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SURFACE WATER QUALITY ASSESSMENT PLANNING FOR PEDHI RIVER IN AMRAVATI TAHSIL, AMRAVATI DISTRICT OF M.S.

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Abstract: This module looks at some of the concepts involved in the management of water quality and in particular how the quality of water can be planned, monitored and assessed. Fresh water is the most precious & one of the most vital resources of all India is a country studded with scenic beauty, comprising of various landforms crisscrossed by rivers. India receives an average annual rainfall equivalent of about 4,000 BCM-Billion cubic meters. This only source of water is unevenly distributed both spatially as well temporally, of 4,000 BCM of available water from precipitation, the mean flow of Countries Rivers is about 1900 BCM. The relationship between water quality and human activities is extremely complicated. Water is used extensively for domestic, industrial and agriculture purpose and after use is usually returned in the degraded state to rivers, lakes, oceans. The growth of population and industry has resulted in an increase, both in the total volume of the sewage and the degree of toxicity of industrial effluent.

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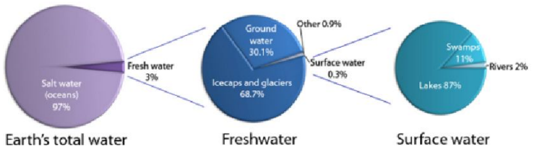
INTRODUCTION

Water is one of the most needs of living things. It is second only to the air we breathe. In fact some scientists believe that all life began with water. Today our Space explorations have found sign that water exist not only on Earth but throughout the universe. If this is so, it may be that living things exist or have existed on these other planets. Water is molecule that consists of two hydrogen atom and one oxygen atom. When these atoms are heated to a high temperature, they join to form water molecule. The scientific way to write this molecule is H_2O.

CLASSIFICATION OF SURFACE WATER QUALITY

The surface water quality classifies into five categories:

- **Class 1** is extra-clean fresh surface water resource used for conservation, not necessarily required to pass through a water treatment process, and requiring only an ordinary process for pathogenic destruction and ecosystem conservation where basic organisms can breed naturally.
- **Class 2** is very clean fresh surface water resource used for consumption, which requires an ordinary water treatment process before use, for aquatic organism of conservation, fisheries, and recreation.
- **Class 3** is medium-clean fresh surface water resource used for consumption, which requires passing through an ordinary treatment process before use for agriculture.
- **Class 4** is fairly clean fresh surface water resource used for consumption, but requires a special water treatment process before use for industry.
- **Class 5** is the source which is not classified in class 1-4 and used only for navigation.



Earth's water distribution

WATER QUALITY ASSESSMENT PLANNING

Setting River Water Quality Objectives

Following the establishment of a comprehensive list of uses, it is necessary to decide on which of the desired future use

should become quality objectives for each defined river reach. In carrying out this task, a number of different factors must be taken into account. The current state of the water body will obviously be relevant as will the resources required to effect the desired change in water quality. It is important when setting targets that realistic, achievable goals are put forward so that everybody can have confidence that the required status will be achieved.

Each objective will be set to achieve a previously-agreed use and may also incorporate a timetable for implementation. For example, the following objectives may be set for a low grade river which will, it has been decided, be a future source of potable water supply:

• That the river will only be suitable for abstraction of water for low-grade industrial use.

• That the river water will be suitable for abstraction for treatment as drinking water.

One important point to note, with regard to this objective setting exercise, is that it is perfectly possible that the river water quality in a particular stretch of river is far better than is necessary to meet the desired quality objectives. In this event, it is necessary to decide whether it is politically acceptable to allow the river water quality to degrade, thereby saving money which may be better spent improving water quality elsewhere.

Setting River Water Quality Standards

For each defined water quality objective, a series of water quality standards must be established. These standards will take the form of physical, chemical and microbiological limits on water quality which, if met, will ensure that the river water complies with its set objective. For example, rivers which have as an objective that they will be capable of supporting fish will have a low limit for the concentration of un-ionized ammonia as this chemical species is toxic to fish.

It is important, if the standards are to be set at a level which is neither too strict (which may inhibit development) nor too lax (which may prevent the water quality objective being met) that the agreed limits are based on the most up to date scientific evidence obtainable with, if necessary, a reasonable margin of error being included. Appropriate limits may thus be obtained from scientific literature on toxicity levels, if protection of plant or animal species is art of the quality objective, or from empirical evidence on the effects of water pollution on other water uses (eg, the effect of high concentrations of microbiological species in water used for irrigation of agricultural crops).

Setting Discharge Limits

Once the allowed concentrations of pollution parameters are established within each river reach it is a relatively simple matter, knowing the flow of a discharge, the flow of the river and the upstream concentration, to calculate the maximum concentration of any parameter which can be allowed within the discharge. This calculated value, plus any desired margin of error to allow for, for example, periods of low river flow, then becomes the discharge limit for this parameter. If a discharge contains many potentially polluting parameters, limits for each one should be put into the overall discharge permit for the effluent.

This method of pollution regulation has the advantage that, aside from any margins of error which may be allowed, only the agreed necessary pollution control will be enforced. Thus if, for whatever reason, a river has a 'low grade' objective (eg, that the water does not become objectionable or foul-smelling) then money is not wasted implementing unnecessary pollution control measures.

A further advantage of this quality objective system is that the maximum assimilative capacity of the receiving watercourse can be used as long as the previously designated water quality standard is not exceeded. Thus, a discharger positioned on an estuary, where dilution is large, is likely to be allowed to discharge a greater concentration of pollutant than a similar discharger on a small river. Although at first glance this seems unfair to the discharger on the small river, it does mean that pollution control is implemented as considered necessary, thus conserving resources.

One potential disadvantage of this pollution control method is the fact that, as referred to above, similar dischargers may be subjected to completely different discharge limits depending upon their location within river catchment areas. This situation, although optimized to the river quality objectives in each location, may be seen by the dischargers as anti-competitive as companies within the same industry may have widely varying pollution control expenditures which may, in turn, have an impact on the price of their goods or services (Hydrology Project, Oct.1999).

Water Quality Planning in India

In India, while there are some very large rivers, there are many others which have only a meager flow. Even in the case of large rivers, because of extraction of water for irrigation the flow is considerably reduced. This is particularly true during low flow season and when the demand of water for agriculture is high. In many cases, because of impoundments and abstractions and also the seasonal nature of the river, the channel may be dry for 3 to 6 months in the year.

Further, water quality planning also has to take into account the fact that for a large fraction of rural population living on the banks of the river, the river water is the only source for domestic water requirements.

The utilization of assimilative capacity of a river for waste disposal, which was discussed in the earlier section, is therefore not considered a viable approach in setting discharge limits. Under the Environment Pollution Control Act 1986, effluent standards have been set for different industries uniformly throughout the country. Only in cases when the effluent is disposed in the sea or estuary, location specific discharge limits may be allowed.

Most of the pollution of rivers in the country can be attributed to the discharge of untreated municipal wastes. In order to mitigate the problem, the following approach is adopted:

• Water quality surveys are carried out in river stretches to establish the existing water quality

• Surveys are also carried out to determine the existing and planned beneficial uses of the stream in different reaches, such as abstraction for drinking water supply, fish culture, organized religious bathing, etc.

• The existing water quality in a river reach is then compared with the water quality standards for the beneficial use in the reach requiring the most stringent water quality

• Action plans are formulated where the existing water quality does not meet the required water quality

The Central Government (National River Conservation Directorate, Ministry of Environment & Forests) co-ordinates the pollution control program identified under the action plan. In the case of municipalities, the Government also gives subsidy to create necessary infrastructure for pollution control measures. State Pollution Control Boards take action in regard to industries, which do not meet their waste discharge permit.

WATER QUALITY MONITORING

Networks for water quality monitoring must conform to the objectives of the monitoring program. A clear statement of the objectives is therefore necessary. This will ensure collection of all necessary data and avoid needless and wasteful expenditure in time, effort and money. Further, the data collected under the program should be periodically evaluated to judge the extent to which the objectives were achieved. If necessary, the program should be modified to fill in any gaps in the data or to take into account any change in the requirements of the program.

The following definitions are suggested to classify the monitoring programs in relation to their objectives:

Monitoring: Continuous, standardized measurement for any one or more of the following purposes

• To classify water resources and build up an overall picture of the aquatic environment

• To collect base-line data against which future changes can be assessed

• To detect trends in water quality changes

Surveillance: Continuous specific observations relative to control or management of the water resource

• To evaluate the suitability of water for a particular use

• To check for compliance of permits for discharge of effluents in the water body

Surveys: A series of finite duration, intensive programs designed to measure the water resource in more detail for a specific purpose, such as

• To investigate pollution

• To collect sufficient data to perform in depth analysis of a particular phenomenon

To ensure that all necessary water quality information is collected systematically throughout, for example, a river catchment, it is customary to design a so-called ‘monitoring network’. Such a network would define the type (and therefore the objective) of each sample together with the number and location of each monitoring station (the ‘network density’), the water quality parameters to be measured and frequency of monitoring**.**

CASE STUDY

MATERIAL AND METHODS

Selection of Site

In actual practice, the studies is carried out for pedhi river in Amravati tahasil. The origin of pedhi river is rithpur in morshi tahasil. The Pedhi flows in easterly direction, after crossing the district it turns westwards and north-westwards to join the Purna river, Rithpur, Walgaon and Bhatkuli are few important villages at banks of the river. The area of the catchment is 2 km near by village dadhi which is dadhi- pedhi location. The dadhi village come under taluaka place bhatkuli of district Amravati. The surface water location for pedhi river is near road bridge at Dadhi-Pedhi village.

Hence keeping this mind we select the station for testing the parameters for surface water quality.

The details of the location are as given below:

Sr .no	Name of Station	Latitude	Longitude	Frequency of Sampling
1	Pedhi river near road bridge at Dadhi-Pedhi village.	20° 49.532'	77° 33.783'	Monthly

The map showing Dadhi-pedhi Location:

COLLECTION OF SAMPLES

The sample should meets the requirement of the sampling programme and it should be handled in such a way that it does not deteriorate or become contaminated before it reaches laboratory. Depending on analysis to be performed , fill container fully or leave space for aeration , mixing etc. For sample that will be transported , preferably leave an air space of about one percent of the container capacity to allow for thermal expansion.

QUANTITY

Collection of two to three litres of samples for most physical and chemical analysis should be done. For certain determination, larger may be necessary. Do not use sample for chemical, bacteriological and microscopic examination because methods for collecting and handling are different.

TESTING OF COLLECTED SAMPLES

The parameters tested in laboratory are as follows:

1) Colour , 2) Odour , 3) Turbidity , 4) Ph , 5) Electrical Conductivity , 6) Total Dissolved Solids , 7) Total Suspended Solids , 8) Dissolved Oxygen , 9) Biochemical Oxygen Demand , 10) Chemical Oxygen Demand , 11) Total hardness (as CaCO3) , 12) Magnesium (as Mg) , 13) Iron (as Fe) ,14) Zinc (as Zn) , 15) Copper (as Cu) , 16) Aluminium (as Al) , 17) Chloride (as Cl) 18) Nitrate (as NO_3)

RESULT

RESULTS OF MONTH JANUARY-2012

PARAMETERS	RESULTS
Colour	<1
Odour	Unobjectionable
Turbidity	3.6
pH	7.9
Electrical Conductivity	1742
Total Dissolved Solids	1016
Total Suspended Solids	12
Dissolved Oxygen	Not Detected
Biochemical Oxygen Demand	8.0
Chemical Oxygen Demand	24
Total hardness (as CaCO3)	395

Magnesium (as Mg)	46.7
Iron (as Fe)	0.23
Zinc (as Zn)	Not Detected
Copper (as Cu)	<0.1
Aluminium (as Al)	Not Detected
Chloride (as Cl)	156

RESULTS OF MONTH FEBRUARY-2012

PARAMETERS	RESULTS
Colour	80
Odour	Unobjectionable
Turbidity	4.0
pH	7.6
Electrical Conductivity	1468
Total Dissolved Solids	863
Total Suspended Solids	25
Dissolved Oxygen	3.5
Biochemical Oxygen Demand	6.0
Chemical Oxygen Demand	16.0
Total hardness (as CaCO3)	412
Magnesium (as Mg)	51
Iron (as Fe)	<0.08
Zinc (as Zn)	Not Detected
Copper (as Cu)	<0.04
Aluminium (as Al)	Not Detected
Chloride (as Cl)	180

RESULTS OF MONTH MARCH-2012

PARAMETERS	RESULTS
Colour	85
Odour	Unobjectionable
Turbidity	4.4
pH	7.5
Electrical Conductivity	1440
Total Dissolved Solids	892
Total Suspended Solids	32
Dissolved Oxygen	4.2
Biochemical Oxygen Demand	6.8
Chemical Oxygen Demand	18.0
Total hardness (as CaCO3)	410
Magnesium (as Mg)	48

Iron (as Fe)	<0.08
Zinc (as Zn)	Not Detected
Copper (as Cu)	<0.04
Aluminium (as Al)	Not Detected
Chloride (as Cl)	184

RESULTS OF MONTH APRIL-2012

PARAMETERS	RESULTS
Colour	78
Odour	Unobjectionable
Turbidity	4.5
pH	7.4
Electrical Conductivity	1525
Total Dissolved Solids	976
Total Suspended Solids	29
Dissolved Oxygen	4.0
Biochemical Oxygen Demand	8.0
Chemical Oxygen Demand	28.0
Total hardness (as CaCO3)	376
Magnesium (as Mg)	42.7
Iron (as Fe)	<0.08
Zinc (as Zn)	Not Detected
Copper (as Cu)	<0.04
Aluminium (as Al)	Not Detected
Chloride (as Cl)	188
Nitrate (as NO_3)	1.81

RESULTS OF MONTH MAY-2012

PARAMETERS	RESULTS
Colour	5.0
Odour	Unobjectionable
Turbidity	18
pH	8.2
Electrical Conductivity	2410
Total Dissolved Solids	1418
Total Suspended Solids	23
Dissolved Oxygen	0.7
Biochemical Oxygen Demand	9.0
Chemical Oxygen Demand	31
Total hardness (as CaCO3)	456
Magnesium (as Mg)	53.5

Iron (as Fe)	Not Detected
Zinc (as Zn)	Not Detected
Copper (as Cu)	Not Detected
Aluminium (as Al)	0.073
Chloride (as Cl)	188
Nitrate (as NO_3)	0.95

RESULTS OF MONTH JUNE-2012

PARAMETERS	RESULTS
Colour	30
Odour	Unobjectionable
Turbidity	0.8
pH	8.2
Electrical Conductivity	1935
Total Dissolved Solids	1142
Total Suspended Solids	35.0
Dissolved Oxygen	5.8
Biochemical Oxygen Demand	13.8
Chemical Oxygen Demand	44
Total hardness (as CaCO3)	460
Magnesium (as Mg)	62.7
Iron (as Fe)	0.444
Zinc (as Zn)	Not Detected
Copper (as Cu)	Not Detected
Aluminium (as Al)	0.06
Chloride (as Cl)	262
Nitrate (as NO_3)	1.14

RESULTS OF MONTH JULY-2012

PARAMETERS	RESULTS
Colour	40
Odour	Unobjectionable
Turbidity	8.2
pH	8.0
Electrical Conductivity	1333
Total Dissolved Solids	750
Total Suspended Solids	64
Dissolved Oxygen	4.0
Biochemical Oxygen Demand	17.6
Chemical Oxygen Demand	56
Total hardness (as CaCO3)	336

Magnesium (as Mg)	38
Iron (as Fe)	0.1
Zinc (as Zn)	0.018
Copper (as Cu)	<0.04
Aluminium (as Al)	0.078
Chloride (as Cl)	126
Nitrate (as NO_3)	11.3

CONCLUSION

From the studies carried out in river water quality analysis following conclusions appears to be justified. According Water Quality Index model water quality of Pedhi River is not good for site location for month Jan-2012 to july 2012 by aggregative method. According to the water quality index of water, quality of water of location, which is not fit for drinking purpose without treatment. Proper conventional treatment makes it fit to supply

From the above parameters studied, it is found that the water of pedhi River in this region appears to be saline water. Due to the more concentration of magnesium and chloride. Which is harmful for human body . The colour of surface water of river found out to be in permissible limits and the odour of river water found out to be unobjectionable. All efforts should be made to remove colour and unpleasant odour as for as practicable. From the heavy metals undertaken in the case study none of the metals were detected except magnesium.

RECOMMENDATION

- Provide various facilities to public such as gardens, crematoria, and water sports.

- Keep the river clean by upgrading the system of garbage collection and disposal regarding solid waste management.

- Construct more sewage treatment plants.

- Constructing toilets for slum pockets.

- Preventing the runoff from the landfill area to control pollution in case of rainy seasons.

In the festival of Ganpati, there is large pollution. To avoid this pollution some measures can be taken like- using permanent idols, symbolic immersion, reuse of idols, use of unbaked mud or clay, immersion of small idols at home in fresh water, use of ecofriendly colours and public awareness.

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