

Supplementary Materials: The following are available online at www.mdpi.com/xxx/s1

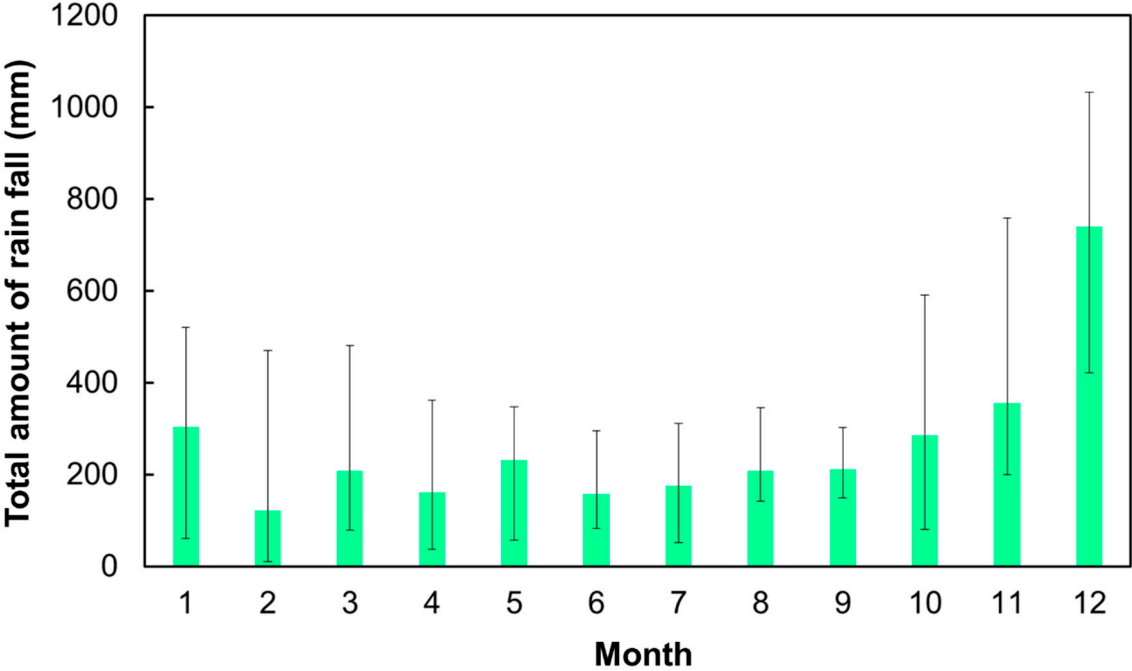


Figure S1. Average precipitation values in the Kuantan area from 2002 to 2012.

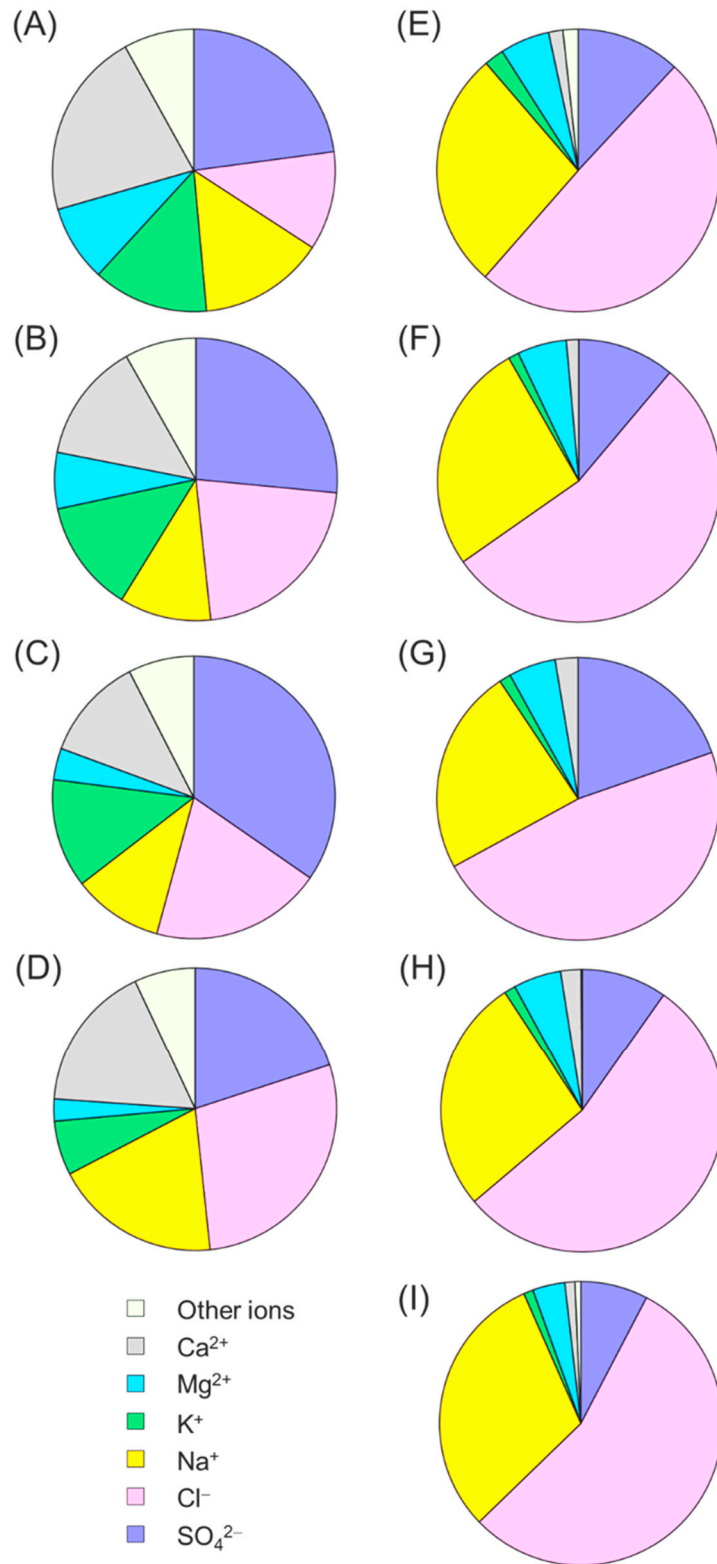


Figure S2. Comparison of averaged ion concentration ratios of the river water samples collected from up- to midstream (A: P-1 to -5, B: K-1 to -6, C: B-1 to -6, D: G1a-4 to 6 and G2-2 to 3), downstream (E: P-6, F: K-7 to -9, G: B-7, H: G1a-7 to 8 and G2-5), and sea water (I: sea water) [23].

Table S1. Natural water quality standards for Malaysia [12].

Parameters	Class*				
	I	II	III	IV	V
DO (mg/L)	> 7	5 - 7	3 - 5	< 3	< 1

pH	6.5 - 8.5	6 - 9	5 - 9	5 - 9	—
COD (mg/L)	< 10	10 - 25	25 - 50	50 - 100	> 100
TP (mg/L)	—	< 0.2	< 0.1	—	—
SO ₄ ²⁻ (mg/L)	—	< 250	—	—	—
Cl ⁻ (mg/L)	—	< 200	—	< 80	—
NO ₃ ⁻ (mg/L)	—	< 7	—	< 5	—
Na ⁺ (mg/L)	—	—	—	—	—
NH ₄ ⁺ -N (mg/L)	< 0.1	0.1 - 0.3	0.3 - 0.9	0.9 - 2.7	> 2.7
K ⁺ (mg/L)	—	—	—	—	—
Mg ²⁺ (mg/L)	—	—	—	—	—
Ca ²⁺ (mg/L)	—	—	—	—	—

* Class I: Conservation of natural environment, Water Supply I - no treatment necessary, Fishery I - very sensitive aquatic species; Class II: Water Supply II - Conventional treatment, Fishery II - sensitive aquatic species, recreational use - body contact; Class III: Water Supply III - Extensive treatment required, Fishery III - Common of economic value and tolerant species, livestock drinking; Class IV: Irrigation; Class V: None of the above.

Table S2. Average values of ionic concentration and water quality indexed parameters in up- and midstream sections of the Pahang, Kuantan, and Belat Rivers and the western and eastern sides of the Galing River.

Analyte/Class	Sampling area (Collection season)							
	Pahang River (April 2016)		Kuantan River (June 2014)		Belat River (June 2014)		Galing River (March 2016)	
	Upstream (P-1 ~ 3)	Midstream (P-4 ~ 5)	Upstream (K-1 ~ 4)	Midstream (K-5 ~ 6)	Upstream (B-1 ~ 3)	Midstream (B-4 ~ 6)	Western (G1)	Eastern (G2)
DO (mg/L)	5.44 / Class II	5.24 / Class II	5.80 / Class II	5.40 / Class II	5.26 / Class II	4.53 / Class III	3.07 / Class III	5.18 / Class II
pH	6.59 / Class I-IV	6.71 / Class I-IV	5.62 / Class III-IV	5.80 / Class III-IV	5.85/ Class III-IV	5.62/ Class III-IV	5.86 / Class III-IV	6.04 / Class II-IV
COD (mg/L)	5.38 / Class I	6.17 / Class I	9.81 / Class I	16.4 / Class II	15.8/ Class II	26.3/ Class III	104 / Class V	9.81 / Class I
TP (mg/L)	0.68 / —	0.43 / —	0.72 / —	0.73 / —	0.68 / —	2.23 / —	5.46 / —	1.64 / —
SO ₄ ²⁻ (mg/L)	4.35 / Class II	5.70 / Class II	1.94 / Class II	5.88 / Class II	3.05 / Class II	9.92 / Class II	11.9 / Class II	12.3 / Class II
Cl ⁻ (mg/L)	1.94 / Class II, IV	3.13 / Class II, IV	1.76 / Class II, IV	4.50 / Class II, IV	2.96 / Class II, IV	4.37 / Class II, IV	23.5 / Class II, IV	13.3 / Class II, IV
NO ₃ ⁻ (mg/L)	1.11 / Class II, IV	2.43 / Class II, IV	0.61 / Class II, IV	1.68 / Class II, IV	1.04 / Class II, IV	1.69 / Class II, IV	0.29 / Class II, IV	2.14 / Class II, IV
Na ⁺ (mg/L)	2.79 / —	3.49 / —	1.08 / —	1.69 / —	1.84/ —	2.02/ —	19.1 / —	10.6 / —
NH ₄ ⁺ -N (mg/L)	0.08 / Class I	0.09 / Class I	0.03 / Class I	0.03 / Class I	0.04/ Class I	0.04 / Class I	8.42 / Class V	1.37 / Class II
K ⁺ (mg/L)	2.48 / —	3.36 / —	0.98 / —	2.77 / —	2.03/ —	2.65 / —	6.96 / —	3.81 / —
Mg ²⁺ (mg/L)	1.73 / —	2.07 / —	0.64 / —	1.09 / —	0.46/—	0.89 / —	2.05 / —	1.48 / —
Ca ²⁺ (mg/L)	5.20 / —	3.62 / —	0.97 / —	3.12 / —	2.13/—	2.31 / —	12.8 / —	10.9 / —

Table S3. Average values of the water quality index in the western and eastern sides of the Galing River from 2014–2016.

Analyte/Class	Month/Year	Sampling area side (sampling points)	
		Western (G1a-4 ~ 6)	Eastern (G2-2 ~ 3)
DO (mg/L)	May/2014	2.37 / Class IV	3.33 / Class III
	May/2015	1.36 / Class IV	3.12 / Class III
	August/2015	2.20 / Class IV	5.23 / Class II
	November/2015	1.66 / Class IV	3.53 / Class III
	March/2016	3.07 / Class III	5.31 / Class II
TP (mg/L)	May/2014	3.30 / —	0.85 / —
	May/2015	—	—
	August/2015	—	—
	November/2015	—	—
	March/2016	3.10 / —	1.66 / —
pH	May/2014	6.61 / Class I	6.56 / Class I
	May/2015	6.53 / Class I	6.75 / Class I
	August/2015	6.37 / Class II	6.35 / Class II
	November/2015	6.45 / Class II	6.45 / Class II
	March/2016	6.10 / Class II	5.91 / Class III
COD (mg/L)	May/2014	39.7 / Class III	30.4 / Class III
	May/2015	—	—
	August/2015	—	—
	November/2015	—	—
	March/2016	39.0 / Class III	6.00 / Class I

Table S4. Average values of ion concentrations in the western and eastern sides of the Galing River from 2014–2016.

Analyte/Class	Month/Year	Sampling area side (sampling points)	
		Western (G1a-4 ~ 6)	Eastern (G2-2 ~ 3)
SO ₄ ²⁻ (mg/L)	May/2014	13.7 / Class II	17.8 / Class II
	May/2015	18.2 / Class II	10.0 / Class II
	August/2015	13.0 / Class II	12.7 / Class II
	November/2015	14.5 / Class II	11.9 / Class II
	March/2016	11.5 / Class II	10.6 / Class II
Cl ⁻ (mg/L)	May/2014	28.5 / Class II, IV	13.2 / Class II, IV
	May/2015	61.1 / Class II, IV	9.57 / Class II, IV
	August/2015	38.0 / Class II, IV	10.9 / Class II, IV
	November/2015	47.3 / Class II, IV	9.27 / Class II, IV
	March/2016	21.4 / Class II, IV	11.2 / Class II, IV
NO ₃ ⁻ (mg/L)	May/2014	0.02 / Class II, IV	0.16 / Class II, IV
	May/2015	0.04 / Class II, IV	1.18 / Class II, IV
	August/2015	0.32 / Class II, IV	2.63 / Class II, IV
	November/2015	0.37 / Class II, IV	1.74 / Class II, IV
	March/2016	0.34 / Class II, IV	2.68 / Class II, IV
Na ⁺ (mg/L)	May/2014	18.4 / —	10.9 / —
	May/2015	40.8 / —	8.09 / —
	August/2015	24.7 / —	6.93 / —

	November/2015	31.7 / —	7.16 / —
	March/2016	17.2 / —	8.35 / —
K ⁺ (mg/L)	May/2014	5.30 / —	4.42 / —
	May/2015	7.09 / —	2.86 / —
	August/2015	4.80 / —	3.79 / —
	November/2015	5.79 / —	3.47 / —
	March/2016	5.37 / —	3.29 / —
Mg ²⁺ (mg/L)	May/2014	2.00 / —	1.59 / —
	May/2015	4.13 / —	1.10 / —
	August/2015	2.91 / —	1.31 / —
	November/2015	3.45 / —	1.23 / —
	March/2016	1.86 / —	1.31 / —
Ca ²⁺ (mg/L)	May/2014	15.9 / —	10.6 / —
	May/2015	11.0 / —	6.36 / —
	August/2015	10.4 / —	6.59 / —
	November/2015	12.8 / —	7.21 / —
	March/2016	11.6 / —	8.60 / —
NH ₄ ⁺ -N (mg/L)	May/2014	5.72 / Class V	5.18 / Class V
	May/2015	9.94 / Class V	3.17 / Class IV
	August/2015	5.21 / Class V	2.29 / Class IV
	November/2015	3.02 / Class IV	0.38 / Class II
	March/2016	6.14 / Class V	0.53 / Class III