Study of water quality index for portable water: in special reference to indian water bodies

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Abstract

In the present study water quality index has been used to assess suitability of serving water quality for drinking purposes. we have collected the values for certain parameters such as ph, total dissolved solids, electrical conductivity, calcium, magnesium, potassium,total hardness,iron,fluoride and turbidity by performing the experiments, simulations and proved it theoretically by weighted arithmetic index method that whether the water is suitable for consumption or not each parameter was compared with its standard permissible limit .

Weighted Arithmetic Index Method

Formula and steps for calculating WQI:

Step:1.Calculate the unit weight (W_n) factors for each parameters by using the formula

$$Wn = \frac{K}{Sn}$$

where

$$K = \frac{1}{\frac{1}{S1} + \frac{1}{S2} + \frac{1}{S3} \cdots \cdots \frac{1}{Sn}} = \frac{1}{\sum \frac{1}{Sn}}$$

S_n = Standard desirable value of the nth parameters
O_n summation of all selected parameters unit weight factors
W_n = 1(unity)

Step: 2.Calculate the Sub-Index (Q_n) value by using the formula.

Where

$$Qn = \frac{[(Vn - Vo)]}{[(Sn - Vo)]} * 100$$

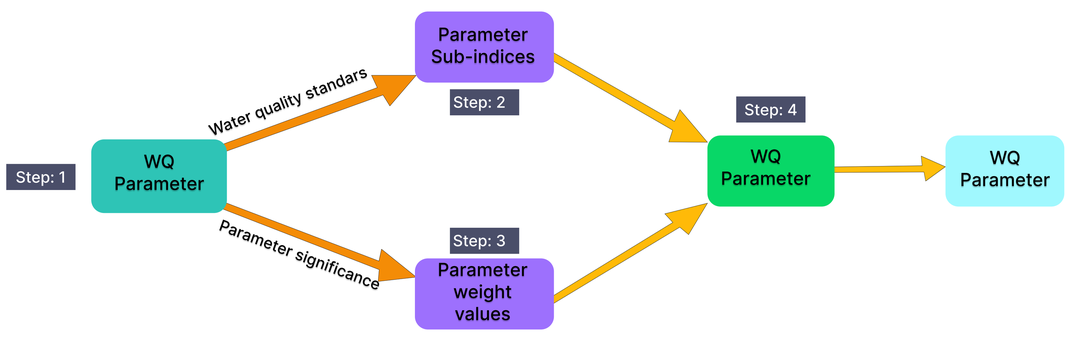
V_n = mean concentration of the nth parameters
S_n = Standard desirable value of the nth parameters
V_n = Actual values of the parameters in Pure water (generally V_o = 0) for parameters except for pH.

$$QpH = [(VpH - 7)] / [(8.5 - 7)] * 100$$

Step. 3. Combining Step 1 & Step 2, WQI is calculate as follows

$$Overall\ WQI = \sum \frac{WnQn}{\sum Wn}$$

Analysis



Lets assume these 9 Parameters are analysed for the study
The following are the hypothetical values or concentrations of water samples collected from three different sampling.

Parametry	Site 1	Site 2	Site 3
pH	7.9	4.6	6.1
EC	100.33	310	122
TDS	67.22	473.7	266.66
TH	40.67	239.33	122.87
CALCIUM	55.61	45.05	28.17
MAGNESIUM	6.48	16.5	21.83
Iron	0.05	0.38	0.11
Flouride	0.02	0.06	0.5
Turbidity	1.3	2.48	4.15

NOTE
1. Choice of parameters depends on the study and the researchers
2. Parameters can be physical, chemical or biological in nature
3. Selected parameters should have standards (WHO/BIS/ICMR)

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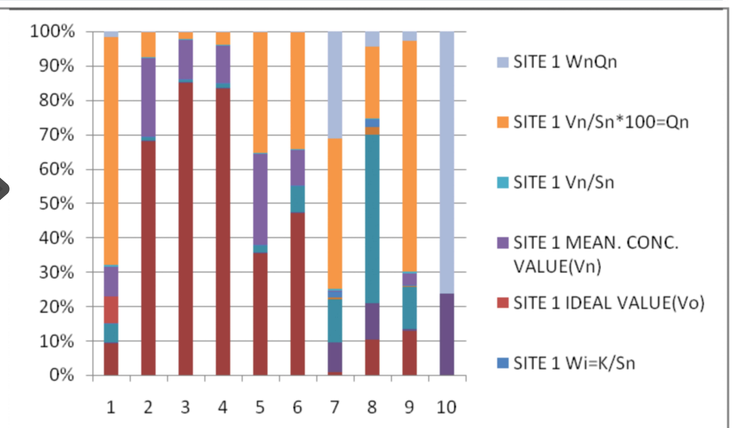
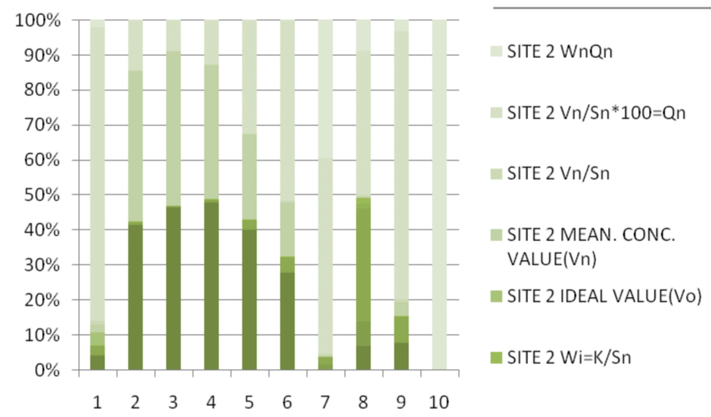
Results and discussion

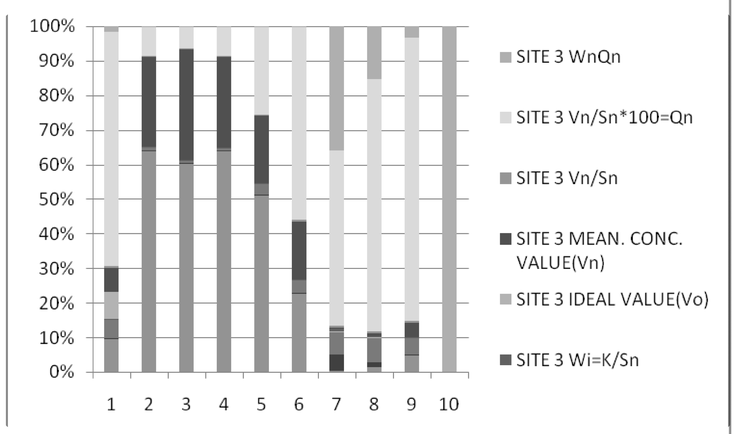
From site 1 graph we can see that the water quality are excellent as its water quality index falls under the range of 0 - 25.





From site 2 graph we can see that the water quality are unfit for consumption as its water quality index falls under the range which is greater than 90.

From site 3 graph we can see that the water quality are good enough as its water quality index falls under the range of 26 to 50.



SITE	INDEX VALUE
SITE 1	15.23
SITE 2	97.82
SITE 3	42.32

This table shows the values which we have observed analytically by taking the means of 40 observations for each site.

Water Quality Index	Description
0 – 25	Excellent
26 – 50	Good
51 – 70	Poor
76 – 90	Very Poor
> 100	Unfit for consuption

This table shows the fundamental results. If the water quality falls under the range of 0-25 means it is excellent.

Conclusion

Higher values of iron and magnesium reduced drinking water quality. Awareness raising on chemical contents in drinking water at household level is required to improve public health we have seen that if the water quality index falls under the range of 0 to 25 then it is excellent quality of water .

Future perspectives

The creation of new WQIs has been repetitive in terms of the aggregation models and the choice of parameters. The use of less rigid, more objective formulas with flexibility in the choice of variables would contribute to the search for an accepted and efficient index worldwide.

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