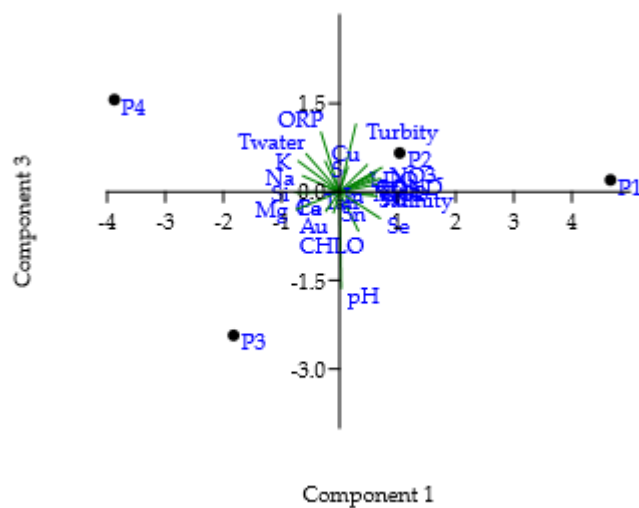


**Figure S1.** Climatology and weather forecast history of 2023 in Imperatriz, Brazil.  
Source: Climatempo (2023).



**Figure S2.** Principal component analysis (PC1 vs PC3) of water quality monitoring data of the middle Tocantins River, Maranhão, Brazil.

**Table S1.** Temperature (air and water) of the middle Tocantins River throughout 2023.

Temperature (°C) - 2023

Sampling area		January	February	March	April	May	June	July	August	September	October	November	December	Average	Standard deviation
P1	Air	30.7	32.2	30.3	27.5	27	26.5	27.7	29.3	30.3	27.9	28	28.2	28.8	1.7
	Water	28.7	30	29.3	29.1	29	27.8	28.6	29.6	31.3	29.5	29.6	29	29.3	0.9
P2	Air	28	28.8	26.6	25.5	29.2	28.5	26.5	28.7	30.3	28.1	26.6	26.4	27.8	1.4

P3	Water	27.8	28.3	28.8	28.1	29.7	29.3	28.9	29.5	30.8	29.8	29.9	29.5	29.2	0.9
	Air	29.6	30.3	24.5	29.3	26.5	28	28.3	28.5	30.2	27.3	33.1	28.4	28.7	2.1
P4	Water	28.3	28.3	27.8	28.9	28.6	29.3	28.9	29.7	31.2	30	31.3	29.9	29.4	1.1
	Air	28.1	28.2	28.5	25.7	29.1	27	30.5	30.6	30.3	29.7	32	31.2	29.2	1.8
	Water	28.3	28.3	28.7	28.1	29.5	29.3	31.2	31.2	31.4	30.6	32.6	30.1	29.9	1.5

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S2.** pH (Unit) in the waters of the middle Tocantins River throughout 2023.

pH (Unit) - 2023																
Sampling area		January	February	March	April	May	June	July	August	September	October	November	December	Average	Standard deviation	
P1	BR1	7.17	7.05	7.24	7.30	4.25	5.88	6.48	6.48	9.19	8.7	8.78	6.87	7.12	7.23	1.03
	BR2	7.20	7.41	7.22	7.41	6.57	6.03	6.64	6.64	8	8.82	7.67	7.78	7.28		
	BR3	7.17	7.39	7.24	7.42	6.98	5.29	6.40	6.40	8.5	8.14	8.05	8.63	7.30		
P2	B1	7.16	6.89	7.26	7.27	6.67	6.83	7.41	7.41	8.29	7.42	6.55	5.84	7.08	7.18	0.67
	B2	7.10	7.62	7.27	7.00	7.00	6.98	6.98	6.98	7.52	7.52	6.34	7.5	7.15		
	B3	7.11	7.70	7.29	7.32	7.13	6.98	6.78	6.78	9.5	8.14	5.38	7.57	7.31		
P3	E1	5.48	7.67	7.11	7.39	6.33	6.98	6.48	6.48	8.68	8.13	9	8.55	7.36	7.41	
	E2	5.40	7.61	7.16	7.23	6.76	7.06	6.51	6.51	8.01	8.52	9.13	9.08	7.42		
	E3	6.00	7.58	7.20	7.41	7.00	6.73	6.51	6.51	8.31	8.38	9.52	8.27	7.45		
P4	V1	5.76	7.68	6.45	7.81	4.81	6.48	6.38	6.38	8.53	8.6	5.26	7.03	6.76	7.00	1.03
	V2	5.80	7.40	6.84	7.44	6.24	6.42	6.22	6.43	9.01	8.11	7.48	8.15	7.13		
	V3	5.88	6.26	7.06	7.37	6.27	6.49	6.87	6.47	8.57	8.39	7.15	8.65	7.12		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S3.** Conductivity (µS/cm) in the waters of the middle Tocantins River throughout 2023.

Conductivity (μS/cm) - 2023																
Sampling area		January	February	March	April	May	June	July	August	September	October	November	December	Average	Standard deviation	
P1	BR1	55.2	193.6	53.0	67.1	44.2	22.2	42.0	41.4	31.6	28.3	34.4	48.3	55.11	51.67	34.00
	BR2	55.0	65.5	55.2	64.9	40.8	22.2	52.2	156.3	37.1	30.9	30.6	35.6	53.86		
	BR3	56.0	63.8	73.8	71.6	28.2	13.3	48.6	47.9	44.4	31.5	34.7	38.8	46.05		
P2	B1	38.7	51.3	43.8	49.5	41.5	38.8	37.2	36.9	22.8	27.5	43.4	55.9	40.61	37.70	8.24
	B2	40.0	39.0	43.6	49.8	40.8	39.0	35.0	38.0	23	28.6	28.3	30.4	36.29		
	B3	41.0	40.6	43.4	49.8	40.9	39.0	33.5	35.0	22.9	28.5	29.3	30.4	36.19		
P3	E1	47.8	48.7	44.0	49.4	38.4	15.7	37.6	33.3	23.9	23.9	31.7	31.3	35.48	36.93	9.19
	E2	48.0	48.2	43.8	48.9	30.5	40.6	38.5	39.9	24	25.5	33.1	31.1	37.68		
	E3	48.1	47.2	43.9	49.0	30.5	38.9	39.0	39.7	24.4	28.1	31.8	31	37.63		
P4	V1	47.8	44.8	49.2	48.4	34.5	39.4	45.5	45.2	25.7	30	32.3	39	40.15	39.68	10.87
	V2	48.0	46.8	43.4	48.4	31.9	35.8	46.7	44.7	24.9	16.2	33.3	32.5	37.72		
	V3	47.8	78.5	43.6	47.8	28.8	41.4	45.9	40.0	25.1	30.7	32.4	32.1	41.18		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S4.** Salinity (PPT) in the waters of the middle Tocantins River throughout 2023.

Salinity (PPT) - 2023																
Sampling area		January	February	March	April	May	June	July	August	September	October	November	December	Average	Standard deviation	
P1	BR1	0.01	0.09	0.01	0.03	0.01	0.01	0.01	0.01	0.03	0	0	0.01	0.02	0.02	0.02
	BR2	0.02	0.02	0.01	0.03	0.01	0.01	0.01	0.07	0.01	0	0	0	0.02		
	BR3	0.02	0.02	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0	0	0.01	0.01		



Sampling area		January	February	March	April	May	June	July	August	September	October	November	December	Average	Standard deviation	
P1	BR1	55.0	56.0	55.0	24.3	19.9	61.7	117.7	68.0	44.5	35.8	37.5	48.6	52.00	49.56	24.34
	BR2	58.0	59.0	54.9	24.4	19.1	34.6	115.3	55.0	39.5	35.5	37.3	48.6	48.43		
	BR3	59.0	60.0	54.9	24.5	18.5	29.4	114.7	50.9	46.3	35.3	37	48.6	48.26		
P2	B1	57.9	34.1	55.1	21.6	31.3	24.3	113.8	45.0	36	36.3	45.6	50	45.92	45.04	23.55
	B2	58.0	31.5	55.1	22.1	34.5	23.9	113.3	40.9	35.2	36.2	42.6	48.5	45.15		
	B3	58.1	35.1	55.6	22.7	25.8	24.1	112.7	37.6	34	36	41.5	45.5	44.06		
P3	E1	53.0	0.0	55.0	24.5	27.7	29.1	123.7	34.4	37	37.3	38.7	41	41.78	40.92	28.25
	E2	53.3	0.0	55.1	23.7	30.5	23.8	120.3	27.8	36.6	36.9	38.4	42	40.70		
	E3	53.2	0.0	55.1	24.1	30.5	25.5	119.0	21.9	36.4	36.6	38	43	40.28		
P4	V1	54.3	0.0	114.5	25.9	34.6	25.3	112.3	35.3	38.6	39.1	39.8	44	46.98	42.84	28.63
	V2	54.4	0.0	54.7	22.0	31.9	24.9	111.9	33.4	38	38.3	39.4	47	41.33		
	V3	55.0	0.0	55.0	21.2	28.8	24.6	111.8	32.0	37.4	37.8	39.1	40	40.23		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S8.** Chlorophyll ( $\mu\text{G/L}$ ) in the waters of the middle Tocantins River throughout 2023.

Chlorophyll (µG/ L) - 2023																
Sampling area		January	February	March	April	May	June	July	August	September	October	November	December	Average		Standard deviation
P1	BR1	2.70	3.70	2.26	2.00	1.87	0.70	0.60	0.52	1.05	0.61	0.78	0.7	1.46	1.47	0.95
	BR2	2.88	3.55	2.05	2.15	1.93	0.73	0.62	1.15	1.11	0.8	0.56	0.79	1.53		
	BR3	2.75	3.22	1.97	2.05	1.91	0.88	0.68	0.52	0.88	0.71	0.75	0.84	1.43		
P2	B1	2.80	2.32	1.98	1.70	1.57	0.70	0.64	0.46	0.97	0.69	0.44	0.47	1.23	1.24	0.80
	B2	2.79	2.31	1.74	1.62	1.57	0.86	0.62	0.41	0.8	0.64	0.62	0.54	1.21		
	B3	2.88	2.42	2.44	1.64	1.41	0.82	0.72	0.54	0.74	0.68	0.46	0.58	1.28		
P3	E1	2.00	2.84	1.99	1.87	2.05	0.86	0.59	0.48	1.09	0.49	0.52	0.59	1.28	1.35	0.75
	E2	2.01	2.78	2.02	2.09	1.81	1.31	0.97	0.56	0.8	0.71	0.56	0.52	1.35		
	E3	1.99	2.48	1.90	2.42	2.17	0.71	1.29	1.11	0.86	0.57	0.69	0.8	1.42		
P4	V1	2.00	2.07	2.15	2.20	1.87	0.66	0.70	0.86	0.76	0.38	0.66	0.69	1.25	1.28	0.80
	V2	2.02	2.11	2.49	2.26	2.27	0.63	0.66	0.47	0.74	0.5	0.55	0.54	1.27		
	V3	2.10	2.70	2.47	2.16	2.00	0.67	0.65	0.50	0.71	0.48	0.82	0.5	1.31		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S9.** ORP (mV) in the waters of the middle Tocantins River throughout 2023.

ORP (MV) - 2023																
Sampling area		January	February	March	April	May	June	July	August	September	October	November	December	Average		Standard deviation
P1	BR1	162	120	119	112	32	297	70	230	44	36	87	173	123.50	123	63.22
	BR2	160	117	123	116	5	172	117	261	105	56	88	177	124.75		
	BR3	158	115	119	115	24	131	78	204	100	109	137	158	120.67		
P2	B1	195	194	143	130	159	157	81	139	45	39	273	211	147.13	152	132.85
	B2	200	163	144	125	150	146	52	833	47	45	261	148	192.79		
	B3	197	158	146	131	158	148	18	25	65	53	165	135	116.60		
P3	E1	195	133	152	130	154	132	130	147	35	129	110	162	134.05	131	38.40
	E2	190	120	145	121	175	140	112	143	35	128	111	160	131.71		
	E3	189	110	143	126	167	137	99	139	21	122	120	141	126.10		
P4	V1	218	145	219	380	214	240	35	45	43	179	154	216	173.96	150	75.41
	V2	222	153	202	117	189	165	24	49	45	154	149	188	138.10		
	V3	220	152	154	130	170	152	20	143	46	139	140	176	136.75		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S10.** Ammonium ( $\text{NH}_4^+$ ) (mg/L) in the waters of the middle Tocantins River throughout 2023.

Ammonium ( $\text{NH}_4^+$ , mg/L)											
Sampling area	April	May	June	July	August	September	October	November	December	Average	Standard deviation

P1	BR1	2.78	2.33	2.18	2.38	4.02	4.11	4.11	4.00	6.45	3.60	3.96	2.46
	BR2	1.55	4.70	6.45	2.94	12.82	3.19	3.19	2.02	3.19	4.45		
	BR3	1.88	4.29	1.32	1.59	8.16	3.66	3.64	6.86	3.14	3.84		
P2	B1	1.91	1.61	0.69	0.01	2.83	1.95	1.95	0.67	3.14	1.64	1.59	1.13
	B2	1.23	1.14	0.02	0.22	2.06	1.41	1.41	1.73	3.01	1.36		
	B3	0.44	4.97	0.06	1.34	1.61	1.16	1.16	2.15	2.96	1.76		
P3	E1	1.43	2.78	0.49	2.38	1.95	2.06	3.66	2.74	1.84	2.15	1.65	0.97
	E2	0.71	1.19	0.20	0.01	1.86	2.94	2.94	1.52	1.30	1.41		
	E3	0.31	1.16	0.02	2.06	1.61	2.29	2.29	0.98	1.70	1.38		
P4	V1	0.92	3.39	1.41	1.16	4.52	2.36	2.36	2.67	2.20	2.33	1.91	1.64
	V2	1.61	6.20	0.24	1.19	3.91	1.34	1.34	1.19	0.87	1.99		
	V3	1.52	6.16	0.01	0.01	1.41	0.94	0.94	0.85	0.85	1.41		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S11.** Nitrite (NO<sup>2</sup>) (mg/L) in the waters of the middle Tocantins River throughout 2023.

		Nitrite (NO <sup>2</sup> ) (mg/L)											
Sampling area		April	May	June	July	August	September	October	November	December	Average	Standard deviation	
P1	BR1	0.01	0.01	0.01	0.01	0.10	0.10	0.10	0.01	0.01	0.04	0.07	0.10
	BR2	0.01	0.01	0.01	0.01	0.07	0.11	0.11	0.37	0.00	0.08		
	BR3	0.02	0.07	0.03	0.05	0.09	0.09	0.09	0.43	0.00	0.10		
P2	B1	0.01	0.00	0.01	0.01	0.01	0.08	0.08	0.01	0.01	0.03	0.03	0.03
	B2	0.01	0.01	0.01	0.01	0.01	0.10	0.10	0.01	0.01	0.03		
	B3	0.01	0.01	0.01	0.01	0.01	0.08	0.08	0.01	0.01	0.03		
P3	E1	0.02	0.01	0.01	0.01	0.01	0.06	0.06	0.01	0.01	0.02	0.02	0.02
	E2	0.01	0.01	0.01	0.01	0.01	0.06	0.06	0.01	0.01	0.02		
	E3	0.01	0.01	0.01	0.01	0.01	0.06	0.06	0.01	0.00	0.02		
P4	V1	0.01	0.01	0.01	0.01	0.01	0.07	0.07	0.01	0.01	0.02	0.02	0.02
	V2	0.01	0.01	0.01	0.01	0.01	0.07	0.07	0.01	0.01	0.02		
	V3	0.00	0.03	0.01	0.01	0.01	0.06	0.06	0.01	0.01	0.02		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S12.** Nitrate (NO<sub>3</sub><sup>-</sup>) (mg/L) in the waters of the middle Tocantins River throughout 2023.

		Nitrate (NO <sub>3</sub> <sup>-</sup> ) (mg/L)											
Sampling area		April	May	June	July	August	September	October	November	December	Average	Standard deviation	
P1	BR1	0.01	0.074	0.01	0.01	6.227	0.107	0.242	2.649	3.572	1.43	0.98	1.59
	BR2	0.01	0.105	0.01	0.01	0.010	0.242	0.242	2.222	3.414	0.70		
	BR3	0.010	0.033	0.010	0.010	2.514	0.062	0.062	2.222	2.244	0.80		
P2	B1	0.01	0.093	0.01	0.01	0.01	0.010	0.010	2.109	2.379	0.52	0.86	1.28
	B2	0.01	0.022	0.01	0.01	0.01	1.389	1.389	3.842	3.257	1.10		
	B3	0.01	0.044	0.01	0.01	0.01	1.164	1.164	2.379	3.864	0.96		
P3	E1	0.01	0.143	0.01	0.01	0.01	0.010	0.010	3.324	2.267	0.64	0.60	1.14
	E2	0.01	0.134	0.01	0.01	0.01	0.010	0.010	3.437	1.974	0.62		
	E3	0.01	0.050	0.01	0.01	0.01	0.010	0.010	2.267	2.537	0.55		
P4	V1	0.01	0.043	0.01	0.01	0.01	0.062	0.377	3.482	2.109	0.68	0.60	1.04
	V2	0.01	0.201	0.01	0.01	0.01	0.377	0.354	2.694	2.087	0.64		
	V3	0.01	0.014	0.01	0.01	0.01	0.010	0.264	2.649	1.479	0.50		

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S13.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - January. 2023												
Sampling area		Al	Au	Ca	Cu	Fe	K	Mg	Na	S	Si	Sn
P1	BR1	0.784	0.012	12.7	0.0083	0.938	0.43	1.53	0.601	0.0706	5.84	0.0236
	BR2	0.801	0.012	12.5	0.0083	0.932	0.43	1.53	0.602	0.0706	5.9	0.0236
	BR3	0.795	0.014	12.6	0.009	0.933	0.42	1.52	0.6	0.077	5.99	0.022
P2	B1	0.697	0.0125	12.6	0.0079	0.933	0.4	1.56	0.51	0.0412	5.91	0.0219
	B2	0.666	0.0125	12	0.0079	0.933	0.4	1.55	0.51	0.0412	5.92	0.0219
	B3	0.687	0.013	12.5	0.0078	0.922	0.42	1.56	0.53	0.044	5.93	0.02
P3	E1	0.525	0.0124	11.8	0.0081	0.736	0.51	1.4	0.537	0.0576	5.47	0.0179
	E2	0.499	0.012	11.8	0.0081	0.736	0.51	1.4	0.54	0.0576	5.47	0.0179
	E3	0.555	0.013	11.7	0.007	0.72	0.55	1.3	0.52	0.06	5.4	0.016
P4	V1	0.606	0.0104	11.3	0.0077	0.836	0.409	1.35	0.615	0.0518	5.59	0.0102
	V2	0.609	0.0104	11	0.0077	0.83	0.41	1.35	0.6	0.0518	5.66	0.01
	V3	0.671	0.1	11.2	0.008	0.82	0.42	1.3	0.615	0.052	5.65	0.0102
P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area)												

**Table S14.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - February. 2023														
Sampling area		Al	Au	Ca	Cu	Fe	In	K	Mg	Na	S	Se	Si	Sn
P1	BR1	4.9	0.68	8.88	0.276	1.76	3.29	2.04	1.03	0.824	0	1.53	7.71	2.03
	BR2	4.00	0.432	7.77	0.149	1.41	2.11	1.62	1.034	0.876	0	1.53	10	1.11
	BR3	4.8	0.166	4	0.147	1.507	3	1.38	1.056	0.805	0	1.3	11	1
P2	B1	5.36	0.684	44.2	0.306	7.14	2.95	3.95	6.05	2.89	0.235	1.97	32.2	2.14
	B2	4.76	0.699	38.1	0.321	6.14	3.18	3.07	5.4	2.5	0.213	2.01	28.8	2.25
	B3	4.66	0.776	24.5	0.348	5.99	3.59	2.81	3.62	1.84	0.0394	2.17	21.8	2.46
P3	E1	4.67	0.596	66.2	0.248	7.26	2.3	3.53	8.64	4.76	0.393	1.62	37.2	1.83
	E2	4.38	0.646	65.1	0.272	7.02	2.55	3.46	8.52	4.51	0.41	1.88	36.7	1.98
	E3	3.83	0.613	66.9	0.264	6.17	2.41	3.43	8.67	4.57	0.434	1.73	36.5	1.9
P4	V1	4.48	0.578	73	0.213	7.92	2.15	10.2	8.75	6.14	0.442	1.6	37.2	1.72
	V2	3.43	0.561	68.3	0.214	6.64	2.06	3.47	8.79	6	0.46	1.49	37.2	1.65
	V3	3.49	0.598	59	0.236	6.78	2.3	3.49	7.86	5.42	0.384	1.67	34.2	1.78
P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).														

**Table S15.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - March. 2023			
Sampling area	K	Na	
P1	BR1	0.76	0
	BR2	0.74	0
	BR3	0.741	0
P2	B1	0.837	0.0961
	B2	0.825	0.0872
	B3	0.807	0.051
P3	E1	1.03	0.512
	E2	0.959	0.302
	E3	0.87	0.193
P4	V1	1.15	0.486
	V2	1.08	0.466

V3	0.985	0.228
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P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S16.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

		Elements (mg/L) - April. 2023													
Sampling area		Al	Au	B	Ca	Cu	Fe	In	K	Mg	Na	S	Se	Si	Sn
P1	BR1	0.311	0.072	0.0019	7.490	0.040	0.447	0.324	0.345	0.912	0.748	0.119	0.205	3.440	0.234
	BR2	0.336	0.070	0.0002	7.210	0.039	0.507	0.306	0.339	0.898	0.671	0.109	0.190	3.480	0.224
	BR3	0.333	0.074	0.0056	7.350	0.040	0.493	0.320	0.358	0.874	0.786	0.132	0.213	3.400	0.235
P2	B1	0.342	0.069	0	6.700	0.038	0.484	0.314	0.294	0.918	0.354	0.052	0.192	3.610	0.224
	B2	0.341	0.069	0	6.330	0.038	0.487	0.316	0.290	0.880	0.345	0.049	0.194	3.490	0.225
	B3	0.347	0.069	0	6.810	0.038	0.511	0.303	0.296	0.936	0.363	0.051	0.193	3.680	0.221
P3	E1	0.334	0.067	0	7.660	0.038	0.508	0.288	0.308	0.897	0.382	0.076	0.186	3.620	0.211
	E2	0.332	0.055	0	7.540	0.032	0.543	0.225	0.318	0.998	0.406	0.067	0.140	4.000	0.171
	E3	0.336	0.067	0	7.350	0.037	0.499	0.290	0.304	0.818	0.346	0.058	0.178	3.470	0.210
P4	V1	0.345	0.052	0	7.080	0.032	0.653	0.220	0.334	1.000	0.557	0.101	0.133	4.160	0.163
	V2	0.344	0.051	0	7.730	0.031	0.660	0.213	0.333	0.987	0.550	0.085	0.130	4.150	0.158
	V3	0.343	0.056	0	6.130	0.033	0.648	0.232	0.327	0.963	0.529	0.078	0.141	4.050	0.172

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S17.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

		Elements (mg/L) - May. 2023													
Sampling area		Al	Au	Ca	Cu	Fe	In	K	Mg	Na	S	Se	Si	Sn	
P1	BR1	0.217	0.022	8.820	0.010	0.392	0.058	0.346	1.120	0.656	0.045	0.010	4.450	0.051	
	BR2	0.220	0.021	8.380	0.010	0.387	0.056	0.348	1.080	0.625	0.043	0.008	4.360	0.050	
	BR3	0.208	0.021	8.880	0.010	0.389	0.052	0.346	1.120	0.658	0.044	0.001	4.450	0.047	
P2	B1	0.246	0.020	8.440	0.009	0.423	0.060	0.334	1.100	0.495	0.032	0.009	4.460	0.049	
	B2	0.231	0.019	9.230	0.008	0.403	0.049	0.332	1.140	0.522	0.031	0.000	4.500	0.044	
	B3	0.228	0.020	8.490	0.009	0.408	0.053	0.332	1.100	0.499	0.029	0.006	4.460	0.045	
P3	E1	0.221	0.020	7.750	0.009	0.405	0.048	0.336	1.030	0.492	0.026	0.003	4.660	0.043	
	E2	0.232	0.021	7.860	0.009	0.399	0.061	0.334	1.040	0.498	0.026	0.011	4.330	0.049	
	E3	0.258	0.021	8.050	0.010	0.423	0.062	0.336	1.050	0.511	0.030	0.002	4.380	0.050	
P4	V1	0.222	0.021	7.640	0.010	0.473	0.063	0.351	1.040	0.799	0.059	0.018	4.470	0.051	
	V2	0.211	0.022	7.800	0.010	0.468	0.061	0.347	1.040	0.813	0.060	0.009	4.320	0.050	
	V3	0.205	0.022	7.690	0.010	0.454	0.058	0.344	1.040	0.801	0.057	0.010	4.330	0.048	

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S18.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

		Elements (mg/L) - June. 2023											
Sampling area		Al	Au	Ca	Cu	Fe	In	K	Mg	Na	Se	Si	Sn
P1	BR1	0.0319	0.0265	0.146	0.0192	0	0.132	0.157	0.0515	0.0491	0.0221	0.0028	0.0626

	BR2	0.0935	0.0512	0.639	0.0216	0	0.262	0.249	0.231	0.208	0.0415	0.452	0.164
	BR3	0.0612	0.0394	0.191	0.0143	0	0.198	0.191	0.132	0.11	0.0774	0.148	0.111
	B1	0.0823	0.0426	0.14	0.0156	0.0075	0.212	0.198	0.141	0.0866	0.062	0.211	0.123
P2	B2	0.0264	0.0234	0	0.0058	0	0.116	0.155	0.0361	0.0501	0.0149	0.111	0.0492
	B3	0.0244	0.0225	0	0.0068	0	0.116	0.15	0.0208	0.0386	0.0149	0.001	0.0477
	E1	0.124	0.0467	0.881	0.0174	0.371	0.208	0.212	0.0043	0.0801	0.064	0.0695	0.123
P3	E2	0.0482	0.0314	0.466	0.0067	0.0099	0.137	0.169	0.108	0.0807	0.0437	0.692	0.0732
	E3	0.123	0.0585	0	0.0211	0.0363	0.275	0.203	0.148	0.0666	0.128	0.876	0.171
	V1	0.0517	0.0195	0.0297	0.0051	0.38	0.0982	0.158	0.0213	0.044	0	0	0.0342
P4	V2	0.0158	0.0158	0	0.0022	0.114	0.0776	0.144	0.0213	0.0256	0	0	0.0188
	V3	0	0.0025	0	0.0022	0.0561	0.0776	0.13	0.01	0.0164	0	0	0.0188

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S19.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - July. 2023											
Sampling area		Al	Ca	Cu	Fe	K	Mg	Mn	Na	S	Si
P1	BR1	0.182	7.68	0.0176	0.106	0.265	0.816	0.0043	0.708	0.456	4.43
	BR2	0.0565	6.69	0.0531	0.147	0.333	0.659	0.0043	1.07	0.104	4.37
	BR3	0.127	9.16	0.0238	0.494	0.33	0.9	0.0043	1.11	0.136	4.65
P2	B1	0.033	7.2	0.0173	0.0762	0.249	0.812	0	0.465	0.0249	4.5
	B2	0	5.76	0.0563	0.214	0.281	0.601	0	0.629	0.0308	4.48
	B3	0.0954	7.09	0.0233	0.307	0.244	0.822	0	0.49	0.0363	4.68
P3	E1	0.0485	6.51	0.0481	0.336	0.273	1.03	0	0.994	0.0415	4.95
	E2	0.0438	5.36	0.0456	0.139	0.254	0.618	0	0.625	0.0466	4.64
	E3	0.0423	6.79	0.0262	0.247	0.256	0.778	0	0.663	0.0321	4.85
P4	V1	0.0538	6.93	0.0228	0.261	0.267	0.783	0.0093	0.882	0.0822	4.62
	V2	0.0825	7.38	0.0329	0.294	0.291	0.789	0.0055	1	0.121	4.64
	V3	0.0833	5.54	0.0607	0.445	0.279	0.602	0.0041	0.956	0.0905	4.49

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S20.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - August. 2023									
Sampling area		Ca	Cu	Fe	K	Mg	Na	S	Si
P1	BR1	5.7	0.0567	0	0.299	0.621	0.871	0.13	4.37
	BR2	14.9	0.0208	6.47	0.659	1.19	3.77	0.443	4.7
	BR3	6.56	0.0159	0	0.254	0.75	0.657	0.042	4.42
P2	B1	5.34	0.0431	0	0.236	0.637	0.556	0	4.35
	B2	6.86	0.0213	0	0.244	0.789	0.473	0	4.37
	B3	6.87	0.0178	0	0.26	0.805	0.472	0	4.59
P3	E1	5.89	0.0554	0	0.349	0.669	0.932	0.0188	4.33
	E2	8.13	0.0145	0	0.333	0.878	1.29	0.0457	4.35
	E3	7.79	0.0084	0	0.287	0.868	0.618	0.0188	4.49
P4	V1	5.62	0.0419	0.247	0.325	0.648	1.06	0.0685	4.56
	V2	6.65	0.0167	0.0935	0.279	0.764	0.865	0.0404	4.44
	V3	7.34	0.0099	0.139	0.279	0.829	0.886	0.0567	4.45

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).



**Table S21.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - September. 2023									
Sampling area		Ca	Cu	Fe	K	Mg	Na	S	Si
P1	BR1	6.4	0.0487	0.0127	0.272	0.669	0.932	0.129	4.27
	BR2	8.32	0.0205	0	0.278	0.857	1.03	0.121	4.27
	BR3	7.8	0.0187	0.0137	0.25	0.838	0.791	0.725	4.24
P2	B1	6.07	0.0291	0	0.242	0.706	0.637	0.041	4.24
	B2	7.18	0.0178	0	0.228	0.83	0.569	0.254	4.27
	B3	7.74	0.0136	0	0.219	0.889	0.554	0.537	4.33
P3	E1	1.14	0.0349	0	0.154	0.237	0.167	0.088	4
	E2	1.22	0.0454	0	0.184	0.263	0.141	0.273	4.3
	E3	7.64	0.0216	0	0.287	0.866	0.82	0.585	4.31
P4	V1	6.11	0.0387	0.0499	0.256	0.73	0.913	1.34	4.21
	V2	7.22	0.0179	0.0082	0.247	0.843	0.848	0.458	4.28
	V3	7.83	0.0125	0	0.241	0.903	0.807	0.721	4.29

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S22.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - October. 2023													
Sampling area		Al	Au	Ca	Cu	Fe	In	K	Mg	Na	S	Si	Sn
P1	BR1	0.0694	0.0123	9.21	0.087	0.128	0.0572	0.497	1.03	2.5	0.177	4.19	0.0402
	BR2	0.0792	0.0152	11	0.0542	0.0782	0.0632	0.448	1.19	2.29	0.211	4.2	0.0519
	BR3	0.0831	0.0169	10.9	0.0554	0.0762	0.0772	0.439	1.18	2.22	0.211	4.21	0.0606
P2	B1	0.0489	0.0078	9.38	0.0729	0.0414	0.0504	0.539	1.07	2.96	0.159	4.13	0.0339
	B2	0.0512	0.0101	10.6	0.0506	0.0304	0.054	0.492	1.19	2.62	0.162	4.16	0.0413
	B3	0.0616	0.0136	10.7	0.0452	0.0358	0.0702	0.466	1.2	2.37	0.118	4.16	0.0548
P3	E1	0.0475	0.006	10.2	0.0654	0.0889	0.0302	0.689	1.14	3.95	0.194	4.13	0.0233
	E2	0.0348	0.0089	11.5	0.0463	0.361	0.0448	0.596	1.25	3.29	0.248	4.08	0.0588
	E3	0.0598	0.0078	9.66	0.0635	0.0683	0.0518	0.556	1.08	3.08	0.251	4.12	0.0353
P4	V1	0.0532	0.0073	11.9	0.0579	0.081	0.0266	1.26	1.28	4.00	0.464	4.19	0.0259
	V2	0.0334	0.0006	12.8	0.0339	0.0653	0	0.679	1.36	3.95	0.186	4.17	0.0058
	V3	0.0631	0.0079	13	0.0449	0.0967	0.0366	0.839	1.36	5.02	0.332	4.2	0.0362

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S23.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - November. 2023													
Sampling area		Al	Au	Ca	Cu	Fe	In	K	Mg	Na	S	Si	Sn
P1	BR1	0.0635	0.0169	8.8	0.0646	0.366	0.0701	0.319	1.05	1.2	0.0741	4.23	0.0488
	BR2	0.0351	0.0174	9.52	0.0469	0.157	0.0663	0.288	1.15	1.08	0.0636	4.22	0.0521

	BR3	0.0363	0.018	9.98	0.0475	0.0787	0.0679	0.299	1.18	1.14	0.0785	4.24	0.0558
	B1	0.0478	0.0177	9.48	0.0396	0.062	0.0622	0.278	1.2	0.992	0.039	4.26	0.0522
P2	B2	0.0276	0.0124	7.86	0.0695	0.0373	0.0321	0.319	0.993	1.32	0.0669	4.29	0.0252
	B3	0.0286	0.0172	8.77	0.0545	0	0.0672	0.281	1.14	1.03	0.0414	4.26	0.051
	E1	0.0553	0.0152	8.98	0.0651	0.0651	0.0615	0.314	1.01	1.2	0.0633	4.22	0.0425
P3	E2	0.0939	0.0167	9.07	0.053	0.0543	0.0624	0.301	1.13	1.07	0.0564	4.33	0.0491
	E3	0.0319	0.016	9.24	0.0409	0.0195	0.0566	0.29	1.16	1.08	0.0496	4.24	0.0471
	V1	0.0667	0.0182	8.11	0.0703	0.202	0.0687	0.331	1.01	1.25	0.152	4.37	0.0495
P4	V2	0.034	0.0173	8.79	0.0498	0.0366	0.0697	0.319	1.12	1.23	0.0947	4.34	0.053
	V3	0.0389	0.0165	12.7	0.0417	0.0969	0.0678	0.642	1.35	1.78	0.0934	4.31	0.0537

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S24.** Results of essential and potentially toxic elements in the waters of the middle Tocantins River throughout 2023.

Elements (mg/L) - December. 2023											
Sampling area		Al	Au	Ca	Cu	Fe	K	Mg	Na	S	Si
	BR1	0.0028	0.0019	10.4	0.0599	0.47	0.366	1.1	1.27	0.398	3.82
P1	BR2	0.0042	0.0016	10.2	0.0389	0.0871	0.263	1.17	0.751	0.124	3.82
	BR3	0.0122	0.0024	11.2	0.0371	0.0682	0.282	1.26	0.825	0.131	3.8
	B1	0.0059	0.0024	8.14	0.0538	0.157	0.318	1.05	0.7	0.0917	3.88
P2	B2	0.0033	0.0021	9.48	0.0364	0.0165	0.237	1.2	0.708	0.0116	3.79
	B3	0	0.0019	9.53	0.037	0.0254	0.287	1.21	0.603	0.0712	3.79
	E1	0.0063	0.0023	7.52	0.055	0.0162	0.256	1.01	0.671	0.0233	3.86
P3	E2	0	0.0033	8.8	0.0379	0.106	0.251	1.14	0.61	0.0343	3.88
	E3	0.0063	0.0029	9	0.035	0.146	0.297	1.16	0.678	0.171	3.8
	V1	0	0.004	7.52	0.0532	0.561	0.264	1.07	0.719	0.055	4.01
P4	V2	0	0.0025	8.45	0.0404	0.0125	0.246	1.13	0.679	0.0545	3.83
	V3	0.0294	0.0024	8.75	0.0358	0.102	0.246	1.16	0.673	0.0392	3.9

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area).

**Table S25.** The human health risk assessment indices for cancer risks from ingestion and absorption of studied metals for children and adults.

Parameters	Sampling Points	Children			Adults		
		EXPing	EXPder	THQ	EXPing	EXPder	THQ
Al	P1	0.0209	0.0866	0.0273	0.000419	0.0218	0.000185
	P2	0.0215	0.0889	0.0279	0.000432	0.0224	0.000190
	P3	0.0192	0.0790	0.0246	0.000384	0.0199	0.000168
	P4	0.0176	0.0724	0.0226	0.000353	0.0182	0.000155
Cu	P1	0.006	0.0062	0.0013	0.00073	0.0018	0.000139
	P2	0.0072	0.0075	0.0016	0.00087	0.0021	0.000167
	P3	0.006	0.0062	0.0013	0.00073	0.0018	0.000139
	P4	0.006	0.0062	0.0013	0.00073	0.0018	0.000139
Fe	P1	0.00612	0.0577	0.0182	0.00671	0.0163	0.000153
	P2	0.01254	0.1191	0.0377	0.01385	0.0337	0.000316
	P3	0.01356	0.1279	0.0406	0.01406	0.0362	0.000341
	P4	0.01476	0.1395	0.0442	0.01540	0.0394	0.000372
Mg	P1	0.0237	0.1205	0.2636	0.000605	0.0341	0.2930
	P2	0.0322	0.1654	0.3605	0.000823	0.0468	0.4005
	P3	0.0395	0.2008	0.4384	0.000995	0.0570	0.4889
	P4	0.0400	0.2035	0.4434	0.00101	0.0578	0.4953
Se	P1	0.020	0.0251	0.0034	0.0080	0.0070	0.0045
	P2	0.019	0.0237	0.0032	0.0077	0.0066	0.0043

	<i>P3</i>	0.017	0.0212	0.0028	0.0068	0.0059	0.0038
	<i>P4</i>	0.013	0.0163	0.0022	0.0052	0.0045	0.0029
<i>HI</i>				1.2423			1.5856

P1: Beira Rio (urban area), P2: Bananal (rural area), P3: Embiral (rural area), P4: Cidelândia (rural area). EXP-ing: exposure dose through ingestion of water (mg/kg/day). EXP-der: exposure dose through dermal absorption (mg/kg/day). THQ: Target Hazard Quotient. HI: Hazardous Index.

**Table S26.** Pearson correlation coefficients for water quality monitoring data of the middle Tocantins River, Maranhão, Brazil.

	TS	TW	pH	COND	SAL	TDS	LDO	TURB	CHLO	ORP	NH <sub>4</sub> <sup>+</sup>	NO <sub>2</sub>	NO <sub>3</sub> <sup>-</sup>	Al	Au	In	Ca	Cu	Fe	K	Mg	Na	S	Se	Si	Sn
TS		0.211	0.906	0.755	0.803	0.743	0.116	0.347	0.430	0.579	0.699	0.988	0.563	0.196	0.235	0.119	0.659	0.069	0.978	0.498	0.755	0.192	0.032	0.376	0.736	0.137
TW	0.789		0.572	0.772	0.678	0.773	0.256	0.676	0.945	0.787	0.797	0.550	0.316	0.066	0.668	0.077	0.260	0.464	0.476	0.089	0.389	0.029	0.163	0.048	0.308	0.512
pH	-0.094	-0.428		0.815	0.945	0.839	0.753	0.322	0.594	0.376	0.877	0.893	0.784	0.918	0.802	0.942	0.967	0.763	0.982	0.644	0.855	0.796	0.659	0.691	0.972	0.778
COND	0.244	-0.228	-0.185		0.009	0.000	0.848	0.901	0.286	0.417	0.004	0.029	0.241	0.630	0.188	0.761	0.185	0.668	0.052	0.402	0.120	0.669	0.693	0.486	0.143	0.302
SAL	0.197	-0.322	-0.055	<b>0.991</b>		0.007	0.841	0.960	0.238	0.338	0.008	0.020	0.233	0.577	0.225	0.711	0.146	0.667	0.026	0.320	0.107	0.601	0.769	0.408	0.107	0.349
TDS	0.257	-0.227	-0.161	<b>0.999</b>	<b>0.993</b>		0.868	0.927	0.267	0.395	0.002	0.031	0.253	0.640	0.181	0.772	0.189	0.648	0.052	0.400	0.127	0.676	0.687	0.488	0.146	0.294
LDO	-0.884	-0.744	-0.247	0.152	0.159	0.132		0.128	0.566	0.608	0.923	0.649	0.245	0.096	0.573	0.057	0.390	0.123	0.657	0.394	0.414	0.139	0.238	0.289	0.451	0.443
TURB	-0.653	-0.324	-0.678	0.099	0.040	0.073	0.872		0.383	0.319	<b>0.988</b>	0.784	0.398	0.393	0.686	0.337	0.642	0.173	0.852	0.785	0.576	0.484	0.559	0.672	0.690	0.612
CHLO	0.569	-0.055	0.406	0.714	0.762	0.733	-0.434	-0.617		0.034	0.227	0.366	0.782	0.949	0.193	0.807	0.554	0.207	0.326	0.594	0.568	0.989	0.544	0.736	0.493	0.244
ORP	-0.420	0.213	-0.624	-0.583	-0.662	-0.605	0.392	0.681	-0.966		0.353	0.454	0.826	0.969	0.374	0.902	0.564	0.289	0.384	0.508	0.628	0.901	0.741	0.640	0.515	0.433
NH <sub>4</sub> <sup>+</sup>	0.301	-0.203	-0.123	<b>0.996</b>	<b>0.992</b>	<b>0.998</b>	0.077	0.012	0.773	-0.647		0.043	0.289	0.679	0.158	0.816	0.211	0.594	0.060	0.415	0.152	0.710	0.655	0.510	0.165	0.266
NO <sub>2</sub>	0.011	-0.450	-0.107	<b>0.971</b>	<b>0.980</b>	<b>0.969</b>	0.351	0.216	0.634	-0.546	<b>0.957</b>		0.121	0.419	0.349	0.539	0.069	0.860	0.008	0.237	0.036	0.452	0.931	0.299	0.044	0.492
NO <sub>3</sub> <sup>-</sup>	-0.436	-0.684	-0.216	0.759	0.767	0.747	0.755	0.602	0.218	-0.174	0.711	0.879		0.138	0.757	0.202	0.041	0.651	0.133	0.165	0.027	0.185	0.669	0.155	0.054	0.922
Al	-0.804	-0.934	0.082	0.370	0.423	0.360	0.904	0.607	-0.051	-0.031	0.321	0.581	0.862		0.760	0.011	0.167	0.351	0.388	0.114	0.237	0.008	0.239	0.057	0.215	0.593
Au	-0.764	-0.332	0.198	-0.812	-0.775	-0.819	0.427	0.314	-0.807	0.626	-0.842	-0.651	-0.243	0.240		0.627	0.667	0.225	0.387	0.914	0.563	0.729	0.209	0.958	0.593	0.016
In	-0.881	-0.923	0.058	0.239	0.289	0.228	0.943	0.663	-0.193	0.098	0.184	0.461	0.798	0.989	0.373		0.256	0.249	0.509	0.184	0.329	0.020	0.168	0.107	0.313	0.472
Ca	0.340	0.740	-0.033	-0.815	-0.854	-0.811	-0.610	-0.358	-0.446	0.436	-0.789	-0.931	-0.959	-0.833	0.333	-0.744		0.838	0.053	0.070	0.019	0.184	0.699	0.092	0.003	0.838
Cu	-0.930	-0.536	-0.237	-0.332	-0.333	-0.352	0.877	0.827	-0.793	0.711	-0.406	-0.140	0.349	0.649	0.775	0.751	-0.162		0.851	0.767	0.874	0.384	0.176	0.623	0.914	0.163
Fe	0.022	0.524	-0.018	<b>-0.948</b>	<b>-0.974</b>	<b>-0.948</b>	-0.343	-0.148	-0.674	0.616	-0.940	<b>-0.992</b>	-0.867	-0.612	0.613	-0.491	0.947	0.149		0.177	0.043	0.406	<b>0.994</b>	0.243	0.030	0.536
K	0.502	0.911	-0.356	-0.598	-0.680	-0.600	-0.606	-0.215	-0.406	0.492	-0.585	-0.763	-0.835	-0.886	0.086	-0.816	0.930	-0.233	0.823		0.159	0.090	0.461	0.011	0.088	0.914
Mg	0.245	0.611	0.145	-0.880	-0.893	-0.873	-0.586	-0.424	-0.432	0.372	-0.848	-0.964	-0.973	-0.763	0.437	-0.671	0.981	-0.126	0.957	0.841		0.275	0.835	0.183	0.015	0.724
Na	0.808	<b>0.971</b>	-0.204	-0.331	-0.399	-0.324	-0.861	-0.516	0.011	0.099	-0.290	-0.548	-0.815	<b>-0.992</b>	-0.271	-0.980	0.816	-0.616	0.594	0.910	0.725		0.204	0.038	0.232	0.563
S	<b>0.967</b>	0.837	-0.341	0.307	0.231	0.313	-0.762	-0.441	0.456	-0.259	0.345	0.069	-0.331	-0.761	-0.791	-0.832	0.301	-0.824	-0.006	0.539	0.165	0.796		0.356	0.774	0.115
Se	-0.624	<b>-0.952</b>	0.309	0.514	0.592	0.512	0.711	0.328	0.264	-0.360	0.490	0.701	0.845	0.943	0.042	0.893	-0.908	0.377	-0.757	-0.989	-0.817	-0.962	-0.644		0.121	0.785
Si	0.263	0.692	-0.028	-0.857	-0.893	-0.854	-0.549	-0.310	-0.507	0.485	-0.835	-0.956	-0.946	-0.785	0.407	-0.687	<b>0.997</b>	-0.086	0.970	0.912	0.985	0.768	0.226	-0.879		0.760
Sn	-0.862	-0.488	0.222	-0.698	-0.651	-0.706	0.557	0.388	-0.756	0.567	-0.734	-0.508	-0.078	0.406	0.984	0.528	0.162	0.837	0.464	-0.086	0.276	-0.437	-0.885	0.215	0.240	

TS: Temperature surface, TW: Temperatura water, TDS: Total Dissolved Solids, CON: Conductivity, SAL: Salinity, TURB: Turbity, CHLO: Chlorophyll, LDO: Luminescent Dissolved Oxygen. ORP: Oxidation Reduction Potential. NH<sub>4</sub><sup>+</sup>: Ammonium, NO<sub>2</sub>: Nitrite, and NO<sub>3</sub><sup>-</sup>: Nitrate.

**Table S27.** Loadings from Principal Component Analysis (PCA).

Parameters	Loadings		
	PC 1	PC 2	PC 3
<b>T surface</b>	-0.098731	<b>-0.30391</b>	0.03989
<b>T water</b>	-0.20394	-0.17141	<b>0.22939</b>
<b>pH</b>	0.010061	0.004281	<b>-0.5821</b>
<b>Conductivity</b>	<b>0.21587</b>	-0.18446	0.12079
<b>Salinity</b>	<b>0.22658</b>	-0.17605	0.04606
<b>TDS</b>	<b>0.21475</b>	-0.18904	0.10693
<b>LDO</b>	0.16954	<b>0.23766</b>	0.16336
<b>Turbidity</b>	0.10031	0.19939	<b>0.40822</b>
<b>Chlorophyll</b>	0.11493	<b>-0.26557</b>	-0.23363
<b>ORP</b>	-0.11352	0.21768	<b>0.35965</b>
<b>NH4+</b>	<b>0.20856</b>	-0.20244	0.083853
<b>NO2</b>	<b>0.24851</b>	-0.11967	0.079791
<b>NO3-</b>	<b>0.25941</b>	0.036191	0.14752
<b>Al</b>	<b>0.22868</b>	0.17336	-0.025265
<b>Au</b>	-0.083145	<b>0.30473</b>	-0.11497
<b>In</b>	0.20547	<b>0.21222</b>	-0.012319
<b>Ca</b>	<b>-0.26982</b>	0.0086509	-0.0021416
<b>Cu</b>	0.050256	<b>0.31052</b>	0.14958
<b>Fe</b>	<b>-0.25333</b>	0.11292	-0.0075229
<b>K</b>	<b>-0.25258</b>	-0.048788	0.1862
<b>Mg</b>	<b>-0.26391</b>	0.035309	-0.10488
<b>Na</b>	<b>-0.22424</b>	-0.17397	0.096629
<b>S</b>	-0.087887	<b>-0.29162</b>	0.18491
<b>Se</b>	<b>0.24762</b>	0.095227	-0.15827
<b>Si</b>	<b>-0.26836</b>	0.035027	-0.0043972
<b>Sn</b>	-0.036604	<b>0.31668</b>	-0.12516

**Table S28.** Scores from Principal Component Analysis (PCA).

	PC 1	PC 2	PC 3
<b>P1</b>	46.649	-24.633	0.20358
<b>P2</b>	10.347	43.446	0.66114
<b>P3</b>	-18.245	-0.14397	-24.308
<b>P4</b>	-38.751	-17.374	15.661

**Table S29.** Summary from Principal Component Analysis (PCA).

PC	Eigenvalue	% variance
<b>1</b>	13.73	52.79
<b>2</b>	9.33	35.88
<b>3</b>	2.95	11.33