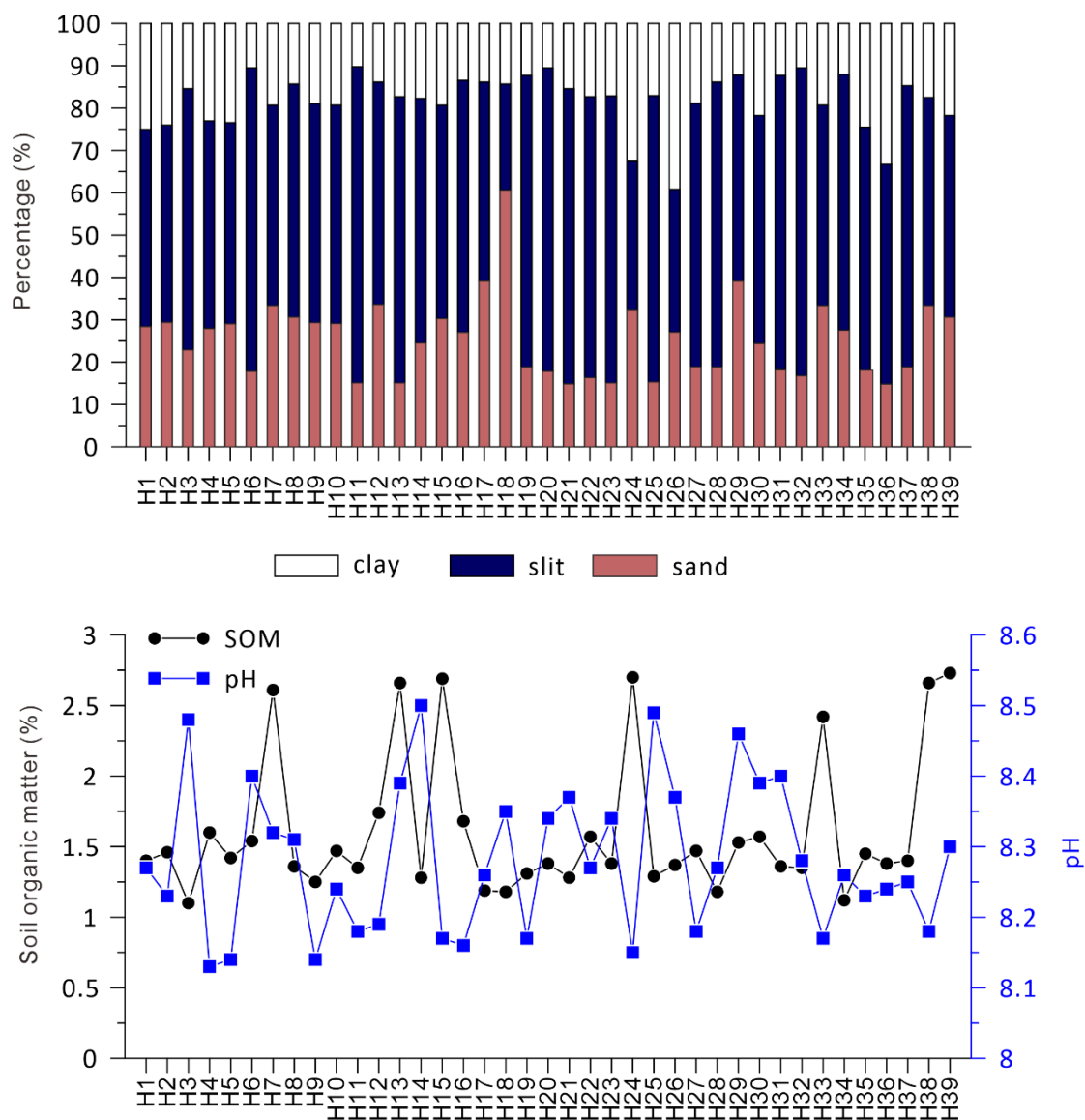
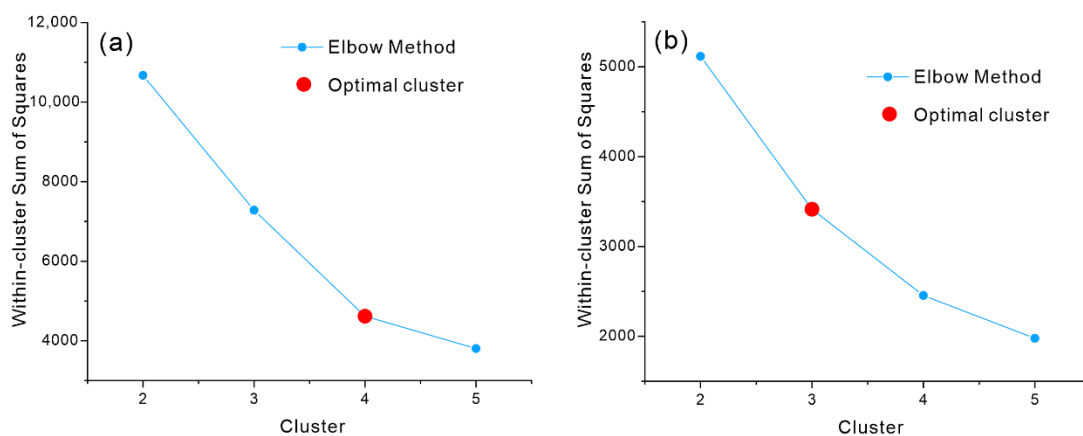


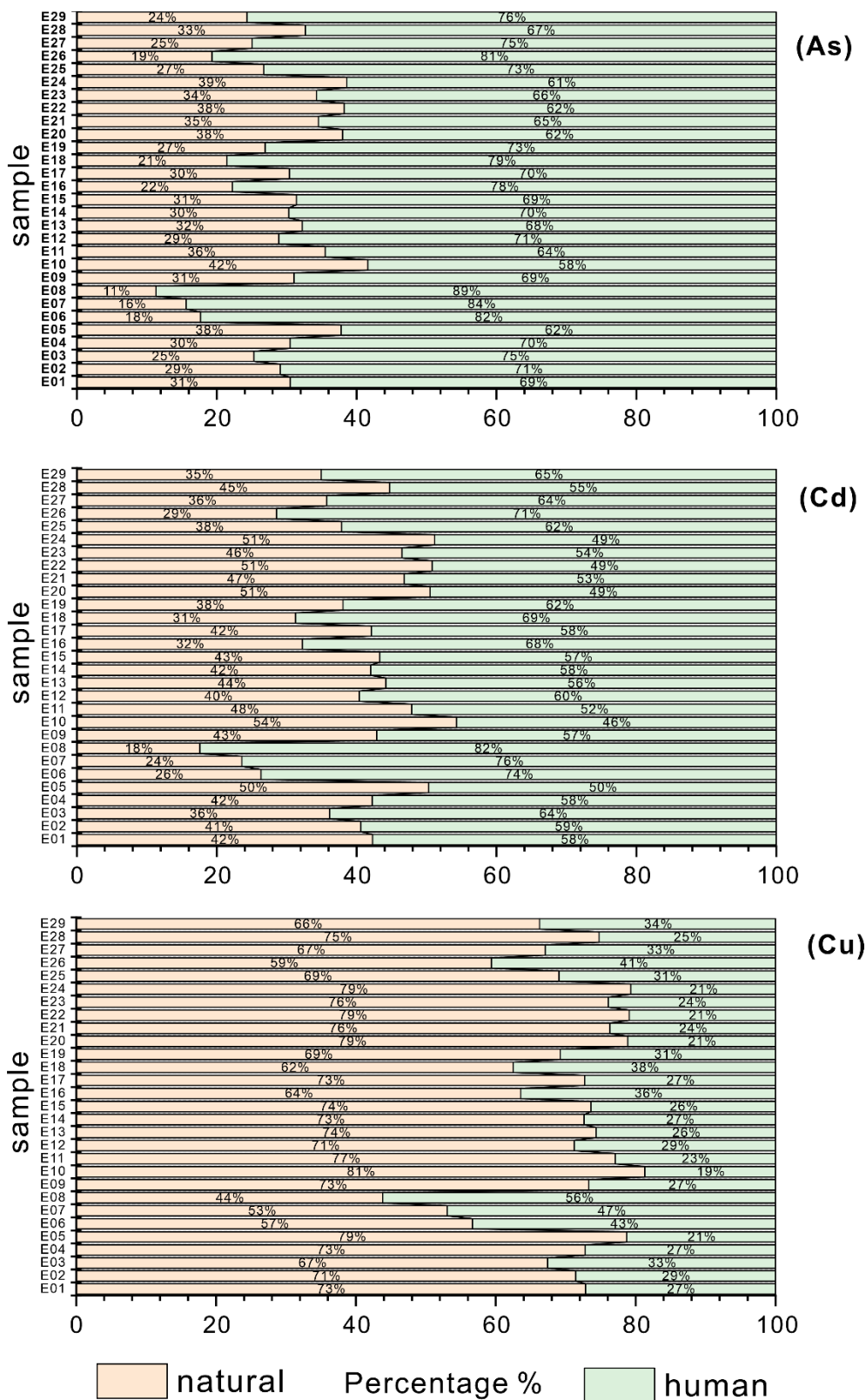
**Figure S1.** The soil texture, pH, and soil organic matter (SOM) for sampling sites in the Bortala River Basin.



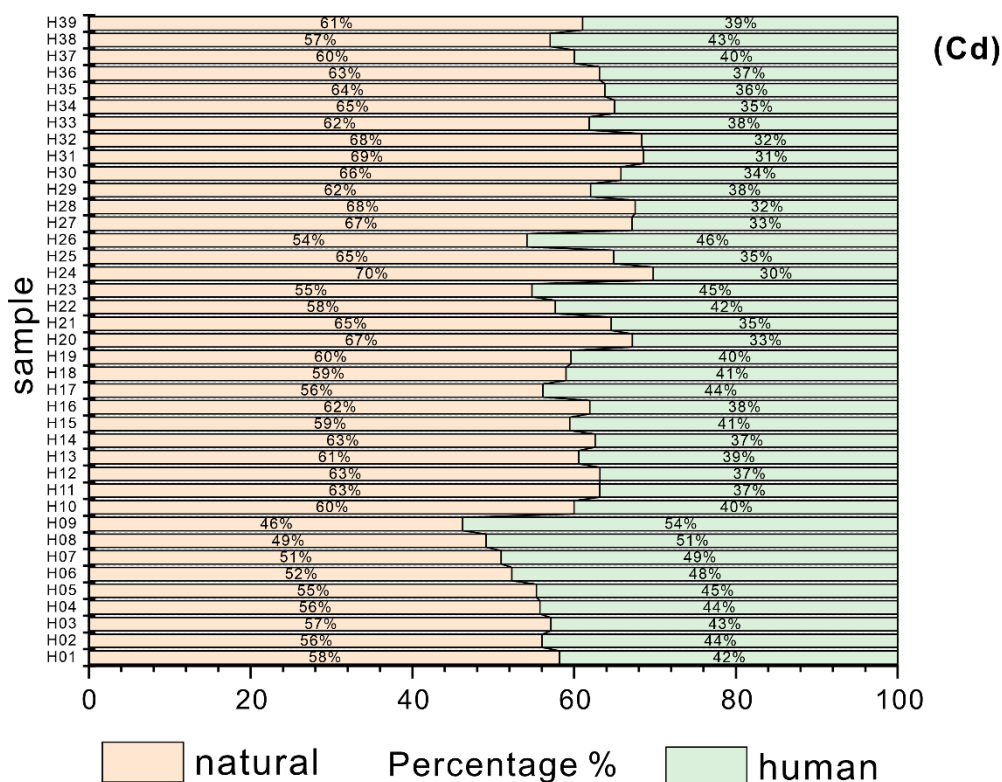
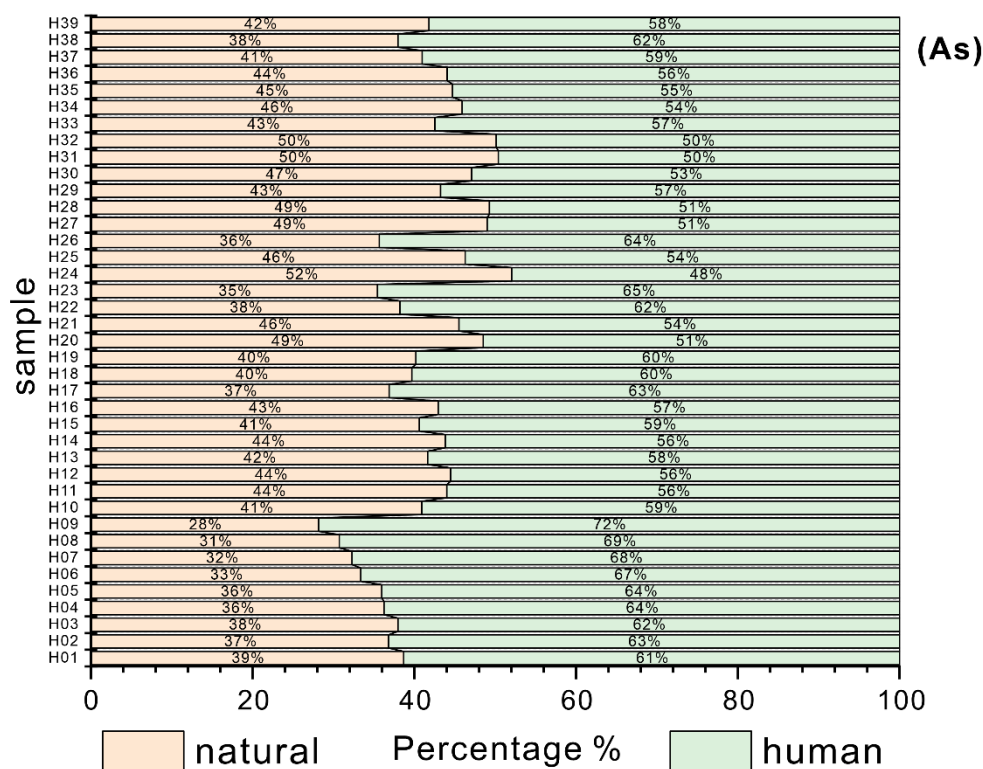
**Figure S2.** The soil texture, pH, and soil organic matter (SOM) sampling sites in the Yili River Basin.



**Figure S3.** Optimal cluster number determination with the Elbow Method for the Bortala River Watershed (a) and the Yili River Watershed (b).



**Figure S4.** The percentage of anthropogenic and natural sources for As, Cd and Cu in each sample point in the Bortala River Watershed.



**Figure S5.** The percentage of anthropogenic and natural sources for As and Cd in each sample point in the Yili River Watershed.

Table S1. The Pearson correlation for the Potentially toxic elements (PTEs) and soil texture (sand, silt, clay), soil organic matter (SOM) and pH in the soils of Yili River Basin.

Variables	Parameters	Fe	Mn	V	Cr	Co	Ni	Cu	Zn	As	Cd	Pb	Sand	Slit	Clay	SOM	pH
Fe	Pearson Corr.	1.00	0.84	0.94	0.80	0.88	0.84	0.78	0.81	0.62	0.59	0.74	-0.24	0.31	-0.21	-0.09	-0.01
	p-value	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.06	0.20	0.58	0.95
Mn	Pearson Corr.	0.84	1.00	0.67	0.52	0.77	0.67	0.63	0.67	0.75	0.54	0.63	-0.24	0.29	-0.18	-0.07	-0.05
	p-value	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.07	0.27	0.66	0.78
V	Pearson Corr.	0.94	0.67	1.00	0.85	0.83	0.82	0.79	0.80	0.50	0.62	0.77	-0.20	0.25	-0.18	-0.01	-0.02
	p-value	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.12	0.28	0.95	0.92
Cr	Pearson Corr.	0.80	0.52	0.85	1.00	0.79	0.93	0.84	0.64	0.27	0.54	0.59	-0.26	0.26	-0.10	-0.07	0.14
	p-value	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.11	0.11	0.55	0.67	0.39
Co	Pearson Corr.	0.88	0.77	0.83	0.79	1.00	0.90	0.88	0.78	0.62	0.58	0.77	-0.33	0.33	-0.12	-0.12	-0.12
	p-value	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.45	0.45	0.47
Ni	Pearson Corr.	0.84	0.67	0.82	0.93	0.90	1.00	0.88	0.69	0.50	0.58	0.66	-0.37	0.36	-0.12	-0.16	0.05
	p-value	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.46	0.34	0.75
Cu	Pearson Corr.	0.78	0.63	0.79	0.84	0.88	0.88	1.00	0.77	0.36	0.50	0.61	-0.35	0.34	-0.11	-0.05	-0.04
	p-value	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.03	0.00	0.00	0.03	0.04	0.52	0.76	0.81
Zn	Pearson Corr.	0.81	0.67	0.80	0.64	0.78	0.69	0.77	1.00	0.51	0.72	0.86	-0.26	0.33	-0.22	-0.19	-0.18
	p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.11	0.04	0.18	0.26	0.26
As	Pearson Corr.	0.62	0.75	0.50	0.27	0.62	0.50	0.36	0.51	1.00	0.46	0.65	-0.20	0.19	-0.05	-0.23	-0.18
	p-value	0.00	0.00	0.00	0.09	0.00	0.00	0.03	0.00	--	0.00	0.00	0.21	0.25	0.77	0.16	0.26
Cd	Pearson Corr.	0.59	0.54	0.62	0.54	0.58	0.58	0.50	0.72	0.46	1.00	0.76	-0.12	0.17	-0.12	-0.06	-0.07
	p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.45	0.31	0.45	0.73	0.69
Pb	Pearson Corr.	0.74	0.63	0.77	0.59	0.77	0.66	0.61	0.86	0.65	0.76	1.00	-0.21	0.26	-0.18	-0.32	-0.18
	p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.21	0.11	0.28	0.04	0.27
Sand	Pearson Corr.	-0.24	-0.24	-0.20	-0.26	-0.33	-0.37	-0.35	-0.26	-0.20	-0.12	-0.21	1.00	-0.83	0.07	0.19	-0.13

Slit	p-value	0.14	0.15	0.23	0.11	0.04	0.02	0.03	0.11	0.21	0.45	0.21	--	0.00	0.68	0.25	0.44
	Pearson Corr.	0.31	0.29	0.25	0.26	0.33	0.36	0.34	0.33	0.19	0.17	0.26	-0.83	1.00	-0.61	-0.28	0.20
Clay	p-value	0.06	0.07	0.12	0.11	0.04	0.02	0.04	0.04	0.25	0.31	0.11	0.00	--	0.00	0.08	0.22
	Pearson Corr.	-0.21	-0.18	-0.18	-0.10	-0.12	-0.12	-0.11	-0.22	-0.05	-0.12	-0.18	0.07	-0.61	1.00	0.24	-0.18
SOM	p-value	0.20	0.27	0.28	0.55	0.45	0.46	0.52	0.18	0.77	0.45	0.28	0.68	0.00	--	0.14	0.27
	Pearson Corr.	-0.09	-0.07	-0.01	-0.07	-0.12	-0.16	-0.05	-0.19	-0.23	-0.06	-0.32	0.19	-0.28	0.24	1.00	-0.24
pH	p-value	0.58	0.66	0.95	0.67	0.45	0.34	0.76	0.26	0.16	0.73	0.04	0.25	0.08	0.14	--	0.13
	Pearson Corr.	-0.01	-0.05	-0.02	0.14	-0.12	0.05	-0.04	-0.18	-0.18	-0.07	-0.18	-0.13	0.20	-0.18	-0.24	1.00
	p-value	0.95	0.78	0.92	0.39	0.47	0.75	0.81	0.26	0.26	0.69	0.27	0.44	0.22	0.27	0.13	--

Table S2. The Pearson correlation for the Potentially toxic elements (PTEs) and soil texture (sand, silt, clay), soil organic matter (SOM) and pH in the soils of Bortala River Basin.

Variables	Parameters	Fe	Mn	V	Cr	Co	Ni	Cu	Zn	As	Cd	Pb	Sand	Slit	Clay	SOM	pH
Fe	Pearson Corr.	1.00	0.87	0.88	0.84	0.92	0.79	0.65	0.80	0.09	0.29	0.86	0.14	-0.20	0.16	0.14	-0.21
	p-value	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.13	0.00	0.46	0.30	0.41	0.46	0.28
Mn	Pearson Corr.	0.87	1.00	0.81	0.74	0.88	0.83	0.66	0.72	0.05	0.31	0.76	0.05	-0.05	0.01	0.16	-0.30
	p-value	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.10	0.00	0.79	0.80	0.97	0.40	0.12
V	Pearson Corr.	0.88	0.81	1.00	0.85	0.90	0.75	0.59	0.58	-0.15	0.22	0.69	0.12	-0.24	0.27	0.04	-0.19
	p-value	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.45	0.25	0.00	0.52	0.21	0.16	0.82	0.32
Cr	Pearson Corr.	0.84	0.74	0.85	1.00	0.92	0.79	0.69	0.69	0.00	0.28	0.73	0.12	-0.17	0.12	0.18	-0.16
	p-value	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.98	0.14	0.00	0.53	0.39	0.52	0.36	0.40
Co	Pearson Corr.	0.92	0.88	0.90	0.92	1.00	0.83	0.75	0.76	0.05	0.30	0.82	0.07	-0.11	0.10	0.14	-0.16
	p-value	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.81	0.12	0.00	0.71	0.56	0.59	0.47	0.41
Ni	Pearson Corr.	0.79	0.83	0.75	0.79	0.83	1.00	0.54	0.69	-0.01	0.27	0.75	0.03	-0.01	-0.02	0.29	-0.24

	p-value	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.96	0.16	0.00	0.89	0.94	0.93	0.13	0.20
Cu	Pearson Corr.	0.65	0.66	0.59	0.69	0.75	0.54	1.00	0.81	0.47	0.61	0.68	0.20	-0.17	-0.02	0.07	-0.12
	p-value	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.01	0.00	0.00	0.29	0.39	0.90	0.72	0.55
Zn	Pearson Corr.	0.80	0.72	0.58	0.69	0.76	0.69	0.81	1.00	0.39	0.61	0.83	0.17	-0.19	0.08	0.23	-0.15
	p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.04	0.00	0.00	0.37	0.32	0.66	0.23	0.44
As	Pearson Corr.	0.09	0.05	-0.15	0.00	0.05	-0.01	0.47	0.39	1.00	0.48	0.19	-0.05	0.15	-0.22	-0.20	0.17
	p-value	0.66	0.78	0.45	0.98	0.81	0.96	0.01	0.04	--	0.01	0.32	0.81	0.44	0.24	0.29	0.37
Cd	Pearson Corr.	0.29	0.31	0.22	0.28	0.30	0.27	0.61	0.61	0.48	1.00	0.39	0.07	-0.10	0.07	0.22	-0.04
	p-value	0.13	0.10	0.25	0.14	0.12	0.16	0.00	0.00	0.01	--	0.03	0.71	0.62	0.72	0.25	0.82
Pb	Pearson Corr.	0.86	0.76	0.69	0.73	0.82	0.75	0.68	0.83	0.19	0.39	1.00	0.12	-0.20	0.19	0.25	-0.22
	p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.03	--	0.53	0.30	0.31	0.18	0.25
Sand	Pearson Corr.	0.14	0.05	0.12	0.12	0.07	0.03	0.20	0.17	-0.05	0.07	0.12	1.00	-0.87	0.01	0.03	-0.32
	p-value	0.46	0.79	0.52	0.53	0.71	0.89	0.29	0.37	0.81	0.71	0.53	--	0.00	0.98	0.89	0.09
Slit	Pearson Corr.	-0.20	-0.05	-0.24	-0.17	-0.11	-0.01	-0.17	-0.19	0.15	-0.10	-0.20	-0.87	1.00	-0.49	-0.03	0.24
	p-value	0.30	0.80	0.21	0.39	0.56	0.94	0.39	0.32	0.44	0.62	0.30	0.00	--	0.01	0.87	0.22
Clay	Pearson Corr.	0.16	0.01	0.27	0.12	0.10	-0.02	-0.02	0.08	-0.22	0.07	0.19	0.01	-0.49	1.00	0.02	0.09
	p-value	0.41	0.97	0.16	0.52	0.59	0.93	0.90	0.66	0.24	0.72	0.31	0.98	0.01	--	0.92	0.65
SOM	Pearson Corr.	0.14	0.16	0.04	0.18	0.14	0.29	0.07	0.23	-0.20	0.22	0.25	0.03	-0.03	0.02	1.00	-0.44
	p-value	0.46	0.40	0.82	0.36	0.47	0.13	0.72	0.23	0.29	0.25	0.18	0.89	0.87	0.92	--	0.02
pH	Pearson Corr.	-0.21	-0.30	-0.19	-0.16	-0.16	-0.24	-0.12	-0.15	0.17	-0.04	-0.22	-0.32	0.24	0.09	-0.44	1.00
	p-value	0.28	0.12	0.32	0.40	0.41	0.20	0.55	0.44	0.37	0.82	0.25	0.09	0.22	0.65	0.02	--