Electronic Supplementary Materials

Supplementary Table S1. Water Quality and Heavy Metal Monitoring Methods

Monitoring item	Test method	Method explanation
Water Quality Parameter		
Air and Water Temperature	NIEA W217.51A	Thermometer
pH	NIEA W424.52A	Electrode Method
Conductivity	NIEA W203.51B	The method of conductivity meter
Suspended Solids	NIEA W210.58A	Drying at 103℃～105℃
Biochemical Oxygen Demand	NIEA W510.55B	Detection method of BOD5 in the water
Chemical Oxygen Demand	NIEA W515.54A	Potassium dichromate method
	NIEA W516.55A	Potassium dichromate method with halide ions of high concentration
Total Organic Carbon	NIEA W532.52C	Oxidization heating for Peroxy-Pyrosulfate / Infrared determination
Ammonia	NIEA W448.51B	Indophenol colorimetry
	NIEA W437.52C	Indophenol method
Nitrate	NIEA W415.53B	Ion chromatographic method
	NIEA W436.52C	Flow Injection analysis method of cadmium reduction
Nitrite	NIEA W418.53C	Spectrophotometer method
	NIEA W436.52C	Flow Injection analysis method of cadmium reduction
Dissolved Oxygen	NIEA W455.52C	Electrode Method
Total Phosphate	NIEA W427.53B	Spectrophotometer method / Vitamin C method
Coliform	NIEA E202.55B	Filter membrane method
Heavy Metal Parameter		
Zn	NIEA W311.53C	Inductively coupled plasma atomic emission spectrometry
	NIEA W313.53B	Inductively coupled plasma mass spectrum method
	NIEA W308.22B	Chelation-solvent extraction separation with ion-exchange resin
Cu	NIEA W311.53C	Inductively coupled plasma atomic emission spectrometry
	NIEA W313.53B	Inductively coupled plasma mass spectrum method
	NIEA W308.22B	Chelation-solvent extraction separation with ion-exchange resin
Pb	NIEA W311.53C	Inductively coupled plasma atomic emission spectrometry
	NIEA W313.53B	Inductively coupled plasma mass spectrum method
	NIEA W308.22B	Chelation-solvent extraction separation with ion-exchange resin
As	NIEA W435.53B	Batched hydride- atomic absorption spectrometry
	NIEA W434.54B	Automatic continuous flow injection-hydride generation-atomic absorption spectrometry
Cd	NIEA W311.53C	Inductively coupled plasma atomic emission spectrometry

	NIEA W313.53B	Inductively coupled plasma mass spectrum method
	NIEA W308.22B	Chelation-solvent extraction separation with ion-exchange resin
Hg	NIEA W330.52A	Cold-vapor atomic absorption spectroscopy
Se	NIEA W340.51A	Selenium hydride-atomic absorption spectrometry
	NIEA W341.51B	Automatic continuous flow injection-hydride generation-atomic absorption spectrometry
Ag	NIEA W313.53B	Inductively coupled plasma mass spectrum method
	NIEA W311.53C	Inductively coupled plasma atomic emission spectrometry
Cr	NIEA W320.52A	Colorimetry
Mn	NIEA W311.53C	Inductively coupled plasma atomic emission spectrometry
	NIEA W308.22B	Chelation-solvent extraction separation with ion-exchange resin

Supplementary Table S2. Taiwan EPA water quality standards for heavy metal content in surface water

Heavy Metal Parameters	Max Concentration (mg/L)[a]
As (Arsenic)	0.05
Pb (Lead)	0.01
Cd (Cadmium)	0.005
Cr (Chromium)	0.05
Zn (Zinc)	0.5
Hg (Mercury)	0.001
Cu (Copper)	0.03
Mn (Manganese)	0.05
Ag (Silver)	0.05
Se (Selenium)	0.01

[a] Taiwan Environmental Standards for Protecting Human Health – Terrestrial Surface Water Bodies

Supplementary Table S3. River Pollution Index Descriptive Statistic Table (mg/L)

Year	N1 N = 84 Mean	SD	N2 N = 48 Mean	SD	N3 N = 156 Mean	SD	N4 N = 84 Mean	SD	E1 N = 72 Mean	SD	C1 N = 60 Mean	SD	C2 N = 226 Mean	N
2002	4.1	2.78	6.13	1.17	4.68	2.20	5.94	1.39	3.29	0.95	3.57	1.21	3.23	1.70
2003	4.31	3.10	6.32	1.18	4.4	2.12	6.45	1.55	3.27	0.62	3.69	1.47	3.34	1.78
2004	3.89	2.53	6.18	1.65	4.06	2.00	5.16	1.72	2.6	0.98	3.31	1.08	3.33	1.58
2005	3.56	2.92	5.72	1.81	3.48	2.02	5.67	1.58	2.28	0.91	3.44	0.83	3.26	1.48
2006	3.8	2.72	6.02	1.80	3.29	1.89	5.54	1.52	2.21	0.90	2.88	0.81	2.86	1.56
2007	3.92	2.69	6.23	1.99	3.42	1.97	4.78	1.44	2.35	0.93	2.85	0.78	2.7	1.52
2008	2.88	2.07	4.76	1.46	2.9	1.81	4.48	1.66	2.31	0.94	2.91	0.83	2.48	1.44
2009	2.88	2.38	5.08	1.30	3.19	2.00	4.92	1.79	2.24	1.09	2.78	0.85	2.44	1.40
2010	2.85	2.35	4.89	1.63	3.04	1.90	4.65	1.61	2.53	0.84	2.94	0.78	2.61	1.47
2011	2.99	2.40	4.88	1.77	2.96	1.72	4.71	1.33	2.34	0.74	2.83	1.00	2.71	1.72
2012	2.27	1.71	4.09	1.46	2.34	1.45	3.8	1.00	2.1	0.80	3.03	0.77	2.47	1.32
2013	2.58	2.27	84	1.61	2.62	1.61	4.56	1.50	2.68	0.89	3.4	1.03	2.63	1.59
2014	2.62	2.23	4.26	1.67	2.77	1.72	4.3	1.29	2.25	0.77	3.11	0.77	2.43	1.45
2015	2.83	2.38	4.81	1.51	2.75	1.84	4.29	1.44	2.23	0.79	2.96	0.83	2.33	1.52
2016	2.46	2.11	3.95	1.32	2.68	1.81	3.38	1.33	2.13	0.82	3.05	0.87	2.08	1.21
Total Average	3.2		5.19		3.24		4.84		2.48		3.14		2.73	
Classification*	M		M		M		M		L		M		L	

Year	C3 N = 60 Mean	SD	S1 N = 156 Mean	SD	S2 N = 195 Mean	SD	S3 N = 96 Mean	SD	S4 N = 84 Mean	SD	S5 N = 72 Mean	SD	S6 N = 120 Mean	SD
2002	4.88	1.06	7.59	1.62	3.1	2.43	5.77	1.87	4.68	2.40	5.68	2.32	2.5	1.51
2003	4.95	1.47	7.61	1.52	2.7	2.31	6.02	2.02	4.73	2.39	5.93	2.41	2.36	1.60
2004	4.9	1.18	7.27	1.76	2.87	2.12	5.71	2.15	4.82	2.49	6.01	2.58	2.52	1.27
2005	4.54	1.32	6.97	1.95	3.37	2.08	5.05	2.10	3.6	2.12	5.18	2.24	2.29	1.05
2006	4.27	1.15	6.78	1.79	3.11	2.27	5.13	2.15	3.94	2.15	5.18	2.31	2.23	1.10
2007	4.37	1.08	6.64	1.98	3.17	2.15	5.05	2.10	3.72	1.90	5	2.23	2.28	1.22
2008	4.33	1.13	6.15	1.81	2.91	1.91	4.69	2.00	3.4	1.85	4.47	1.95	1.83	0.86
2009	4.57	1.22	6.72	1.85	3.02	2.04	5.03	2.15	3.4	1.73	4.92	2.17	1.89	0.95

Year	C3 N = 60		S1 N = 156		S2 N = 195		S3 N = 96		S4 N = 84		S5 N = 72		S6 N = 120	
	Mean	SD	Mean	SD	Mean	SD	Mean		Mean	SD	Mean	SD	Mean	SD
2010	4.87	1.61	6.35	1.74	3.59	1.58	4.89	1.95	3.68	1.76	4.78	2.23	1.81	0.95
2011	4.93	1.18	6.18	1.69	3.28	1.57	4.78	2.29	3.24	1.94	4.44	2.45	1.85	1.01
2012	4.52	1.44	6.33	1.62	3.58	1.50	4.67	1.66	3.5	1.93	3.96	2.32	1.79	0.81
2013	4.5	1.11	6.08	1.48	3.66	1.70	4.91	1.83	3.88	1.91	3.78	2.24	1.95	1.00
2014	4.51	0.92	5.91	1.59	3.47	1.75	5.04	1.93	3.9	1.87	3.81	2.37	1.81	0.81
2015	4.78	1.13	5.41	1.50	3.33	2.04	4.92	1.90	3.41	1.92	4.08	2.24	2.05	0.94
2016	4.82	1.00	5.1	1.51	3.44	1.46	4.97	1.85	3.47	1.70	4.26	1.95	1.88	0.94
Total Average	4.65		6.51		3.24		5.1		3.81		4.81		2.07	
Classification*	M		S		M		M		M		M		L	

*) L = Lightly Polluted; M = Moderately Polluted; S = Severely Polluted