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Comparative Study of Water Quality of Denwa River and Palakmati River Water

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Abstract: ***Present generation have to face many environmental problems such as global warming, greenhouse effect, acid rain and water pollution [1]. Water pollution is increasing around of the coastal areas and in major Rivers around the world. It is due to massive discharge of industrial wastes, domestic sewage, mine drainage, oil spill sand extensive fishing techniques. These degrade in river water is due to both natural and anthropogenic activities, which deteriorate their quality. Water pollution is one of the biggest problems of the world. India is included among top ten world most water polluted country. The quality of water is identified by its physical, chemical and biological properties which also provide significant information about the available resources for supporting life in that ecosystem. Hence, the present study was conducted to study the physico-chemical properties of river Palakmati and Denwa for a period of two years from July2010 to May 2012.***

Keywords: Physical parameter, Chemical parameter, Biological parameter, Biological oxygen demand, Chemical oxygen demand, Coli form, E. coli

1. Introduction

Environment consists of mainly two components, biotic components and abiotic components. Biotic parts of the environment comprises of all the living being while abiotic part includes all types of non-living beings like lands, climate, temperature, air and water. Water is the most abounded and most important component of our planet. Besides our need for survival of life, water also plays a versatile role in the functioning of the biosphere. Rivers is one of the water ways available across the world which provides main water resources for domestic, industrial and agricultural purpose. River water is critical resources for both natural ecosystem and human development. The quality of water is identified by its physical, chemical and biological properties which also provide significant information about the available resources for supporting life in that ecosystem. Hence, the preset study was conducted to study the physico-chemical properties of river Palakmati and Denwa for a period of two years from July2010 to May 2012.

2. Introduction of Study Area

In order to evaluate the water quality, range of samples and data over periods of time has been collected for river Palakmati and Denwa which are located in Hoshangabad district in Madhya Pradesh. Geographical parameters and water utilization for study area are given in following sections.

2.1 Denwa river

The Denwa river is life line of Satpura National park of Hoshangabad district. The origin of the river is situated at holy and Tourist place *Pachamarhi (Chorni)*, which is 55 Km away from Pipariya Railway Station in south direction.

2.1.1 Geography

The origin of Denwa river is situated at Chorni (Pachamarhi) at Latitude $22^0$26' 32" and Longitude $78^0$23' 32". The total length of river is about 105 Km from origin to up to joining point to Tawa river. Coordinate of joining Point of Tawa river and Denwa river is at Latitude $22^0$23' 12" and Longitude $77^0$58' 44".

Figure 1: Sampling location for river Denwa is shown in above figure

2.1.2 Utility of Denwa River

2.1.2.1 Domestic use: Villages which are situated near the river Denwa utilize water for drinking, preparing food, washing clothes and agriculture purpose.

2.1.2.2 Major Tawa Dam: The Dam was constructed at the Sangam of Tawa and Denwa at Rainpur village, which allows maximum utilization of water throughout year for irrigation and domestic use.

2.1.2.3 Satpuda National Park: It also situated at the south side of the river Reservoir bank. Water comes about 40 Km upstream side of river surrounded by the wild animals of park. In Satpuda National Park boating facility is also available in the reservoir.

2.1.3 Pollution in Denwa River

Denwa river is flowing through one of the biggest forest area situated in and around Satpura ranges of Central India. Domestics and industrial use of the river is limited as it flows through this dense forest region. Domestics and industrial west are major factor of river water pollution and so Denwa river is less polluted. But continues deforestation and increasing the construction of dams could be cause of pollution. The construction of Tawa Dam is the first major dam on the tributary of Narmada (Situated the joining place of Denwa river and Tawa river) deforested 24,000 hectares (1966). Destruction of forests will bring havoc to the Denwa through floods in future.

2.2 Palakmati River

Palakmati river is one of the tributary river of Narmada. The origin of Palakmati river is situated 3 Km away towards south from the village Chherka, which comes into the Sohagpur block of Hoshangabad district of Madhya Pradesh.

2.2.1 Geography: The origin of Palakmati river is situated at N $22^0$36'35" and S $78^0$11'25". Palakmati and Narmada river joins at Pamli village at N $22^0$02'10" and S $78^0$06'55" coordinate. The total catchment area of river is 131.66 Sq.km.

2.2.2 Pollution in Palakmati River:

Sohagpur tehsil with population around 25,000 [calculated in year 2011] is one of the biggest Tehsil near Palakmati river. All the sewer line and drainage are connected with the river. Hence the pollution of river may not to be ignored, which may also affect the holy water of Narmada river. The major sources of water pollution in Palakmati river are due to:

- Discharge of sewage.
- Agricultural runoff.

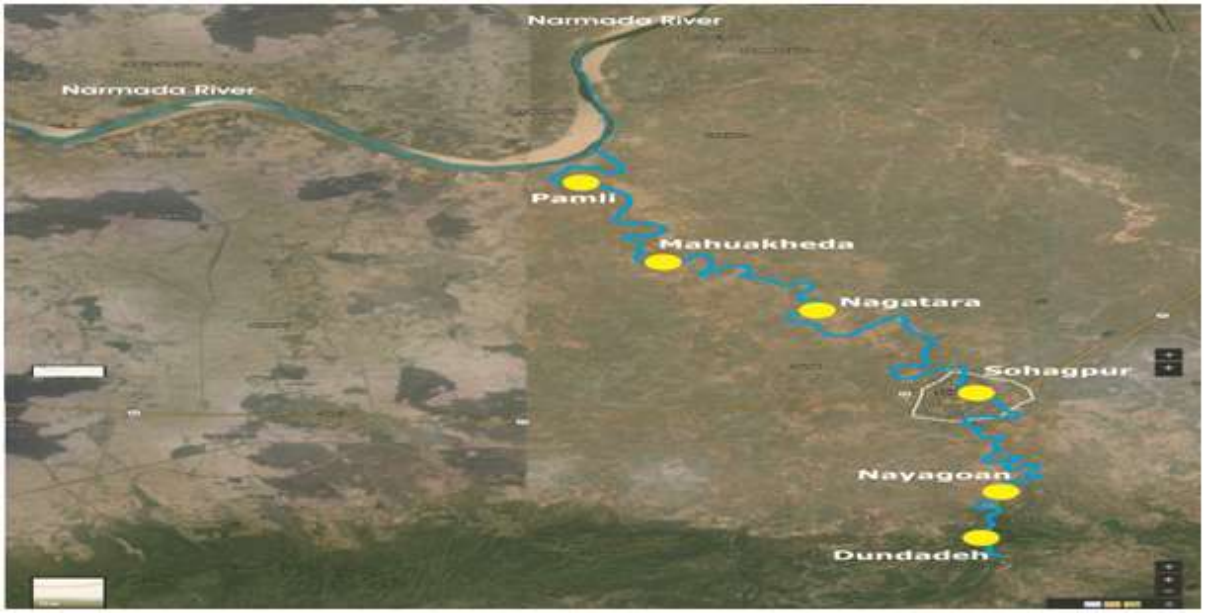

Figure 2: Sampling location for river Palakmati is shown in above figure

Picture-1. Origin place of Palakmati River (Palakmati Kund) at Chherka

Picture- 2. Sangam Place of Palakmati and Narmada River at Pamli.

Picture-3:- Show The Palakmati River in Urban Area (Sohagpur).

Picture -4 :- Show The Sampling Location of Ramganj.

Picture 8: A Over bridge of Palakmati river

Picture -5:- Show The Pollution in near the bank of Palakmati River.

Picture -6:- Show The Pollution in the Palakmati River due to dumping of domestic waste& polythene .

Picture 7: View of Denwa River flow in the forest region

Picture 8: View of Denwa River in rainy season

3. Observation

Water quality characteristic are influencing on the aquatic ecosystem. These concepts kept in mind, have studied of the basic water quality parameter of Denwa river and Palakmati river.

Water Analysis Report-1

Average value of different parameter of different location of Denwa River

•	river's Name→		SAMPLING LOCATION OF DENWA RIVER					
•	**Sampling Point→**		**LOC -1**	**LOC -2**	**LOC -3**	**LOC - 4**	**LOC - 5**	**LOC - 6**
1.	Air Temperature	^{0}C	32.15	32.3	32	32.15	32.1	32.23
2.	Water Temperature	^{0}C	22.09	22.23	21.97	22.15	21.75	22.02
3.	Turbidity	NTU	5.328	5.414	5.035	5.842	5.271	5.514
4.	TSS	mg/L	57.85	56.6	61.44	58.85	54.64	62.28
5.	TDS	mg/L	194.0	216.0	237.4	234.3	262.5	274.1
6.	pH	-	7.76	7.84	7.72	7.86	7.84	7.92
7.	Conductivity	$\mu\ \Omega^{-1}cm^1$	136.4	162.8	165.4	150.0	148.6	139.8
8.	Dissolved Oxygen	mg/L	4.907	5.278	5.085	5.014	5.092	5.071
9.	Bio. Oxy. Demand	mg/L	2.178	2.557	2.392	2.346	2.385	2.371
10.	T. Ammonia(NH_3)	mg/L	1.692	1.757	1.75	1.75	1.778	1.807
11.	Phosphate ion(PO_4^{3-})	mg/L	0.541	0.532	0.550	0.275	0.229	0.312
12.	COD	mg/L	252.4	286.4	274.2	249.8	277.0	276.5
13.	Total Hardness (TH)	mg/L	213.4	262.8	288.5	271.2	254.6	337.8
14.	Calcium Hardness	mg/L	148.1	171.9	197.0	173.9	168. 2	226.7
15.	Chloride ion (Cl^-)	mg/L	284.8	266.9	348. 1	311.4	294.4	290.8
16.	Fluoride ion(F^-)	mg/L	0.607	0.842	0.75	0.778	0.714	0.785
17.	Total Alkalinity	mg/L	471.2	483.0	474.2	485.5	481.5	478.4
18.	Bicarbonate Alkali.	mg/L	156.2	138.5	138.7	140.5	141.7	145.0
19.	Total Iron	mg/L	0.354	0.427	0.591	0.474	0.511	0.493
20.	Coli forms M.P.N.	mg/L	12.42	12.85	13.57	13.14	14.57	79.5

Water Analysis Report-2

Average value of different parameter of different location of Palakmati River

•	river's Name→		SAMPLING LOCATION OF PALAKMATI RIVER					
•	**Sampling Point→**		**LOC -1**	**LOC -2**	**LOC -3**	**LOC - 4**	**LOC - 5**	**LOC - 6**
1.	Air Temperature	^{0}C	32.3	32.3	32.4	31.8	31.8	32.14
2.	Water Temperature	^{0}C	22.32	22.14	22.24	22.16	22.33	22.07
3.	Turbidity	NTU	6.34	6.3	6.27	6.49	6.35	7.00
4.	TSS	mg/L	104.7	106.9	107.7	108.7	110.7	99.81
5.	TDS	mg/L	394.9	329.3	389.1	295.5	305.2	290.2
6.	pH	-	6.4	6.3	6.3	6.3	6.3	6.3
7.	Conductivity	$\mu\ \Omega^{-1}cm^1$	190.2	193.6	199.1	183.5	180.5	191.3
8.	Dissolved Oxygen	mg/L	4.7	4.9	5.0	4.6	4.5	4.4
9.	Bio. Oxy. Demand	mg/L	2.1	2.1	2.4	1.9	1.8	1.8
10.	T. Ammonia(NH_3)	mg/L	1.26	1.3	1.2	1.2	1.3	1.1
11.	Phosphate ion(PO_4^{3-})	mg/L	0.40	0.44	0.41	0.40	0.36	0.41
12.	COD	mg/L	293.5	299.5	311.7	289.4	296.0	279.4
13.	Total Hardness (TH)	mg/L	469.4	530.8	502.2	514.1	493.4	507.5
14.	Calcium Hardness	mg/L	315.4	348.8	326.8	326.3	333.5	343.0
15.	Chloride ion (Cl^-)	mg/L	408.8	414.4	412.9	385.1	375.5	401.8
16.	Fluoride ion(F^-)	mg/L	1.15	0.93	0.98	1.10	1.13	1.12
17.	Total Alkalinity	mg/L	278.3	273.8	263.8	285.0	266.0	262.5
19.	Total Iron	mg/L	1.282	1.278	1.276	1.532	1.573	1.547
20.	Coli forms M.P.N.	mg/L	276.6	276.7	314.4	285.0	284.0	293.1

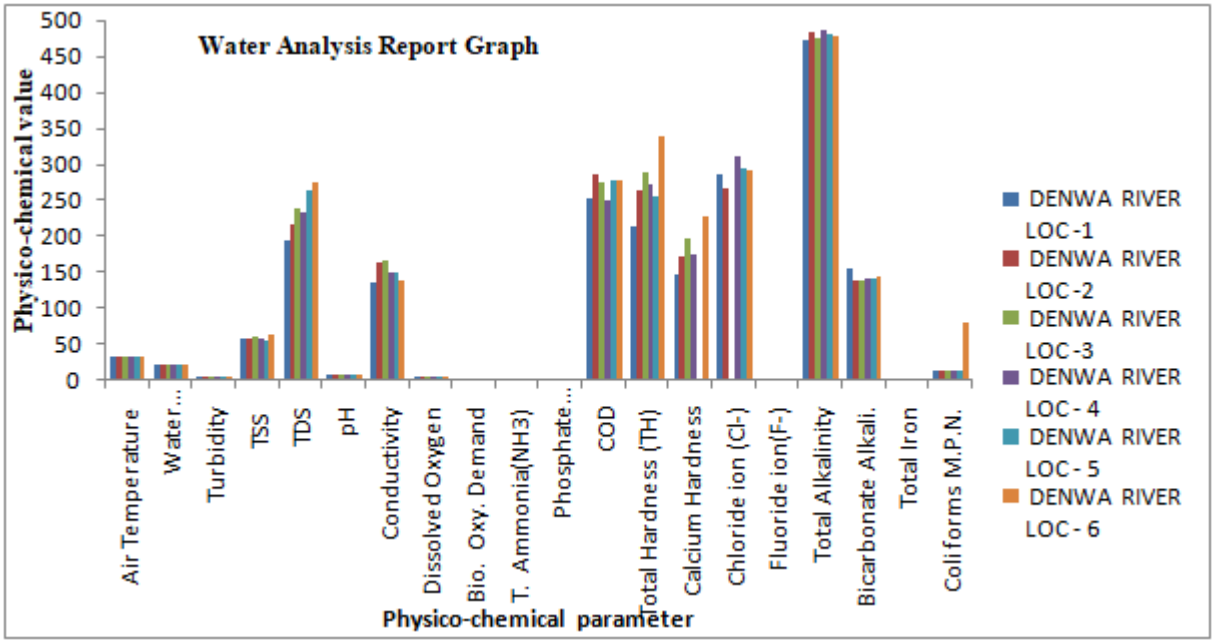

Figure 3: Show the Physico-chemical report of Denwa River at different sampling location.

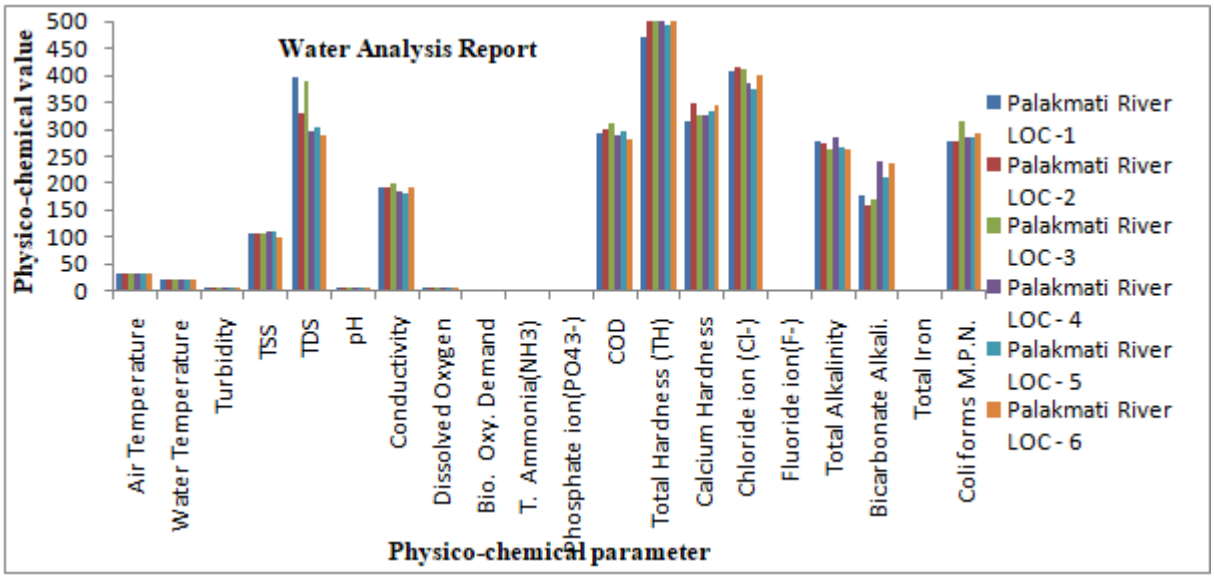

Figure 4: Show the Physico-chemical report of Palakmati River at different sampling location

4. Result and discussion

This study would be the first step of obtaining water quality analysis for river Denwa and Palakmati. The results obtain during the course of study will not only be helpful for analysis of water quality data of these rivers but also allow to access effect on environment and on human population too.

According to present research following conclusions are drawn out

- Narmada river is life line of Madhya Pradesh and it has great mythological importance to people in India. Water of Narmada is used widely by large population of this state and other states too. Palakmati and Denwa river is small tributary of holy river Narmada. Polluted water of both the river merged into Narmada river and contributes to degrade the water quality of this river so that the pollution load of these rivers cannot be ignored.
- The current work includes monitoring of parameters such as pathogenic bacteria, which is harmful for human health. Result shows the presence of E-Coli in Palakmati river. This information found helpful to identify the source of fecal pollution and set measures for protecting drinking water sources from contamination.
- Study of Palakmati river shows the presence of bicarbonate alkalinityin range from 118 to 225mg/L. These values found beyond the standard permissible limit. At few sampling location the value of pH found 6.0causes due to bicarbonate alkalinity.
- In the present study, it has been measured the Chemical Oxygen Demand value of Palakmati Rive is higher which shows the presence of organic pollutant in the river water. This organic pollutant helps of bacterial growth.
- The Palakmati river suffers from many problems most important ones beings the lean flow during dry season a dumping of untreated sewage in to the river. Chloride

value in water of Palakmati river found higher due to direct merging of sewage into it.

- The taste of water found bitter for Denwa river. Higher value of Total Dissolved solids in Denwa river water found the main cause of it. TDS value of Denwa river in comparison to Palakmati river found higher. During site visit for sampling, interaction with villagers living near Denwa river reported gastrointestinal problem and gastrointestinal irritation which is mainly causes due to higher TDS value.
- Conductivity, Total Suspended Solid, Total Dissolved Solids, Dissolved Oxygen and Biological Oxygen Demand value for both the river are higher in monsoon season and lower value observed in summer season. Chemical Oxygen Demand and Chloride value higher in summer season for Palakmati river. Total Alkalinity of Denwa river is higher than Palakmati river throughout period of study.
- Among all sampling location in Denwa river water was found mostly in alkaline in nature, while Palakmati river water is acidic in nature. The pH of both river water has as per desirable limits of WHO standards.

5. Discussion of water quality data

- The value of pH between 6.0 – 8.5 of Denwa river and Palakmati river water. Denwa river water is partially alkaline in nature, while Palakmati river water is slightly acidic in nature.
- The biological data of Palakmati river and Denwa river are important for public health. For Denwa river E. Coli is not detected in all sampling location because most part of this river flow in forest region. But in Palakmati river coli form and E. coli found in all the sampling points. But high value noted at third sampling location due to heavily human activity E. coli may be from human or animal excreta washed into the river (Le Minor, 2003)
- The results showed that most of the physico-chemical parameters of Palakmati river and Denwa River determined did not exceed the permissible limit of the world Health Organization (WHO, 2006).

6. Water quality of Denwa river and Palakmati river

Physico-chemical study and biological study of Denwa river water and Palakmati river water show the small deviation of prescribed water quality standards given by World Health Organization, Beauro of Indian Standard (10500) and Central Pollution Control Board of India. By following rules of the National Water Policy and public awareness for the utilization of river water is helpful for conserving of both river and useful for drinking boating and outdoor bathing purpose.

7. Evaluation of water quality data

The physico-chemical parameters of Denwa river and Palakmati river has been investigated and calculated for assessment deviation of water quality with respect to the existing national water quality standards. In our present work, it has been observed that some of the physico-chemical parameters such as turbidity, total suspended solids, total dissolved solid (for Denwa river), chemical oxygen demand, Calcium Hardness, Total Hardness for Palakmati river values found beyond the standard limits.

8. Conclusion

The research shows that the current monitoring system is limited in its ability to provide adequate information about drinking water quality of the Palakmati river and Denwa river. The current monitoring parameters list does not include pollutants such as pathogenic bacteria and persistent organic pollutants, which can pose risks to human health if found in elevated concentrations in drinking water. The coverage of monitoring stations is also limited in its ability to provide adequate information for locating contaminants that can alter the drinking water quality of the Palakmati and Denwa river.

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