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Supplementary Material

Polybrominated Diphenyl Ethers and Heavy Metals in a Regulated E-Waste Recycling Site, Eastern China: Implications for Risk Management

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This file has 14 pages and includes two figures and nine tables.

Section 1

Sample Preparation

The polybrominated diphenyl ethers (PBDEs) in soils, sediments and vegetables were determined used the method described by Tang et al. [1], with some modifications. Each sample (10.0 g) was extracted using a 1:1 (*v*/*v*) mixture of *n*-hexane and dichloromethane in an ultrasonic bath for 30 min, twice. The extracts were combined and desulfurized by copper. The concentrated extracts were passed through a 10 mm inner diameter glass column containing neutral alumina (6 cm), neutral silica gel (2 cm), alkaline silica gel (5 cm), neutral silica gel (2 cm), acidic silica gel (8 cm) and anhydrous sodium sulfate (2 cm), and then eluted with a mixture of 70 mL hexane and dichloromethane (*v*/*v*, 1:1). The extraction solution was concentrated to 0.2 mL, and amount of ^{13}C-PCB-208 was added as internal standard, and analyzed by a gas chromatography/mass spectrometry (GC/MS).

Heavy metals in soils and sediment samples were measured with the method described by Tang et al. [2]. Briefly, 0.25 g of sample was added to the mixed solution (5.0 mL HNO_3 + 10 mL HF + 2.0 mL $HClO_4$), and then heated to 200 °C until the liquid had evaporated. 8 mL of aqua regia were added and the mixture was heated. When the volume is reduced to 2–3 mL, the digestive solution was diluted to 25 mL with deionized water. Then 1 mL of the solution was selected and diluted to 10 mL with 2% nitric acid for analysis. Vegetable samples were digested by a microwave method described by Cheng et al. [3]. A total of 0.50 g of vegetable sample was put into a Teflon vessel and then the mixed solution (5.0 mL HNO_3 + 2.0 mL H_2O_2) was added, and then digested with the following conditions: 2 min for 250 W, 2 min for 0 W, 6 min for 250 W, 5 min for 400 W, 8 min for 550 W, vent: 8 min. After digestion and cooling, the solution was filtered and diluted to 10 mL with 1 mol·L^{-1} HNO_3 for analysis.

Section 2

Instrumental Analysis

The quantitative analysis of the PBDEs was carried out using an Agilent 7890 gas chromatograph coupled to an Agilent 5975 mass spectrometer (Agilent 7890A/5975C, Agilent Technologies, Santa Clara, CA, USA) using a negative chemical ionization source in selected ion monitoring mode. A DB-5MS column (15 m × 0.25 mm × 0.1 μm; Agilent) was used for separation of PBDE homologues. The temperature of ion source was 150 °C. The

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GC oven temperature program was 80 °C for 0.75 min, increased to 240 °C at 10 °C·min^{-1}, then at 20 °C·min^{-1} increased to 290 °C and held for 10 min. The injector temperature was 250 °C, and the helium mobile phase flow rate was 1.0 mL·min^{-1}. The injector was used in the splitless mode for the less brominated PBDEs (BDE-28, BDE-47, BDE-66, BDE-85, BDE-99, BDE-100, BDE-138, BDE-153, BDE-154, BDE-183, and BDE-190) and the split mode for more heavily brominated PBDEs (BDE-196, BDE-197, BDE-201, BDE-202, BDE-203, BDE-205, BDE-206, BDE-207, BDE-208, and BDE-209).

The concentrations of Cr, Cu, Zn, Cd, Sb, and Pb were determined using an inductively coupled plasma mass spectrometer (Agilent 7500a, Agilent Technologies, Santa Clara, CA, USA), while concentrations of As and Hg were measured using an atomic fluorescence spectrometer (XGY-1011A, IGGE, Langfang, China).

Section 3

Geoaccumulation Index (I_{geo})

The I_{geo}, introduced by Muller [4], has been used widely used in heavy metal pollution research. The equation $I_{geo} = \log_2 (C_n/1.5B_n)$ was used to calculate the geoaccumulation index, where C_n is the measured concentration of the metal in soil or sediment, and B_n is the geochemical background concentration of the metal. We selected the background values for soil metal in Shandong, China, as the B_n values, which were shown in Table 2 (see article). The coefficient 1.5 was used to amplify very small anthropogenic influences.

Table S1. Exposure factors and values used in the non-carcinogenic risk estimation.

Parameter	Definition	Unit	Value		Reference
			Children	Adult	
IngR	Soil ingestion rate	mg/day	200	100	[5]
InhR	Inhalation rate	m^3/day	5	15	[6]
EF	Exposure frequency	day/year	345	345	[7]
ED	Exposure duration	year	24	6	[5]
BW	Average body weight	kg	15	60	[6]
AT	Average time	day	365 × ED	365 × ED	[8]
SA	Exposed skin surface area	m^2	1600	4350	[6]
AF	Skin adherence factor	mg/(cm^2 day)	0.7	0.2	[9]
PEF	Particle emission factor	m^3/kg	1.36×10^9	1.36×10^9	[5]

Table S2. Reference dose (RfDs) of different exposure routes and skin absorption factors (ABS) for heavy metals and PBDEs.

Compound	Ingestion	Inhalation	Dermal contact	ABS
As	0.0003 [1]	0.0003 [1]	0.000123 [1]	0.03 [2]
Cd	0.001 [3]	0.001 [3]	0.00001 [3]	0.14 [2]
Cr	0.003 [1]	0.000029 [1]	0.003 [1]	0.04 [2]
Cu	0.04 [1]	0.042 [1]	0.012 [1]	0.1 [2]
Hg	0.00016 [3]	0.0000857 [3]	0.000021 [3]	0.05 [2]
Mn	0.14 [1]	0.000014 [1]	0.023 [1]	0.01 [3]
Ni	0.02 [1]	0.021 [1]	0.0054 [1]	0.35 [2]
Pb	0.0035 [1]	0.00352 [1]	0.000525 [1]	0.006 [2]
Sb	0.0004 [3]	0.000014 [3]	0.000008 [3]	0.001 [3]
Zn	0.3 [1]	0.3 [1]	0.06 [1]	0.02 [2]

BDE-47	0.0001 [4]	0.0001 [8]	0.0001 [8]	1 [8]
BDE-99	0.0001 [5]	0.0001 [8]	0.0001 [8]	1 [8]
BDE-153	0.0002 [6]	0.0002 [8]	0.0002 [8]	1 [8]
BDE-209	0.007 [7]	0.007 [8]	0.007 [8]	1 [8]

[1] [10]; [2] [11]; [3] [6]; [4] [12]; [5] [13]; [6] [14]; [7] [15]; [8] In this study, the inhalation RfD and dermal RfD of BDE-47, 99, 153 and BDE-209 are assumed to be equal to its corresponding ingestion RfD, respectively; the values of ABS were all assumed to be equal to 1.

Table S3. Polybrominated diphenyl ether (PBDE) concentrations ($ng \cdot g^{-1}$ dry weight) in soils from the regulated e-waste recycling area and from other areas.

Locations	Sampling Times	Types	BDE-209 (max–min) Median/Mean	∑PBDEs (max–min) Median/Mean	References
Qingdao, China	**2015**	**Regulated e-waste recycling site**	**(3.05–1,331) 8.09**	**(3.05–1,366) 9.23**	**This study**
Guiyu, China	2009–2010	Irregulated e-waste recycling sites	(ND–12,130) 10,090	(2.00–71,840) 44,360	[16]
Guiyu, China	2004	Irregulated e-waste recycling sites	(510–1,270) 890	(1,440–3,570) 2,505	[17]
Guiyu, China	2014	Irregulated e-waste recycling sites	14,107	17,930	[18]
Qingyuan, China	-	Irregulated e-waste recycling sites	(21.7–23,131) 5,568	(28.2–23,517) 5,813	[19]
Qingyuan, China	-	Irregulated e-waste recycling sites	(4.40–21,467) 2,126	(5.27–22,108) 2,283	[19]
Longtang, China	2012	Irregulated e-waste recycling sites	(347–3,340) 1,994	(421–3,713) 2,273	[20]
Taizhou, China	2007	Irregulated e-waste recycling sites	(69.9–5,530) 1,800	(71.6–5,710) 1,910	[21]
Zhejiang, China	2008	Irregulated e-waste recycling sites	(1.20–356) 148	654	[22]
Shanghai, China	2007	Urban and industrial areas	(1.93–268) 40.6	(2.03–269) 40.6	[21]
Tianjin, China	2018	Urban and industrial areas	(0.93–106) 9.16	(1.11–108) 9.76	[23]
Shanghai, China	2006	Urban and industrial areas	(0.001–2.91) 0.48	(0.024–3.80) 0.74	[24]
China	2012	Urban and industrial areas	(0.47–790) 72.0	(0.60–800) 75.0	[25]
Taiyuan, China	2006	Urban and industrial areas	(0.006–210) 13.3	(0.016–211) 14.7	[26]
Shen-Fu, China	2016	Urban and industrial areas	(ND–39.1)	(0.28–50.7) 10.5	[27]
Shanghai, China	2012	Urban and industrial areas	(4.74–35.6) 18.0	(5.19–40.5) 19.7	[28]
Baotou, China	2017	Urban and industrial areas	(1.59–64.3) 13.1	13.3	[29]
Huhhot, China	2017	Urban and industrial areas	(2.13–47.9) 5.91	5.99	[29]
Shanghai, China	2007	Agricultural and rural areas	(0.03–0.80) 0.25	(0.13–1.25) 0.43	[30]

The Yangtze River Delta, China	2014	Agricultural and rural areas	(ND–109) 3.01	(ND–382) 4.02	[31]
Shanghai, China	2012	Agricultural and rural areas	(3.55–48.7) 16.1	(4.31–49.3) 17.7	[28]
Baynnur, China	2017	Agricultural and rural areas	(0.51–3.97) 1.4	1.45	[29]
Tongliao, China	2017	Agricultural and rural areas	(0.69–2.25) 1.31	1.36	[29]

Table S4. Polybrominated diphenyl ether (PBDE) concentrations (ng·g^{-1} dry weight) in sediments from the regulated e-waste recycling area and from other areas.

Location	Sampling Times	Types	BDE-209 (max–min) Median/Mean	∑PBDEs (max–min) Median/Mean	References
The ditches in Qingdao, China	**2015**	**Regulated e-waste recycling site**	**(4.27–314) 10.8**	**(4.31–328) 11.6**	**This study**
The river in Longtang, China	2012	Irregulated e-waste recycling sites	(384–4,449) 2,405	(483–5,314) 5,314	[20]
A pond in Qingyuan, China	2016	Irregulated e-waste recycling sites	-	(65–98,000) 530	[32]
A pond in Qingyuan, China	2016	Irregulated e-waste recycling sites	-	(122–125,000) 510	[32]
A pond in Qingyuan, China	2016	Irregulated e-waste recycling sites	-	(5,000–1,030,000) 43,000	[32]
The rivers in Guiyu, China	2006	Irregulated e-waste recycling sites	(7.02–66,573) 8,840	(9.59–87,779) 9,054	[33]
The Nanyang River, China	2004	Irregulated e-waste recycling sites	(16.9–62.2) 35.9	(4,434–16,088) 9,357	[34]
The Yongning River, China	2014	Irregulated e-waste recycling sites	(300–25,751) 10,108	(303–26,838) 10,363	[35]
The river in South China, China	2013	Irregulated e-waste recycling sites	(740–1,000) 910	(2,000–4,700) 2,900	[36]
The Pearl River, China	2006	Urban and industrial areas	(12.2–488) 123	(12.5–524) 127	[33]
The Zhujiang River, China	2002	Urban and industrial areas	(26.3–3,575) 890	(27.7–3,587) 903	[37]
The Yangtze River Delta, China	2012	Urban and industrial areas	56.6–2,059	(57.1–2,061) 305	[38]
Lake Chaohu, China	2010	Urban and industrial areas	(2.44–72.5) 20.5	(3.64–86.7) 25.5	[39]
Lake Taihu, China	2016	Urban and industrial areas	(16.6–160) 46.8	(20.1–180) 53	[40]
Maanshan, China	2018	Urban and industrial areas	(0.02–26.6) 6.00	(0.02–106) 30.7	[41]
Wuhu, China	2018	Urban and industrial areas	(0.01–19.4) 5.35	(0.01–77.6) 23.1	[41]
Tongling, China	2018	Urban and industrial areas	(0.54–35.8) 6.04	(0.01–84.8) 20.5	[41]
The Haihe River, China	2017	Agricultural and rural areas	(1.10–4.90) 2.40	(0.27–4.9) 3.40	[42]

The Xijiang River, China	2002	Agricultural and rural areas	(1.90–77.4) 5.68	(2.10–77.9) 6.04	[37]
Lake Chaohu, China	2010	Agricultural and rural areas	(2.44–72.5) 20.5	(3.64–86.7) 25.5	[39]
The Maozhou River, China	2010	Agricultural and rural areas	(1.93–101) 16.9	(2.11–128) 19.0	[43]

Table S5. Polybrominated diphenyl ether (PBDE) concentrations ($ng \cdot g^{-1}$ dry weight) in vegetables from the regulated e-waste recycling area and from other areas.

Location	Sampling Times	Types [1]	BDE-209 (max–min) Median/Mean	∑PBDEs (max–min) Median/Mean	References
Qingdao, China	**2015**	**Wheat leaf**	**(94.9–204) 185**	**(100–205) 188**	**This study**
Qingdao, China	**2015**	**Metasequoia leaf**	**(246–322) 284**	**(249–327) 288**	**This study**
Qingdao, China	**2015**	**Pine needle**	**(133–138) 136**	**(134–139) 137**	**This study**
Qingdao, China	**2015**	**Rattan grass**	**(198–268) 232**	**(202–272) 237**	**This study**
Qingdao, China	**2015**	**Aspen leaf**	**(90.2–378) 181**	**(93.9–383) 183**	**This study**
Qingdao, China	**2015**	**Baby's breath**	**(295–419) 357**	**(300–425) 362**	**This study**
Taizhou, China	2007	Tree and shrub leaf (IR-sites)	(1.45–40.3) 12.3	(17.1–64.2) 30.6	[21]
Taizhou, China	2006	Tree bark (IR-sites)	19.5	25.3	[44]
Taizhou, China	2008	*C. Camphora* leaf (IR-sites))	(ND–2.32)	(0.46–400)	[45]
Southern China	2007–2009	Eucalyptus leaf (IR-sites)	(6.87–45.2) 25.6	(18.9–103) 65.5	[46]
Southern China	2007–2009	Pine needle (IR-sites)	(15.6–75.1) 40.5	(27.9–383) 145	[46]
South China	2006	*Erigeron annuus* (L.) leaf (IR-sites))	15	326	[47]
Longtang, China	2012	Herb plants (IR-sites)	(3.32–76.3) 39.1	(4.84–124) 52.1	[20]
Guiyu, China	2009–2010	Edible plant (IR-sites)	(0.24–0.86) 0.55	(0.92–1.39) 1.16	[16]
Guiyu, China		Pumpkin root (IR-sites))	35.1	132	[48]
Guiyu, China	2012	Vegetable shoots (IR-sites)	(1.75–143) 17.8	(10.3–164) 37.5	[49]
Liushi, China	2009–2010	Grass leaf (UI-areas)	-	(22–223) 75.1	[50]
Ningbo, China	2009–2010	Grass leaf (UI-areas)	-	(1.40–25.6) 4.00	[50]
Shanghai, China	2015	Pine needle (UI-areas)	(Nd–324) 1.69	(3.71–4,020) 237	[51]
Baotou, China	2017	Willow bark (UI-areas)	(1.35–1.75) 1.60	1.64	[29]
Huhhot, China	2017	Willow bark (UI-areas)	(0.50–5.96) 1.67	1.73	[29]
Suzhou, China	2009	Camphor bark (UI-areas)	(82–7,420) 927	(112–7,460) 950	[52]
Nantong, China	2009	Camphor bark (UI-areas)	(148–3,240) 950	(182–3,290)1,059	[52]
Wuxi, China	2009	Camphor bark (UI-areas)	(121–2,590) 542	(156–2,600) 563	[52]

Longtang, China	2012	Herb plants (AR-areas)	(15.0–18.2) 16.3	(19.0–23.3) 21.7	[20]
Baynnur, China	2017	Willow bark (AR-areas)	(1.09–1.17) 1.13	1.21	[29]
Tongliao, China	2017	Willow bark (AR-areas)	(0.17–1.04) 0.42	0.49	[29]

[1] IR-sites, irregulated e-waste recycling sites; UI-areas, urban and industrial areas; AR-areas, agricultural and rural areas.

Table S6. Mean metal concentrations (μg·g^{-1}) in soils from the regulated e-waste recycling area and from other areas.

Location	Types	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Zn	References
Qingdao, China	**Regulated e-waste recycling site**	**20.0**	**0.12**	**104**	**27.9**	**0.04**	**1,839**	**38.9**	**33.4**	**2.11**	**54.0**	**This study**
Guiyu, China	Irregulated e-waste recycling sites	-	1.96	154	788	-	3,374	114	1,431	-	-	[16]
Guiyu, China	Irregulated e-waste recycling sites	-	6.82	318	1,568	-	410	362	1,423	500	2,978	[18]
Guiyu, China	Irregulated e-waste recycling sites	70.4	5.30	277	1,207	-	420	295	1,001	3,834	-	[53]
Longtang, China	Irregulated e-waste recycling sites	-	17.1	-	11,140	-	-	-	4,500	-	3,690	[54]
Longtang, China	Irregulated e-waste recycling sites	-	10.3	63.3	4,851	-	-	100	1,715	-	1,017	[55]
Longtang, China	Irregulated e-waste recycling sites	-	39.3	-	6,372	-	-	-	1,635	-	3,040	[56]
Longtang, China	Irregulated e-waste recycling sites	80.2	6.33	-	2,159	1.38	-	78.1	576	-	1,366	[20]
Shijiao, China	Irregulated e-waste recycling sites	-	21.3	-	4,001	-	-	-	944	-	2,045	[56]
Taizhou, China	Irregulated e-waste recycling sites	-	2.60	88.6	158	0.40	-	42.9	164	-	300	[57]
Yulin, China	Urban and industrial areas	5.35	-	45.1	15	-	374	17.9	21.5	-	57.7	[10]
Guizhou, China	Urban and industrial areas	14.2	0.78	353	41.5	14.2	-	33.6	59.3	46.7	249	[58]
Liaoning, China	Urban and industrial areas	-	0.86	69.9	52.3	-	-	33.5	45.1	-	213	[59]
Guangdong, China	Urban and industrial areas	7.89	0.06	22.5	11.1	0.08	-	12	42.4	-	56.6	[60]
Beijing, China	Urban and industrial areas	-	0.15	35.6	23.7	-	-	27.8	28.6	-	65.6	[61]
Hangzhou, China	Urban and industrial areas	-	1.30	47.5	41.0	-	-	24.1	75.7	-	148	[62]
Shanghai, China	Urban and industrial areas	-	0.52	108	59.3	-	-	31.1	70.7	-	301	[63]
China, China	Urban and industrial areas	12.2	0.39	68.5	40.4	0.31	-	24.9	55.2	-	109	[64]
Heilongjiang, China	Agricultural and rural areas	8.69	0.10	53.6	18.6	0.03	-	23.3	22	-	56	[65]
Heibei, China	Agricultural and rural areas	6.16	0.15	57.8	21.2	0.08	-	25.0	18.8	-	70.0	[66]

Henan, China	Agricultural and rural areas	3.16	0.06	57.8	22.3	0.05	-	-	15.2	-	48.5	[67]
Hainan, China	Agricultural and rural areas	2.67	0.09	52.9	-	0.06	-	-	20.2	-	-	[68]
Jiangsu, China	Agricultural and rural areas	-	0.04	55	23.9	0.07	-	29.2	27.4	-	65.1	[69]
Jiangsu, China	Agricultural and rural areas	9.26	0.04	61.6	21.2	0.08	-	-	24.2	-	-	[70]
Jilin, China	Agricultural and rural areas	7.20	0.07	35	16.7	0.01	-	15.2	18.3	-	35	[71]
China	Agricultural and rural areas	-	0.21	61.4	40.5	-	573	28.2	33	1.23	92.6	[72]
China	Agricultural and rural areas	12.1	0.23	68.5	27.1	0.09	-	29.6	31.2	-	79	[73]

Table S7. Mean metal concentrations (μg·g^{-1}) in sediments from the regulated e-waste recycling area and from other areas.

Location	Types	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Zn	References
The ditches in Qingdao, China	**Regulated e-waste recycling site**	**12.0**	**0.42**	**144**	**41.6**	**0.76**	**1,145**	**40.7**	**62.3**	**20.7**	**223**	**This study**
The Lianjiang River, China	Irregulated e-waste recycling sites	-	0.24	35.3	66.7	-	-	51.5	55.0	-	134	[74]
The Nanyang River, China	Irregulated e-waste recycling sites	-	6.28	65.4	2,154	-	-	294	395	-	483	[74]
The rivers in Guiyu China	Irregulated e-waste recycling sites	-	5.66	10.2	3,370	-	1,000	216	2,170	3,990	1,190	[75]
The river in Longtang, China	Irregulated e-waste recycling sites	290	11.1	-	3,393	4.08	-	134	1,170	-	2,183	[20]
A pool and dam in Qingyuan, China	Irregulated e-waste recycling sites	-	1.12	1.89	766	-	-	-	130	-	181	[76]
The Nanguan River, China	Irregulated e-waste recycling sites	12.0	6.31	317	4,788	1.55	-	153	377	-	-	[77]
The Lian River, China	Irregulated e-waste recycling sites	-	3.48	98.8	1,270	-	599	175	570	154	772	[78]
The Daliao River, China	Urban and industrial areas	-	-	-	-	-	624	-	-	0.68	-	[79]
The Yangtze River, China	Urban and industrial areas	14.2	1.10	84	50	0.14	-	39	42	-	133	[80]
The Yangtze River, China	Urban and industrial areas	14.8	0.55	113	49	0.12	-	46	43	-	165	[80]
The Yangtze River, China	Urban and industrial areas	15.2	0.40	91	41	0.14	-	42	44	-	121	[80]
The Yellow River, China	Urban and industrial areas	-	-	77.9	23	-	596	28.5	-	-	50.2	[81]
Lake Chaohu, China	Urban and industrial areas	44.4	-	102	79.4	0.49	-	-	49.5	-	206	[39]
The Yangtze River Estuary, China	Agricultural and rural areas	11.0	0.42	43.5	30.7	-	-	33.4	35.8	1.61	117	[82]
Lake Taihu, China	Agricultural and rural areas	-	0.15	95.9	40.7	-	-	49.2	52	-	95.2	[83]

The Yellow River, China	Agricultural and rural areas	11.2	0.46	79.4	32.0	0.14	-	36.1	32.1	-	118	[84]
The lakes in Wuhan, China	Agricultural and rural areas	10.0	0.32	95.5	37.4	-	420	43.7	29.5	-	96.0	[85]

Table S8. Mean metal concentrations (μg·g^{-1}) in vegetables from the regulated e-waste recycling area and from other areas.

Location	Types [1]	As	Cd	Cr	Cu	Hg	Mn	Ni	Pb	Sb	Zn	References
Qingdao, China	**Regulated e-waste recycling site**	**0.95**	**0.14**	**5.49**	**9.99**	**0.17**	**177**	**3.39**	**3.94**	**0.62**	**42.2**	**This study**
Guiyu, China	Edible plant samples (IR-sites)	-	2.92	2.66	29.0	-	123	13.4	11.4	-	-	[16]
Longtang, China	Vegetables (IR-sites)	-	2.62	-	20.4	-	-	-	5.79	-	135	[54]
Longtang, China	Rice (IR-sites)	-	0.43	-	42.3	-	-	-	13.6	-	94	[54]
Longtang, China	Wild plants (IR-sites)	-	1.59	-	94.5	-	-	-	54	-	143	[54]
South China	Rice (IR-sites)	-	0.44	-	20.3	-	-	1.33	0.20	-	33.1	[86]
Longtang, China	Herb plants (IR-sites)	8.63	0.34	-	96.1	0.17	-	ND	3.03	-	138	[20]
Longtang, China	Tree and herb root	-	0.81	-	303	-	-	-	31.1	-	41.5	[55]
Longtang, China	Tree and herb stalk	-	0.64	-	21.8	-	-	-	7.91	-	31.8	[55]
Longtang, China	Tree and herb leaf	-	0.58	-	49.3	-	-	-	12.3	-	40.3	[55]
Shanghai, China	*Osmanthus fragran* (UI-areas)	-	0.10	-	3.90	-	-	-	1.16	-	28.8	[87]
Shanghai, China	*Metasequoia glyptostroboides* (UI-areas)	-	0.04	-	5.88	-	-	-	1.22	-	22.4	[87]
Shanghai, China	*Pittosporum tobira* (UI-areas)	-	0.11	-	3.79	-	-	-	0.85	-	38.6	[87]
Shanghai, China	Leafy vegetables (UI-areas)	0.04	0.03	-	0.04	0.67	-	-	-	-	3.96	[88]
Hefei, China	*M. grandfora* branch (UI-areas)	-	0.05	-	-	-	-	-	1.01	-	-	[89]
Zhejiang, China	Rice (AR-areas)	-	0.09	-	2.98	-	-	0.35	-	-	22.4	[90]
Dongguan, China	Vegetable (AR-areas)	-	0.13	-	1.94	-	-	-	1.72	-	14.1	[91]
Shaoguan, China	Vegetable (AR-areas)	-	0.35	-	1.36	-	-	-	1.62	-	15.1	[91]
Guangzhou, China	Vegetable (AR-areas)	-	0.07	-	1.09	-	-	-	1.21	-	7.02	[91]
The Yangtze River, China	Lotus leaf (AR-areas)	0.20	0.28	4.66	4.62	-	-	-	0.62	-	24.1	[92]

[1] IR-sites, irregulated e-waste recycling sites; UI-areas, urban and industrial areas; AR-areas, agricultural and rural areas.

Table S9. Non-carcinogenic risks for individual polybrominated diphenyl ethers (PBDEs) in soils from the regulated electronic waste recycling site.

	Children			Adults		
Compound	**P_5**	**P_{50}**	**P_{95}**	**P_5**	**P_{50}**	**P_{95}**
BDE-47	4.82×10^{-7}	4.82×10^{-7}	4.54×10^{-5}	8.86×10^{-8}	8.86×10^{-8}	8.34×10^{-6}
BDE-99	1.34×10^{-6}	1.34×10^{-6}	1.33×10^{-5}	2.46×10^{-7}	2.46×10^{-7}	2.44×10^{-6}
BDE-153	8.65×10^{-7}	8.65×10^{-7}	2.38×10^{-5}	1.59×10^{-7}	1.59×10^{-7}	4.37×10^{-6}
BDE-209	4.34×10^{-5}	9.61×10^{-5}	6.87×10^{-3}	7.97×10^{-6}	1.77×10^{-5}	1.26×10^{-3}

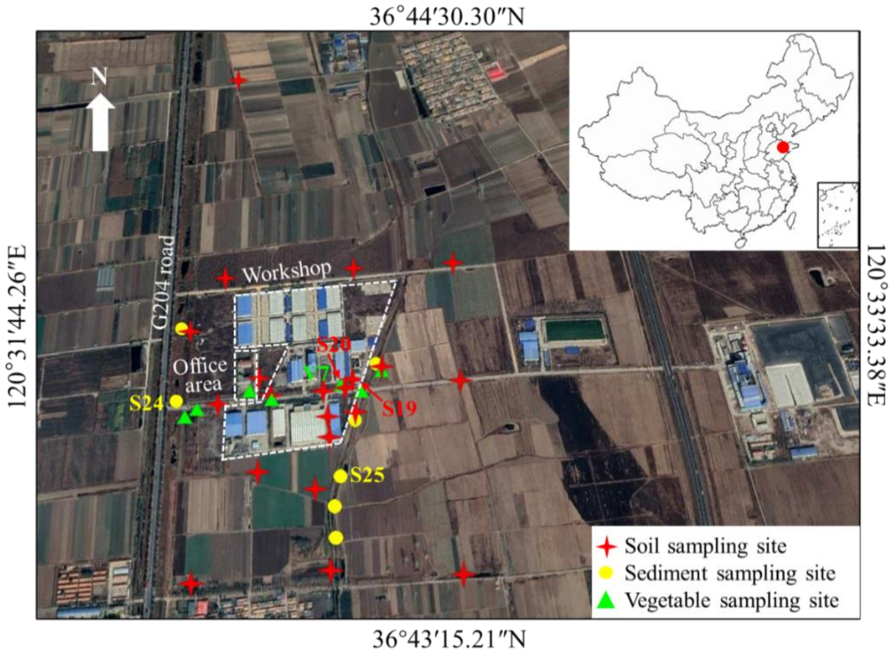

Figure S1. Map of the soil, sediment, vegetable sampling sites in regulated e-waste recycling site.

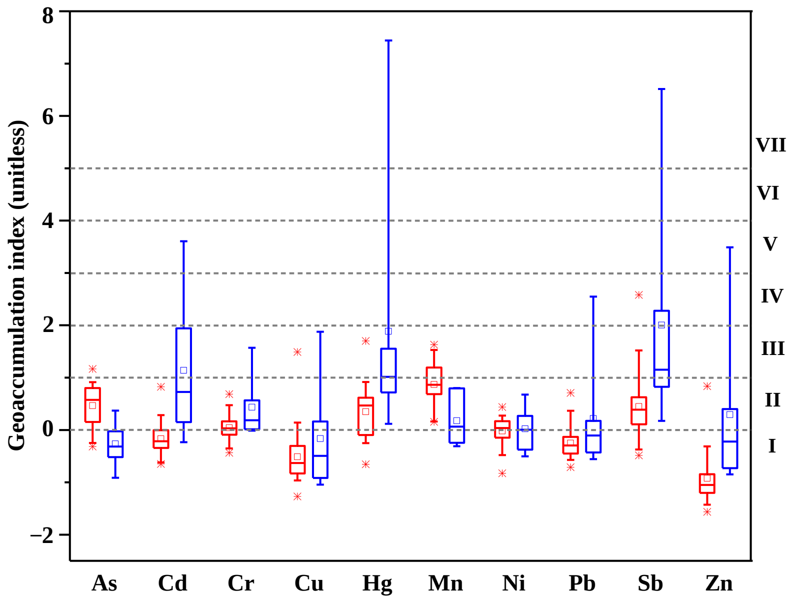

Figure S2. Box plots of the geoaccumulation index for heavy metals in soils (red) and sediments (blue) from regulated e-waste recycling site. Horizontal lines represent the 5%, 50%, and 95% values; the boxes represent the 25% and 75% values. The horizontal line and square in the box indicate the median and mean value; the asterisk below or above indicates the outlier value. Contamination classes: unpolluted ($I_{geo} \leq 0$) (I), unpolluted to moderately polluted ($0 < I_{geo} \leq 1$) (II), moderately polluted ($1 < I_{geo} \leq 2$) (III), moderately to heavily polluted ($2 < I_{geo} \leq 3$) (IV), heavily polluted ($3 < I_{geo} \leq 4$) (V), heavily to extremely polluted ($4 < I_{geo} \leq 5$) (VI), and extremely polluted ($I_{geo} > 5$) (VII), using the method developed by Muller [4].

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