

(GIS)

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// : // :

()

()

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(GIS)

(Merian et al., 2004)

(Harrison et al., 1981: Surthland et al., 2000)

(Botkin & Keller, 2003)

%

()

()

Aiuppa et al.,)

(2005

(Dudka et al.,

.1996)

()

()

(Bowie & Thornton, 1985)

()

(Krauskopf, 1995)

(US EPA, 2006)

)

Al,

(

Fe, Mg, Ca, Na, K

As, Bi, Cd, Co, Cr, Cu, Hg,

Mn, Mo, Ni, Pb, Rb, S, Sb, Se, Sn, Sr, Th, Ti, U,

V, W, Zn

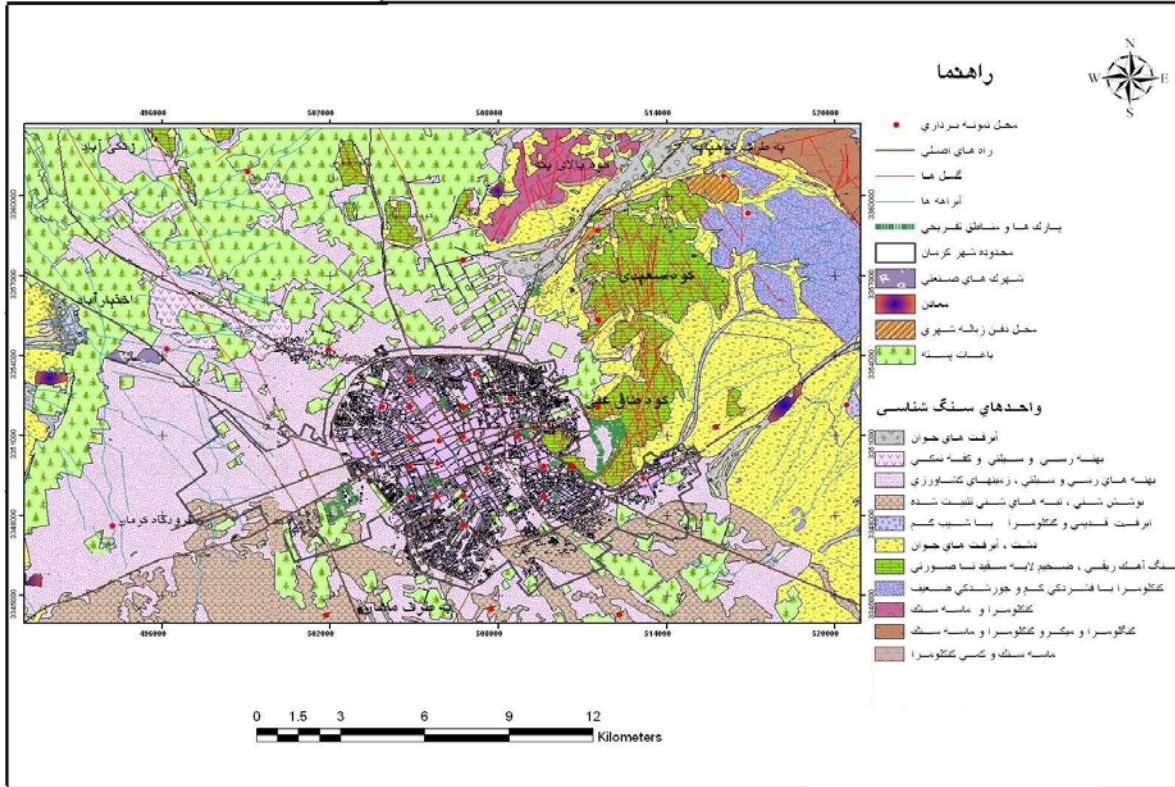
GIS

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(Atapour & ())

.(Aftabi, 2002

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.(Faure, 1992)

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/ / /

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mg.kg-1

mg.kg-1

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/ / / / / /

pH

/ / / / / / / / / /

()

/

.....

: ()

.(ppm)

()							()		
/	/	/	/	/	/	/	/		As
/	/	/	/	/	/	/		< /	Bi
				/		/			Ca
/	/	/	/	/	/	/	/	/	Cd
	/	/	/	/	/	/		/	Co
		/		/		/		/	Cr
	/	/		/		/			Cu
				/		/			Fe
/	/	/	/				/	/	Hg
				/		/			K
				/		/			Mg
				/		/			Mn
/	/	/	/	/	/	/		/	Mo
						/			Na
	/	/	/	/		> /		< /	Ni
/			/	/		/			Pb
	/	/	/	/	/	/			Rb
				/		/			S
/		/			/	/	/	/	Sb
/							/		Se
	/	/	/		/	/		/	Sn
				/		/			Sr
	/	/		/	/	/		/	Th
				/		/			Ti
/	/	/	/	/	/	/		/	U
				/		/			V
/	/	/	/	/	/	/	/	/	W
				/		/			Zn

)

(Ahrens,1995):() (Bodek,1988) (Faure, 1992):() (

()	(ppm)				: ()	
	/	/		/	/	Al
/	/	/	/	/	/	As
						Bi
						Ca
/	/	/	/	/	/	Cd
	/	/		/	/	Co
		/			/	Cr
		/				Cu
						Fe
/	/	/	/	/	/	Hg
						K
						Mg
						Mn
	/	/	/	/	/	Mo
		/	/	/	/	Na
	/	/	/	/	/	Ni
		/			/	Pb
/	/	/	/	/	/	Rb
						S
		/	/			Sb
/		/			/	Se
		/		/	/	Sn
						Sr
	/			/	/	Th
						Ti
	/	/	/	/	/	U
		/				V
	/			/	/	W
						Zn

(Earnshaw&Greenwood,1997) (Ronov&Yaroshevsky,1969):()

U, Ti, Th, S, Mn, Hg, Co, Cd, Bi,

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(Yu Jing et al., 2004)
()
Tl,
V Sn, Se, Ni, Mo, Mn, Hg, Cr

(Merian et al., 2004)

Walker) /
(et al., 1995)

()

() Tl Cd Pb Zn °c
% % Bi

(Merian et al., 2004)

K Mg, Na, Fe, Cu, Si, Al
Zn Pb, Cd, Se, Sb, As
V U, Sr, Ni, Sn, Cr, Be, Ba
(Merian et al., 2004)

(Eby, 2004)

)

pH

(

()

mg.kg-1

m.Eq/100gr

(α -Al(OH₃))

(α - FeOOH)

ZPC

(Earnshaw &

.Greenwood, 1997)

()

()

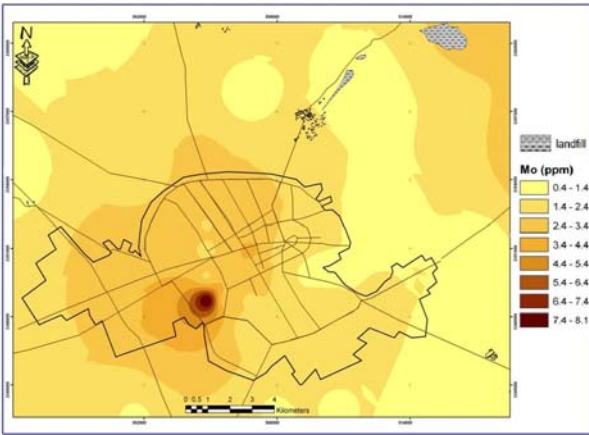
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ArcGIS9.1

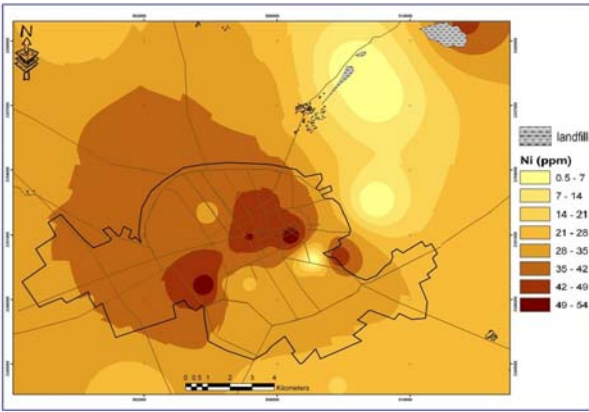
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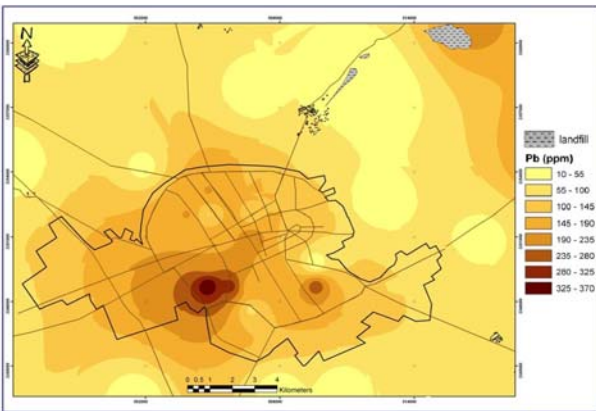
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(ppm:



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ppm :)



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(ppm

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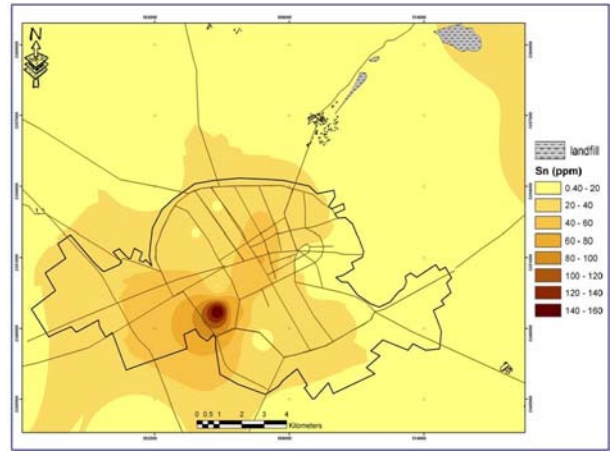
:)
(ppm

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Hester & Harrison, 1997)

.(Fergusson, 1982)

.(Stoessell, 2004)



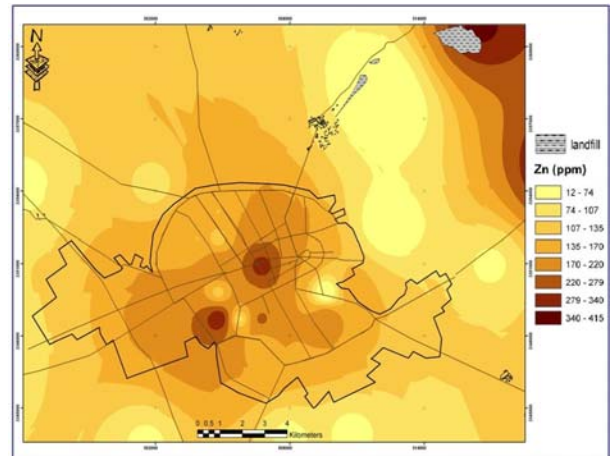
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(ppm

- 1- Inductively coupled plasma mass spectrometry (ICPMS)
- 2- X-ray diffraction (XRD)
- 3- Zero point of charge
- 4- Phytoremediation



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(ppm

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