

$$V1+V2 = VT$$

$$VT \times T/1000 = VA\ m^3$$

V1 = The volume start the flow
V2 = The volume end the flow
VT = Average of the volume
T = Time of the (60 min)
VA = Total volume (m^3)

$$C = WT/VA\ \mu g/m^3$$

where, C is Final concentration of suspended particles ($\mu g/m^3$). The concentrations of heavy metals are determinate by the analysis of suspended particles using the AAS instrument after digestion of filter paper.

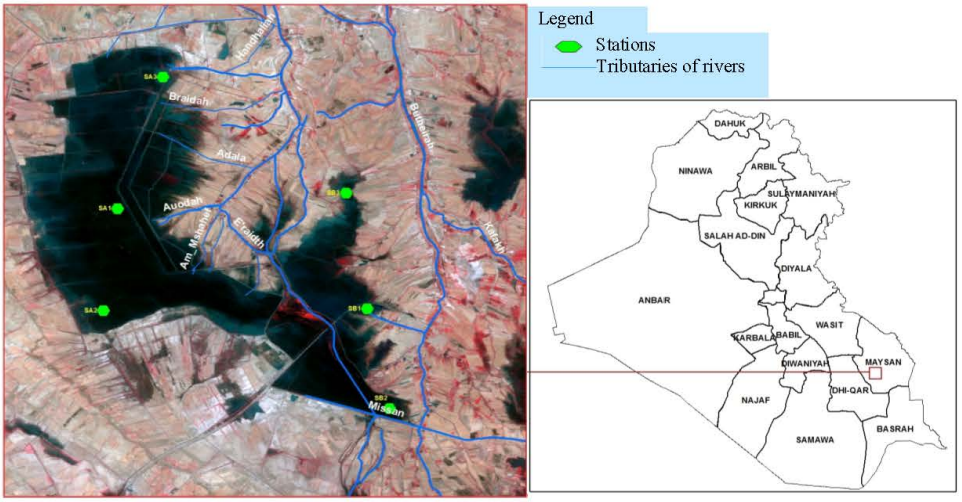

Fig. 1: Boundaries of the six marshes where samples were collected (Arc10 Map GIS development 6 station under study area)

Table 1: Parameter operating for the determination of elements

Wavelength	Step	Time (min)	CRM and SRM
RF power (W) 1300	Temp. (°C)	14	ERM-CC580
Gas Flow (L min-1)	150	12	IAEA-140TM
Plasma 15	170	16	TORT-2
Auxiliary 0.2	100	15	DORM-2
Nebulizer 0.8	100	10	0
Read delay (s) 75	200	25	NIST 2709
Replicates 5	175-200	One time to each	SRM-1974b
Probe in sample (n)	100	10	0
Rinse (n)	100	10	0

Preparing experimental and analysis

Preparation of samples for analysis by top wave analytic jena type: Filter samples of all types were collected by weigh 50 mg into the digestion vessel, add 5 mL of nitric acid HNO_3 65% after that shake the mixture carefully or stir with clean glass bar necessary and wait at least 20 min before the vessel is closed, heat in the microwave oven with the following program to avoid foaming and splashing wait until the vessels have cooled the same room temperature about 20 min. Carefully open the digestion vessel in fume hood wearing hand eye and body protection, since, a large amount of gas will be produced during the digestion process then were quantitatively transferred to Falcon tubes and diluted to 15 mL with deionized water. For the quality control analysis, 0.250 g of CRM and SRM types (Environmental and Biological) were transferred into a Teflon vessel, reconstituted with 2 mL of deionized water, followed by the addition of 4 mL of HNO_3. For all samples digestions, five replicates were performed also calibration blanks of 2.0 mL deionized water were taken through the same digestion process. Detection Limits (DLM) for Mercury in this study were calculated based on three times the standard deviation of the average of 5 blank measurements to one test depending methods (Ataro *et al*., 2008; Nascimento *et al*., 2008).

Calibration method: In inspection air samples need to detect energy calibration of the place mixed source which contains in front of the detector at detection time period 10800 sec. Software Genie 2000 (Canberra) provide following information in Table 1.

Statistical method: The statistical analysis was performed according to Sigma Plot in 2016 was assessed using different measures of statistical coefficient of determination, concordance correlation coefficient and interclass correlation coefficient, mean prediction error the concentration compared with the data from their label and proposed guidelines published by WHO/USEPA under the principal components analysis of elements normality test (Henze-Zinkler), normality test (Shapiro-Wilk and Mann-Whitney Rank Sum test). The coefficient of determination, R_2 was calculated where N is the total number of paired observations. A value of $R_2 = 1$ indicates 100% precision between the methods to determine overall. The mean Prediction error (Pe) was computed to describe the predictive performance of the methods and to compare prediction methods to the standard method. Data plotting method by used to analyses the agreement between the standard methods and according WHO and EPA. The 98% limits of agreement were calculated as the mean Sigma Plot System (2016).

RESULTS AND DISCUSSION

Measurement the total suspended particles in air samples: The concentration of the minutes of the most outstanding plants that have been sampling them within permissible limits of the determinants of the Iraqi National 350 $\mu g/m^3$ which recorded the lowest concentration at all the sites which means being away from the industrial activities and lack of traffic and the dust flying from the land. Where sites are located on the edge of the marshes near rural villages and the inhabitants of the marshes and small towns and near the low-traffic. The potential ecological risk index was one quantitative index put forward by Swedish scientist Hakanson (1980) based on the response to element abundance and the synergistic effect of pollutants. It is one of the most commonly used methods for pollution level and potential ecological risk assessment of heavy metals in atmospheric particulates and sediments (Xu *et al*.,2017). This method not only reflects the potential ecological harm from heavy metals in single specific sediment but also considers the integrated ecological effect of a variety of heavy metals. What is more, the method can quantitatively differentiate the potential ecological risk of heavy metals by the calculated index values. It is one comprehensive index that can represent the influence degree of heavy metals on the ecological environment. The mean of the concentrations of TSP and max-min values in all study stations in Table 2 and Fig. 2.

In general all of these are not inadvertently allowed more than half of the concentrated parameters of the Iraqi National. This is indicative of the purity of the air of the marsh area and therefore, encourages the building of tourist complexes in the marsh to enjoy the beauty of nature and the atmosphere especially in winter month this result corresponds with (Xiong *et al*., 2017a, b). From these results, the TSP concentrations in most stations were within the world and Iraqi standard limits (350 $\mu g/m^3$) and the different values from station to another station shows the low value in 11, 12, 40 that meaning the industrial activities and mobiles movement don't found and decreasing the dust (Fig. 3).

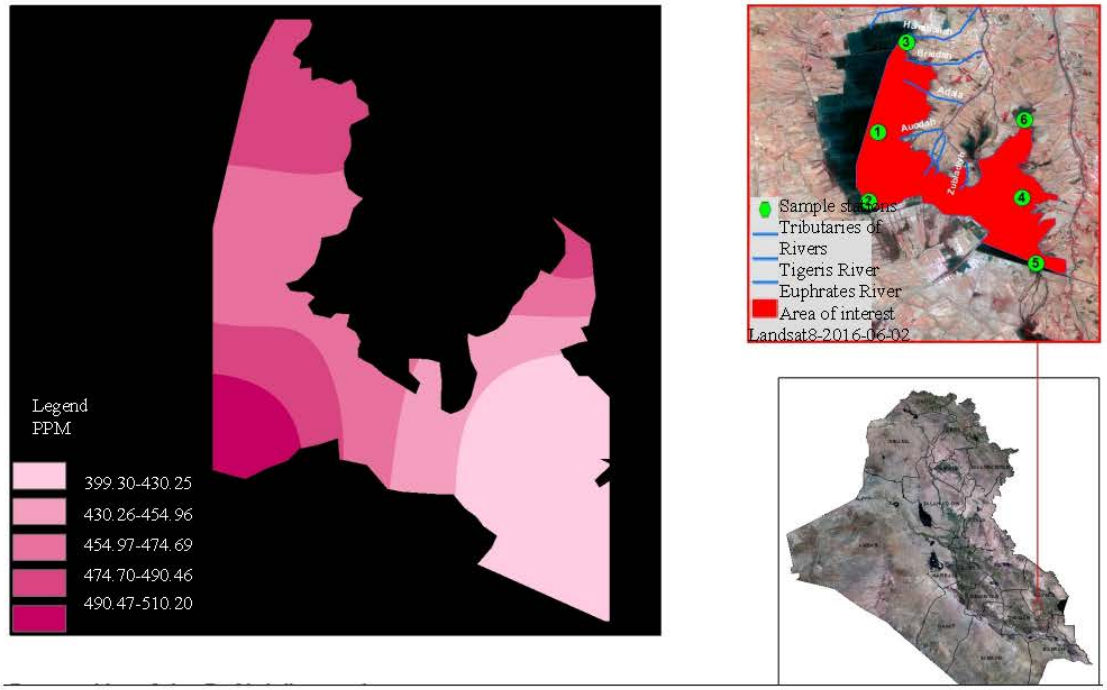

Fig. 2: TSP and Max-Min values in all study stations

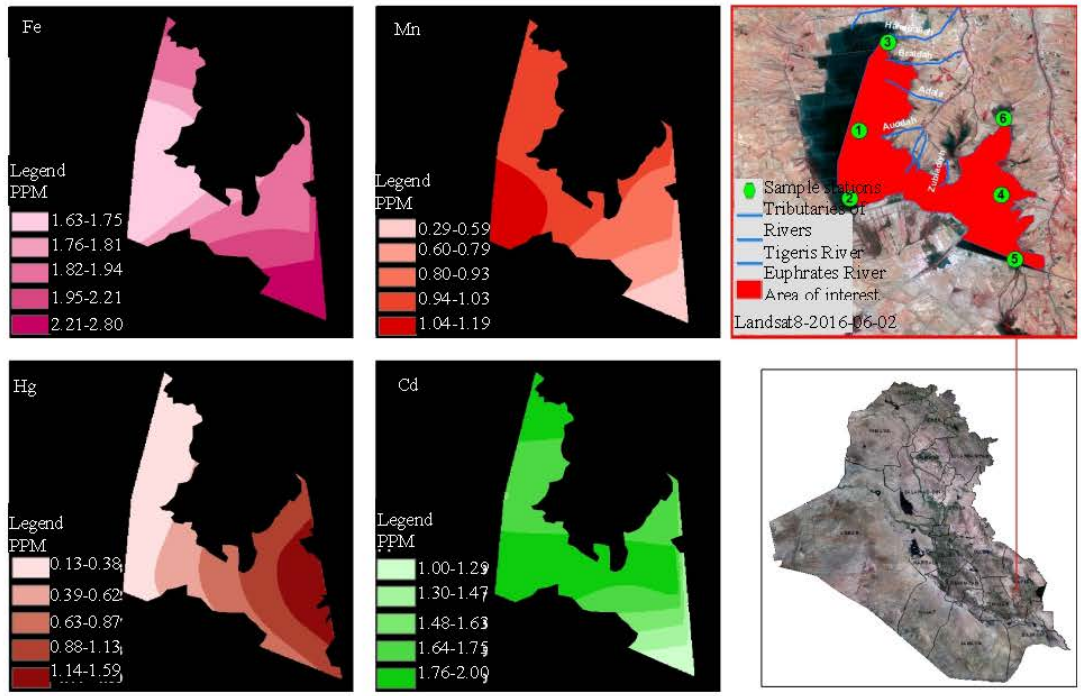

Fig. 3: Cd, Fe, Mn, Hg Max-Min values in all study stations

Heavy metals: In relation to the concentration of heavy metals in these areas did not record all of the stations measured in the southern marshes of any pollution in the high concentration of these elements and due to the absence of any factories or plants or a civil government in those cities as well as reduced traffic for cars. In Table 2

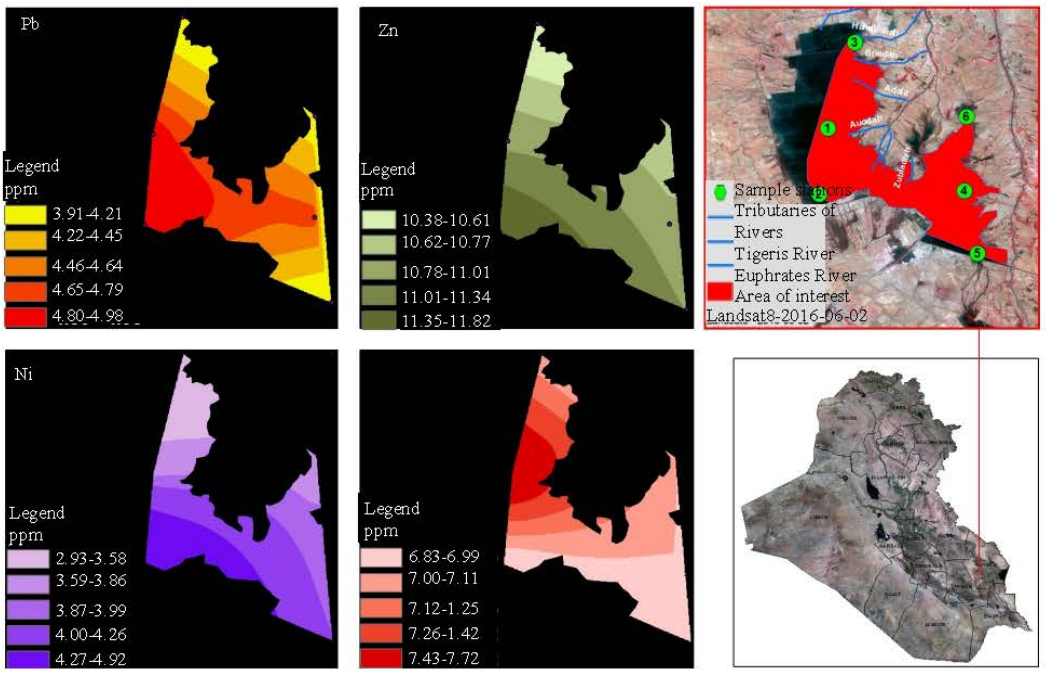

Fig. 4: Pb, Zn, Ni, Cu Max-Min values in all study stations

Table 2: Mn, Pn, Zn, Ni , Hg concentration values in all study stations (ppm)

Run Details	Mn	Pb	Zn	Ni	Hg
SA1	1.01	4.92	10.92	3.82	0.61
SA2	1.2	4.99	11.83	4.93	0.63
SA3	1	3.91	10.38	2.93	0.55
SA1	0.82	4.72	10.83	3.92	1.82
SA2	0.29	3.92	11	4	0.76
SA3	1	4	10.63	3.82	0.68

Table 3: TSP (µg/m), Cd,, Cu, Fe concentration values in all study stations (ppm)

Run details	TSP (µg/m)	Cd	Cu	Fe
SA1	470	1.62	7.73	1.63
SA2	510.2	2.01	6.83	1.69
SA3	489.29	1.93	7	2
SA1	399.3	1.83	6.99	1.92
SA2	402	1	6.94	2.81
SA3	483	1.63	7	1.82

and 3 (Fig. 3). The apparent discrepancy in the concentrations of reparable dust and heavy metals in specific study may be due to the reason of the emission sources of contamination and accumulation in the atmosphere and the increase in the focus could be due to dust storms in the atmosphere. From the results obtained free models of air pollution Marsh (Wan *et al*., 2016a, b) heavy elements or its presence in small percentages in comparison with the national determinants, even after the marshes for industrial activities and heavy traffic and lack of dust from the land either increase in some locations to increase the output speed of dust and therefore, increasing concentrations in the atmosphere (Xiong *et al*., 2017a, b).

Results of air pollutants recorded from the measurement of different types of pollutants parameters in various locations area pollutant concentration in different locations this is agree with (Xiong *et al*., 2017a, b). The behavior of the individual heavy metal, assessment methods makes the fate and exposure modeling of heavy metals significantly more dependent on ambient conditions reflecting the very different speciation pattern and behavior of heavy metals at different sites and hence, increases the need for spatially differentiated fate and exposure modeling (Fig. 4).

CONCLUSION

Environmental pollution used to boundaries with any changes of Iraqi marsh by periodically time to assess and determine the nature reserved of marshes used spatial analysis by GIS system to combine multiple datasets to get standardized information have been integrated of quantitative computing and qualitative analysis has enhanced the easy and credibility of the elements models to describe the general environmental properties and has been applied in the management of Iraqi aquatic systems. The results of the study have shown data from GIS can be necessary used to produce detailed air pollution map. Therefore, marshes observations made by GIS are likely to be a valuable tool for of providing complete and views of large areas in one snap-shot.

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REFERENCES

Anonymous, 1995. Inorganic lead. International Programme on Chemical Safety (IPCS), World Health Organization, Geneva, Switzerland.

Anonymous, 2002. User guide: Ecotoxicology database system. United States Environmental Protection Agency, Washington, D.C., USA.

Anonymous, 2016. Preparing world heritage nominations. UNESCO, Paris, France.

Ataro, A., R.I., McCrindle, B.M. Botha, C.M.E McCrindle and P.P. Ndibewu, 2008. Quantification of trace elements in raw cow`s milk by inductively coupled plasma mass spectrometry (ICP-MS). Food Chem., 111: 243-248.

Bradl, H., 2005. Heavy Metals in the Environment: Origin, Interaction and Remediation. 1st Edn., Academic Press, New York, USA., ISBN-13: 9780120883813, Pages: 282.

Dehghan, A., N. Khanjani, A. Bahrampour, G. Goudarzi and M. Yunesian, 2018. The relation between air pollution and respiratory deaths in Tehran, Iran-using generalized additive models. BMC. Pulm. Med., 18: 49-57.

Duffus, J.H., 2002. Heavy metals a meaningless term. Pure Appl. Chem., 74: 793-807.

Foreman, T.W., 1998. The History of Geographic Information Systems: Perspectives from the Pioneers. 5th Edn., Prentice Hall, Upper Saddle River, New Jersey, USA., ISBN:9780138621452, Pages: 397.

Hakanson, L., 1980. An ecological risk index for aquatic pollution control. A sedimentological approach. Water Res., 14: 975-1001.

Lasat, M.M., 2000. Phytoextraction of metals from contaminated soil: A review of plant/soil/metal interaction and assessment of pertinent agronomic issues. J. Hazard. Subst. Res., 2: 1-25.

Nascimento, E.A., R. Chang, S.A. Morais, D. Pilo-Veloso and D.C. Reis, 2008. [An easily detectable chemical marker for Propolis of Field Rosemary (Baccharis dracunculifolia) (In Portugese)]. Rev. Bras. Farmacogn., 18: 379-386.

Partow, H., 2001. The Mesopotamian marshlands: Demise of and ecosystem. UN Environment, Nairobi, Kenya.

Richardson, C.J. and N.A. Hussain, 2006. Restoring the garden of Eden: An ecological assessment of the marshes of Iraq. AIBS. Bull., 56: 477-489.

Wan, D., Z. Han, J. Yang, G. Yang and X. Liu, 2016a. Heavy metal pollution in settled dust associated with different urban functional areas in a heavily air-polluted city in North China. Intl. J. Environ. Res. Public Health, Vol. 13, 10.3390/ijerph13111119

Wan, L., L. Xu and Y. Fu, 2016b. Contamination and risk assessment of heavy metals in lake bed sediment of a large lake scenic area in China. Intl. J. Environ. Res. Public Health, Vol. 13,

Wind-Mulder, H.L., L. Rochefort and D.H. Vitt, 1996. Water and peat chemistry comparisons of natural and post-harvested peatlands across Canada and their relevance to peatland restoration. Ecol. Eng., 7: 161-181.

Xiong, Q., W. Zhao, J. Zhao, W. Zhao and L. Jiang, 2017a. Concentration levels, pollution characteristics and potential ecological risk of dust heavy metals in the metropolitan area of Beijing, China. Intl. J. Environ. Res. Public Health, 14: 1159-1160.

Xiong, Q.L., J.Y. Zhao, W.J. Zhao, H.F. Wang and W.W. Li *et al*., 2017b. Pollution characteristics and potential ecological risks of heavy metals in topsoil of Beijing. China Environ. Sci., 37: 2211-2221.

Xu, Y., Y. Wu, J. Han and P. Li, 2017. The current status of heavy metal in lake sediments from China: Pollution and ecological risk assessment. Ecol. Evol., 7: 5454-5466.