

Supplementary materials

Entropy weight water quality index (EWQI) is calculated as the following three steps [1].

Step 1: an entropy weight must be assigned to each water quality parameter.

For calculating entropy weight when m water samples ($i=1, 2, \dots, m$) are taken to evaluated the water quality and each sample is analyzed for “ n ” quality and each sample is analyzed for “ n ” quality parameters ($j= 1, 2, \dots, n$), according to observed data, Eigen value matrix X can be constructed as follows:

(1)

Data pretreatment should be applied to eliminate the impact of different units of characteristic indices and different quantity grades of quality. According to attribution of every index, the feature indexes may be divided into four types: efficiency type, cost type, fixed type and interval type. For the efficiency type, the construction function of normalization is

(2)

While for the cost type, the construction function of normalization is

(3)

After transformation, the standard-grade matrix Y can be obtained as shown below:

(4)

Then the ratio of index value of the j index and in I sample is

(5)

The information entropy is expressed by the formula as below

(6)

The smaller the value of e_j is, the bigger the effect of j index. Then the entropy weight can be calculated with the following formula:

(7)

In the formula, w_j is defined as the entropy weight of j parameter.

Step 2: Calculating EWQI is to assign a quality rating scale (q_j) for each parameter.

The q_j is calculated by the following formula:

(8)

Where C_j is the concentration of each chemical parameter in each water sample in mg/l, and S_j is the limit for drinking groundwater of each parameter in mg/l according to quality standards for groundwater of WHO. The above equation ensures that if j parameter is totally absent in the water, the q_j is 0, and when the amount of this parameter is just equal to its permissible value, the q_j is 100.

Step 3: The EWQI can be calculated by the following formula:

(9)

References

1. Amiri, V.; Rezaei, M.; Sohrabi, N. Groundwater quality assessment using entropy weighted water quality index (ewqi) in lenjanat, iran. *Environmental Earth Sciences* **2014**, 72, 3479-3490.