# Investigation of Water Quality Analysis of Godavari River

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***Abstract-*** *A précised and a systematic study was carried out in order to evaluate the water quality of the River Godavari. The assessment of the water quality was done by considering the seven parameters which play an important role in determination of water quality. This study covers the seasonal variation of the river in its physiochemical properties due to addition of untreated sewage in to it. For this purpose samples from 15 stations were collected to monitor the water quality along course of river from Ramkund to Dasak Bridge for a period of three to four months. It was observed during the study that the water quality is degrading from Ramkund to Dasak Bridge due to continuous addition of waste. The parameters such as DO, BOD, COD, Turbidity, pH, Total Solids, TDS. With the help of values of these parameters the water quality was found to be poor. WQI proves to a successful tool to transform the complex water quality data in to a simplified data which is easily understood by the public in general. Hence the present study is aimed to examine the water quality of the Godavari River and find the present pollution status of the River.*

***Keywords-*** Water Quality, Pollution, River Godavari, WQI.

## I. INTRODUCTION

The remarkable combination of hydrogen and oxygen finally results in one of the most vital component of earth's environment. Water is one of the most essential component required for the survival of living organisms. The enormous exploitation which is caused due to human interventions has led to the degradation of the water quality and quantity and increase in the content of pollutants. The present increase in population has exerted a great pressure on water resource. The never ending growth of population and exploitation of the water resource up to the great extent has created a situation, where the very survival of man has become endangered.

In most of the cases sewage is partly treated or untreated which is directly discharged into the streams and rivers. The use of partially treated wastewater and water supplies contaminated With sewage for irrigation has been implicated as one of the highest sources of pathogenic micro-organisms, in addition to agricultural runoff may pose serious health hazards. The quality and quantity of available water resources play an important key role for the development of a nation.

Hence various technologies and policies, to ensure the safety of this valuable resource, is the need of the hour for a developing country like India. For preventing and controlling the overall degradation of the quantity and quality of these resources proper management of available water resources is essential for the survival of mankind.

As per Water Act 1974, water pollution means such alteration of the physical, chemical or biological properties of water or discharge of any sewage or industrial waste or any other liquid, gaseous or solid substances into water which may or is likely to create a nuisance or render such water harmful or injurious to public health or safety or to domestic, commercial, industrial, agricultural or other legitimate uses or to the life and health of animals or plants or of aquatic organisms.

## II. POLLUTION SRESSES OF RIVERS

The degree of pollution of the river in catchment area depends on various human interventions and activities that are performed in the catchment area and can be headed under two groups: point sources and non-point sources.

**Point sources:**

These are organized sources of pollution where the pollution load can be measured, e.g. surface drains carrying municipal sewage or industrial effluents, sewage pumping stations and sewerage systems, trade effluents from industries, etc. Pollution loads due to untreated sewage is one of the main reasons threatening the ecological health of rivers. Most of the urban lakes in the country are also facing similar challenges.Point sources of pollution are those which lead to pollution of river at the site such as addition of domestic sewage discharge, effluent from refineries and waste water from water treatment plants, etc.

**Non point sources :**

These are non-measurable sources of pollution such as run-off from agricultural fields carrying chemicals and fertilizers, run-off from solid waste dumps and areas used for open defecation, dumping of un-burnt/half-burnt dead bodies and animal carcasses, dhobi Ghats, cattle wallowing, etc. On the other hand non-point sources of pollution are those which lead to pollution of river along the length of the river and the activities which lead to this are agricultural runoff, in stream water uses, bathing, clothes washing, etc. The pollution of river is caused due to other sources which include soil erosion, atmospheric fall out of pollutants, accidental causes of shipment and river damping effect.

## III. PURPOSE

As the Godavari River is getting polluted due various types of practises of dumping all kind of domestic sewage. Therefore it is important to assess the water quality of river Godavari. This can be done by conducting the test for the following parameters such as DO, BOD, pH, Turbidity, Total Solids. The following test were conducted to find the present pollution status of River Godavari.The previous study shows that the river was highly polluted due to direct flow of untreated waste water into the Godavari River. Due to this direct outflow the biological life of the river has been affected to a great extent. As Khumbhmela 2015 in very nearby so this study will play important role to know about the present condition of River water. In the above study we have mainly studied the seven parameters which play an important role in determination of water quality index. Depending upon the values of these parameters the water quality can be determined. The parameters that are analysed are given below:

- D.O
- B.O.D
- pH
- Turbidity
- TDS
- Total Solids
- C.O.D

The Determination of above seven parameters will give a shear idea of the river condition and whether there has been any improvement in its condition after the government started the routing of sewage. The series of above test were conducted for the period of about 3-4 months. The variation of these results show the condition of the river along its course. Standard methods as recommended by the Central Pollution Control Board were used for the conduction of the test. 15 sampling stations were chosen for this purpose and names of the sampling stations are given below:

## IV. METHODOLOGY

To complete any type of conservation work we have to follow specific path. For carrying out present study following methodology has been adopted:

1. Reconnaissance survey
2. Data generation (Primary)
3. Data collection (secondary)
4. Establishment of baseline Environmental scenario.
5. Environmental Impacts and Mitigation Measures
6. Suggesting an appropriate Environmental Management Plan.

The reconnaissance survey deals with the complete survey area under the study. In this the sewage addition points are determined from which the untreated sewage is added in to the river. The identification of the point and non-point sources was done in this survey. In total 15 such stations were located in course from Ramkund to Dasak Bridge. This identification helps us to know the degree of pollution caused due to addition of sewage. After the identification of such points sampling schedule was fixed. Samples were collected monthly from these stations and regular testing was done. The methods adopted for collection of samples were according to the "Standard Methods ". The samples were stored in prescribed manner in standard conditions. Then the test were carried out on these samples according to the standard procedures to record the seasonal variation in the water quality of River water. The details of sampling stations is given below

Table No. 1 Sampling Stations

| Codes | Sample Points Names |
|---|---|
| P1 | Ramkund |
| P2 | Amardham |
| P3 | Godavari River near Tapovan STP |
| P4 | Kapila River |
| P5 | 100 m from Tapovan Outlet |
| P6 | Nasardi River at Takli Bridge |
| P7 | 100 m from Nasardi River At Takli Bridge |
| P8 | 100 m from Agartakli STP |
| P9 | Dasak Bridge |
| S1 | 1st sewage at Amardham |
| S2 | 2nd sewage at Amardham |
| S3 | 3rd sewage at Amardham |
| S4 | Kapila Pumping Station |
| S5 | Outlet of Tapovan STP |
| S6 | Outlet of Agartakli STP |

## V. ANALYSIS OF RESULTS

**i) Dissolved Oxygen (D.O):**

Dissolved Oxygen is the level of the oxygen dissolved in the river water. From the tests conducted and there results it is quite evident that the river is not in good state.The variation of dissolved oxygen show that the level of oxygen along the course of river varies from 6.0 to 0.5 mg/l. Results show that at the points of addition of untreated waste water in to the river the dissolved oxygen is reduced drastically. Theses untreated sewage waste have reduced the underwater condition of the river. According to analysis done there are various untreated sewage addition points along the course of the river and at these points the dissolved oxygen level is extremely low. The water quality depending upon the results is slightly better at Ramkund but it gets worse along the course of the river with worst results at Dasak Bridge.

**ii) Biochemical Oxygen Demand (B.O.D):**

B.O.D is defined as "the amount of dissolved oxygen from wastewater required by heterotrophic micro-organisms to degrade biodegradable organic matter at 20°C for 5 days period". BOD values generally approximates the amount of oxidisable organic matter and is therefore used as a measure of degree of water pollution and waste level. Thus mostly BOD value is proportional to the amount of organic waste present in water. BOD values increases at the untreated sewage addition points. BOD values increases as the DO value decreases. According to the results it is evident that the water quality on the basis of BOD is getting degraded.

**iii) pH:**

The hydrogen ion concentration is an important quality parameter of wastewaters. It may alter the concentration in the natural waters. The pH values in this study varies from 6.95-9.29 along the course of river.

**iv) Turbidity:**

Presence of colloidal solids which may be clay or split particles or micro-organisms. Turbidity value indicates the presence of such colloidal particles in river water. An increase in Turbidity value indicates more polluted water.

**v) Chemical Oxygen Demand (C.O.D):**

C.O.D is defined as a measure of the oxygen equivalent off the organic matter content of a sample that is subjected to oxidation by a strong chemical oxidant. COD values is generally higher that BOD value because more compounds can be oxidised chemically.

**vi) Total solids:**

The amount of the total solids indicates the amount of the solids waste added in to the river water through the untreated sewage. The total solids include the amount of the dissolved solids plus the volatile solids. The amount of total solids is very important in determination of water quality of the river water.

**vii) Total Dissolved Solids (TDS):**

TDS values play an important parameter in determination of water quality of River. Water having high TDS are composed mainly of carbonates, bicarbonates, chlorides, phosphates and nitrates of Calcium, Magnesium, Sodium, Potassium, Manganese, organic matter salt and other particles. So the water having higher values of TDS is not suitable for drinking as well as irrigational purposes... TDS values in present study ranged between 650 to 940 mg/l. The acceptable limit of TDS in drinking water is 600 mg/l. Maximum values were observed in December and January and minimum values were observed in March.

## VI. OBSERVATIONS

Table No.2 Results of parameters of September 2014

| Samples | Reading of Parameters | | | | | |
|---|---|---|---|---|---|---|
| | D.O | B.O.D | pH | Turbidity | TDS | TOTAL SOLIDS |
| P1 | 1.8 | 130 | 8 | 66.87 | 746 | 366.67 |
| P2 | 2.1 | 140 | 8.5 | 71.63 | 756 | 466.67 |
| P3 | 1.3 | 136 | 8.2 | 70.12 | 643 | 833.333 |
| P4 | 0 | 150 | 8.1 | 67.11 | 778 | 1033.33 |
| P5 | 2 | 132 | 8.1 | 55.85 | 798 | 1233.33 |
| P6 | 0.2 | 150 | 8.6 | 73.65 | 825 | 1833.33 |
| S1 | 5.6 | 8 | 8.6 | 10.26 | 646 | 366.67 |
| S2 | 4.5 | 10 | 8.3 | 15.86 | 748 | 466.67 |
| S3 | 3.5 | 17 | 7.2 | 18.96 | 647 | 666.67 |
| S4 | 4 | 19 | 8 | 21.54 | 703 | 833.33 |
| S5 | 4.5 | 13 | 8.5 | 24.56 | 767 | 566.67 |
| S6 | 4.7 | 10 | 8.6 | 28.67 | 789 | 1033.33 |
| S7 | 3.5 | 16 | 8.7 | 29.67 | 798 | 966.67 |
| S8 | 0 | 30 | 8.2 | 48.65 | 812 | 1333.33 |
| S9 | 0.5 | 26 | 8.5 | 32.56 | 761 | 864 |

Table No.3 Results of parameters of January 2015

| Samples | Reading of Parameters | | | | | |
|---|---|---|---|---|---|---|
| | D.O | B.O.D | pH | Turbidity | TDS | Total Solids |
| P1 | 2.6 | 132 | 8.4 | 41.28 | 845 | 1000 |
| P2 | 1.9 | 138 | 8.54 | 17.86 | 842 | 2000 |
| P3 | Sample not available | | | | | |
| P4 | 0 | 141 | 7.8 | 60.13 | 812 | 833.33 |
| P5 | 2.1 | 133 | 8.12 | 24.021 | 806 | 1333.33 |
| P6 | 0 | 152 | 7.88 | 65.46 | 856 | 1000 |
| S1 | 5.2 | 8 | 7.4 | 5.2 | 929 | 280 |
| S2 | 5 | 15 | 7.8 | 11.67 | 676 | 310 |
| S3 | 4.1 | 19 | 7.2 | 10.54 | 684 | 354 |
| S4 | Sample not available | | | | | |
| S5 | 4.3 | 16 | 8.93 | 16.67 | 824 | 466.67 |
| S6 | 4.6 | 11 | 8.1 | 20.68 | 912 | 333.33 |
| S7 | 3.8 | 17 | 7.24 | 30.54 | 854 | 677.77 |
| S8 | 1 | 38 | 8.84 | 64.86 | 832 | 333.33 |
| S9 | 1.1 | 27 | 8.9 | 40.38 | 865 | 366.67 |

Table No. 4 Results of parameter of March 2015

| Samples | Reading of Parameters | | | | | |
|---|---|---|---|---|---|---|
| | D.O | B.O.D | pH | Turbidity | TDS | Total Solids |
| P1 | 2.7 | 132 | 8.5 | 43.26 | 865 | 1033.33 |
| P2 | 2.1 | 138 | 8.6 | 21.53 | 872 | 2333.33 |
| P3 | Sample not available | | | | | |
| P4 | 0 | 151 | 8.1 | 71.32 | 834 | 1633.3 |
| P5 | 1.9 | 138 | 8.3 | 36.54 | 812 | 1333.3 |
| P6 | 0.5 | 152 | 7.96 | 78.68 | 862 | 833.33 |
| S1 | 5.1 | 8 | 7.4 | 4.8 | 926 | 310 |
| S2 | 4.3 | 14 | 7.8 | 12.46 | 690 | 330 |
| S3 | 3.9 | 18 | 7.2 | 11.6 | 642 | 374 |
| S4 | Sample not available | | | | | |
| S5 | 4.6 | 15 | 8.93 | 18.05 | 840 | 667.67 |
| S6 | 4.5 | 12 | 8.1 | 22.98 | 926 | 466.67 |
| S7 | 3.6 | 19 | 7.24 | 32.52 | 863 | 766.67 |
| S8 | 3.2 | 33 | 8.84 | 75.62 | 850 | 466.67 |
| S9 | 0 | 35 | 8.9 | 42.23 | 879 | 733.3 |

## VII. CONCLUSION

From the limited study carried out it was found that water quality of river is degrading due continuous addition of untreated sewage. These sewage are causing serious damage to the aquatic life present in the water. The values of BOD and DO are clear evidence that water near In Godavari River is highly polluted. And form the observation made it is evident that this pollution is caused due various human activities continuously carried out on bank of river and this may lead to serious health problems to human as well as aquatic life prevailing there. The results of parameters studied clearly show that the values of the parameters are well above the desirable limits due to improper drainage system of different units. Higher BOD values are observed at Amardham, near Tapovan STP outlet and Agartakli STP outlet which clearly indicates the presence of more organic matter in sewage. The focusing point of the study is that water Quality of Godavari River is poor and is not fit for drinking and irrigational use. So it is very important to reduce the addition of untreated waste in River to improve it water quality. From the analysis results of the present study it may be said that the River water quality of Godavari is continuously hampered due to addition of waste.

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