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Environmental Chemistry

Supplementary Material

Occurrence, spatial distribution, risk assessment, and management of environmental estrogens in surface waters of the Taihu basin

Minhao Wang[A,B], *Hongran Ding*[A], *Guiyu Liang*[A], *Xueyin Wang*[A], *Luyue Yang*[A], *Ting Tong*[A], *Dongling Li*[A], *Xiao Zhou*[A], *Haifei Zhang*[B], *Fang Wang*[C], *Xiaowei Tie*[C] and *Lei Han*[A,*]

[A]Department of Health and Environmental Sciences, School of Science, Xi'an Jiaotong–Liverpool University, Suzhou, 215123, PR China

[B]Department of Chemistry, University of Liverpool, Crown Street, Liverpool, L69 7ZD, UK

[C]Eurofins Technology Service (Suzhou) Co., Ltd, Suzhou, 215100, PR China

*Correspondence to: Email: lei.han@xjtlu.edu.cn

Table S1. Coordinate information and description of sampling points.

Lake	Sampling Points	Coordinate information	Description
Taihu Lake	T1	31°57′23″N, 120°23′0"E	Eco Resort
	T2	30°59′57″N, 120°27′46"E	Level 4 water source gate
	T3	31°6′37″N, 120°26′17"E	Abandoned construction site
	T4	31°8′6″N, 120°37′48"E	Recreation Park Pier
	T5	31°11′19″N, 120°35′43"E	No-Catch Zone
	T6	31°12′49″N, 120°21′57"E	Villa Complex
	T7	31°17′3″N, 120°21′33"E	The estuary of the lake, next to the village
	T8	31°19′7″N, 120°20′3"E	Sluice Gate
	T9	31°22′11″N, 120°22′57"E	Camping Area
	T10	31°25′34″N, 120°24′0"E	Undeveloped wasteland
Yangcheng Lake	Y1	31°23′12.7″N, 120°47′17.69"E	Near the restaurant and Hotel
	Y2	31°23′12.59″N, 120°42′28.12"E	Near the rail line
	Y3	31°21′32″N, 120°42′43"E	Sports Eco Park
	Y4	31°23′8″N, 120°41′5"E	Farmer's House
	Y5	31°25′56″N, 120°42′45"E	Farmer's House
	Y6	31°27′0″N, 120°46′11"E	Resort
	Y7	31°26′37″N, 120°44′54"E	Crab Manor
	Y8	31°29′27″N, 120°48′39"E	Neat the source of drinking water
	Y9	31°28′4″N, 120°50′18"E	Near the watermelon field
	Y10	31°23′55″N, 120°49′50"E	Park
Dushu Lake	D1	31°19′17.34"E, 120°40′45.24"E	Construction site of the entrance to the cross-lake tunnel
	D2	31°19′31.45"E, 120°41′45.17"E	Leisure Park
	D3	31°18′58.18"E, 120°42′38.33"E	General residential area
	D4	31°18′26.53″N, 120°42′40.75"E	Villa area
	D5	31°18′9.54″N, 120°42′32.36"E	Marina
	D6	31°18′9.73"E, 120°41′1.53"E	Eco Park
	D7	31°18′16.52"E, 120°40′53.51"E	Leisure Plaza
	D8	31°18′45.07"E, 120°40′51.1"E	Eco Park
Shanghu Lake	S1	31°39′7″N, 120°40′15"E	Near the High School
	S2	31°39′37″N, 120°39′56"E	Next to the Farm Restaurant
	S3	31°40′19″N, 120°40′26"E	Dam
	S4	31°39′46″N, 120°40′50"E	Farmstead
	S5	31°39′13″N, 120°41′27"E	Tourist Resort
	S6	31°38′50″N, 120°42′12"E	Farmland
	S7	31°37′49″N, 120°43′46"E	Residential Area
	S8	31°38′64″N, 120°41′59"E	Tourist Resort
Jinji Lake	J1	31°15′35.63"E, 120°41′50.92"E	Upscale Hotel Pier
	J2	31°15′36"E, 120°41′51"E	Beside the Lake Trail
	J3	31°17′17"E, 120°40′22"E	Near the Yacht Club
	J4	31°17′42"E, 120°40′54"E	Near Hot Spring Hotel
	J5	31°17′3"E, 120°42′14"E	Trestle in the lake
	J6	31°16′38"E, 120°42′58"E	Near Restaurant and Hotel
	J7	31°15′56"E, 120°43′7"E	Entrance to Square
	J8	31°15′20"E, 120°42′52"E	Lakeside Park

Table S2. Previous studies and current research of environmental EDC concentrations (ng L^{-1}).

Name (Location)	E1	E2	EE2	BPA	Reference
Rivers (France)	0.8–3.9	0.8–3.6	1.2–3.5	n.d.	(Cargouët et al., 2004)
Kitatama (Japan)	107.6	14.7	0.2	61.7	(Furuichi et al., 2004)
HaraBridge (Japan)	47.6	5.2	0.2	33.2	(Furuichi et al., 2004)
Rivers (Austria)	1.1–20.9	0.54–3.80	0.04–0.52	4–59	(Ying et al., 2009)
Taihu Lake (China)	0.5–15.8	n.d.–10.8	n.d.–16.4	9.2–33.5	(Lu et al., 2011)
Taihu Lake (China)	1.8–28.8	40–117	n.d.–33.5	22.5–194	(Wang et al., 2015)
Yundang Lagoon (China)	n.d.–5.4	n.d.–1.6	n.d.–0.6	14.2–31.4	(Zhang et al., 2011)
Tiber River (Italy)	5–12	2–6	n.d.–	15–29	(Laganà et al., 2004)
Danube River (Serbia)	0.1–9.8	<0.037	1 /	0.6–105.7	(Čelić et al., 2020)
Iberian River (Spain)	d.–7.3	n.d. –7.8	n.d.–2.2	n.d.–649	(Gorga et al., 2015)
Dushu Lake	n.d.–0.02	n.d.–1.18	0.06–1.83	1.62–14.08	Present study
Jinji Lake	n.d.–0.06	n.d.–0.26	0.02–0.09	5.29–12.61	
Shang Lake	n.d.–0.15	n.d.–30.7	n.d.–179.7	1.8–209	
East Taihu Lake	n.d.–0.64	0.02–0.98	0.02–0.65	2.8–27.6	
Yangcheng Lake	n.d.–0.04	n.d.–0.04	n.d.–0.33	0.4–23.3	

n.d. indicates not detectable.

Table S3. Concentration (ppb) of heavy elements in surface water in Taihu Basin.

Lake	Sample ID	As	Ba	Be	Cd	Cr	Cu	Ga	Mn	Ni	Pb	Sb	Sn	Ti	Tl	V
Shanghu Lake	S1	5.76	45.6	0.01	n.d.	240	3.27	0.94	7.9	1.7	n.d.	1.55	0.07	1.69	0.1	1.17
	S2	6.54	44.7	0.01	0.01	413	1.85	0.82	n.d.	1.79	n.d.	1.37	n.d.	1.86	0.01	1.48
	S3	5.73	48.4	n.d.	0.06	137	2.62	1.07	5.4	2.02	n.d.	1.43	n.d.	1.64	0.01	1.62
	S4	5.42	49.7	n.d.	0.01	108	2.19	1.17	n.d.	3.3	n.d.	1.51	n.d.	1.21	0.01	2.43
	S5	3.74	45.5	n.d.	0.01	76.4	1.45	1.1	0.46	2.07	n.d.	1.19	n.d.	1.12	n.d.	1.37
	S6	3.78	39.9	n.d.	0.03	110	0.96	0.97	4.83	1.54	n.d.	1	n.d.	1.03	n.d.	1.33
	S7	3.41	34.2	n.d.	0.01	69	0.75	0.85	1.75	1.29	n.d.	0.94	n.d.	0.74	n.d.	1.31
	S8	2.53	39.2	n.d.	n.d.	38	0.46	1.01	n.d.	1.3	n.d.	1.02	n.d.	0.37	n.d.	1.43
Jinji Lake	J1	8.82	43.3	n.d.	n.d.	25	2.24	1.23	0.61	2.85	n.d.	1.52	n.d.	1.55	n.d.	4.06
	J2	12.1	37.6	n.d.	0.02	69.5	1.56	1.08	0.61	2	n.d.	1.64	n.d.	0.79	n.d.	3.68
	J3	11.8	40.5	n.d.	0.03	57.3	2.41	1.2	n.d.	2.38	n.d.	1.66	n.d.	1	n.d.	3.45
	J4	9.67	42.5	n.d.	0.02	48.5	1.57	1.3	n.d.	3.47	n.d.	1.5	n.d.	0.91	n.d.	3.1
	J5	11.6	37.4	n.d.	n.d.	44.8	1.32	1.13	n.d.	1.48	n.d.	1.47	n.d.	0.42	n.d.	3.17
	J6	12.1	39	n.d.	0.01	64.1	2.16	1.13	n.d.	1.74	n.d.	1.45	0.01	0.63	n.d.	2.76
	J7	16.5	35.3	n.d.	0.01	147	1.58	1	n.d.	1.44	n.d.	1.52	n.d.	1.69	n.d.	2.61
	J8	10.5	42.1	n.d.	n.d.	51.5	1.62	1.24	n.d.	2.7	n.d.	1.54	n.d.	0.39	n.d.	3.52
Taihu Lake	T1	5.53	40.5	n.d.	n.d.	76.3	1.22	1.21	n.d.	0.9	n.d.	1.17	n.d.	2.42	0.01	2
	T2	5.23	33.8	n.d.	0.01	61.5	0.79	1	n.d.	0.52	n.d.	0.86	n.d.	1.39	0.01	2.2
	T3	2.92	47.3	n.d.	0.03	52.6	0.86	1.36	3.3	1.16	n.d.	0.62	n.d.	0.62	n.d.	0.6
	T4	4.18	53.4	n.d.	n.d.	118	0.56	1.51	n.d.	1.76	n.d.	1.08	n.d.	2.59	n.d.	1.9
	T5	4.41	27.9	n.d.	n.d.	65.1	0.62	0.84	4.34	n.d.	n.d.	0.95	n.d.	1.47	n.d.	2.13
	T6	3.56	42	n.d.	n.d.	78.1	0.53	1.19	n.d.	0.55	n.d.	0.88	n.d.	1.23	n.d.	1.68
	T7	6.7	91.1	n.d.	0.11	108	1.4	2.31	52.61	2.78	n.d.	0.87	n.d.	1.78	n.d.	1.95
	T8	2.84	111	n.d.	0.02	57.1	0.82	2.91	n.d.	2.18	n.d.	1.19	n.d.	1.37	n.d.	1.79
	T9	3.58	44.7	n.d.	0.04	73.9	0.82	1.28	4.76	1.99	n.d.	0.74	n.d.	0.69	n.d.	1.02
	T10	4.28	58.8	n.d.	0.02	56.1	0.97	1.72	3.29	2.3	n.d.	1.28	n.d.	0.95	n.d.	2.1

Lake	Sample ID	As	Ba	Be	Cd	Cr	Cu	Ga	Mn	Ni	Pb	Sb	Sn	Ti	Tl	V
Yangcheng Lake	Y1	5.29	42.5	n.d.	n.d.	58.1	0.44	1.26	n.d.	1.96	n.d.	2.86	n.d.	0.34	n.d.	2.4
	Y2	9.84	41.8	n.d.	n.d.	50.6	1.68	1.27	0.54	2.96	n.d.	1.66	n.d.	1.09	n.d.	4.74
	Y3	8.74	43.2	n.d.	0.01	120	1.47	1.21	10.95	2.75	n.d.	1.38	n.d.	1.76	n.d.	3.58
	Y4	9.48	47.2	n.d.	0.01	135	1.83	1.3	n.d.	3.79	n.d.	1.27	n.d.	1.76	n.d.	3.36
	Y5	10.6	40.1	n.d.	0.02	75.9	2.14	1.19	n.d.	2.54	n.d.	2.31	n.d.	1.32	n.d.	4.19
	Y6	8.23	38.7	n.d.	0.01	73.3	2.78	1.13	0.84	2.66	n.d.	1.79	n.d.	0.64	n.d.	2.53
	Y7	11.3	35.1	n.d.	n.d.	57.5	1.59	1.07	7.27	2.46	n.d.	4.31	n.d.	1.11	n.d.	3.46
	Y8	13.8	33.8	n.d.	n.d.	121	1.34	0.97	0.15	1.95	n.d.	1.47	n.d.	1.2	n.d.	2.89
	Y9	7.3	38.6	n.d.	n.d.	54.6	0.98	1.18	5.44	2.38	n.d.	1.19	n.d.	0.89	n.d.	2.34
	Y10	6.77	45.1	n.d.	n.d.	148	0.9	1.26	n.d.	2.83	n.d.	1.78	n.d.	1.11	n.d.	1.52
Dushu Lake	D1	11.8	38.7	n.d.	n.d.	66.3	1.8	1.17	n.d.	1.66	n.d.	1.24	n.d.	1.27	n.d.	3.01
	D2	3.21	47.9	n.d.	0.06	64.6	2.82	1.5	60	3.47	n.d.	1.6	n.d.	0.93	0.01	3.77
	D3	11.9	41.1	n.d.	n.d.	74.1	3.51	1.25	n.d.	2.35	n.d.	1.59	n.d.	1.29	n.d.	3.11
	D4	10.3	37.2	n.d.	0.01	73.6	1.91	1.18	n.d.	2.1	n.d.	1.2	n.d.	0.94	n.d.	2.82
	D5	11.2	35.5	n.d.	n.d.	56.2	2.2	1.13	n.d.	1.55	n.d.	1.24	n.d.	0.71	n.d.	2.85
	D6	11.9	35	n.d.	n.d.	53.8	2.3	1.17	n.d.	1.45	n.d.	1.25	n.d.	0.42	n.d.	2.81
	D7	14.6	35.1	n.d.	n.d.	125	2.19	1.1	n.d.	1.73	n.d.	2.04	n.d.	1.03	n.d.	2.63
	D8	13.5	36.7	n.d.	0.01	100	2.44	1.18	n.d.	2.27	n.d.	1.21	n.d.	0.97	n.d.	2.5

n.d. indicates not detectable.

Table S4. Concentration of water quality physicochemical parameters of surface water in Taihu Basin.

Lake	Sample ID	Turbidity (NTU)	pH	NO_3-N (mg L^{-1})	NH_3-N (mg L^{-1})	Conductivity (μs cm^{-1})	DO (mg L^{-1})	DO (%)
Shanghu Lake	S1	4.7	7.65	0.28	0.31	345	3	53
	S2	5.57	8.14	0.89	0.22	361	6.44	85.8
	S3	12.5	7.57	0.53	0.25	362	2.38	31.3
	S4	26.6	8.18	0.66	0.3	207	7.57	98.3
	S5	18	7.58	0.65	0.24	346	8.61	115
	S6	10.4	7.53	0.64	0.18	350	3.11	41.2
	S7	15.4	7.54	1.12	0.14	363	6.17	81.9
	S8	4.88	8.2	0.55	0.27	375	7.54	101
Jinji Lake	J1	31.1	8.95	0.4	0.49	398	11.1	148
	J2	12.6	8.74	0.42	0.62	400	12.8	177
	J3	30.8	9.03	0.95	0.33	398	11.8	160
	J4	26.4	8.51	0.33	0.44	379	10.5	141
	J5	23	8.86	1.16	0.32	389	9.56	124
	J6	12.8	9.06	0.71	0.32	389	11.4	152
	J7	18.3	9	0.96	0.29	389	10.8	146
	J8	28.6	8.99	0.67	0.42	399	11.6	156
Taihu Lake	T1	24.2	9.2	0.62	0.43	274	9.98	131
	T2	24.3	8.95	0.49	0.41	235	7.93	105
	T3	5.59	7.45	0.57	0.27	325	5.75	77.8
	T4	22.1	8.3	1.18	0.37	360	9.34	126
	T5	4.78	9.09	0.29	0.47	292	9.77	133
	T6	11	8.51	0.96	0.35	333	9.26	124
	T7	12.2	7.46	1.14	0.65	407	3.63	47.6
	T8	11.5	8.45	1.1	0.46	419	8.6	114
	T9	15.1	7.84	0.57	0.39	358	9.15	123
	T10	20.7	7.96	0.73	0.44	392	5.36	70.7

Lake	Sample ID	Turbidity (NTU)	pH	NO_3-N (mg L^{-1})	NH_3-N (mg L^{-1})	Conductivity (μs cm^{-1})	DO (mg L^{-1})	DO (%)
Yangcheng Lake	Y1	3.8	9.03	0.46	0.3	364	9.95	132
	Y2	35	9.63	0.34	0.55	421	7.62	102
	Y3	19.3	7.51	0.36	1.19	450	4.69	63.4
	Y4	68.3	8.44	0.43	2.17	477	13.4	182
	Y5	43.8	9.68	0.63	0.34	415	8.96	122
	Y6	67.1	8.59	0.49	0.48	395	9.33	128
	Y7	17	7.9	0.96	0.57	388	6.52	87.2
	Y8	26.7	8.46	0.64	0.42	368	8.05	110
	Y9	4.18	7.65	0.37	0.55	423	3.82	51.7
	Y10	14.6	7.67	0.64	0.54	429	4.9	65.3
Dushu Lake	D1	37.4	8.93	0.78	0.31	428	9.32	125
	D2	29.1	7.81	1.57	0.51	538	6.48	88.2
	D3	15.3	8.76	1.29	0.43	427	11.7	158
	D4	20	8.86	3.35	0.43	409	9.24	123
	D5	27	8.92	0.71	0.43	416	10.4	140
	D6	21.8	8.97	0.48	0.35	416	8.97	121
	D7	18.7	8.86	0.61	0.36	421	8.29	111
	D8	9.2	8.53	0.96	0.19	431	6.73	88.9

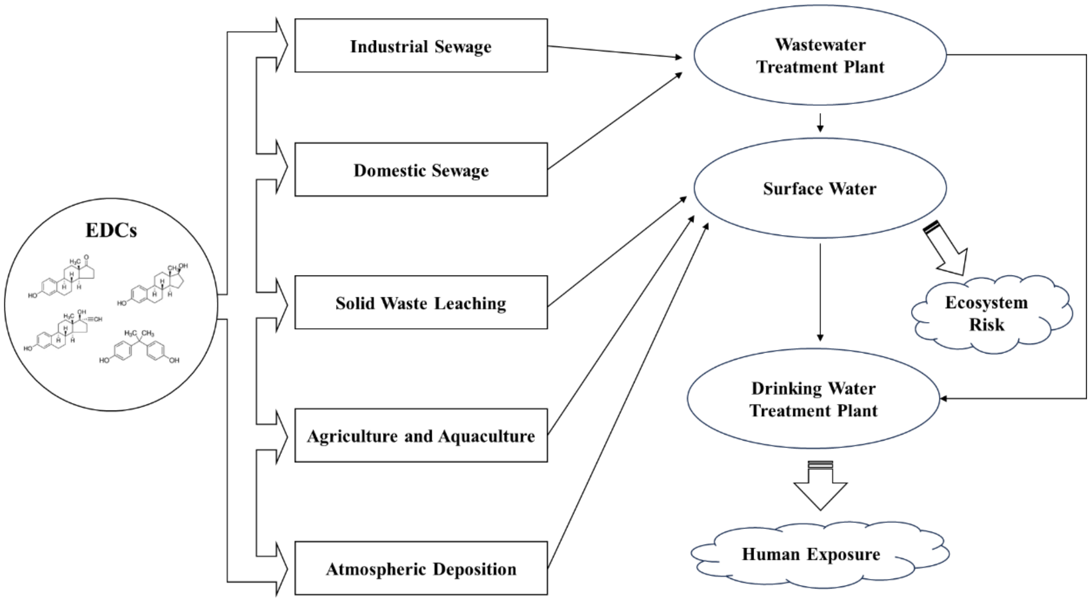

Fig. S1. Sources and exposure routes of environmental estrogens in surface water.

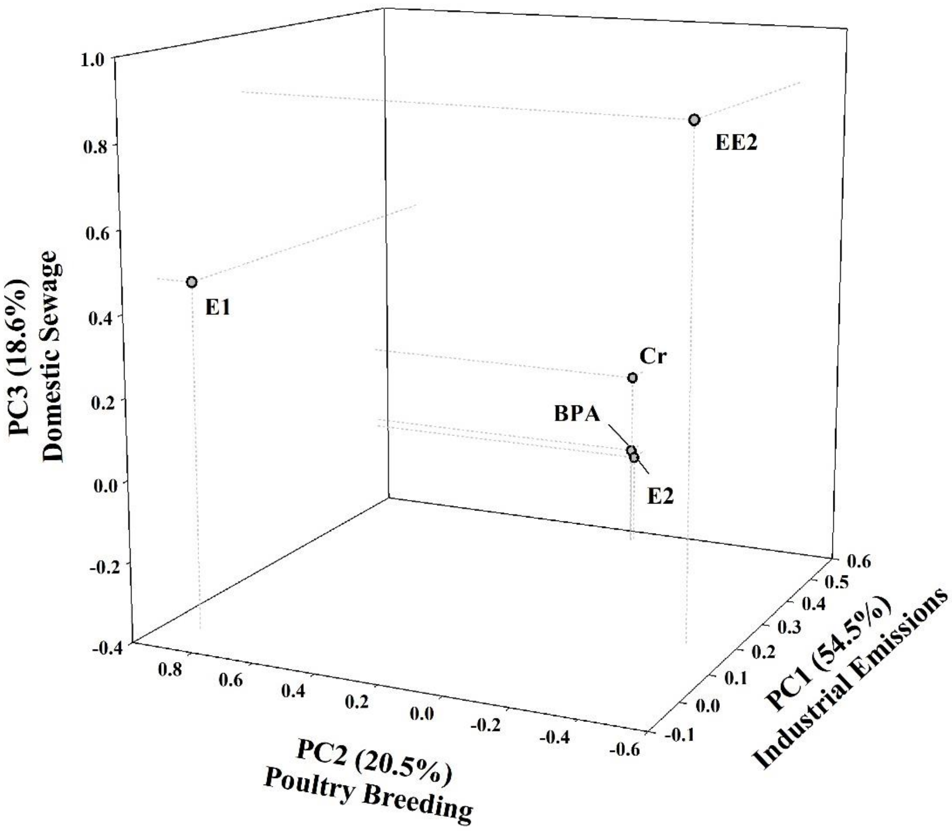

Fig. S2. Spatial three-dimensional factor loading plot for principal component analysis of estrogen and chromium. Factors with closer relationships (larger absolute loading values) are selected as feature vectors by performing principal component analysis on each test parameter.

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