

# **A Study Of Physicochemical Characteristics To Assess Pollution Status Of River Punpun**

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## **Abstract**

*It is well recognised that the environment is deteriorating at the fastest rate due to human disruption. Assessing pollution status is very much important for environmental management and people's health awareness. This study evaluates the physicochemical characteristics of the river Punpun to assess its pollution status. Rivers, as being the vital freshwater resources, are constantly subjected to pollution from different anthropogenic and natural sources. It is one of the fundamental natural sources for the growth and evolution of life on earth. The present research work focused on sampling water from two different selected sites along the Punpun river and analyzing its key parameters, including colour, odour, pH, dissolved oxygen (DO), temperature total dissolved solids (TDS), turbidity.*

*The results displayed remarkable variations in these parameters, indicating a possible risk to aquatic creatures and public health. Altered parameter levels were also observed in regions near populated areas which suggest a strong correlation between human activities and Punpun river pollution.*

*The findings emphasize the need for regular monitoring and the implementation of effective pollution control approaches. This study gives a complete measure for policymakers and environmental managers to build up sustainable river management practices which assure the protection of water quality of river Punpun and its surrounding ecosystem.*

**Keywords** - Punpun River, Physicochemical Parameters, Human activities.

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## **I. Introduction**

In tandem with the population growth, water is becoming more and more necessary for household, industrial and agricultural operations. It is the most essential element for all creatures, and any changes to it could affect their ability to survive. One of the biggest crises of the 21st century may be the scarcity of freshwater. Lakes, rivers, ponds, streams etc. are sources of freshwater. River is a crucial and delicate freshwater ecosystem where sustainability of all life depends on it. It fulfills the primary demands for freshwater supplies, including those for drinking and agriculture. However, it is concerning that the declining water quality is endangering this natural system's ability to survive. The term water quality means the Physicochemical and biological characteristics of the water which are generally related to its fitness for bathing and drinking. The health of aquatic ecosystems depends on the quality of water where in clean water aquatic flora and fauna flourish. Aquatic ecosystem is contaminated by chemicals and heavy metals from urban and industrial wastes. For aquatic life these pollutants are harmful, usually shortening the life span and limiting the capacity of reproduction of the organisms. As per Sharma et.al (2020), the deficiency of wastewater treatment facilities, inadequate sewage infrastructure and rising water demand have a detrimental effect on water resources's availability, hence modifying the ecology and environment. Domestic and commercial garbage are frequently dumped in rivers in underdeveloped and developing countries. Numerous components in the trash degrade the quality of the river (Amira et.al; 2018). Poor water quality harmed human health also. Diarrhoea, cholera, dysentery, typhoid, skin disease are the most common waterborne diseases. According to Khan et.al (2022) water pollution kills about 14000 people everyday in underdeveloped nations, largely as a result of untreated sewage contaminating drinking water. It is also estimated that 700 million Indians lack access to clean bathrooms, which results in 1000 child deaths per day. The river's water quality is significantly impacted negatively by industrial growth, urbanization and widespread use of chemical fertilizers (Barbulesca et.al; 2021).

The Punpun, a holy river for Hindu's. It is a 210 km long river mostly rainfed and during the dry season, it carries little water. It originates in the hills of Palamu District which falls into chotanagpur of Jharkhand. It

enters Aurangabad district of Bihar and closes in north-east direction through Jahanabad and Patna and joins the Ganga at Fatuha. The morhar, the madar, the batre, the batane, and the adari are the principal tributaries of the Punpun (Rai, 2020). The Punpun is well-known for its valuable building materials and precious stones like gomed, garnel, sfatick, and mariyam (Raj, 2020).

The untreated trash, plastic waste disposal, animal and human waste bathing runoff and carelessly thrown domestic waste have all been found in substantial quantities in the Punpun river.

Everyday local people bathe in this river and every year people from other places offer prayers to their ancestors after taking bath in Punpun river. It is important to look into the river water quality in order to comprehend metabolic processes occurring in this aquatic ecosystem. To maintain the bathing area free from any pollution it is now required to analyze the significant water factors that can reveal both positive and negative changes.

## II. Materials And Methods

### Study Area

The research area is located in the river Punpun at Patna is the capital of Bihar with a population of more than 20 gaps. An average annual rain on the middle plains is 104 cm mainly by the southwest monsoon from July to September (Krishna-Murti et al.1991 and Sinha & Sinha 2020).

### Sample Collection

Water samples were collected from Punpun ghat upstream (Site-1) and from Gaurichak bridge downstream (Site-2). It was collected during the Pre-monsoon season in 2024. Samples were collected in a cleaned 1000 ml plastic bottle and taken to the laboratory for experimental evaluation and the average value for each parameter was reported.

**Upstream Punpun** - This site is selected on the basis of human activities like dumping of solid waste, animal and human bathing, fishing etc.

### Geographical Coordinates:

**Latitude**- 25.501849°

**Longitude** - 85.100201°

**Downstream Punpun** - This site is selected on the basis of human activities like dumping of solid waste, agricultural runoff, idol immersion, fishing etc.

### Geographical Coordinates:

**Latitude** - 25.48854°

**Longitude** - 85.183012°

### Sample Analysis Method

All the selected parameters were analyzed using standard methods (APHA 2012). Collected water samples were analyzed for turbidity, colour, odour, pH, Dissolved Oxygen (DO), Total Dissolved Solids (TDS) and temperature.

PARAMETERS	TEST METHODS
Colour	Visual Method
Odour	Physiological Sense
Temperature	Thermometer
pH	pH Meter
Total Dissolved Solids	TDS Meter
Turbidity	Turbidity Meter
Dissolved Oxygen	Winkler's Method

Table-1 showing test methods of selected parameters.

### III. Result And Discussion

PARAMETERS	Unit	S1 (upstream)	S2 (downstream)
Colour		Colourless	Colourless
Odour		No smell	No smell
Temperature	°C	28	26.5
pH		8.40	7.93
Total Dissolved Solids (TDS)	mg/L	245.30	221.29
Turbidity	NTU	44	44
Dissolved Oxygen (DO)	mg/L	6.17	7.97

**Table-2 Analysis of selected parameters of Punpun river water at upstream and downstream regions.**

**Colour** - Colour of water at both sites was colourless. Same outcome was noted by Kumar et al, (2014).

**Odour** - Odour of water at both sites was odourless. Same outcome was noted by Kumar et al, (2014).

**Temperature** - One of the most crucial elements in the aquatic environment is temperature of water since it affects both the physicochemical and biological activities ( Kamboj, & Kamboj 2019). In the present study it was 28 °c in the upstream and 26.5 °c in the downstream region. According to Rai (2020) the average temperature of this river varies between 23.21°c to 28.44°c.

**pH** - In general, pH indicates how basic and acidic a water sample is. It affects the chemical reaction. It was more alkaline (8.40) at upstream as compared to downstream (7.93). It may be due to the dissolved salts, acids and bases. Average pH of this river varies between 7.1 to 7.5 (Rai, 2020).

**TDS (Total Dissolved Solids)** - The straight measure of particles dissolved in the water sample is known as total dissolved solids. TDS at the downstream site (221.29 mg/l) was comparatively lower than the upstream site (245.30 mg/l). According to Rai (2020) the average TDS of the river Punpun lies between 228.14 to 241.54 mg/l.

**Turbidity** - It is one of the crucial factors in the observance of the water quality. Turbidity means how cloudy or opaque water is. Light entrance in the water bodies is reduced by greater turbidity values. Turbidity was the same at both sites (44 NTU). It is due to the high concentration of silt clay and organic matter discharged from the drain. According to Sinha & Sinha (2020) average turbidity found in Ganga river was 34.43 to 265.10 NTU.

**Dissolved Oxygen** - Dissolved oxygen is a crucial factor in evaluating water quality. Its physical and biological properties help in indicating the level of pollution in aquatic environments (Kamboj, & Kamboj 2019). In the study the average value of dissolved oxygen was 6.17 in upstream and 7.97 in downstream region. According to Rai (2020) average dissolved oxygen of the Punpun river ranges between 5.23 to 6.0.

### IV. Conclusion

By analyzing data it was concluded that notable variations were seen among the colour, odour, pH, TDS and dissolved oxygen at both sites. At present study, Punpun river water is not suitable for drinking. This is happening due to discharge of domestic sewage, dumping of solid waste. The findings emphasize the need for regular monitoring and the implementation of effective pollution control approaches.

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#### Conflict of interest

None

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