Supplementary Information

Table S1. Distribution of sampling sites of the Songhua River.

Name	longitude（E）	latitude (N)	Site
S1	124°48'28"	45°10'2"	Songyuan（Estuary）
S2	125°5'57"	45°44'57"	Zhanyuan（Estuary）
S3	125°41'31"	45°27'13"	Lalinhe（Estuary）
S4	126°31'11"	45°46'10"	Harbin（City）
S5	126°42'2"	45°48'55"	Harbin（City）
S6	127°32'37"	46°2'29"	Bayan（Cultivated field）
S7	128°2'26"	45°56'22"	Mulan（Town）
S8	128°45'60"	45°58'22"	Tonghe（Town）
S9	129°32'12"	46°19'48"	Yilan（Town）
S10	129°57'25"	46°44'54"	Tangyuan（Cultivated field）
S11	130°15'57"	46°50'3"	Jiamusi（City）
S12	130°24'45"	46°50'32"	Jiamusi（City）
S13	131°57'23"	47°14'7"	Fujin（Cultivated field）
S14	132°30'54"	47°41'27"	Tongjiang（Estuary）

Table S2. Classifications of heavy metal pollution degree in drinking water.

HPI	Degree of pollution [1]
$HPI < 15$	low
$15 \leq HPI < 30$	medium
$30 \leq HPI < 100$	high

Table S3. Classification of heavy metal pollution degree.

P_i	P_N	Degree of pollution [2,3]
$P_i \leq 1$	$P_N \leq 1$	nonpollution
$1 < P_i \leq 2$	$1 < P_N \leq 2.5$	Light pollution
$2 < P_i \leq 3$	$2.5 < P_N \leq 7$	Moderate pollution
$P_i > 3$	$P_N > 7$	Severe pollution

Table S4. Worldwide average concentration of trace elements in sediment from major river of the world (mg kg^{-1}).

River	Cu	Cr	Zn	Pb	Ni	Cd	References
Songhuajiang (China)	14.6	64.0	175.8	16.8	22.7	0.28	This study
Yellow river (China)	40.7	62.4	68.4	15.2	23.6	0.085	[4]
Ebro River (Portugal)	21.8	34.3	83.5	15.8	13.7	0.3	[5]
Seine River (France)	14	52	76	26	27	0.3	[6]
Yangtze river (China)	30.7	78.9	94.3	27.3	31.8	0.26	[7]
Xiangjiang (China)	35.16	38.17	346.17	111.83	-	15.28	[8]
Brisbane River (Australia)	20-110	82-332	142-257	25-126	20-34	0.6-0.9	[9]
Shur River (Iran)	9174	-	522	162	-	6.85	[10]
Urμguay River (Argentina)	55	19	85	13	16	-	[11]
Jiaozhou Bay (China)	23.6	69.3	64.6	20.2	-	0.159	[12]
Nile River (Egypt)	-	173	74	-	48	0.3	[13]

Table S5. The single contamination factor (*Pi*) of sediment and riparian soil in Songhua River.

Sampling	Cu		Cr		Zn		Pb		Ni		Cd	
site	Sediment	Soil	Sediment	Soil	Sediment	Soil	Sediment	Soil	Sediment	Soil	Sediment	Soil
S1	1.19	0.83	1.52	1.17	3.24	2.29	0.97	0.78	0.99	1.02	5.24	3.22
S2	0.74	1.05	1.45	1.38	2.22	1.82	0.89	0.74	0.83	1.34	2.91	1.88
S3	0.49	0.54	1.08	1.01	1.42	1.64	0.65	0.72	0.97	0.72	1.91	3.08
S4	0.92	0.59	1.50	0.82	1.83	1.15	0.71	0.38	1.47	0.62	2.87	3.27
S5	0.62	0.89	0.84	0.29	1.69	1.96	0.64	0.65	0.72	0.73	1.48	3.85
S6	0.59	1.54	0.93	1.25	2.04	2.41	0.33	1.17	0.94	1.06	2.69	6.82
S7	0.71	1.26	0.82	1.51	2.89	1.80	0.33	0.82	0.99	1.31	3.56	2.27
S8	0.61	0.96	0.57	1.27	1.70	1.48	0.69	0.88	0.89	1.37	1.36	5.51
S9	1.14	0.97	0.96	1.62	2.60	1.95	0.73	0.89	1.55	1.14	6.79	2.62
S10	0.49	0.74	0.99	1.37	4.61	3.13	0.72	0.80	0.88	1.04	3.69	10.15
S11	0.40	0.57	0.92	1.13	1.77	1.64	0.77	0.70	0.59	1.33	3.02	1.50
S12	0.73	1.00	1.18	1.54	4.10	1.88	0.76	0.94	1.15	0.92	5.04	2.76
S13	0.62	0.97	1.09	1.81	2.29	2.12	0.79	0.65	0.84	0.78	2.02	2.85
S14	0.96	0.88	1.42	1.56	2.38	3.61	0.77	0.76	1.14	1.23	3.20	0.43
Mean	0.73	0.91	1.09	1.27	2.49	2.06	0.70	0.78	1.00	1.04	3.27	3.59

Table S6. Pearson correlation matrix for heavy metals in surface sediments of the Songhua River.

	Cu	Cr	Zn	Pb	Ni	Cd
Cu	1					
Cr	0.689**	1				
Zn	0.225	0.402	1			
Pb	0.266	0.322	0.217	1		
Ni	0.729**	0.953**	0.502	0.361	1	
Cd	-0.022	-0.017	0.035	0.024	0.063	1

** Correlation is significant at $p< 0.01$ level (two-tailed);

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