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**Supplementary Materials**
**Table S1.** The interaction results of V by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.205									
Slope aspect	0.343	0.018								
Slope gradient	0.267	0.144	0.070							
Strata	0.312	0.189	0.243	0.133						
Soil type	0.315	0.180	0.165	0.279	0.074					
pH	0.414	0.263	0.322	0.332	0.213	0.149				
Organic matter	0.458	0.158	0.265	0.233	0.121	0.259	0.046			
Clay content	0.449	0.303	0.372	0.310	0.405	0.424	0.429	0.246		
Agricultural land type	0.460	0.290	0.284	0.380	0.222	0.296	0.348	0.462	0.172	
Distance to settlements	0.450	0.248	0.187	0.190	0.306	0.353	0.205	0.402	0.507	0.047

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**Table S2.** The interaction results of Cr by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.161									
Slope aspect	0.308	0.026								
Slope gradient	0.229	0.134	0.061							
Strata	0.283	0.233	0.287	0.159						
Soil type	0.264	0.141	0.148	0.285	0.044					
pH	0.357	0.198	0.252	0.301	0.145	0.092				
Organic matter	0.469	0.156	0.289	0.267	0.077	0.158	0.024			
Clay content	0.427	0.312	0.344	0.292	0.341	0.367	0.420	0.227		
Agricultural land type	0.407	0.189	0.207	0.337	0.148	0.186	0.266	0.385	0.097	
Distance to settlements	0.435	0.292	0.236	0.242	0.300	0.297	0.234	0.382	0.320	0.071

**Table S3.** The interaction results of Co by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.068									
Slope aspect	0.243	0.013								
Slope gradient	0.278	0.083	0.027							
Strata	0.207	0.209	0.199	0.143						
Soil type	0.213	0.093	0.125	0.243	0.055					
pH	0.275	0.202	0.166	0.232	0.210	0.128				
Organic matter	0.324	0.165	0.122	0.288	0.102	0.254	0.036			
Clay content	0.469	0.427	0.393	0.467	0.355	0.384	0.476	0.313		
Agricultural land type	0.249	0.182	0.187	0.359	0.209	0.267	0.256	0.453	0.147	
Distance to settlements	0.370	0.355	0.196	0.250	0.221	0.296	0.247	0.494	0.328	0.102

**Table S4.** The interaction results of Ni by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.172									
Slope aspect	0.462	0.037								
Slope gradient	0.279	0.140	0.004							
Strata	0.494	0.499	0.509	0.422						
Soil type	0.375	0.091	0.176	0.517	0.037					
pH	0.393	0.189	0.139	0.450	0.116	0.053				
Organic matter	0.563	0.178	0.233	0.548	0.077	0.141	0.006			
Clay content	0.587	0.540	0.520	0.579	0.454	0.491	0.590	0.432		
Agricultural land type	0.525	0.102	0.098	0.552	0.088	0.121	0.212	0.531	0.025	
Distance to settlements	0.599	0.276	0.216	0.521	0.426	0.210	0.262	0.542	0.213	0.078

**Table S5.** The interaction results of Cu by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.261									
Slope aspect	0.492	0.025								
Slope gradient	0.447	0.082	0.025							
Strata	0.468	0.454	0.440	0.412						
Soil type	0.413	0.098	0.100	0.467	0.037					
pH	0.542	0.177	0.114	0.467	0.136	0.048				
Organic matter	0.452	0.160	0.188	0.488	0.101	0.168	0.053			
Clay content	0.529	0.294	0.204	0.528	0.191	0.196	0.410	0.109		
Agricultural land type	0.384	0.133	0.135	0.564	0.148	0.121	0.231	0.257	0.076	
Distance to settlements	0.575	0.360	0.112	0.447	0.204	0.212	0.194	0.321	0.180	0.044

**Table S6.** The interaction results of Zn by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.173									
Slope aspect	0.321	0.015								
Slope gradient	0.252	0.082	0.011							
Strata	0.224	0.049	0.047	0.029						
Soil type	0.219	0.038	0.052	0.044	0.010					
pH	0.250	0.105	0.090	0.068	0.079	0.042				
Organic matter	0.455	0.154	0.093	0.099	0.091	0.164	0.047			
Clay content	0.425	0.161	0.232	0.145	0.159	0.195	0.279	0.087		
Agricultural land type	0.258	0.113	0.077	0.083	0.062	0.074	0.218	0.186	0.045	
Distance to settlements	0.431	0.129	0.086	0.073	0.115	0.134	0.229	0.213	0.116	0.040

**Table S7.** The interaction results of As by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.075									
Slope aspect	0.285	0.087								
Slope gradient	0.122	0.129	0.008							
Strata	0.092	0.132	0.043	0.028						
Soil type	0.111	0.112	0.037	0.040	0.006					
pH	0.221	0.273	0.220	0.118	0.155	0.060				
Organic matter	0.194	0.241	0.094	0.083	0.065	0.173	0.038			
Clay content	0.180	0.238	0.099	0.064	0.084	0.177	0.282	0.031		
Agricultural land type	0.256	0.252	0.235	0.165	0.149	0.198	0.365	0.214	0.107	
Distance to settlements	0.231	0.225	0.142	0.113	0.098	0.300	0.302	0.326	0.282	0.074

**Table S8.** The interaction results of Mo by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.129									
Slope aspect	0.260	0.026								
Slope gradient	0.187	0.110	0.037							
Strata	0.163	0.087	0.070	0.024						
Soil type	0.214	0.094	0.061	0.095	0.014					
pH	0.393	0.248	0.272	0.299	0.211	0.174				
Organic matter	0.252	0.172	0.165	0.102	0.050	0.246	0.022			
Clay content	0.325	0.235	0.193	0.209	0.231	0.303	0.455	0.119		
Agricultural land type	0.316	0.299	0.250	0.296	0.226	0.305	0.326	0.367	0.200	
Distance to settlements	0.354	0.243	0.123	0.095	0.212	0.317	0.280	0.359	0.429	0.066



**Table S9.** The interaction results of Cd by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.049									
Slope aspect	0.161	0.038								
Slope gradient	0.120	0.109	0.018							
Strata	0.070	0.105	0.064	0.010						
Soil type	0.086	0.059	0.044	0.066	0.010					
pH	0.136	0.151	0.109	0.077	0.086	0.058				
Organic matter	0.379	0.224	0.198	0.184	0.173	0.347	0.122			
Clay content	0.199	0.201	0.078	0.083	0.064	0.175	0.439	0.015		
Agricultural land type	0.205	0.136	0.078	0.109	0.072	0.116	0.279	0.112	0.040	
Distance to settlements	0.265	0.187	0.139	0.094	0.115	0.146	0.367	0.220	0.143	0.048

**Table S10.** The interaction results of Sb by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.109									
Slope aspect	0.362	0.086								
Slope gradient	0.132	0.112	0.012							
Strata	0.116	0.110	0.023	0.005						
Soil type	0.133	0.207	0.075	0.072	0.056					
pH	0.417	0.426	0.329	0.134	0.402	0.099				
Organic matter	0.173	0.208	0.079	0.029	0.126	0.272	0.014			
Clay content	0.197	0.166	0.097	0.046	0.122	0.244	0.148	0.034		
Agricultural land type	0.201	0.206	0.107	0.044	0.119	0.266	0.207	0.140	0.031	
Distance to settlements	0.147	0.201	0.063	0.049	0.089	0.297	0.093	0.121	0.122	0.037

**Table S11.** The interaction results of TI by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.090									
Slope aspect	0.344	0.095								
Slope gradient	0.132	0.189	0.042							
Strata	0.097	0.125	0.051	0.006						
Soil type	0.132	0.175	0.079	0.046	0.030					
pH	0.144	0.169	0.121	0.028	0.094	0.010				
Organic matter	0.154	0.182	0.128	0.030	0.086	0.134	0.010			
Clay content	0.228	0.205	0.118	0.042	0.128	0.156	0.132	0.021		
Agricultural land type	0.180	0.205	0.121	0.057	0.088	0.092	0.114	0.156	0.033	
Distance to settlements	0.187	0.222	0.078	0.059	0.088	0.098	0.163	0.183	0.143	0.044

**Table S12.** The interaction results of Hg by the interaction detector of geographic detector.

	Altitude	Slope aspect	Slope gradient	Strata	Soil type	pH	Organic matter	Clay content	Agricultural land type	Distance to settlements
Altitude	0.165									
Slope aspect	0.431	0.119								
Slope gradient	0.241	0.341	0.069							
Strata	0.173	0.148	0.083	0.010						
Soil type	0.189	0.253	0.166	0.092	0.074					
pH	0.267	0.321	0.158	0.074	0.213	0.047				
Organic matter	0.290	0.261	0.241	0.068	0.167	0.171	0.048			
Clay content	0.349	0.356	0.212	0.099	0.236	0.169	0.182	0.083		
Agricultural land type	0.283	0.232	0.170	0.059	0.158	0.107	0.159	0.205	0.034	
Distance to settlements	0.302	0.255	0.271	0.118	0.162	0.188	0.294	0.343	0.168	0.090