

Supporting Information

Impact of the Conservation in Futian Mangrove National Nature Reserve on Water Quality in the Last 20 Years

Detailed steps for calculating weights by the entropy method:

Normalization:

Forward normalization is applied to parameters that exhibit higher values indicative of superior water quality:

$$y_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)}$$

Negative normalization is employed for parameters where lower values signify better water quality:

$$y_{ij} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)}$$

In this context, y_{ij} denotes the normalized value of the j th indicator for the i th sample., $i=1,2,3,\dots,m, j=1,2,\dots,n$

Calculate the weight of indicators:

$$p_{ij} = \frac{y_{ij}}{\sum_{i=1}^m y_{ij}}$$

In this context, p_{ij} represents the weight of the j th indicator for the i th sample., $i=1,2,3,\dots,m, j=1,2,\dots,n$

Calculate the entropy value:

$$e_j = -k \sum_{i=1}^m p_{ij} \ln(p_{ij})$$

Where, $k>0, e_j>0$. The value of k in the above equation is related to the number of samples m , generally $k=1/\ln(m)$, then $0 \leq e_j \leq 1$.

Calculate the weight:

$$w_j = \frac{1 - e_j}{\sum_{i=1}^m 1 - e_j}$$

Table S1. Parameters for indices calculation in the water quality index (WQI).

Parameters	unit	Standards	Relative weight (w_i)
AN	(mg/L)	0.15-2.0 ^a	0.1459464
COD ₅	(mg/L)	3.0-10.0 ^a	0.1486297

DO	(mg/L)	2.0-7.5 ^a	0.1416847
pH	-	6.0-9.0 ^a	0.1250389
TP	(mg/L)	0.02-0.4 ^a	0.1446751
TN	(mg/L)	0.2-2.0 ^a	0.147073
TUR	(NTU)	1.0-5.0 ^b	0.1469522

Note: Standards of trace elements signed with a are from the standard for Chinese Surface Water Quality Standard (GB 3838-2002); the Standard of trace elements signed with b is from the standards of the Bureau of Indian Standards (Chandrasekhar, R., et al. "A case study of the effect of seawater intrusion on the water quality index of the Indian Southeastern Coastal Region." ACS ES&T Water 3.6 (2023): 1610-1619, DOI10.1021/acsestwater.2c00350)

Table S2 The normalized value of Ci.

Normalized (Ci)	DO (mg/L)	BOD ₅ (mg/L)	AN (mg/L)	TP (mg/L)	TN (mg/L)	pH	TUR (NTU)
100	7.50	3.00	0.15	0.02	0.20	7.40	1.00
75	6.00	3.00	0.50	0.10	0.50	7.80	2.00
50	3.00	4.00	1.00	0.20	1.00	8.20	3.00
25	3.00	6.00	1.50	0.30	1.50	8.60	4.00
0	2.00	10.00	2.00	0.40	2.00	9.60	5.00