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A study on Physical, Chemical and Biological parameters of River Godavari

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Abstract - *Rivers are the most valuable resources for the survival of mankind. The development of an area and standards of living mainly depend on the type of surface water body in that area. Due to urbanization and industrialization, the water bodies were suffering seriously due to the disposal of highly concentrated liquid waste in them. ETP'S and STP'S play a major role in protecting water, but there are several zones where water bodies undergo serious disruption. Therefore, it is crucial to take immediate action to protect our rivers and other surface water bodies from pollution caused by human activities. This can be achieved through the implementation of stricter regulations, better waste management practices, and the use of advanced technologies to treat wastewater. It is our responsibility to preserve these valuable resources for the benefit of future generations. Therefore, it is crucial to take measures to protect our rivers and other surface water bodies from pollution and degradation caused by human activities. This includes implementing effective waste management systems, promoting sustainable development practices, and enforcing strict regulations to prevent industrial and urban waste from being dumped into water bodies. By doing so, we can ensure the long-term survival of these valuable resources and maintain a high standard of living for ourselves and future generations.*

This present work is intended to study the physical, chemical, and biological parameters of the river Godavari. To find zones of pollution and educate the public about the environmental impact.

***Key Words*: Effluent treatment plant, Sewage treatment plant, Physical parameters, Chemical parameters, Biological parameters.**

1.INTRODUCTION

1.1 RIVER: A river is defined as a large natural stream of water emptying into an ocean, lake, or other body of water and usually fed along its course by converging tributaries.

Rivers and streams drain water that falls in upland areas.

1.2 IMPORTANCE OF RIVERS: Rivers are the backbone of human civilization; They provide us with fresh water, which is helpful for various purposes such as drinking, cleaning, washing, etc. Without rivers, life will come to a halt. Rivers provide us with fresh drinking water. It is one of the biggest source of fresh water. Around 96% of the water body consists of saline water which cannot be consumed by humans. As a result, we need to rely heavily upon the rivers for drinking water. There are various civilizations formed around rivers. Some of the earliest valleys includes the Nile River Valley, the Indus River Valley, the Yellow River Valley etc. These civilizations started near rivers because river plains had fertile soil which helps in cultivation.

1.3 WATER POLLUTION: Pollution is defined as undesirable change in physical, chemical, and biological constituents of water. The main reasons for the pollution are "fertilizers, industrial waste, oils and domestic waste disposals".

a) Fertilizers:

the concentration of nitrate and phosphate in the water increases considerably. Algae use these substances to grow and multiply rapidly turning the water green. This massive growth of algae, called eutrophication, leads to pollution. When the algae die, they are broken down by the action of the bacteria which quickly multiply, using up all the oxygen in the water which leads to the death of many animals.

b) Industrial waste: Chemical waste products from industrial processes are sometimes accidentally discharged into rivers. Examples of such pollutants include cyanide, zinc, lead, copper, cadmium, and mercury. These substances may enter the water in such high concentrations that fish and other animals are killed immediately. Sometimes the pollutants enter a food chain and accumulate until they reach toxic levels, eventually killing birds, fish, and mammals.

c) Oils: If oil enters a slow-moving river, it forms a rainbow-colored film over the entire surface preventing oxygen from entering the water. On larger stretches of water, the oil contaminates the feathers of water birds and when they preen the oil enters the gut and kills them. On the other hand, decomposition of oils consumes high concentrations of oxygen.

d) DOMESTIC: This Waste includes solid, liquid waste from houses, educational institutions, hotels...etc., liquid waste gets merged with water body but solid waste floats on the surface causes Nuisance.

1.4 SALIENT FEATURES OF RIVER GODAVARI (RAJAHMUNDRY):

Within the state of Andhra Pradesh, the river flows through hilly terrain of the Eastern Ghats known as the Papi hills which explains the narrowing of its bed as it flows through a gorge for a few km, only to re-widen at Polavaram. The deepest bed level of Godavari River, located 36 km upstream of Polavaram dam, is at 45 meters below the sea level.

Before crossing the Papi hills, it receives its last major tributary Sabari River on its left bank. The river upon reaching the plains begins to widen out until it reaches Rajahmundry. Arma Konda (1,680 m (5,510 ft)) is the highest peak in the Godavari river basin as well as in Eastern Ghats. Dowleswaram Barrage was constructed across the river in Rajahmundry. At Rajahmundry, the Godavari splits into two large branches which are called Gautami (Gautami Godavari) and Vasishta Godavari and five smaller branches.

Similarly, the Vasishta splits into two branches named Vasishta and Vainateya.

2.1 SELECTION OF SAMPLE CONTAINERS:

1) Selection of sample container is utmost importance in sampling. Containers are generally made of glass or plastic. Some sample Analytes may get absorbed into the walls of plastic containers and/or some contaminants may leach into samples.

2) Trace level of some metals and pesticides may get adsorbed and/or Absorbed onto the walls of the glass container. In the same way, Silica, sodium, and boron may be leached from soft glass.

3) Always use hard glass containers for all organics analyses such as Pesticides, volatile organics, PCBs, and oil & grease.

4) Some of the analytes like pesticides, PAH etc. are light sensitive. Hence collect them in amber-coloured glass containers to minimize Photo degradation.

2.4 TYPE OF SAMPLES:

a. Grab or catch samples: A sample collected at a particular time and place can represent only the Composition of the source at that time and place.

b. Composite samples: The term composite refers to a mixture of grab samples collected at the Same sampling point at different time. A composite sample of 24 hr. period is considered Standard for most determinations. Composite samples cannot be used for determinations, of Components or characteristics subject to significant and unavoidable changes on storage.

c. Integrated samples: Mixture of grab samples collected from different points simultaneously or as nearly as possible is called integrated sample. Such samples are useful for river or stream that Varies in composition across its width and depth. The preparation of integrated samples requires Special equipment to collect samples from a known depth, without contamination by over lying Water. Prior knowledge about volume, movement, and composition of the various parameters of the water being sampled is also required.

3. WATER QUALITY ANALYSIS

After the collection of Samples, the samples are transported to the Laboratory. Here the samples were analyses for various water quality parameters. These Analysis parameters include.

Physico-chemical analysis is the main way to Identify the quality of water for its best usage say for drinking, bathing, industrial processing and so on. In case of wastewater either domestic or industrial to know the pollution strength and its Effect on ecology Physico chemical analysis is very much used

3.1 CHARACTERSTICS OF WATER:

Characteristics of water determines the quality of Water Based on state of matter water quality is classified into

A) Physical water quality: physical water quality defines the Characteristics of water which Responds to sense of sight, touch, smell, and taste. Physical water quality is determined by Following tests.

a) Temperature
b) Color
c) Turbidity
d) Odor or Smell
e) Total Suspended Solids (TSS)
f) Oils and grease

B) Chemical water quality: Tests which determines the chemical Characteristics of water Are

1. pH
2. Hardness
3. Acidity
4. Alkalinity
5. DO
6. BOD
7. COD
8. Nitrates
9. Sulphates
10. Chlorides
11. Phosphates
12. Metal Traces

13. Detergents.

C) Biological water quality: Biological water quality determines the microbial concentration in the water. These tests includes.

a) MPN

b) E-COLI

c) TVC.

4 RESULTS AND DISCUSSION

After the complete collection and analysis of samples, the obtained values were taken to the Average values. These average values were compared with the Prescribed standards to find the extreme conditions.
A total of 10 samples were collected at each site for a month.

ZONE:1 - is considered from SEETHAMMA PETA to MANGALAVARI PETA which makes a stream stretch of 10 km. This area gains waste from up streams and disposals from surrounding residential areas.
The water in this area appears to be colored due to presence of Mud particles.

ZONE:2 - is considered from MANGALAVARI PETA to DHAVALESWARAM which makes a stream stretch of 8km. This area gains waste from upstream and disposal from surrounding residential areas.

ZONE:3 - is considered from MANGALAVARI PETA to KATHERU which makes a stream stretch of 16 km. This area gains waste from Surrounding Industry (AP PAPER MILL) and from surrounding residential areas.

1. **Month – 1**

a. **Zone – 1**

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	15	17	14	18	15	17	15	16	17	18	16
2	TURBIDITY	140	147	138	150	149	153	147	149	137	145	146
3	ODOR (TON)	4	4	3	5	4	5	4	5	4	4	4
4	pH	7.9	7.2	7.5	7.7	7.8	8.3	7.9	7.6	7.3	8.0	7.73
5	ELECTRICAL CONDUCTIVITY	176	179	173	180	182	183	176	178	180	179	179
6	SUSPENDED SOLIDS	105	106	102	104	100	101	106	105	104	105	105
7	TOTAL DISSOLVED SOLIDS	126	128	125	124	121	127	126	125	125	128	125
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	96	99	105	96	97	99	98	96	98	95	98
10	TOTAL HARDNESS	88	95	87	93	99	97	103	96	96	97	98
11	CHLORIDES	29	24	25	26	23	28	27	26	27	27	27
12	FLUORIDES	0.3	0.5	0.7	0.8	0.4	0.3	0.5	0.4	0.5	0.3	0.4
13	NITRITES as N	0.39	0.37	0.4	0.39	0.5	0.4	0.36	0.39	0.31	0.38	0.4
14	NITRATES as NO3	18	16	14	17	16	20	17	19	18	18	18
15	PHOSPORUS	0.03	0.04	0.03	0.05	0.03	0.02	0.03	0.03	0.05	0.05	0.04
16	DISSOLVED OXYGEN	6	7	5	8	7	6	5	7	7	5	7
17	BIOCHEMICAL OXYGEN DEMAND	19	18	13	15	13	12	13	12	15	13	13
18	CHEMICAL OXYGEN DEMAND	21	29	32	28	29	33	36	33	39	35	33
19	MOST PROBABLE NUMBER (MPN)	69	69	70	75	73	68	65	63	65	69	69
20	E-COLI	49	46	43	43	48	47	48	48	46	43	43

b. **Zone – 2**

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	18	16	17	19	14	13	12	17	16	17	17
2	TURBIDITY	143	138	149	145	142	137	139	141	139	138	140
3	ODOR (TON)	4	3	3	3	3	4	5	5	4	3	4
4	pH	7.9	7.5	7.5	7.6	7.9	8.0	8.3	8.1	7.9	7.8	7.9
5	ELECTRICAL CONDUCTIVITY	180	183	185	185	183	186	187	190	182	189	186
6	SUSPENDED SOLIDS	106	103	109	108	107	106	108	109	104	107	109
7	TOTAL DISSOLVED SOLIDS	129	128	126	129	127	132	135	129	133	133	130
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	99	94	96	98	100	96	95	93	91	92	98
10	TOTAL HARDNESS	89	93	92	99	104	86	95	98	99	105	95
11	CHLORIDES	29	25	28	24	26	27	26	25	24	24	24
12	FLUORIDES	0.5	0.4	0.3	0.2	0.5	0.2	0.3	0.35	0.4	0.5	0.4
13	NITRITES as N	0.4	0.5	0.4	0.36	0.37	0.4	0.37	0.35	0.4	0.38	0.38
14	NITRATES as NO3	19	18	14	13	17	15	16	15	17	16	16
15	PHOSPORUS	0.04	0.03	0.05	0.05	0.02	0.02	0.07	0.05	0.05	0.035	0.04
16	DISSOLVED OXYGEN	6	8	7	7	6	5	7	6	6	5	6
17	BIOCHEMICAL OXYGEN DEMAND	13	12	11	12	11	10	7	9	11	9	11
18	CHEMICAL OXYGEN DEMAND	33	39	42	36	39	32	29	29	28	29	32
19	MOST PROBABLE NUMBER (MPN)	59	57	63	68	63	61	64	56	64	62	62
20	E-COLI	38	39	48	43	42	41	49	43	48	42	42

c. **Zone – 3**

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	17	18	16	14	15	17	16	14	13	14	15
2	TURBIDITY	139	136	139	132	138	136	137	136	139	138	139
3	ODOR (TON)	4	3	4	3	5	4	5	3	5	4	4
4	pH	6.9	7.3	7.3	7.9	7.5	6.9	6.8	7.2	7.5	6.9	7.2
5	ELECTRICAL CONDUCTIVITY	190	187	183	188	192	185	176	178	190	182	179
6	SUSPENDED SOLIDS	106	102	107	105	102	108	103	109	108	106	106
7	TOTAL DISSOLVED SOLIDS	138	133	139	136	135	133	139	132	135	139	136
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	103	102	99	97	105	94	98	96	99	92	99
10	TOTAL HARDNESS	94	98	92	91	98	105	103	101	89	93	98
11	CHLORIDES	28	27	26	28	25	28	30	27	26	29	28
12	FLUORIDES	0.3	0.4	0.3	0.3	0.6	0.4	0.6	0.5	0.3	0.3	0.3
13	NITRITES as N	0.5	0.4	0.3	0.7	0.6	0.3	0.5	0.3	0.4	0.3	0.5
14	NITRATES as NO3	19	17	15	20	19	23	15	16	14	14	17
15	PHOSPORUS	0.04	0.05	0.07	0.06	0.05	0.06	0.07	0.04	0.06	0.06	0.06
16	DISSOLVED OXYGEN	5	6	6	5	4	5	5	4	4	5	4
17	BIOCHEMICAL OXYGEN DEMAND	9	11	12	13	16	13	10	9	12	11	12
18	CHEMICAL OXYGEN DEMAND	38	39	42	39	37	38	36	38	32	38	38
19	MOST PROBABLE NUMBER (MPN)	54	55	59	52	60	52	59	53	53	52	54
20	E-COLI	39	38	40	43	37	38	36	39	35	32	36

b. Zone – 2

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	15	17	14	18	15	17	15	16	17	18	16
2	TURBIDITY	140	147	138	150	149	153	147	149	137	145	146
3	ODOR (TON)	4	4	3	5	4	5	4	5	4	4	4
4	pH	7.9	7.2	7.5	7.7	7.8	8.3	7.9	7.6	7.3	8.0	7.73
5	ELECTRICAL CONDUCTIVITY	176	179	173	180	182	183	176	178	180	179	179
6	SUSPENDED SOLIDS	105	106	102	104	100	101	106	105	104	105	105
7	TOTAL DISSOLVED SOLIDS	126	128	125	124	121	127	126	125	125	128	125
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	96	99	105	96	97	99	98	96	98	95	98
10	TOTAL HARDNESS	88	95	87	93	99	97	103	96	96	97	98
11	CHLORIDES	29	24	25	26	23	28	27	26	27	27	27
12	FLUORIDES	0.3	0.5	0.7	0.8	0.4	0.3	0.5	0.4	0.5	0.3	0.4
13	NITRITES as N	0.39	0.37	0.4	0.39	0.5	0.4	0.36	0.39	0.31	0.38	0.4
14	NITRATES as NO3	18	16	14	17	16	20	17	19	18	18	18
15	PHOSPORUS	0.03	0.04	0.03	0.05	0.03	0.02	0.03	0.03	0.05	0.05	0.04
16	DISSOLVED OXYGEN	6	7	5	8	7	6	5	7	7	5	7
17	BIOCHEMICAL OXYGEN DEMAND	19	18	13	15	13	12	13	12	15	13	13
18	CHEMICAL OXYGEN DEMAND	21	29	32	28	29	33	36	33	39	35	33
19	MOST PROBABLE NUMBER (MPN)	69	69	70	75	73	68	65	63	65	69	69
20	E-COLI	49	46	43	43	48	47	48	48	46	43	43

2. Month – 2

a. Zone – 1

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	18	16	17	19	14	13	12	17	16	17	17
2	TURBIDITY	143	138	149	145	142	137	139	141	139	138	140
3	ODOR (TON)	4	3	3	3	3	4	5	5	4	3	4
4	pH	7.9	7.5	7.5	7.6	7.9	8.0	8.3	8.1	7.9	7.8	7.9
5	ELECTRICAL CONDUCTIVITY	180	183	185	185	183	186	187	190	182	189	186
6	SUSPENDED SOLIDS	106	103	109	108	107	106	108	109	104	107	109
7	TOTAL DISSOLVED SOLIDS	129	128	126	129	127	132	135	129	133	133	130
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	99	94	96	98	100	96	95	93	91	92	98
10	TOTAL HARDNESS	89	93	92	99	104	86	95	98	99	105	95
11	CHLORIDES	29	25	28	24	26	27	26	25	24	24	24
12	FLUORIDES	0.5	0.4	0.3	0.2	0.5	0.2	0.3	0.35	0.4	0.5	0.4
13	NITRITES as N	0.4	0.5	0.4	0.36	0.37	0.4	0.37	0.35	0.4	0.38	0.38
14	NITRATES as NO3	19	18	14	13	17	15	16	15	17	16	16
15	PHOSPORUS	0.04	0.03	0.05	0.05	0.02	0.02	0.07	0.05	0.05	0.035	0.04
16	DISSOLVED OXYGEN	6	8	7	7	6	5	7	6	6	5	6
17	BIOCHEMICAL OXYGEN DEMAND	13	12	11	12	11	10	7	9	11	9	11
18	CHEMICAL OXYGEN DEMAND	33	39	42	36	39	32	29	29	28	29	32
19	MOST PROBABLE NUMBER (MPN)	59	57	63	68	63	61	64	56	64	62	62
20	E-COLI	38	39	48	43	42	41	49	43	48	42	42

c. Zone – 3

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	17	18	16	14	15	17	16	14	13	14	15
2	TURBIDITY	139	136	139	132	138	136	137	136	139	138	139
3	ODOR (TON)	4	3	4	3	5	4	5	3	5	4	4
4	pH	6.9	7.3	7.3	7.9	7.5	6.9	6.8	7.2	7.5	6.9	7.2
5	ELECTRICAL CONDUCTIVITY	190	187	183	188	192	185	176	178	190	182	179
6	SUSPENDED SOLIDS	106	102	107	105	102	108	103	109	108	106	106
7	TOTAL DISSOLVED SOLIDS	138	133	139	136	135	133	139	132	135	139	136
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	103	102	99	97	105	94	98	96	99	92	99
10	TOTAL HARDNESS	94	98	92	91	98	105	103	101	89	93	98
11	CHLORIDES	28	27	26	28	25	28	30	27	26	29	28
12	FLUORIDES	0.3	0.4	0.3	0.3	0.6	0.4	0.6	0.5	0.3	0.3	0.3
13	NITRITES as N	0.5	0.4	0.3	0.7	0.6	0.3	0.5	0.3	0.4	0.3	0.5
14	NITRATES as NO3	19	17	15	20	19	23	15	16	14	14	17
15	PHOSPORUS	0.04	0.05	0.07	0.06	0.05	0.06	0.07	0.04	0.06	0.06	0.06
16	DISSOLVED OXYGEN	5	6	6	5	4	5	5	4	4	5	4
17	BIOCHEMICAL OXYGEN DEMAND	9	11	12	13	16	13	10	9	12	11	12
18	CHEMICAL OXYGEN DEMAND	38	39	42	39	37	38	36	38	32	38	38
19	MOST PROBABLE NUMBER (MPN)	54	55	59	52	60	52	59	53	53	52	54
20	E-COLI	39	38	40	43	37	38	36	39	35	32	36

3. Month – 3

a. Zone – 1

b.

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	18	16	17	19	14	13	12	17	16	17	17
2	TURBIDITY	143	138	149	145	142	137	139	141	139	138	140
3	ODOR (TON)	4	3	3	3	3	4	5	5	4	3	4
4	pH	7.9	7.5	7.5	7.6	7.9	8.0	8.3	8.1	7.9	7.8	7.9
5	ELECTRICAL CONDUCTIVITY	180	183	185	185	183	186	187	190	182	189	186
6	SUSPENDED SOLIDS	106	103	109	108	107	106	108	109	104	107	109
7	TOTAL DISSOLVED SOLIDS	129	128	126	129	127	132	135	129	133	133	130
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	99	94	96	98	100	96	95	93	91	92	98
10	TOTAL HARDNESS	89	93	92	99	104	86	95	98	99	105	95
11	CHLORIDES	29	25	28	24	26	27	26	25	24	24	24
12	FLUORIDES	0.5	0.4	0.3	0.2	0.5	0.2	0.3	0.35	0.4	0.5	0.4
13	NITRITES as N	0.4	0.5	0.4	0.36	0.37	0.4	0.37	0.35	0.4	0.38	0.38
14	NITRATES as NO3	19	18	14	13	17	15	16	15	17	16	16
15	PHOSPORUS	0.04	0.03	0.05	0.05	0.02	0.02	0.07	0.05	0.05	0.035	0.04
16	DISSOLVED OXYGEN	6	8	7	7	6	5	7	6	6	5	6
17	BIOCHEMICAL OXYGEN DEMAND	13	12	11	12	11	10	7	9	11	9	11
18	CHEMICAL OXYGEN DEMAND	33	39	42	36	39	32	29	29	28	29	32
19	MOST PROBABLE NUMBER (MPN)	59	57	63	68	63	61	64	56	64	62	62
20	E-COLI	38	39	48	43	42	41	49	43	48	42	42

b. Zone – 2

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	17	18	16	14	15	17	16	14	13	14	15
2	TURBIDITY	139	136	139	132	138	136	137	136	139	138	139
3	ODOR (TON)	4	3	4	3	5	4	5	3	5	4	4
4	pH	6.9	7.3	7.3	7.9	7.5	6.9	6.8	7.2	7.5	6.9	7.2
5	ELECTRICAL CONDUCTIVITY	190	187	183	188	192	185	176	178	190	182	179
6	SUSPENDED SOLIDS	106	102	107	105	102	108	103	109	108	106	106
7	TOTAL DISSOLVED SOLIDS	138	133	139	136	135	133	139	132	135	139	136
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	103	102	99	97	105	94	98	96	99	92	99
10	TOTAL HARDNESS	94	98	92	91	98	105	103	101	89	93	98
11	CHLORIDES	28	27	26	28	25	28	30	27	26	29	28
12	FLUORIDES	0.3	0.4	0.3	0.3	0.6	0.4	0.6	0.5	0.3	0.3	0.3
13	NITRITES as N	0.5	0.4	0.3	0.7	0.6	0.3	0.5	0.3	0.4	0.3	0.5
14	NITRATES as NO3	19	17	15	20	19	23	15	16	14	14	17
15	PHOSPORUS	0.04	0.05	0.07	0.06	0.05	0.06	0.07	0.04	0.06	0.06	0.06
16	DISSOLVED OXYGEN	5	6	6	5	4	5	5	4	4	5	4
17	BIOCHEMICAL OXYGEN DEMAND	9	11	12	13	16	13	10	9	12	11	12
18	CHEMICAL OXYGEN DEMAND	38	39	42	39	37	38	36	38	32	38	38
19	MOST PROBABLE NUMBER (MPN)	54	55	59	52	60	52	59	53	53	52	54
20	E-COLI	39	38	40	43	37	38	36	39	35	32	36

c. Zone – 3

S.No	Parameters	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	AVG value
1	COLOR (Hazens)	15	17	14	18	15	17	15	16	17	18	16
2	TURBIDITY	140	147	138	150	149	153	147	149	137	145	146
3	ODOR (TON)	4	4	3	5	4	5	4	5	4	4	4
4	pH	7.9	7.2	7.5	7.7	7.8	8.3	7.9	7.6	7.3	8.0	7.73
5	ELECTRICAL CONDUCTIVITY	176	179	173	180	182	183	176	178	180	179	179
6	SUSPENDED SOLIDS	105	106	102	104	100	101	106	105	104	105	105
7	TOTAL DISSOLVED SOLIDS	126	128	125	124	121	127	126	125	125	128	125
8	P- ALKALINITY	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
9	M-ALKALINITY	96	99	105	96	97	99	98	96	98	95	98
10	TOTAL HARDNESS	88	95	87	93	99	97	103	96	96	97	98
11	CHLORIDES	29	24	25	26	23	28	27	26	27	27	27
12	FLUORIDES	0.3	0.5	0.7	0.8	0.4	0.3	0.5	0.4	0.5	0.3	0.4
13	NITRITES as N	0.39	0.37	0.4	0.39	0.5	0.4	0.36	0.39	0.31	0.38	0.4
14	NITRATES as NO3	18	16	14	17	16	20	17	19	18	18	18
15	PHOSPORUS	0.03	0.04	0.03	0.05	0.03	0.02	0.03	0.03	0.05	0.05	0.04
16	DISSOLVED OXYGEN	6	7	5	8	7	6	5	7	7	5	7
17	BIOCHEMICAL OXYGEN DEMAND	19	18	13	15	13	12	13	12	15	13	13
18	CHEMICAL OXYGEN DEMAND	21	29	32	28	29	33	36	33	39	35	33
19	MOST PROBABLE NUMBER (MPN)	69	69	70	75	73	68	65	63	65	69	69
20	E-COLI	49	46	43	43	48	47	48	48	46	43	43

5 CONCLUSIONS

From the analysis of samples, we clearly observe the standards of the river arein the prescribed limits. But there are some serious observations made which will results in increase in pollution levels and standards if action not taken.

As Godavari river in Rajahmundry is treated as a Holy place, huge number of devotees visits theriver Resulting in high floating population all through the year. Devotees perform various Kinds of Pujas at certain places at the bank of the river. This leads to addition of Organic matter in to the river directly. Some of the activities are:

- Proper use of collection facility for nirmalya should be placed at every Religiously significant place like temples, ghats
- “Pindadan comprising of cooked rice during Dashakriya and nirmalya in the River at Pushkar Ghat
- Human body ash (Asthi) Visarjan activities at Pushkar Ghat.
- Releasing of Ritual flowers leaves, Clothes Color’s in the river.
- NIRMALAYA means ritual offerings. The river Godavari experiences high offerings of NIRMALAYA in festival seasons and on Auspicious occasions. These offerings contains organic matter which depletes the oxygen from the river in order to get organic matter oxidised.
- One of the most important component that effects river water quality is disposal of Domestic waste in to the stream. This Domestic waste water

contains SUSPENDED SOLIDS, DISSOLVED SOLIDS, OILS, DETERGENTS, COLOURS, PATHOGENS etc.

- In appropriate maintenance and repairs of sewers leads to disposal of Domestic waste water into the streams before treatment. This will effect the river water quality.

SUGGESTION TO THE PROBLEM

- Control of ritual inputs by devotees is also essential to check the pollution at The banks of temples specifically at Pushkar Ghats.
- Appointment of special vigilance squad for control of misuse of river at the Banks for washing of clothes, vehicles, and open defecation is recommended.
- Placing of nets on the bridges to avoid throwing of nirmalya across the river flow and also downstream of holy places such as Pushkar Ghat to collect floating Nirmalya disposed by the devotees can be helpful to reduce the amount of nirmalya in the river.
- At present, many permanent ghats have been constructed on the bank of River Godavari. As the river Godavari is a non perennial river, the banks of the river must be protected. Hence temporary ghats may be built if more Ghats are needed in the future.
- Awareness should be created through an audio visual show for violators with The help of NGOs and citizen groups.
- Artificial ponds should be constructed at the banks of river for "Dashkriyavidhi so that entry of putriciable organic matter into the main Stream can be restricted. The water in the artificial pond should be replaced And separate treatment should be provided to this polluted water.

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