CRITERIA FOR CATEGORISATION OF
RIVER MONITORING LOCATION

1.   Introduction

Water Quality monitoring is an essential component to maintain and restore the wholesomeness of resources by way of prevention and control of pollution as prescribed under the Water (Prevention and Control of Pollution) Act, 1974. However, the Water (Prevention and Control of Pollution), Act, 976 does not define the level of wholesomeness to be maintained or restored in different water bodies of the country. In view of the said reason, the Central Pollution Control Board (CPCB) has tried to define the wholesomeness of water in terms of safe human uses, and thus, taken human uses of water as base for identification of water quality objectives for different water bodies in the Country. It is considered ambitious to maintain or restore all natural water body at pristine level which is possible only by taking proper control measures. The level and degree of treatment required can be decided depending on the categorization of the polluted river locations/stretch, as per the criteria detailed below: -

2.   Categorization of River Monitoring Location

The water quality data is required to be analyzed and primarily mean or average values of Biochemical Oxygen Demand (BOD) and Faecal Coliform (FC) need to be estimated. Then, based on the total score estimated for the parameters BOD (weightage- 70 %) and FC (Weightage- 30 %), based on the criteria, the monitoring location is categorized as 'polluted' location. The polluted monitoring locations in a continuous sequence are defined as 'polluted river stretch'. However, actual self-purification distance need to be estimated based on the requisite input parameters which depend on the case-to-case and the local conditions.

The monitoring locations may be categorized in five classes from Category I to Category –V. i.e., critically polluted to Good or Fit for Bathing i.e., Category –I indicates 'critically polluted'; Category-II indicates 'severely polluted'; Category-III indicates 'moderately polluted', Category –IV indicates 'less polluted', Category –V indicates 'Good' or Fit for Bathing'

Above suggested criteria is intended only for categorization of the river monitoring locations. However, if any State/UT desires to identify any other water body such as lakes, tanks may also apply these criteria depending on the need and the requisite achievable goals for rejuvenation of such water bodies.

Table 1 to Table 3 gives the mean or average BOD/Faecal Coliform values or range and the corresponding scores as well as categorization of the monitoring location

Table 1. Observed Mean or Average BOD Value in mg/l and corresponding BOD Score

S. No	Mean or Average BOD (Weightage-70 %)	
	Mean or Average BOD (in mg/l)	BOD Score (X)
1	> 48	100
2	24-48	80
3	12-24	60
4	6-12	40
5	< 6	20

Table 2. Observed Mean or Average Faecal Coliform (in MPN/100 ml) and corresponding FC Score

S. No	Mean or Average Faecal Coliform (Weightage -30 %)	
	Mean or Average Faecal Coliform (in MPN/100 ml)	FC Score (Y)
(1)	> 5,00,000	100
(2)	50000 to 5,00,000	80
(3)	5000 to 50,000	60
(4)	500 to 5000	40
(5)	<500	20

Table 3. Total Score and corresponding Category of River Monitoring Location

S. No	Total Score* (Z')	Category Class of the Monitoring location	Category of Monitoring location
(1)	81-100	Category -I	Critically Polluted
(2)	61-80	Category--II	Severely Polluted
(3)	41-60	Category -III	Moderately Polluted
(4)	21-40	Category -IV	Less Polluted
(5)	< 20	Category -V	Good or Fit For Bathing

Note:

(i)   *Above criteria must be considered only for the river locations having monitored at least for 2 years and 8 observations in each year covering at least pre-monsoon and post-monsoon period;*

(ii)   *Above criteria is a preliminary screening criteria for categorizing monitoring locations. However, comprehensive assessment needs to be done by States/UTs to arrive at the extent of contamination;*

(iii)   *Please refer to the procedure for estimation of Total Score given in S.No 3.;*

2.1   **Criteria for Category- I – Critically Polluted: -** If the Total score is 81-100, then the monitoring location is categorized as **'Critically Polluted'.**

2.2   **Criteria for Category- II – Severely Polluted: -** If the Total score is 61-80, then the monitoring location is categorized as **'Severely Polluted'**

2.3   **Criteria for Category- III-Moderately Polluted: -** If the Total score is 41-60, then the monitoring location is categorized as **'Moderately Polluted'**

2.4   **Criteria for Category-IV –Less Polluted: -** If the Total score is 21-40, then the monitoring location is categorized as **'Less Polluted'**.

2.5   **Criteria for Category -V-Good or Fit for Bathing:-**If the Total score is ≤ 20, then the monitoring location is categorized as '**Good or Fit for Bathing'.**

*For easy understanding, flow chart given in **Figure 1** and steps for calculating the total score may also be referred in the subsequent paras: -*

3.   **Steps for calculating total score and categorizing of monitoring location: -**

(i)   *Depending on the average BOD measured value, assign the BOD score (X) as given in **Table 1.***

(ii)   *Similarly depending on the average FC measured value, assign the FC Score (Y) as given in **Table 2.***

(iii)   *Total score **(Z)** is estimated as: BOD Score **(X) X** (Weightage of BOD i.e., 70 %) + FC Score **(Y) X** (Weightage for FC i.e., 30 %). and*

(iv)   *Now compare calculated Total Score (Z) with the **Z'** Value given in the Table 3 and the monitoring location is categorized suitably.*

For easy understanding, an Example 1 and Table 4 may be referred as given in the subsequent paras.

E.g. (1): *At a particular monitoring location, the average values of BOD and the FC values are observed as 6 mg/l and 9000 MPN/100 ml respectively. Then, the total score is calculated as*

➢ *X is the BOD Score corresponding to the mean BOD value of 6 mg/l as per* **Table 1** = *20*

➢ *Y is the FC Score corresponding to the average FC value of 9000 MPN/100 ml as per* **Table 2** = *60*

➢ *Calculated Total Score* **(Z)** = *X* X **Weightage of BOD** + *Y* X **Weightage of FC** *i.e.,20 X 0.7 + 60 X 0.3 = 14 + 18= 32.*

➢ *Compare 39 value with the* **Z'** *values given in* **Table 3** *to decide on the Category of the Monitoring Location. In this case, monitoring location is Category-IV i.e., 'Less Polluted',*

Table 4. Categorisation of Monitoring Location with Examples

Sl. No (I)	Mean or Average of BOD (mg/L) (II)	Mean or Average of Faecal Coliform (MPN/100mL) (III)	BOD Score (as per Table 1) (IV)	FC Score (as per Table 2) (V)	Calculation of Total score (Z) [0.70(Column IV) + 0.30(Column V)] (VI)	Monitoring Location Category Class (VII)
1	6.0	9000	20	60	32	IV
2	2.0	45	20	20	20	V
3	2.0	550000	20	100	44	III
4	45.0	80	80	20	62	II
5	24.0	200000	60	80	66	II
6	63.3	127500	100	80	94	I

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                          ┌─────────────────────────────────────┐
                          │  Water Quality Monitoring Location   │
                          └─────────────────────────────────────┘
                                            │
                                            ▼
┌──────────────────────┐            ◇───────────────◇
│ MONITORING           │   ┌─────┐  │                │
│ LOCATION -           │◄──│ Yes │──│  Is Total Score│
│ GOOD or FIT FOR      │   └─────┘  │     < 20 ?     │
│ BATHING              │            ◇───────────────◇
│ (Category-V)         │                    │  ┌─────┐
└──────────────────────┘                    ▼  │ NO  │
                                            ◇───────────────◇
┌──────────────────────┐   ┌─────┐  │                │
│ MONITORING           │◄──│ Yes │──│ Is Total Score │
│ LOCATION -           │   └─────┘  │    21-40 ?     │
│ LESS  POLLUTED       │            ◇───────────────◇
│ (Category-IV)        │                    │  ┌─────┐
└──────────────────────┘                    ▼  │ NO  │
                                            ◇───────────────◇
┌──────────────────────┐   ┌─────┐  │                │
│ MONITORING           │◄──│ Yes │──│ Is Total Score │
│ LOCATION -           │   └─────┘  │    41-60?      │
│ MODERATELY           │            ◇───────────────◇
│ POLLUTED             │                    │  ┌─────┐
│ (Category--III)      │                    ▼  │ NO  │
└──────────────────────┘            ◇───────────────◇
                                    │                │
┌──────────────────────┐   ┌─────┐  │ Is Total Score │
│ MONITORING           │◄──│ Yes │──│    61-80?      │
│ LOCATION -           │   └─────┘  ◇───────────────◇
│ SEVERELY             │                    │  ┌─────┐
│ POLLUTED             │                    ▼  │ NO  │
│ (Category--II)       │            ◇───────────────◇
└──────────────────────┘            │                │
                           ┌─────┐  │ Is Total Score │
┌──────────────────────┐◄──│ Yes │──│   81-100 ?     │
│ MONITORING           │   └─────┘  ◇───────────────◇
│ LOCATION -           │
│ CRITICALLY           │
│ POLLUTED             │
│ (Category--I)        │
└──────────────────────┘
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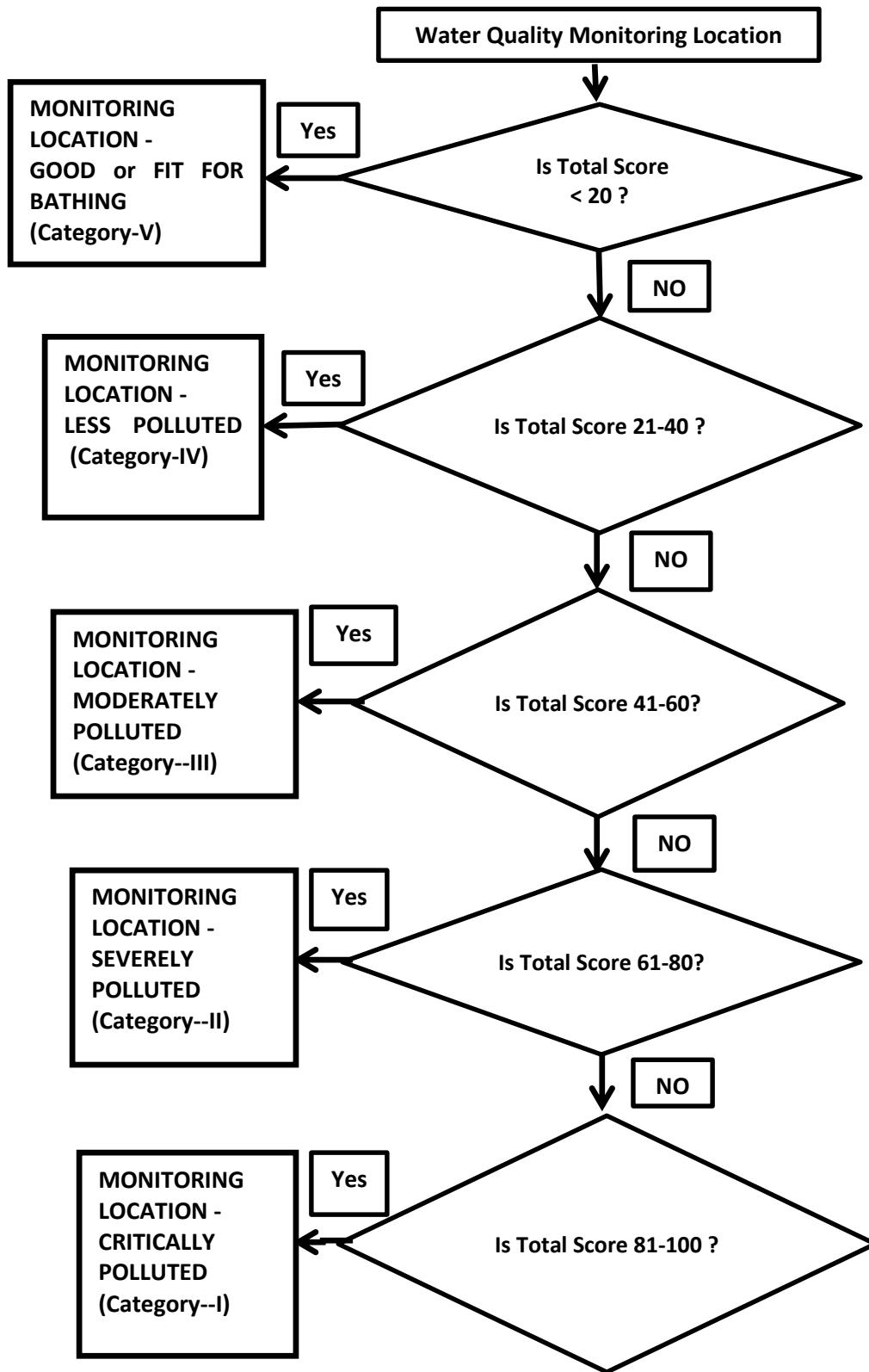
Figure 1. Flow Chart Showing Criteria for Categorization of River Monitoring Location