Supplementary Information

for

Urban land-use type influences water quality in small- and medium-sized urban rivers: a case study in Shanghai, China

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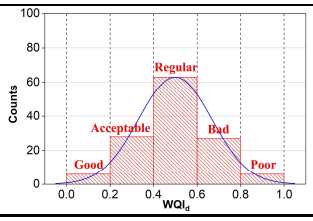
Table S1. Determined weights of 12 selected parameters in the calculation of WQI_d.

Parameters	NTU	DO	BGA	Cond	RA	Chla	TSS	BOD_5	TN	TP	NH_4^+	COD_{MN}
Weight	11.6	13.8	20.3	12.5	6.6	4.4	10.0	3.9	4.5	5.1	3.8	4.5

Table S2. Correspondence of the qualitative results of water quality indicators according to the numerical result of index calculation.

WQI_d (0–1)	Data distribution	Classifications
0–0.20		Good
0.21–0.40		Acceptable
0.41–0.60		Regular
0.61–0.80		Bad
0.81–1.00		Poor

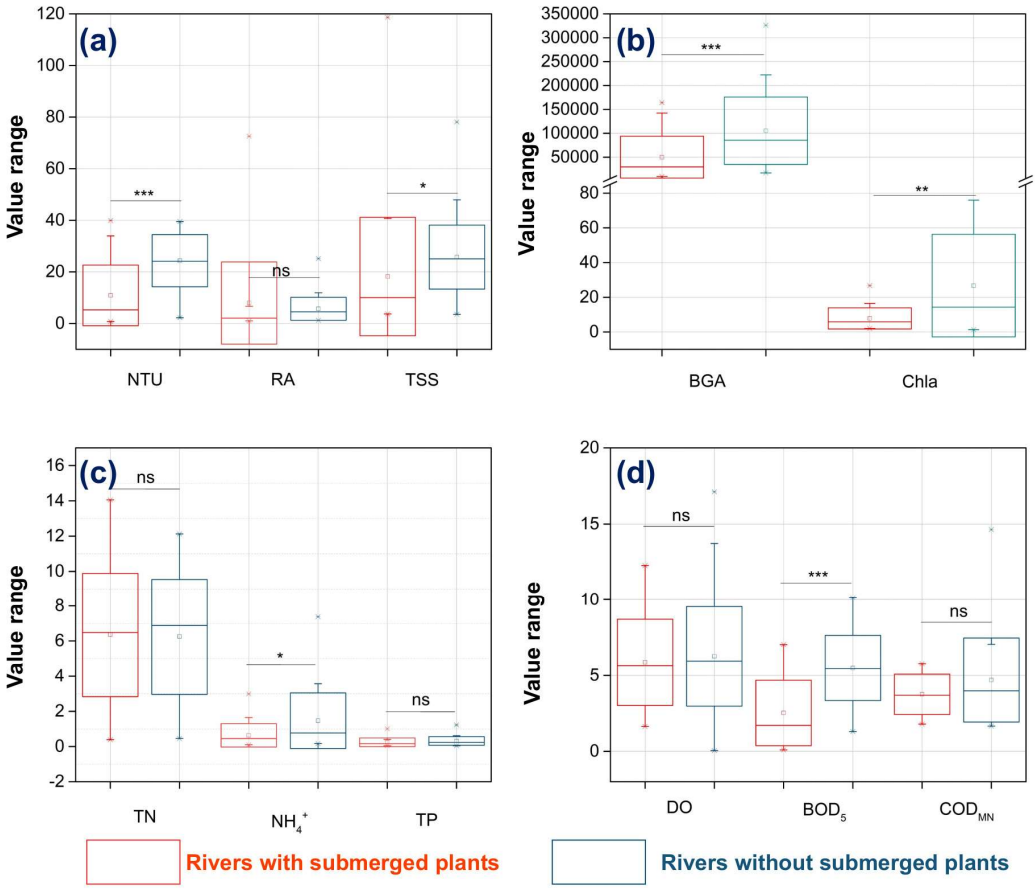


Figure S1. Box charts field collected samples with < 40 turbidity. In panel (a): NTU is turbidity (nephelometric turbidity unit). RA is radiation absorbency (percentage). TSS is total suspend solids (milligram per liter). In Panel (b): BGA is Blue-green Algae (cells per liter). Chla is Chlorophyll a (microgram per liter). In Panel (c): TN is total nitrogen (milligram per liter). NH_4^+ is ammonium nitrogen (milligram per liter). TP is Total phosphorus (milligram per liter). In Panel (d): DO is dissolved oxygen (milligram per liter). BOD_5 is five-day biochemical oxygen demand (milligram per liter). COD_{MN} is permanganate Index (milligram per liter). ns indicates inter-group's non-significant differences. * indicates inter-group's significant differences at the 0.05 level. *** indicates inter-group's significant difference at the 0.01 level.

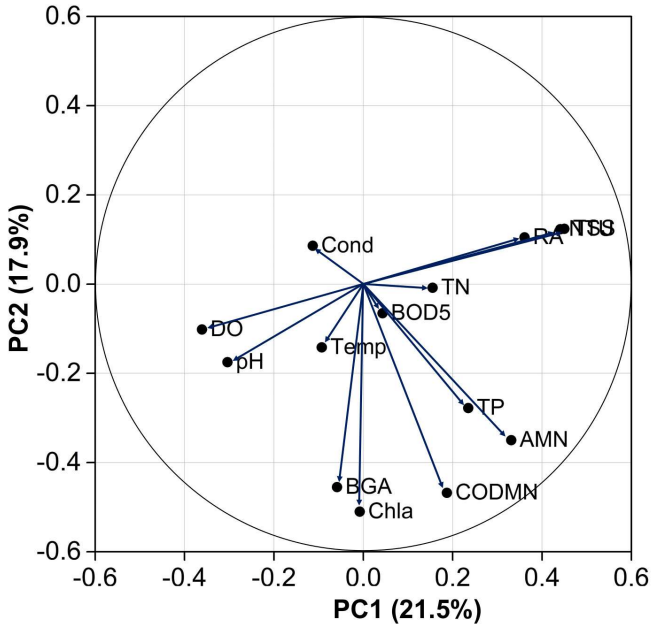


Figure S2. Eigen-analysis of the correlation matrix. Five-day biochemical oxygen demand (BOD5; milligram per liter), Total nitrogen (TN; milligram per liter), and Permanganate Index (CODMN; milligram per liter) are essential biological indicators for water quality assessment. Their "low correlations with PC1 and PC2 are also captured by the ecosystem-specific water quality index, and further revealed the situations of each the investigated river section.

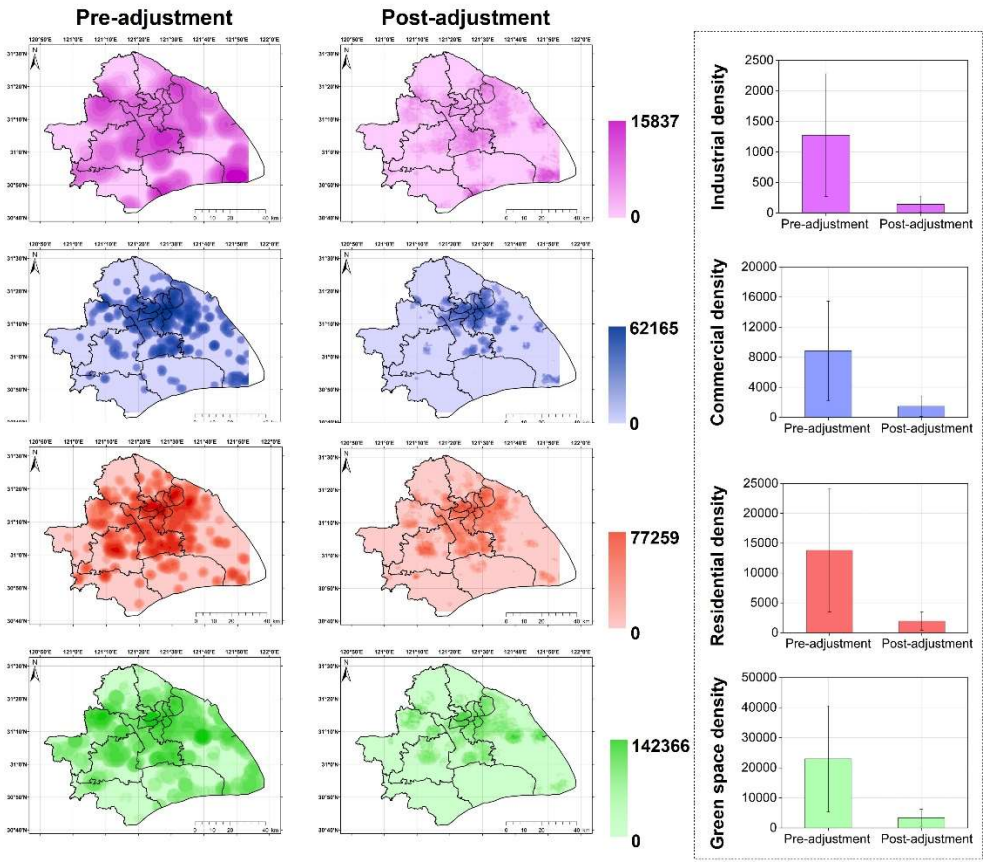


Figure S3. Figures show kernel densities of four land-use types adjusted by the normalized nighttime light (NTL) data. Bar plots are displayed with mean pixel values plus/minus standard deviations.

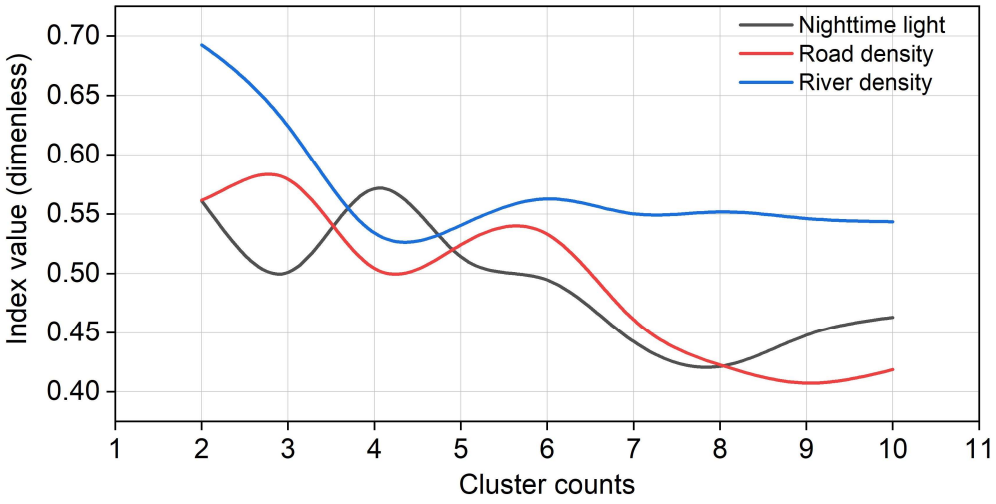


Figure S4. The clustering of the raw nighttime light data, road density data, and river density data using the Davies-Bouldin index. Determined clusters of nighttime light, road density, and river density are 8, 9, and 4, respectively.

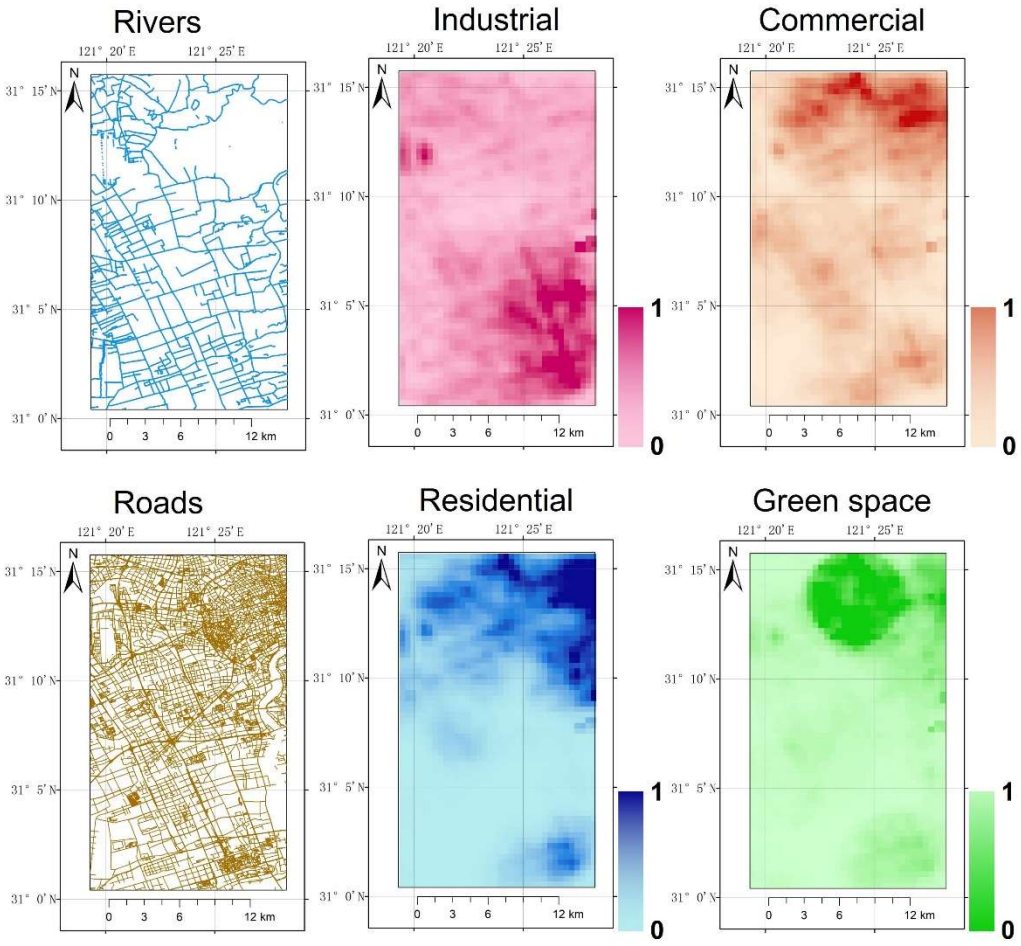


Figure S5. Experimental area for the determinations of mechanisms between land-use types and water quality in Shanghai. Rivers and roads are from OSM datasets. Kernel densities of industrial, commercial, residential, and green space are adjusted by NTL and normalized to 0–1.