

Assessment of Water Quality of River Ganga in West Bengal and Bihar

*A thesis submitted towards partial fulfilment of the requirements for the
degree of*

Master of Engineering
in
Water Resources and Hydraulic Engineering

Submitted by
BHAGBAT MAITY

Examination Roll No. M6WRP24011
Registration No. 160499 of 2021-2022

Under the guidance of

Dr. Arunabha Majumder
Emeritus Professor
School of Water Resources Engineering, Jadavpur University
&
Dr. Rajib Das
Assistant Professor
School of Water Resources Engineering, Jadavpur University

School of Water Resources Engineering
M.E. (Water Resources & Hydraulic Engineering)
Course affiliated to Faculty Council of Engineering & Technology

Jadavpur University
Kolkata-700032, West Bengal, India
2024

Declaration of Originality and Compliance of Academic Ethics

I hereby declare that this thesis contains a literature survey and original research work by the undersigned candidate, as part of my **Master of Engineering in Water Resources and Hydraulic Engineering** in the Faculty Council of Interdisciplinary Studies, Law & Management, Jadavpur University during the academic session 2023-24.

All information in this document have been obtained and presented in accordance with academic rules and ethical conduct.

I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name	: Bhagbat Maity
Exam. Roll Number	: M6WRP24011
Thesis Title	: Assessment of Water Quality of River Ganga in West Bengal and Bihar
Signature with Date	:

M.E. (Water Resources & Hydraulic Engg.) course affiliated to
Faculty Council of Engineering & Technology
Jadavpur University
Kolkata, India

Certificate of Recommendation

This is to certify that the thesis entitled "**Assessment of Water Quality of River Ganga in west Bengal and Bihar** " is a Bonafide work carried out by **Mr. Bhagbat Maity** under our supervision and guidance for partial fulfilment of the requirement for the Post Graduate Degree of Master of Engineering in Water Resources and Hydraulic Engineering during the academic session 2023- 24.

THESIS ADVISOR

Prof. (Dr.) Arunabha Majumder
Emeritus Professor
School of Water Resources Engineering
Jadavpur University

THESIS ADVISOR

Prof. (Dr.) Rajib Das
Assistant Professor
School of Water Resources Engineering
Jadavpur University

DIRECTOR

Prof. (Dr.) Asis Mazumdar
School of Water Resources Engineering
Jadavpur University

DEAN

Prof. (Dr.) Ratan Mandal
Faculty Council of Interdisciplinary Studies,
Law & Management
Jadavpur University

M.E. (Water Resources & Hydraulic Engg.) course affiliated to
Faculty Council of Engineering & Technology
Jadavpur University
Kolkata, India

CERTIFICATE OF APPROVAL **

This foregoing thesis is hereby approved as a credible study of an engineering subject carried out and presented in a manner satisfactorily to warranty its acceptance as a prerequisite to the degree for which it has been submitted. It is understood that by this approval the undersigned do not endorse or approve any statement made or opinion expressed or conclusion drawn therein but approve the thesis only for the purpose for which it has been submitted.

Committee of final	
Examination	
for the evaluation	
of the thesis	
	

** Only in case the thesis is approved.

ACKNOWLEDGEMENTS

At the onset, I feel great pleasure to pronounce the gratitude to my supervisor Prof. (Dr) Arunabha Majumder, Emeritus Professor, School of Water Resources Engineering Jadavpur University and Dr. Rajib Das, Assistant Professor School of Water Resources Engineering, Jadavpur University, for sincere guidance, inspiration, constructive criticism and valuable suggestion in every step of this work, right from the beginning of the project till the final preparation of this manuscript. It would have been impossible to carry out this thesis work, with confidence without their wholehearted involvement, advice, support and constant encouragement throughout.

I am extremely grateful to my Prof.(Dr) Asis Mazumdar Professor, Director, School of Water Resources Engineering, Jadavpur University, Prof (Dr.) Pankaj Kumar Roy, Professor, School of Water Resources Engineering, Jadavpur University, Dr. Subhasish Das, Joint Director, Associate Professor, School of water Resources Engineering, Jadavpur University, Dr. Gourab Banerjee, Assistant Professor, School of water Resources Engineering, Jadavpur University for providing the necessary facilities, support and their valuable suggestion during the period of the project work.

I also express my sincere thanks to Mr. Buddhadev Nandi, and Mr. Tanmoy Das Research Scholar of the School of Water Resources Engineering, Jadavpur University for their unconditional support and affection during my work.

I am indebted to all the staffs of School of Water Resources Engineering and the Regional - cum-Facilitation Centre (RCFC) NMPB, Jadavpur University for their help and support. Finally, thanks to all of my friends of school of water resources engineering for their kind cooperation and help. Last but not the least, I am also grateful to my mother, for her earnest and continuous support and therefore, I dedicate my M.E. thesis to her.

Date :

.....

Place : Jadavpur University

Mr. Bhagbat Maity

Exam Roll No. – M6WRP24011

ABSTRACT

Assessment of water quality can be defined as the analysis of physical, chemical and biological characteristics of water. The present work was carried out to assess a water quality scenario of the River Ganga. The values of physical, chemical and biological parameters like biochemical oxygen demand (BOD), dissolved oxygen (DO), potential hydrogen (pH) and fecal Coliform are considered. The secondary data are collected for a period of 01.01.2021 to 31.12.2023 from West Bengal Pollution Control Board and Bihar State Pollution Control Board official website. The values obtained were compared with the guidelines for organized Outdoor bathing (Class B) purpose suggested by the Gazette of India: Extraordinary [Part-II, Sec-3 (i)] and Bureau of Indian Standard. Four parameters like pH, DO, BOD and Fecal Coliform were selected to evaluate the pollution level change of three Rivers over the years.

An analysis has been made on various water quality parameters at different locations during January 2021 to December 2023 as Minimum -Maximum and as Bathing Standard in percentage (%). The analysis reveals that the river is deteriorating rapidly due to the increased rate of pollution from different industrial, transportation, domestic and agricultural sources.

Key Words: River Ganga, Water Quality

CONTENTS

Topic		Page No
1. Introduction		1
	1.1 Water	1
	1.2 Ground Water	2
	1.3 Surface Water	3
	1.4 Water Pollution (Surface, River, Lake	4
	1.5 River Water pollution Scenario in World	4
	1.6 River Water pollution Scenario in India	4
	1.7 River Water pollution Scenario in West Bengal	5
	1.8 River Water pollution Scenario in Bihar	5
	1.9 Bathing Water	5
2. Literature Review		6 - 8
3. Objective & Scope of the work		9
	3.1 Objective of the Work	9
	3.2 Scope of the Work	9
4. Methodology of the work		10
	4.1 Parameter Specification	10 - 12
	4.2 Tolerance and Classification of Water	13
	4.3 Methodology of the work in detail	18
	4.4 Data	18 - 35
	4.4.1 River Ganga	35 - 38
5. Result and Discussion		39 - 230
6. Conclusion		231
7. References		232 - 233

Chapter 1

INTRODUCTION

1.1 Water

Water is an inorganic compound with the chemical formula H_2O . It is a transparent, tasteless, odorless and nearly colorless chemical substance, and it is the main constituent of Earth's hydrosphere. At a pressure of one atmosphere (atm), ice melts or water freezes (solidifies) at 0°C (32°F) and water boils or vapor condenses at 100°C (212°F). Water covers about 71% of the Earth's surface, with seas and oceans making up most of the water volume (about 96.5%). Small portions of water occur as groundwater (1.7%), in the glaciers and the ice caps of Antarctica and Greenland (1.7%), and in the air as vapor, clouds (consisting of ice and liquid water suspended in air), and precipitation (0.001%). Water moves continually through the water cycle of evaporation, transpiration (evapotranspiration), condensation, precipitation and runoff, usually reaching the sea.

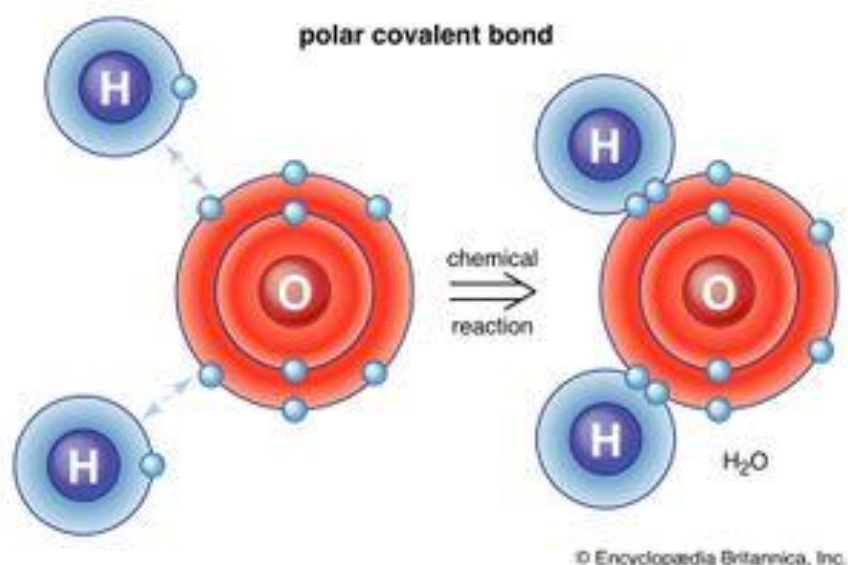


Fig.1.1.1. - water molecule

Hydrology is the study of the movement, distribution, and quality of water throughout the Earth. The water cycle (known scientifically as the hydrologic cycle) is the continuous exchange of water within the hydrosphere, between the atmosphere, soil water, surface water, groundwater, and plants. Water moves perpetually through each of these regions in the water cycle consisting of the following transfer processes:

- 1) Evaporation from oceans and other water bodies into the air and transpiration from land plants and animals into the air.
- 2) Precipitation, from water vapor condensing from the air and falling to the earth or ocean.
- 3) Runoff from the land usually reaching the sea.

Water resources are natural resources of water that are potentially useful for humans for example as a source of drinking water supply or irrigation water. Water can be stored as lakes, water vapor, groundwater or aquifers, and ice and snow.

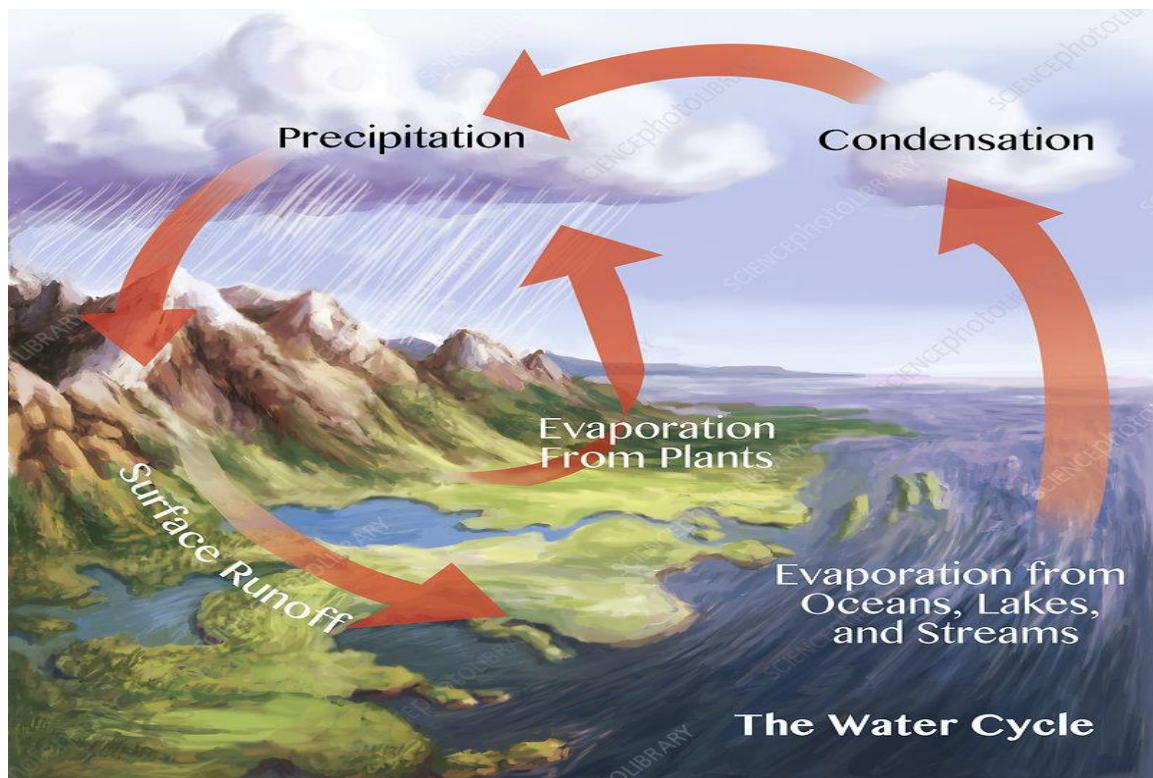


Fig.1.1.2. – Water Cycle

1.2 Groundwater

Groundwater is the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand and rocks called aquifers.

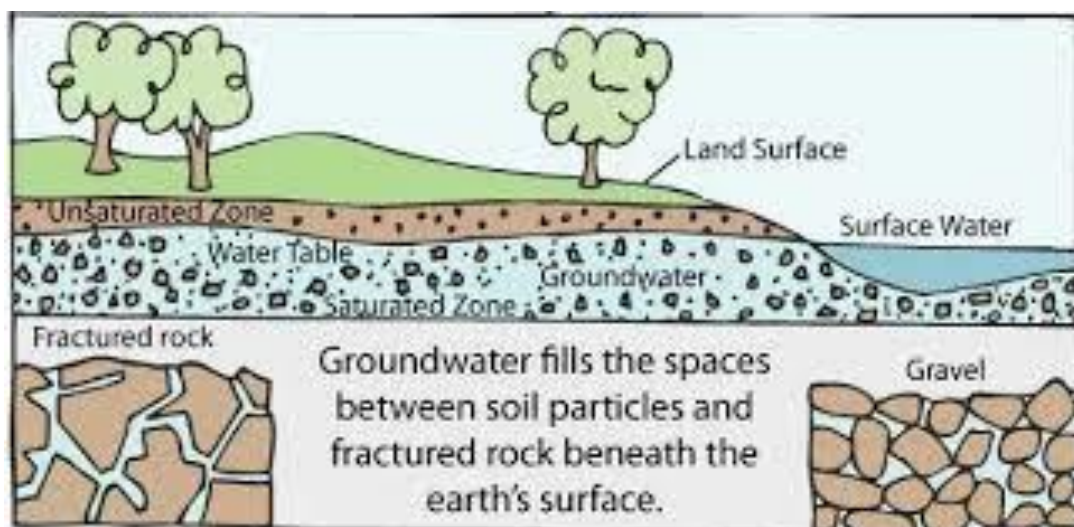


Fig.1.2.1. – Ground Water

The area where water fills the aquifer is called the saturated zone (or saturation zone). The top of this zone is called the water table. The water table may be located only a foot below the ground's surface or it can sit hundreds of feet down.

Aquifers are typically made up of gravel, sand, sandstone, or fractured rock, like limestone. Water can move through these materials because they have large connected spaces that make them permeable. The speed at which groundwater flows depends on the size of the spaces in the soil or rock and how well the spaces are connected. Groundwater supplies are replenished, or recharged, by rain and snow melt that seeps down into the cracks and crevices beneath the land's surface. In some areas of the world, people face serious water shortages because groundwater is used faster than it is naturally replenished. In other areas groundwater is polluted by human activities. Water in aquifers is brought to the surface naturally through a spring or can be discharged into lakes and streams. Groundwater can also be extracted through a well drilled into the aquifer. A well is a pipe in the ground that fills with groundwater. This water can be brought to the surface by a pump. Shallow wells may go dry if the water table falls below the bottom of the well. Some wells, called artesian wells, do not need a pump because of natural pressures that force the water up and out of the well.

1.3 Surface water

Surface water is water located on top of land, forming terrestrial (surrounding by land on all sides) water bodies, and may also be referred to as blue water, opposed to the seawater and water bodies like the ocean.

The vast majority of surface water is produced by precipitation. As the climate warms in the spring, snowmelt runs off towards nearby streams and rivers contributing towards a large portion of human drinking water. Levels of surface water lessen as a result of evaporation as well as water moving into the ground becoming ground-water. Alongside being used for drinking water, surface water is also used for irrigation, wastewater treatment, livestock, industrial uses, hydropower, and recreation. For USGS water-use reports, surface water is considered freshwater when it contains less than 1,000 milligrams per liter (mg/L) of dissolved solids.

There are three major types of surface water. Permanent (perennial) surface waters are present year round, and includes lakes, rivers and wetlands (marshes and swamps). Semi-permanent (ephemeral) surface water refers to bodies of water that are only present at certain times of the year including seasonally dry channels such as creeks, lagoons and waterholes. Human-made surface water is water that can be continued by infrastructures that humans have assembled. This would be dammed artificial lakes, canals and artificial ponds (e.g. garden ponds) or swamps. The surface water held by dams can be used for renewable energy in the form of hydropower. Hydropower is the forcing of surface water sourced from rivers and streams to produce energy. India is river based country, many towns and villages are situated on the river banks. River water is very important among the natural resource for the sustenance of life (Jain et. al, 2016).

1.4 Water Pollution (Surface, River, Lake)

Water Pollution is very important problem of 21st century. Due to water pollution pure water is becoming less scare day by day. The contamination of water bodies such as river lakes, ocean and ground water is known as water pollution. It has become a global problem now a day's. Deaths and diseases are caused worldwide due to water pollution and approximately 14000 people die every day due to water pollution (Letchinger, 2000; Pink, 2006; Larry, 2006). Both developed as well as developing countries are facing water pollution problems (Anh et.al., 2010). Water quality is influenced by many factors like precipitation, climate, soil type, vegetation, geology, flow conditions, ground water and human activities & The greatest threat to water quality is posed by point sources of industries and municipalities. Other activities like mining, Agriculture and Urban development also effect water quality. After drinking polluted water people becoming more and more ill. Every year, unsafe water sickens about 1 billion people. And low-income communities are disproportionately at risk because their homes are often closest to the most polluting industries.

So water pollution control is necessary & to control it requires appropriate infrastructure and management. plans as well as legislation. Technology solutions can include improving sanitation, sewage treatment, industrial wastewater treatment, agricultural wastewater treatment, erosion control, sediment control and control of urban runoff (including storm water management).

Immersion of idols during festivals is also accounted to be one of the reasons for river pollution (Kamal et.al, 1999). The water quality of most of the river water is contaminated due to heavy pollutant loads in India (Jindal & Sharma, 2010). Urbanization is found to be the root cause of this contamination (Roy, 2019).

1.5 River Water Pollution scenario in world

“**Water for Life**” has declared as the International Decade (2005 to 2015) water by the United Nations General Assembly in 2005 for Action for water. Because of the rapid increase in demand for water, and increase in occurrences of pollution of numerous water sources, environmental risks to humans and other life beings are enhanced. Due to changes in the quantity and quality of water, some environmental disasters are causing stresses and hardships in a river basin in around the world (Anh et al., 2010; Arkoosh et al., 2010;). In such issues, water pollution is an important and essential issue in the world which requires ongoing evaluation and revision. The statistical data counted that more than 14,000 people died daily and 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrhea sickness every day (Reporter, 2008; White, 1992). On the other hand, of 90% of china's cities suffer from some degree of water pollution and nearly 500 million people lack access to safe drinking water (Baoxing, 2005). Generally, water pollution is covered in water bodies of toxic chemicals and biological agents which exceed what is naturally found in water and may pose a threat to human health and the environment. The polluted water caused serious problems for human health as well as hampered ecological and environmental agents (Zaidi, 1994; Z. Zhang et al., 2010).

1.6 River Water Pollution Scenario in India

River water pollution in India is One of the biggest problem. In every nine people gets their drinking water from unimproved and unsafe sources & One of the most serious sources of water pollution is a lack of sanitation. In India 90% of sewage is discharged untreated into bodies of water. Every day, 2 million tonnes of sewage and other effluents are discharged into the water supply & Industry releases an estimated 300-400 mega tonnes of waste into bodies of water. Non-point source pollution from agriculture and urban areas frequently contributes, significantly to total pollutant load when combined with industrial point source pollution. The degradation of freshwater ecosystems, primarily due to pollution of water resources and aquatic ecosystems is estimated, to be responsible for a one-third reduction in global biodiversity. Newly emerging pollutants such as personal care and pharmaceuticals, pesticides, industrial and household chemicals, and changing climate patterns pose a new water quality challenge, with long-term effects on human health and ecosystems still unknown.

1.7 River water pollution scenario in West Bengal

Waste water from a majority of areas in WB is discharged into rivers untreated. Kasai River at Medinipur has shown an increase in levels of BOD up to 4.61 mg/l, which is higher than the quality desirable for 'Class B' and 'Class C'. West Bengal's rivers are unfit for bathing. Reports suggest that bacteria mainly found in human faces is present in the waters. In the case of the river Ganga, river stretches have been classified wrongly at 13 locations. At Serampore, the WBPCB has reported bathing and fishing as the two visible activities, which means the water quality has to be maintained for 'Class B' category use (as per CPCB Classification), whereas the WBPCB has noted this stretch as 'Class C'. Polluted rivers threaten the livelihoods of fishermen in West Bengal. Effluent from factories affects the life span of various fresh water species.

1.8 River water pollution scenario in Bihar

The water quality of 22 rivers in Bihar, including Ganga, is unfit even for bathing, according to Bihar State Pollution Control Board's (BSPCB) annual report (2023-24). The water from the Ganga and its 21 tributaries, flowing through 27 districts in Bihar, is unsuitable even for bathing, the report revealed. BSPCB monitored water quality at 98 locations in the state and observed that these rivers failed to meet the prescribed water quality criteria. The water in these rivers exhibited elevated levels of bacterial contamination, including faecal coliforms and total coliforms. According to a study by the Central Pollution Control Board, the number of polluted river in Bihar increased from six in 2018 to 18 in 2022. But now this number has increased to 22, as per the latest annual report of BSPCB. Alarmingly, thousands still continue to use and drink the contaminated water, risking their health massively.

1.9 Bathing Water

A Bathing Water is an area of surface water where it is expected that large numbers of people will 'bathe'. According to CPCB classification waterfalls in "class B" is suitable for Bathing. Tolerance for outdoor bathing are Total Coliforms Organism MPN/100ml shall be 500 or less, pH between 6.5 and 8.5, Dissolved Oxygen 5mg/l or more, Biochemical Oxygen Demand 5 days 20°C 3mg/l.

Chapter 2

Literature Review

Horton (1965), initially developed a system for rating water quality through index numbers, offering a tool for water pollution abatement, since the terms “water quality” and “pollution” are related. The first step to develop an index is to select a list of 10 variables for the index’s construction, which are: sewage treatment, dissolved oxygen (DO), pH, coliforms, electroconductivity (EC), carbon chloroform extract (CCE), alkalinity, chloride, temperature and obvious pollution. The next step is to assign a scale value between zero and 100 for each variable depending on the quality or concentration. The last step, is to designate to each variable is a relative weighting factor to show their importance and influence on the quality index (the higher the assigned weight, the more impact it has on the water quality index, consequently it is more important) (Horton 1965).

Brown et al. (1970) established a new water quality index (WQI) with nine variables: DO, coliforms, pH, temperature, biochemical oxygen demand (BOD), total phosphate, nitrate concentrations, turbidity and solid content based on a basic arithmetic weighting using arithmetic mean to calculate the rating of each variable. These rates are then converted not temporary weights. Finally, each temporary weight is divided by the sum of all the temporary weights in order to get the final weight of each variable (Kachroud et al. 2019a; Shah and Joshi 2017). In 1973, Brown et al., considered that a geometric aggregation (a way to aggregate variables, and being more sensitive when a variable exceeds the norm) is better than an arithmetic one. The National Sanitation Foundation (NSF) supported this effort (Kachroud et al. 2019a; Shah and Joshi 2017).

Steinhart et al. (1982) developed a novel environmental quality index (EQI) for the Great Lakes ecosystem in North America. Nine variables were selected for this index: biological, physical, chemical and toxic. These variables were: specific conductance or electroconductivity, chloride, total phosphorus, fecal Coliforms, chlorophyll *a*, suspended solids, obvious pollution (aesthetic state), toxic inorganic contaminants, and toxic organic contaminants. Raw data were converted to subindex and each subindex was multiplied by a weighting factor (a value of 0.1 for chemical, physical and biological factors but 0.15 for toxic substances). The final score ranged between 0 (poor quality) and 100 (best quality) (Lumb et al. 2011a; Tirkey et al. 2015).

Dinius (1987), developed a WQI based on multiplicative aggregation having a scale expressed with values as percentage, where 100% expressed a perfect water quality (Shah and Joshi 2017).

In the mid 90’s, a new WQI was introduced to Canada by the province of British Columbia, and used as an increasing index to evaluate water quality (Lumb et al. 2011b; Shah and Joshi 2017). A while after, the Water Quality Guidelines Task Group of the Canadian Council of Ministers of the Environment (CCME) modified the original British Columbia Water Quality Index (BCWQI) and endorsed it as the CCME WQI in 2001 (Bharti and Katyal 2011; Lumb et al. 2011b).

In 1996, the **Watershed Enhancement Program (WEPWQI)** was established in Dayton Ohio, including water quality variables, flow measurements and water clarity or turbidity. Taking into consideration pesticide and Polycyclic Aromatic Hydrocarbon (PAH) contamination, is what distinguished this index from the NSFQI (Kachroud et al. 2019a, b).

Liou et al. (2003) established a WQI in Taiwan on the Keya River. The index employed thirteen variables: Fecal coliforms, DO, ammonia nitrogen, BOD, suspended solids, turbidity, temperature, pH, toxicity, cadmium (Cd), lead (Pb), copper (Cu) and zinc (Zn). These variables were downsized to nine based on environmental and health significance: Fecal coliforms, DO, ammonia nitrogen, BOD, suspended solids, turbidity, temperature, pH and toxicity. Each variable was converted into an actual value ranging on a scale from 0 to 100 (worst to highest). This index is based on the geometric means (an aggregation function that could eliminate the ambiguous caused from smaller weightings) of the standardized values (Akhtar et al. 2021; Liou et al. 2004; Uddin et al. 2021).

Said et al. (2004) implemented a new WQI using the logarithmic aggregation applied in streams waterbodies in Florida (USA), based on only 5 variables: DO, total phosphate, turbidity, fecal coliforms and specific conductance. The main idea was to decrease the number of variables and change the aggregation method using the logarithmic aggregation (this function does not require any sub-indices and any standardization of the variables). This index ranged from 0 to 3, the latter being the ideal value (Akhtar et al. 2021; Kachroud et al. 2019a, b; Said et al. 2004; Uddin et al. 2021).

The Malaysian WQI (MWQI) was carried out in 2007, including six variables: DO, BOD, Chemical Oxygen Demand (COD), Ammonia Nitrogen, suspended solids and pH. For each variable, a curve was established to transform the actual value of the variable into a non-dimensional sub-index value.

The next step is to determine the weighting of the variables by considering the experts panel opinions. The final score is determined using the additive aggregation formula (where sub-indices values and their weightings are summed), extending from 0 (polluted) to 100 (clean) (Uddin et al. 2021).

The **Hanh and Almeida indices** were established respectively in 2010 on surface water in Vietnam and 2012 on the Potrero de los Funes in Argentina, based on 8 (color, suspended solids, DO, BOD, COD, chloride, total coliforms and orthophosphate) and 10 (color, pH, COD, fecal coliforms, total coliforms, total phosphate, nitrates, detergent, enterococci and *Escherichia coli*.) water quality variables. Both indices were based on rating curve- based sum-indexing system (Uddin et al. 2021).

Katiyar et al (2011) studied the physicochemical parameters of river Ganga at Jajmu (Kanpur). The result revealed high Chromium and BOD, COD and low DO due to several tanneries located in this area at the Ganga river Bank.

Srivastava et al. (2011) collected the sample water to study the current Physico-chemical status and sewage pollution on river Gomti at Lucknow during pre, post & monsoon seasons

of the year 2008 and 2009. The result showed that variation at the whole stretch of river, in terms of temperature, total solids, total dissolved solids, total suspended solid, conductivity, pH, COD, BOD, DO, Total Coliform (TC) for suitability of the water for various uses like drinking and other domestic applications. The researchers concluded that a large number of drains in Lucknow city and industrial discharge are mainly responsible for pollution in Lucknow.

Hussaina et al. (2012) have studied, In the present work we are reported the Physico chemical properties like pH, conductivity, Turbidity, TDS, DO, fluoride, chloride, Sodium, Sulphate, etc. and the values are compared for treated and untreated water samples. The samples were collected from treatment plant of Ahmedpur, Dist Latur. The values change apparently after the treatment of water.

Negi et al. (2013) studied the impact of pulp and paper mill effluents on the river Ganges. Qualitative and quantitative aspects of phytoplankton were undertaken from the four selected sites on the Ganga river in Bijnor (UP), India. They also observed that the water quality parameters such as temperature, pH and phosphate play a decisive role in altering the phytoplankton distribution.

The most recent developed WQI model in the literature was carried out in 2017. This index tried to reduce uncertainty present in other water quality indices. The **West Java Water Quality Index (WJWQI)** applied in the Java Sea in Indonesia was based on thirteen crucial water quality variables: temperature, suspended solids, COD, DO, nitrite, total phosphate, detergent, phenol, chloride, Zn, Pb, mercury (Hg) and fecal coliforms. Using two screening steps (based on statistical assessment), parameter (variable) redundancy was determined to only 9: temperature, suspended solids, COD, DO, nitrite, total phosphate, detergent, phenol and chloride. Sub-indices were obtained for those nine variables and weights were allocated based on expert opinions, using the same multiplicative aggregation as the NSFQWI. The WJWQI suggested 5 quality classes ranging from poor (5–25) to excellent (90–100) (Uddin et al. [2021](#)).

Mohammad et al. (2020) conducted a study on **reduction in Water Pollution in Yamuna River due to lockdown under COVID-19 Pandemic**. They collected & analyzed water quality data of various pollutants from the Central Pollution Control Board (CPCB) for the Yamuna at 5 monitoring stations i.e. Palla, Nizamuddin Bridge, Okhla (U/S), Najafgarh Drain and Shahdara Drain for the period from 1 s March to 7 April 2020 which have been studied in two phases as pre-lockdown phase (11-23 March, 2020) and lockdown phase (24 March - 7 April, 2020). They Found that the concentrations of pH, EC, DO, BOD and COD showed 1-10%, 33-66%, 51%, 45-90% and 33-82% of reduction in pH, EC, DO, BOD and COD concentrations, respectively during the lockdown phase, as compared to the pre-lockdown phase in Yamuna River. Some positive lessons related to nature gave us a way forward for restraining from the natural calamities if care for nature is established with honesty.

Chapter 3

Objective and Scope of Work

3.1 Objective of Work:

- 1) To assess the Physio-chemical and biological parameters of river water of Ganga in West Bengal and Bihar.
- 2) To analyse the various water quality parameters and to determine the overall water quality scenario and to assess the possible water use pattern.
- 3) To find out the gradual changes of water quality along the flow.
- 4) To depict the overall water quality status in river Ganga which will be helpful for the selection of appropriate methodology for abatement of pollution of the river.

3.2 Scope of Work:

- 1) Collection of Secondary Data (Physio-chemical and biological parameters):
Data are collected from the official website of West Bengal Pollution Control Board (WBPCB), Department of Environment, Government of West Bengal and Bihar State Pollution Control Board, Bihar.
- 2) The collected values were compared with the guidelines of Bureau of Indian Standard (Classification of water given in Table 2) for different water use.
- 3) Graphical representation to identify the exact water quality scenario of these rivers in the selected locations.
 - a. Installation of Bio gas plant specially using cattle shed waste for generation of energy (electricity, bio-CNG etc.) as well as minimizing pollution from cattle shed waste into the river.
 - b. Ensuring rational solid waste management system (as per SWM rule, 2016) ensuring rational solid waste management in citizen town in order to stop dumping of solid waste in river.
 - c. Installation of electric crematorium at different strategic location along the bank of the river to stop dumping of dead bodies or half burnt dead bodies into the river.

Chapter 4

Methodology of the work

4.1 Parameter Specification:

Four parameters have been considered for the study, such as BOD, DO, pH & Fecal Coliform.

BOD

Occurrence and significance

Biochemical oxygen demand is an analytical parameter representing the amount of dissolved oxygen (DO) consumed by aerobic bacteria growing on the organic material present in a water sample at a specific temperature over a specific time period. The BOD value is most commonly expressed in milligrams of oxygen consumed per litre of sample during 5 days of incubation at 20 °C and is often used as a surrogate of the degree of organic water pollution.

The presence of a sufficient concentration of dissolved oxygen is critical to maintaining the aquatic life and aesthetic quality of streams and lakes. Determining how organic matter affects the concentration of dissolved oxygen (DO) in a stream or lake is integral to water- quality management. The decay of organic matter in water is measured as biochemical or chemical oxygen demand. Oxygen demand is a measure of the amount of oxidizable substances in a water sample that can lower DO concentrations. Turbidity can affect the DO of water (Mittal & Ratra, 2000).

Heath and Other effects

High BOD is harmful to ecosystems as fish and other aquatic life may suffocate in oxygen – depleted waters. Furthermore, it is important that wastewater treatment processes are design to handle high organic matter loading present in waste waters. If treatment processes have not removed most of this organic matter, Subsequent chlorination of the final effluent will result in high levels of harmful disinfection by products such as THM's, in receiving water such as sensitive rivers and lakes. Maximum permissible value of BOD for bathing water is 3 mg/litre (The Biochemical Oxygen Demand of 3 mg/l or less of the water ensures reasonable freedom from oxygen demanding pollutants and prevent production of obnoxious gases).

Dissolved oxygen (DO)

Occurrence and significance

Dissolved oxygen refers to the level of free, non-compound oxygen present in water or other liquids. It is an important parameter in assessing water quality because of its influence on the organisms living within a body of water. A dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality. DO is considered an important measure of water quality as it is a direct indicator of an aquatic resource's ability to support aquatic life. All aquatic animals need DO to breath. Low levels of oxygen (hypoxia) or no oxygen levels (anoxia) can occur when excess organic materials, such as large algal blooms, are decomposed by microorganisms. During this decomposition process, DO in the water is consumed. Low oxygen levels often occur in the bottom of the water column and affect organisms that live in

the sediments. In some water bodies, DO levels fluctuate periodically, seasonally and even as part of the natural daily ecology of the aquatic resource. As DO levels drop, some sensitive animals may move away, decline in health or even die. To determine concentration of DO Winkler test is used. Dissolved oxygen (D.O.) is widely used in water quality testing. Dissolved oxygen is necessary to many forms of life including fish, invertebrates, bacteria and plants. These organisms use oxygen in respiration, similar to organisms on land. Fish and crustaceans obtain oxygen for respiration through their gills, while plant life and phytoplankton require dissolved oxygen for respiration when there is no light for photosynthesis. Microbes such as bacteria and fungi also require dissolved oxygen. These organisms use DO to decompose organic material at the bottom of a body of water. Microbial decomposition is an important contributor to nutrient recycling. However, if there is an excess of decaying organic material (from dying algae and other organisms), in a body of water with infrequent or no turnover (also known as stratification), the oxygen at lower water levels will get used up quicker. The variations in dissolved oxygen observed may also be because of time of the day when it is measured. In aquatic ecosystems, the DO usually occur maximum in the afternoon and minimum during night or when the sunlight is less. The minimum dissolved oxygen concentration of 5 mg/l ensures reasonable freedom from oxygen consuming organic pollution immediately upstream which is necessary for preventing production of anaerobic gases (obnoxious gases) from sediment.

Health and Other effects

If DO content in water is decrease, then the stress on aquatic life increased. Fish 'breathe' oxygen through their gills, and are able to absorb oxygen directly from water into their bloodstream. A concentration of 5 mg/l DO is recommended for optimum fish health. Sensitivity to low levels of dissolved oxygen is species specific, however, most species of fish are distressed when DO falls between 2 and 4 mg/l. Death usually occurs at concentrations less than 2 mg/l. larger fish affected by low DO before smaller fish. The number of fish that die during an oxygen depletion event is determined by how low the DO gets and how long it stays down.

pH

Occurrence and significance

pH is defined as negative log of the hydrogen ion concentration of the solution. This is a measure of the ionized hydrogen in solution. Simply, it is the relative acidity or alkalinity of the solution. Measurement of PH is one of the most important and frequently used tests in water chemistry. Practically every phase of water supply and waste water treatment, example, aside base neutralization, water softening precipitation, coagulation, disinfection and corrosion control, is PH dependent. PH is use in alkalinity and carbon di-oxide measurement and many other acids base equilibrium. pH can directly affect the elemental mobilization.

Health and other effects

All chemical and biological processes in the water are PH dependent. For example, different organisms flourish with in different PH ranges. The largest variety of aquatic animals prefers a range of 6.5-9. PH outside this range reduces the diversity in the stream because it stresses the physiological systems of most organisms and can reduce reproduction pH4 and pH10.1 are the

minimum and maximum limits for the most resistant species to survive in water low or high pH can produce conditions that are too toxic to aquatic life, particularly to sensitive species. The permissible level of pH in drinking water is 6.5 to 8.5 (The range provides protection to the skin and delicate organs like eyes, nose, ears etc. which are directly exposed during outdoor bathing) as per {IS: 10500:2012}, beyond this limit test becomes unpleasant.

Fecal Coliform

Occurrence and significance

Fecal coliforms are the organisms most commonly used to monitor the removal of pathogens from waste water treatment plants. This indicator has been compared with other indicators and salmonellae, campylobacter and with *V. cholera* and found to be adequate. Fecal coliform bacteria are the naturally occurring bacteria found in the digestive tracts of most animals. These beneficial organisms aid in digestion, converting certain indigestible fibers and compounds into nutritious compounds. Fecal coliform bacteria are shed along with excrement, and can colonize other individuals or even species different than their original host. Infections from a foreign body's fecal coliform bacteria are typically nonfatal, although severe symptoms can lead to death. Two to four days following infection from fecal coliform bacteria, symptoms such as diarrhea, stomach cramps, headaches, and fever arise. Antibiotics can successfully treat fecal coliform infections, although there is some concern that antibiotic-resistant strains of fecal coliform bacteria are developing. Outside of their preferred host environment, fecal coliform bacteria can survive for weeks; *E. coli*, one of the most common human fecal coliform bacteria, can survive in drinking water from between four to 12 weeks, and can lead to widespread human illness. Some fecal coliform bacteria can also become airborne, and can be inhaled or settle onto surfaces, later to be transferred onto new hosts and ingested or introduced onto mucous membranes. Fecal coliform is very important to be measured in water (APHA 1989).

Health and Other effects

One of the most damaging environmental effects of fecal coliform bacteria stems from contamination of aquatic systems, which can either be from the direct introduction of human or animal waste into waterways, or from wastewater treatment plants, septic systems, or agricultural runoff. Pet waste also contributes heavily to the contamination of freshwater systems by fecal coliform bacteria; some estimates suggest that nonpoint source, rather than point sources for fecal coliform pollution, represent a larger share of water contamination. Contamination of estuaries and marine systems with fecal coliform bacteria can halt shellfish harvesting and even lead to beach closures. Introduction in waterways and other aquatic systems can result in competition for resources with native bacteria, with effects noticeable in higher trophic levels. Additionally, the presence of fecal coliform bacteria typically indicates the incidence of more dangerous pathogens or parasites. The maximum permissible value of Fecal coliform for bathing criteria is 2500 MPN/100 ml.

4.2 Tolerance and Classification of Water

As per ISI-IS: 2296-1982, the tolerance limits of parameters are specified as per classified use of water depending on various uses of water. The following classifications have been adopted in India.

Table 1 : Classification of Water		
Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less
		pH between 6.5 and 8.5
		Dissolved Oxygen 6mg/l or more
		Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pHbetween 6.5 and 8.5 Dissolved Oxygen 5mg/l or more
		Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pHbetween 6 to 9 Dissolved Oxygen 4mg/l or more
		Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more
		Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5
		Electrical Conductivity at 25C micro mhos/cm Max.2250
		Sodium absorption Ratio Max. 26
		Boron Max. 2mg/l



भारत का राजपत्र The Gazette of India

असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (i)

PART II—Section 3—Sub-section (i)

प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

सं. 494]

नई दिल्ली, सोमवार, सितम्बर 25, 2000/आश्विन 3, 1922

No. 494]

NEW DELHI, MONDAY, SEPTEMBER 25, 2000/ASVINA 3, 1922

पर्यावरण और वन मंत्रालय

अधिसूचना

नई दिल्ली, 25 सितम्बर, 2000

सा. का. नि. 742(अ).—केन्द्रीय सरकार, पर्यावरण (संरक्षण) अधिनियम, 1996 (1996 का 29) की धारा 6 और धारा 25 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, पर्यावरण (संरक्षण) नियम, 1996 का और संशोधन करने के लिए निम्नलिखित नियम बनाती है, अर्थात् :—

1. (1) इन नियमों का संक्षिप्त नाम पर्यावरण (संरक्षण) संशोधन नियम, 2000 है।

(2) इस अधिसूचना में अन्यथा जैसा उपबंधित है उसके सिवाय, वे राजपत्र में प्रकाशन की तारीख को प्रवृत्त होंगे।

2. पर्यावरण (संरक्षण) नियम, 1986 में,—

(1) अनुसूची 1 में पटाखों के लिए शोर मानकों से संबंधित क्रम संख्याक 89 और उससे संबंधित प्रविष्टियों के पश्चात् निम्नलिखित क्रम संख्याक और उनसे संबंधित प्रविष्टियां अन्तःस्थापित की जाएंगी, अर्थात् :—

“90. कोयला खानों के लिए मानक

1. वायु क्वालिटी मानक

निम्नलिखित धूल उत्पादक स्रोतों से 500 मीटर की दूरी पर प्रबल हवा की दशा पर विचार करते हुए नीचे की ओर हवा की दिशा में निलंबित कणिकीय पदार्थ (एस. पी. एम.), अन्तः श्वसनीय कणिकीय पदार्थ (आर. पी. एम.), सल्फर डाईआक्साइड (एस ओ₂) और नाइट्रोजन आक्साइड (एन ओ₂) का संकेन्द्रण नीचे दी गई सारणी-I, और II, और III में विनिर्दिष्ट मानकों से अधिक नहीं होगा।

धूल उत्पादन के स्रोत

लड़ाई या उतराई, कर्पण मड़क, कोयला परिवहन मड़क, कोयला हथालने का संयंत्र (मी. एच. बी.) रेल सरकवां, विस्फोट, छेदन अधिक ऊंचे ढेर या कोई अन्य धूल उत्पादन के बाहरी स्रोत जैसे कोक भट्टी (कठोर तथा मुलायम), इष्टिका उद्योग, पास की मड़क आदि।

टिप्पण :—1. जहां उपचारित बहिस्त्राव ऐसे नगर सीवर में डाला जाता है जो अंतिम उपचार संयंत्र में जाता है, वहां जैव-रसायन आक्सीजन मांग (बी ओ डी) की 100 मि.ग्रा./लि. तक और रसायन आक्सीजन मांग (सी ओ डी) की 400 मि.ग्रा./लि. तक छूट दी जा सकेगी।

2. बहिस्त्राव की क्वालिटी (एक लिटर प्रति किलोग्राम उत्पाद) संयुक्त सूती वस्त्र उद्योग संयुक्त ऊनी वस्त्र उद्योग और टैक्सटाइल प्रसंस्करण उद्योग में क्रमशः 100, 250 और 80 होगी।

93. स्नान-जल के लिए प्राथमिक जल क्वालिटी मानदंड

जलाशय या उसके भाग में के जल का कई प्रकार से उपयोग किया जाता है। जल के उपयोगों और क्रियाकलापों के प्रकार पर निर्भर रहते हुए जल क्वालिटी की कसौटी किसी विशिष्ट प्रयोजन के लिए उसकी उपयुक्तता अवधारित करने के लिए विनिर्दिष्ट कर दी गई है। विभिन्न प्रकार के उपयोगों में एक उपयोग यह भी है जो जल के उच्चतर स्तर की क्वालिटी या शुद्धता की मांग करता है और उस जलाशय के विस्तार में उसे "अभिहित सर्वोत्तम उपयोग" के रूप में जाना जाता है। इस पर आधारित प्राथमिक जल क्वालिटी की कसौटी के निबंधनों के अनुसार विभिन्न उपयोगों के लिए जल क्वालिटी अपेक्षाएं विनिर्दिष्ट की गई हैं। सारणी 1 में स्नान-जल के लिए प्राथमिक जल क्वालिटी की तर्कयुक्त कसौटी विनिर्दिष्ट की गई है।

सारणी 1

स्नान-जल के लिए प्राथमिक जल क्वालिटी मानदंड

(संगठित बाह्य स्नान के लिए प्रयुक्त जल)

मानदंड		तर्कआधार
1. फिकल	500 (वांछनीय)	निम्न मल जल संदूषण सुनिश्चित करने के लिए,
कोली फॉर्म	2500 (अधिकतम अनुज्ञेय)	फिकल कोलीफॉर्म और फिकल स्ट्रेप्टोकोक्का के
एम. पी. एन./100 मि.लि.		बारे में यह माना गया है कि वे जीवाणु रोगोत्पादकता
2. फिकल स्ट्रेप्टोकोक्की	100 (वांछनीय)	को दर्शित करते हैं। वांछनीय और अनुज्ञेय सीमाएं
एम. पी. एन./100 मि.लि.	500 (अधिकतम अनुज्ञेय)	पर्यावरणिय दशाओं में उतार-चढ़ाव
		को अनुज्ञात करने के लिए सुझाव देती हैं जैसे कि
		मौसमी परिवर्तन, बहाव की दशाओं में परिवर्तन
		आदि।
2. पी. एस.	6.5 से 8.5 के बीच	यह रेंज त्वचा और आँख, नाक, कान आदि जैसे
		कोमल अंगों को संरक्षण प्रदान करती है जो वाह्य
		स्नान के दौरान सीधे प्रभावित होते हैं।
3. घुली हुई आक्सीजन		5 मि.ग्रा./लि. के न्यूनतम घुली हुई आक्सीजन
		संकेन्द्रण ठीक ऊपरीधारा में आर्गनिक प्रदूषण युक्त
		आक्सीजन लेने से युक्तियुक्त मुक्ति सुनिश्चित करते
		हैं जो तलछट से अनाइरोबिक गैसों (आबनोक्सीयम
		गैसों) के उत्पादन को निवारित करने के लिए
		आवश्यक है।
4. जैव-रसायन		3 मि.ग्रा./लि. या इससे कम जल की जैव रसायन
आक्सीजन मांग (बी ओ डी)		आक्सीजन मांग आक्सीजन डिमांडिंग प्रदूषकों
(27° से. पर 3 दिन)		से युक्तियुक्त मुक्ति सुनिश्चित करती है और
		आबनाक्सीयस गैसों के उत्पादन को रोकती है।"

(2) अनुसूची 6 के शोर मान दंडों से संबंधित भाग ड में, मोटरगाड़ियों के लिए शोर सीमा से संबंधित भाग क के पश्चात् निम्नलिखित अन्तः स्थापित किया जाएगा :—

“कक. 1 जनवरी, 2003 से मोटर यानों के लिए शोर सीमा

मोटर यानों के लिए निम्नलिखित शोर सीमा 1 जनवरी, 2003 से लागू होगी। अनुसरण किए जाने वाली परीक्षण पद्धति भा मा.

MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 25th September, 2000

G.S.R. 742(E).— In exercise of the powers conferred by sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Environment (Protection) Rules, 1986, namely.

1. (1) These rules may be called the Environment (Protection) Amendment Rules, 2000.
(2) Save as otherwise provided in this notification, they shall come into force on the date of their publication in the Official Gazette.
2. In the Environment (Protection) Rules, 1986,—
 - (1) In Schedule I, after serial number 89 relating to Noise standards for fire crackers and the entries relating thereto, the following serial numbers and entries shall be inserted, namely:—

“90. Standards for coal mines**1. Air Quality Standards**

The Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO₂) and Oxides of Nitrogen (NO_x) concentration in downwind direction considering predominant wind direction, at a distance of 500 metres from the following dust generating sources shall not exceed the standards specified in the Tables I, II and III given below:

Dust Generating Sources

Loading or unloading, Haul road, coal transportation road, Coal handling plant (CHP), Railway siding, Blasting, Drilling, Overburden dumps, or any other dust generating external sources like coke ovens (hard as well as soft), briquette industry, nearby road etc.

93. Primary Water Quality Criteria for Bathing Waters.

In a water body or its part, water is subjected to several types of uses. Depending on the types of uses and activities, water quality criteria have been specified to determine its suitability for a particular purpose. Among the various types of uses there is one use that demands highest level of water quality or purity and that is termed as "Designated Best Use" in that stretch of water body. Based on this, water quality requirements have been specified for different uses in terms of primary water quality criteria. The primary water quality criteria for bathing water are specified along with the rationale in table 1.

Table 1.

PRIMARY WATER QUALITY CRITERIA FOR BATHING WATER
(Water used for organised outdoor bathing)

CRITERIA		RATIONALE
1. Fecal Coliform MPN/100 ml:	500 (desirable) 2500 (Maximum Permissible)	To ensure low sewage contamination. Fecal coliform and fecal streptococci are considered as they reflect the bacterial pathogenicity.
2. Fecal Streptococci MPN/100 ml:	100 (desirable) 500 (Maximum Permissible)	The desirable and permissible limits are suggested to allow for fluctuation in environmental conditions such as seasonal change, changes in flow conditions etc.
2. pH:	Between 6.5 –8.5	The range provides protection to the skin and delicate organs like eyes, nose, ears etc. which are directly exposed during outdoor bathing.
3. Dissolved Oxygen:	5 mg/l or more	The minimum dissolved oxygen concentration of 5 mg/l ensures reasonable freedom from oxygen consuming organic pollution immediately upstream which is necessary for preventing production of anaerobic gases (obnoxious gases) from sediment.
4. Biochemical Oxygen demand 3 day, 27°C:	3 mg/l or less	The Biochemical Oxygen Demand of 3 mg/l or less of the water ensures reasonable freedom from oxygen demanding pollutants and prevent production of obnoxious gases";

4.3 Methodology of the work in details

Secondary data of 15 locations of West Bengal have been collected from official website of West Bengal Pollution Control Board. 15 different locations such as Baharampore, Dakhineswar, Diamond Harbour, Durgachak near Patikhali, Farakka, Garden Reach, Murshidabad, Shivpur, Khagra, Nawadip ghospara, Palta shitalatala, Palta, Serampore, Tribeni & Uluberiya of River Ganga.

Also secondary data for 18 locations of Bihar have been collected from official website of Bihar State Pollution Control Board. These locations are D/S Buxar near Veer Kunwar Singh Road Bridge , Ara-Chapra Road Bridge , Maa Ambika Asthan, Gandhighat, Gulabi Ghat, Gaighat , Malsalami – Patna , Kachchi-Dargah Bidupur near Road Bridge , Triveni Ghat , Kewala Ghat , Bakhtiyarpur- Tajpur Bridge near Athmalgola , U/S Mokama Mahadeo Asthan , Barahiya Nepalatala, U/S Sultanganj, Ajgaibinath Mandir, D/S cremation Ghat at Sultanganj – Bhagalpur, Champanagar , water intake point – Bhagalpur, Bhagalpur near Bararighat.

These collected data are of river Ganga for 33 different locations and in every month from year 2021 to 2023. Here in my present study 4 parameter have been considered such as BOD, DO, pH & Fecal Coliform. After that water quality data of these 4 parameters for each month were segregated & plotted with respect to time (year/month). From there we got different trend line for different parameter which is broadly described in the result and section.

4.4 Data

West Bengal pollution Control Board has provided water quality data of river water for Ganga in different districts of West Bengal. Similarly, Bihar State pollution Control Board has also provided water quality data of river water for Ganga in different districts of Bihar.

Figures below shows the google earth images of all the sampling locations.



Fig.4.4.1. D/S Buxar near Veer Kunwar Singh Road Bridge



Fig.4.4.2. Gaighat , D/S Patna



Fig.4.4.3. Malsalami , Patna

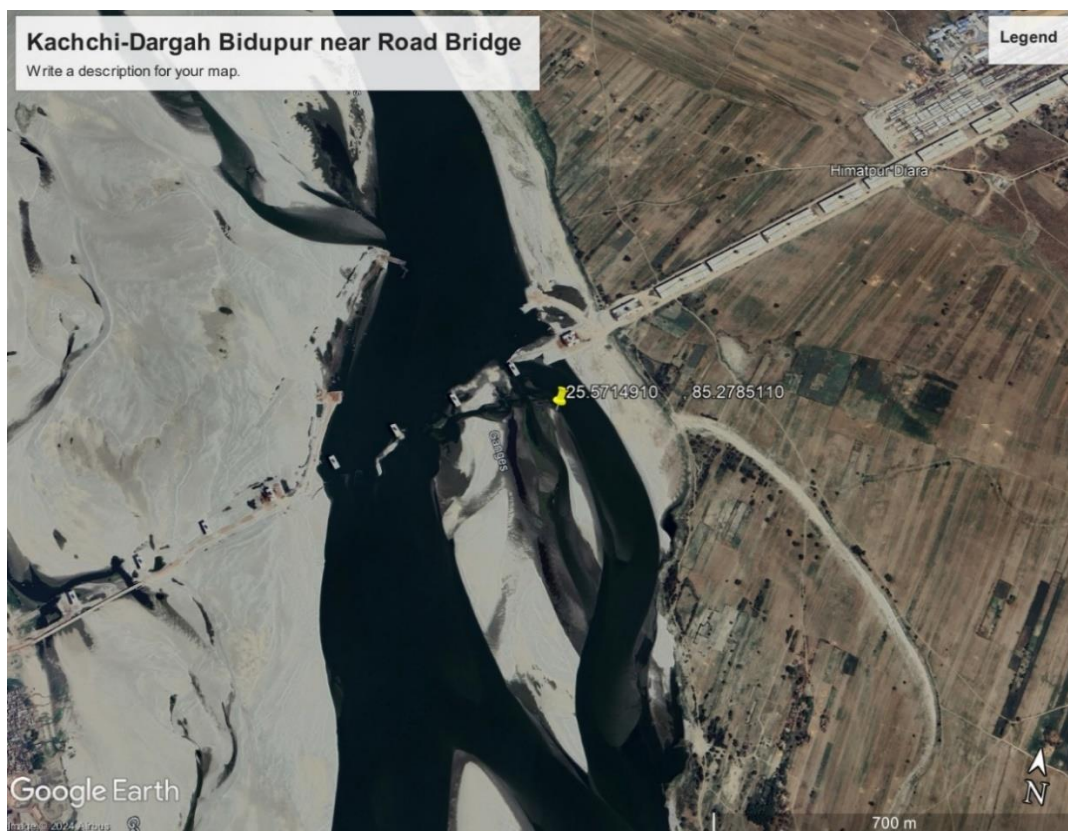


Fig.4.4.4. Kachchi-Dargah Bidupur near Road Bridge



Fig.4.4.5. Ara-Chapra Road Bridge



Fig.4.4.6. Maa Ambika Asthan, AAMI, SARAN



Fig.4.4.7. Triveni Ghat , Patna



Fig.4.4.8. Gandhighat, NIT Patna



Fig.4.4.9. Kewala Ghat , Fatuha



Fig.4.4.10. Bakhtiyarpur- Tajpur Bridge near Athmalgola



Fig.4.4.11. U/S Mokama , Mahadeo Asthan



Fig.4.4.12. Bhagalpur near Bararighat



Fig.4.4.13. U/S Sultanganj, Ajgaibinath Mandir, Bhagalpur

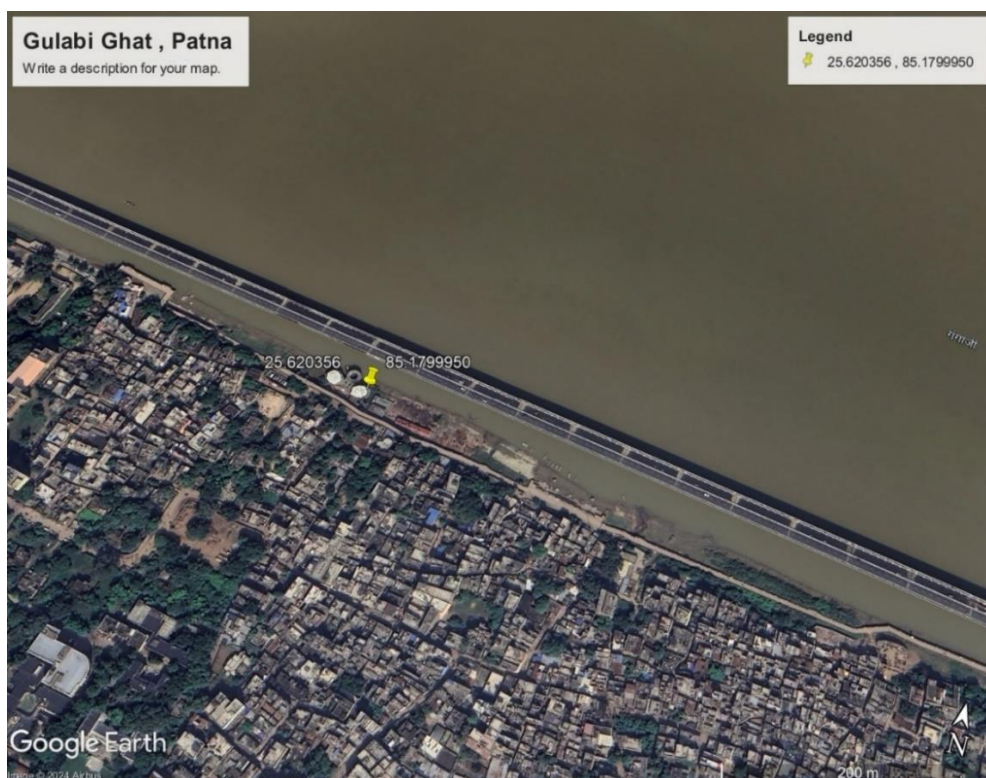


Fig.4.4.14. Gulabi Ghat, Patna

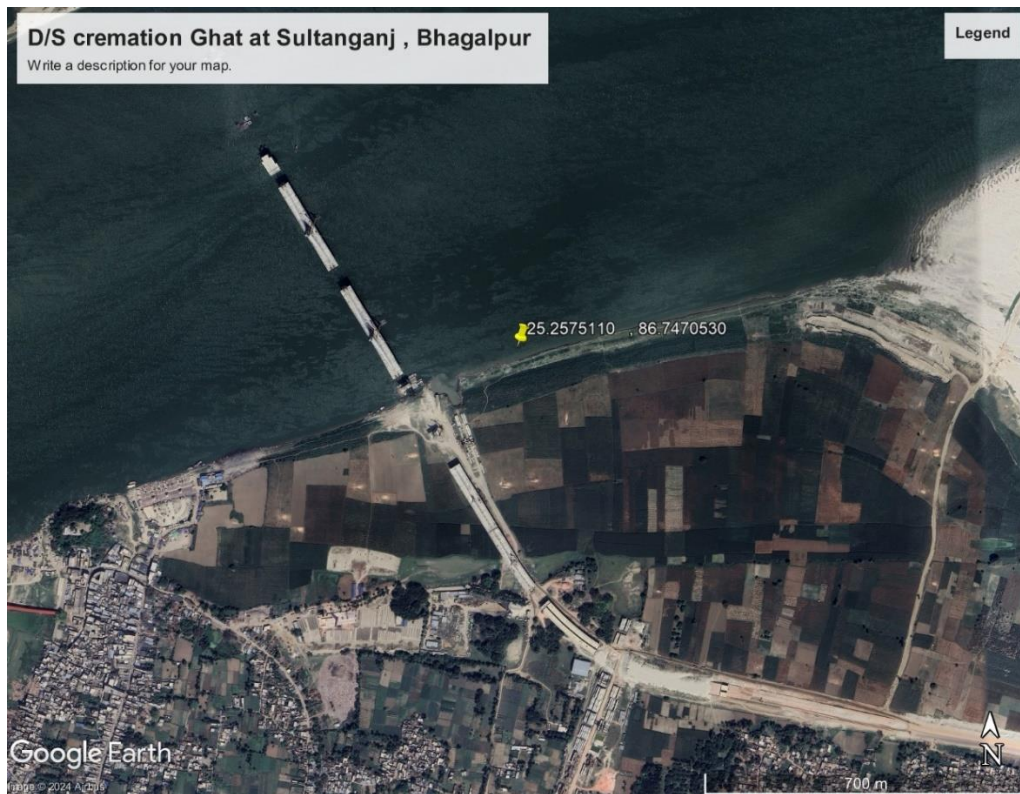


Fig.4.4.15. D/S cremation Ghat at Sultanganj , Bhagalpur



Fig.4.4.16. Champanagar ,Bhagalpur



Fig.4.4.17. Barahiya ,Nepaltala, Maranchi



Fig.4.4.18. water intake point , Bhagalpur

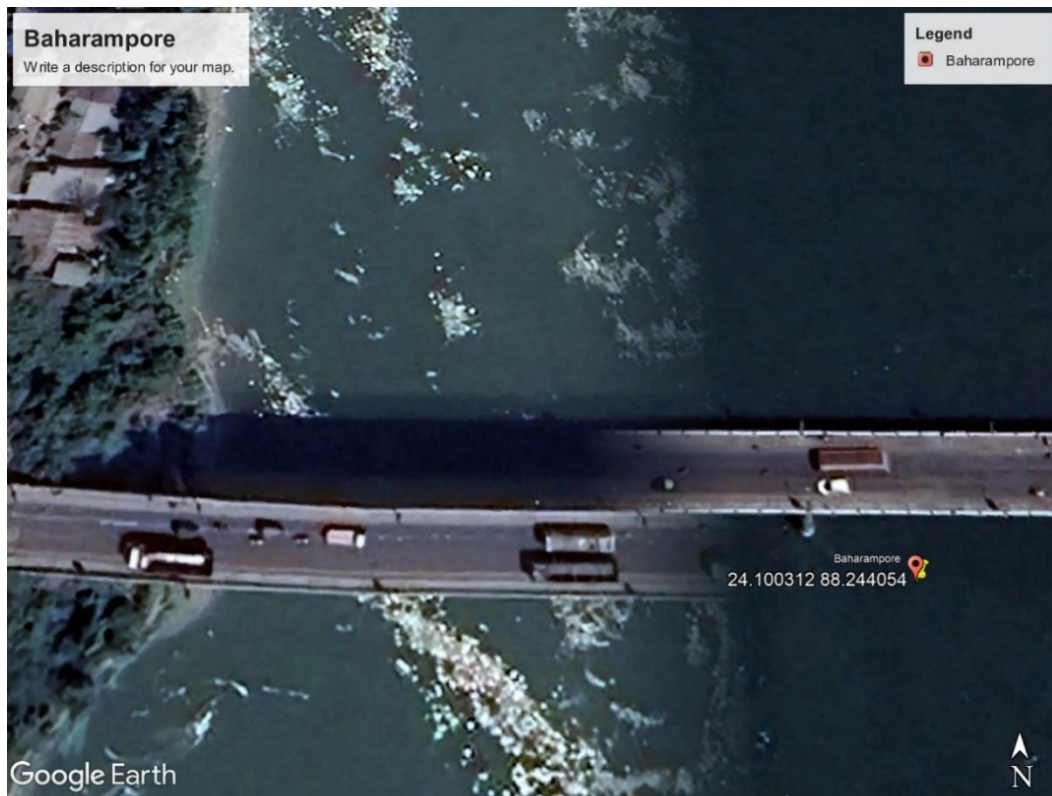


Fig.4.4.19. Baharampore

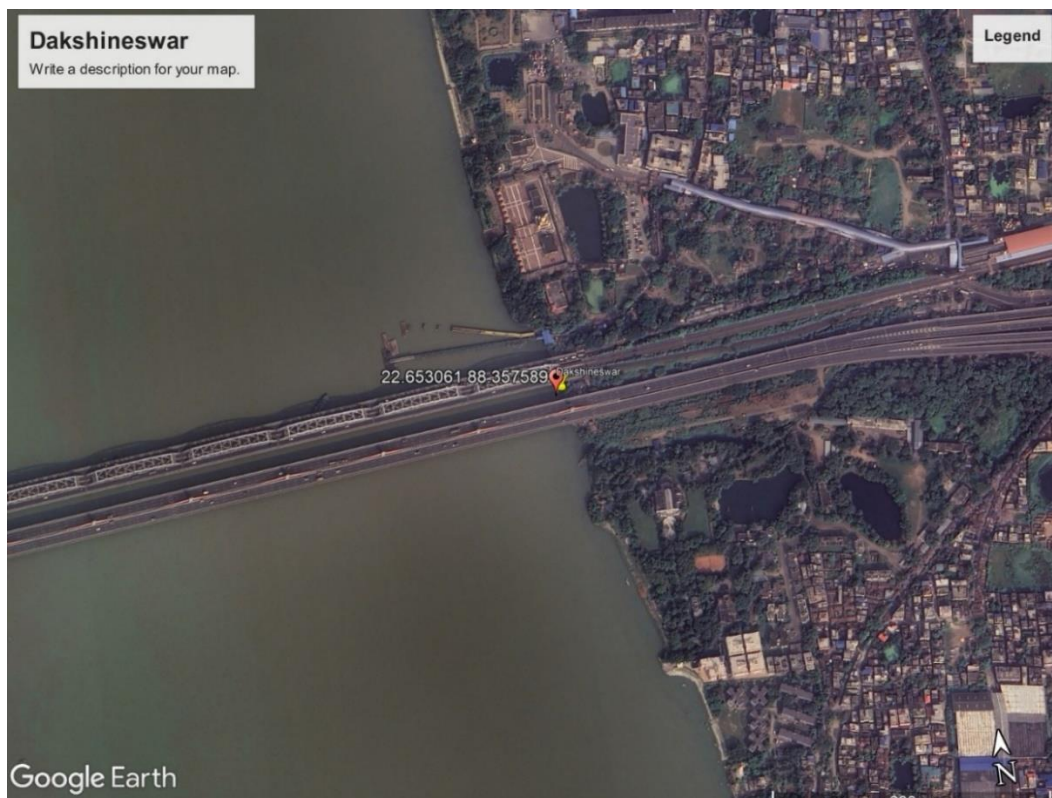


Fig.4.4.20. Dakshineswar



Fig.4.4.21. Diamond Harbour

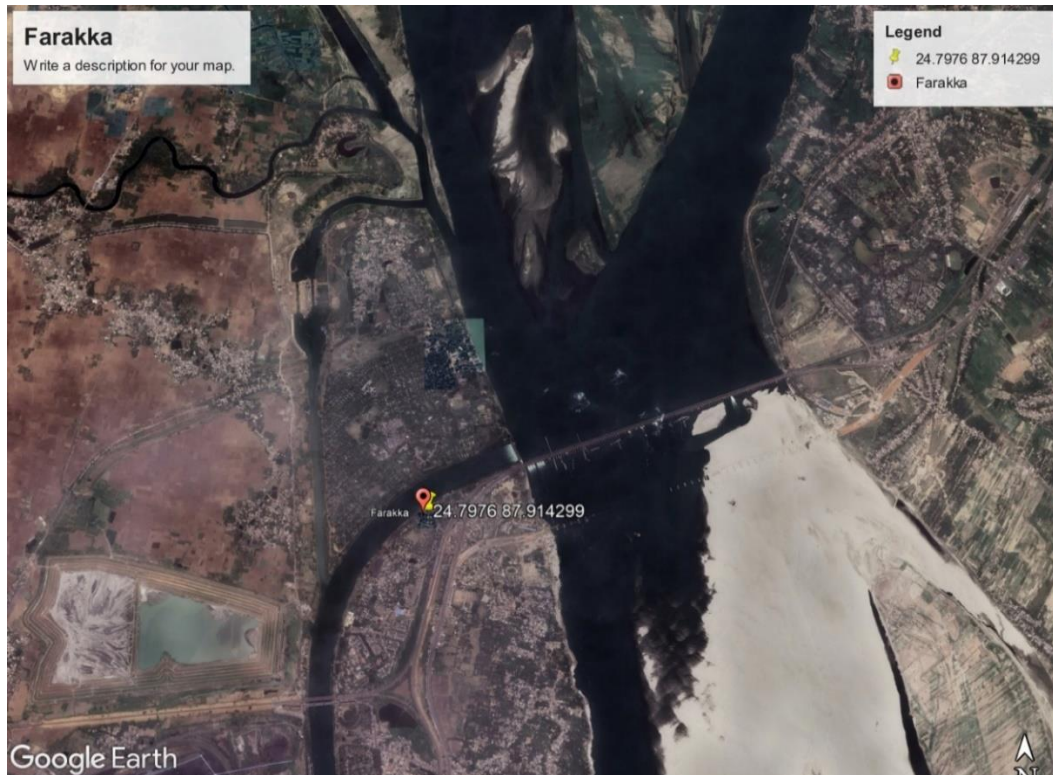


Fig.4.4.22. Farakka

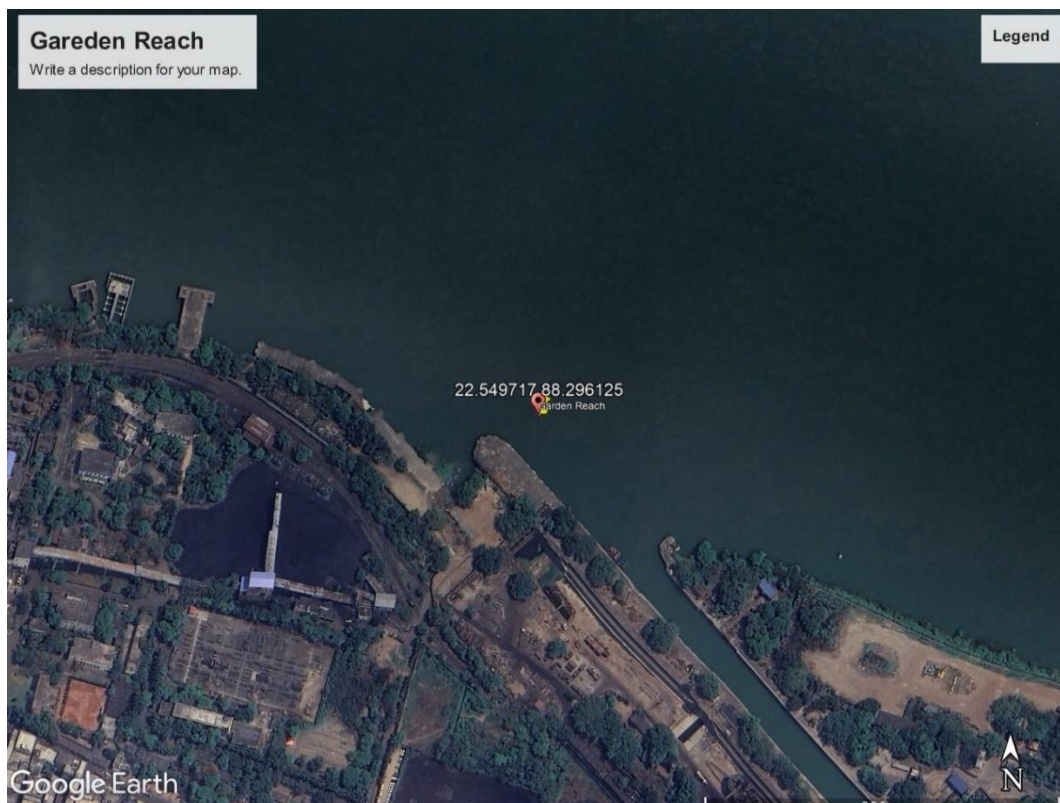


Fig.4.4.23. Garden Reach

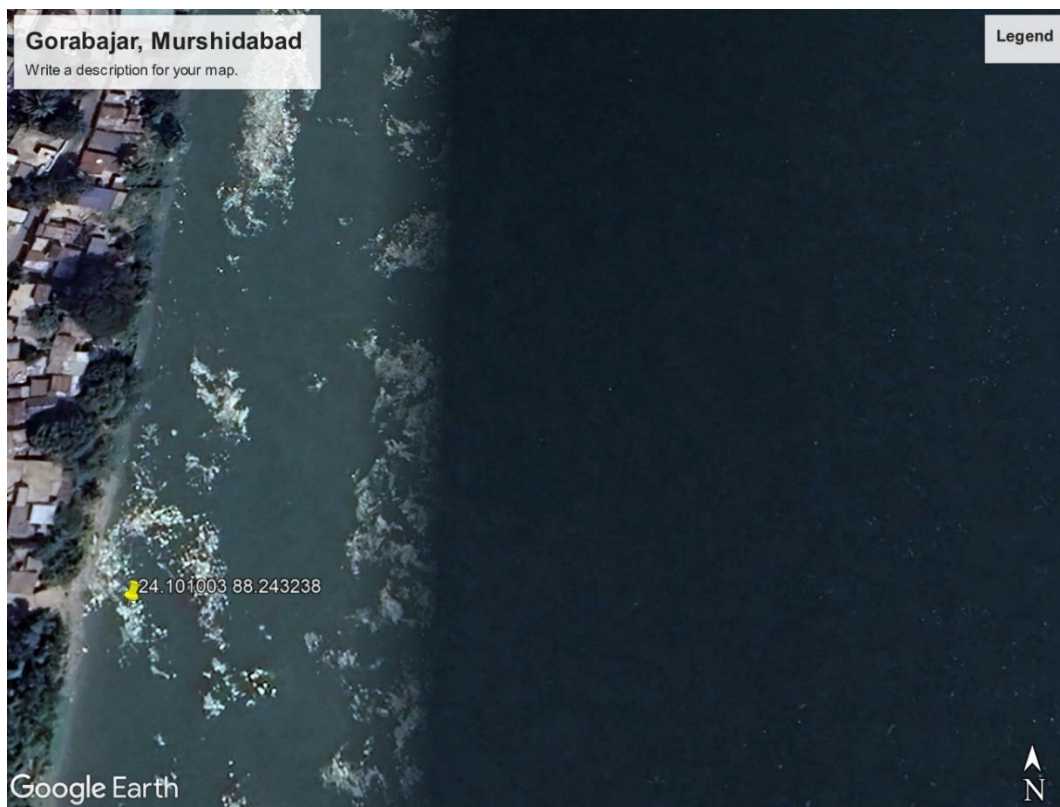


Fig.4.4.24. Gorabajar, Murshidabad

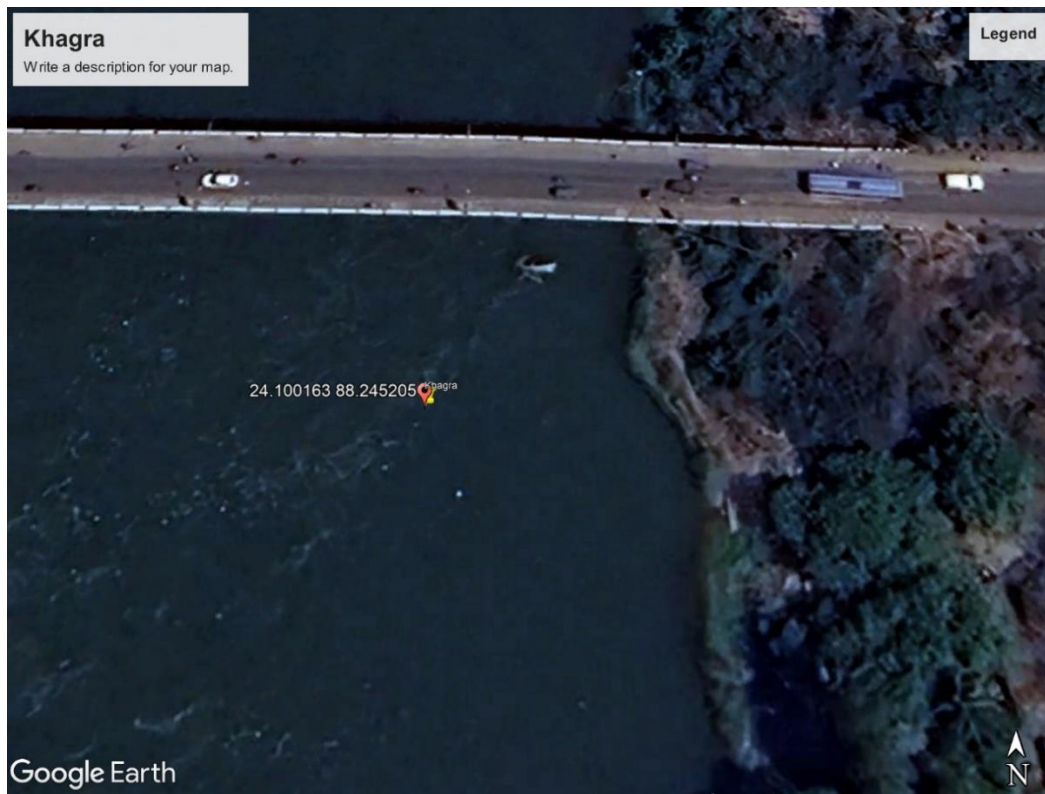


Fig.4.4.25. Khagra



Fig.4.4.26. Nawadip, Ghoshpara



Fig.4.4.27. Palta, Shitaltala

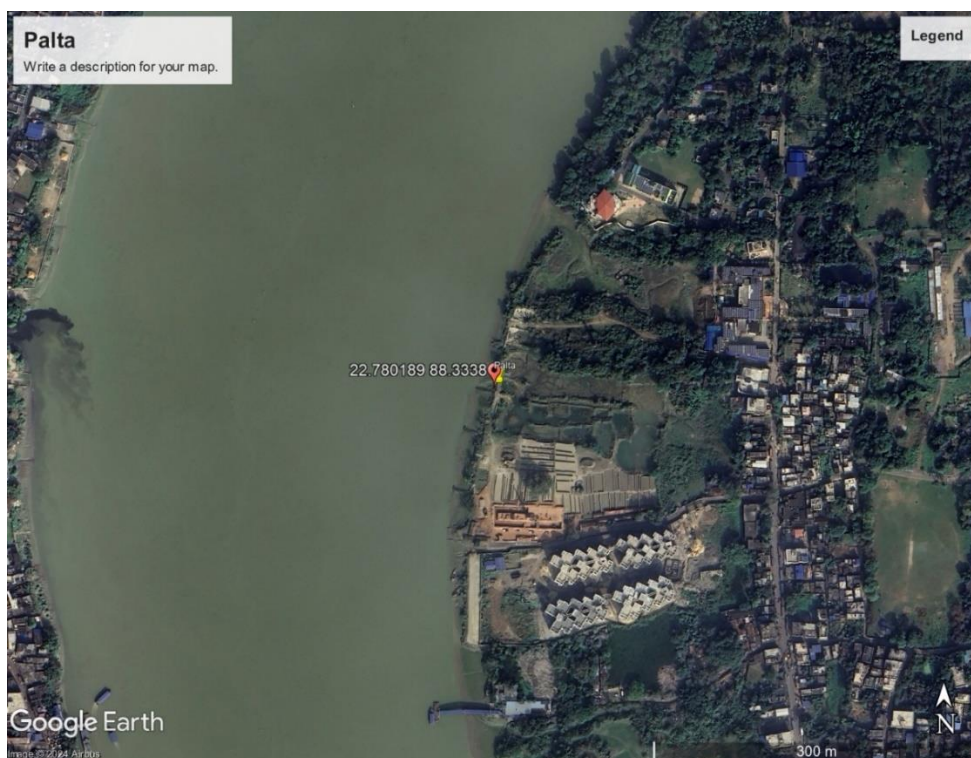


Fig.4.4.28. Palta

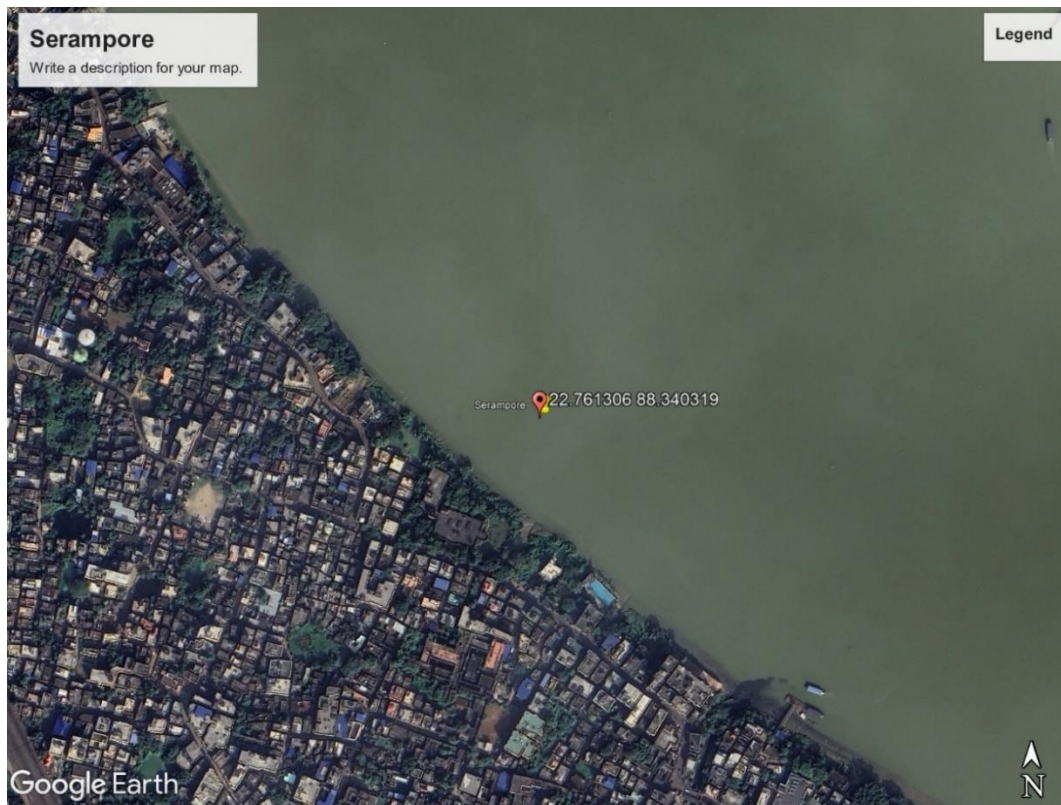


Fig.4.4.29. Serampore

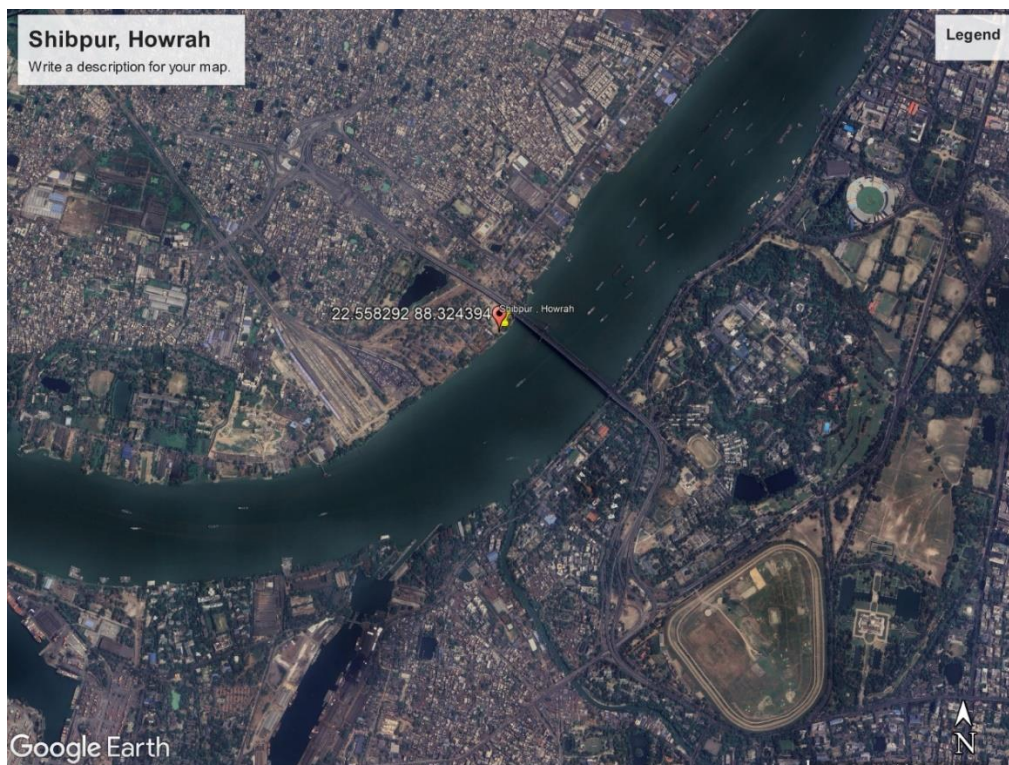


Fig.4.4.30. Shibpur , Howrah

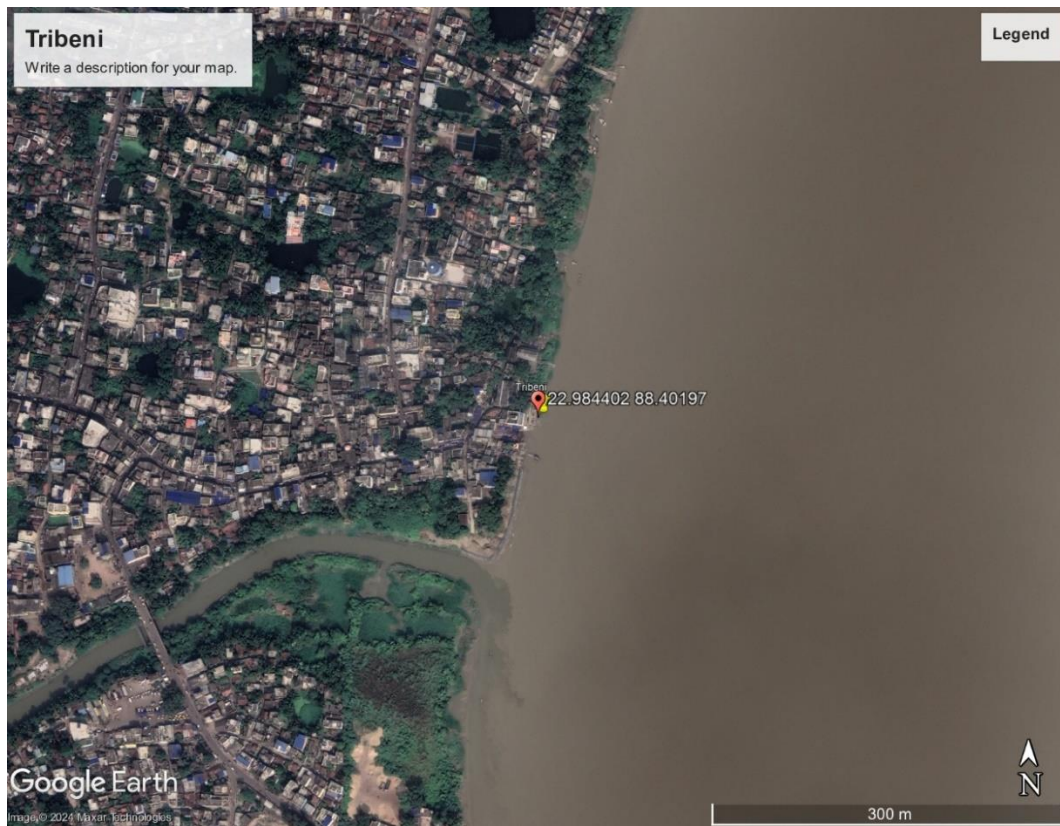


Fig.4.4.31. Tribeni



Fig.4.4.32. Uluberia

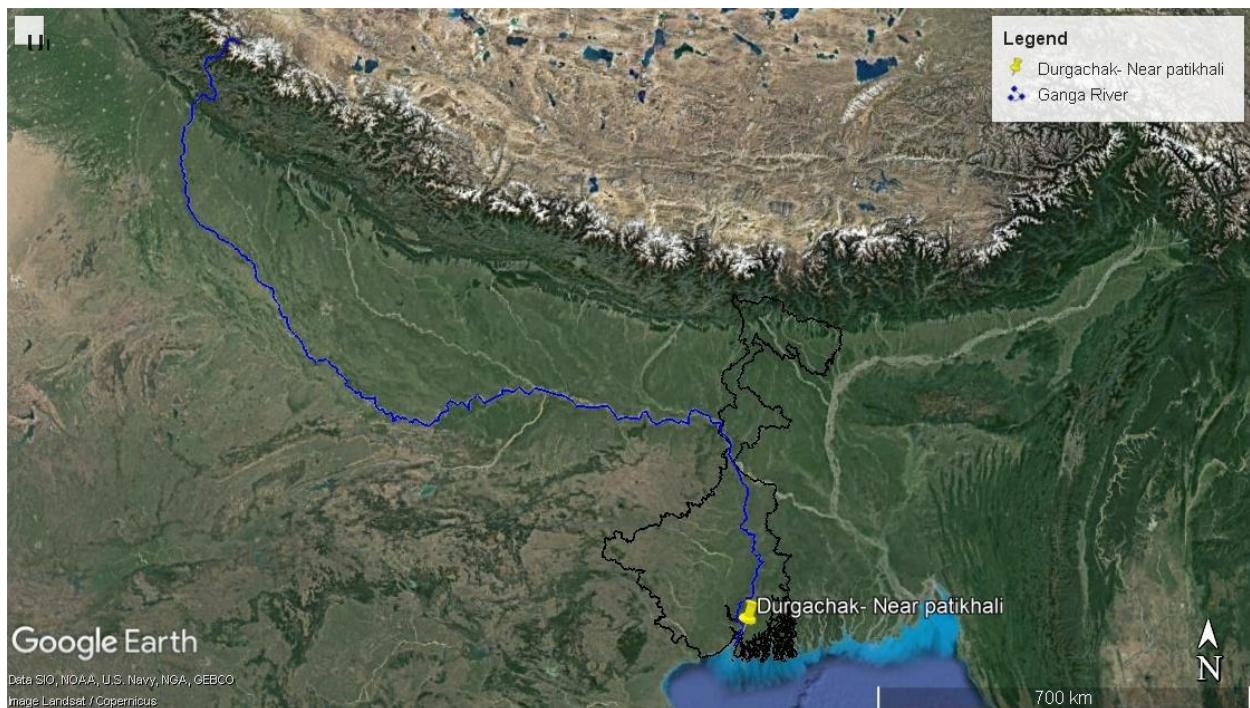


Fig.4.4.33. Durgachak Patikhali

4.4.1 River Ganga

The Ganga originates from the ice caves at Gaumukh (N 30°55', E 79°7') at an elevation of 4100 m. Alaknanda, its main tributary in the mountainous stretch, rises beyond Manna Pass, 8 km from Badrinath (N 30°44', E 79°41') at an altitude of 3123 m, and meets at Devprayag. The Ganga traverses a distance of ≈ 2510 km from its source to its mouth (Ganga Sagar), draining eleven states of India. In her course she is joined by many tributaries, important being Bhilangana, Alaknanda, Ramganga, Kali, Yamuna, Gomti, Ghagra, Gandak, Kosi and Sone. The entire stretch of river Ganga (main stem) can be viewed into three segments:

- A. Upper Ganga ≈ 294 km Gaumukh to Haridwar**
- B. Middle Ganga ≈ 1082 km Haridwar to Varanasi**
- C. Lower Ganga ≈ 1134 km Varanasi to Ganga Sagar**

The Ganges is a lifeline to millions of people who live in its basin and depend on it for their daily needs. It has been important historically, with many former provincial or imperial capital such as Pataliputra, Munger, Kashi, Patna, Hajipur, Delhi, Bhagalpur, Murshidabad, Baharampur, Kampilya and Kolkata located on its banks or the banks of tributaries and connected waterways.



Fig.4.4.1.1. River Ganga near Howrah Bridge, West Bengal

The Ganga along with its large number of tributaries originating in the Himalayan ranges viz., the Yamuna, the Gomati, the Ghaghara, the Gandak, the Kosi, etc. have brought large quantities of alluvium from the mountains and deposited it here to build this extensive plain. The peninsular rivers such as Chambal, Betwa, Ken, Son, etc. joining the Ganga river system have also contributed to the formation of this plain. The general slope of the entire plain is to the east and south east. Depending upon its geographical variations, this plain can be further subdivided into the following three divisions:

a) The Upper Ganga Plain -Comprising the upper part of the Ganga Plain, this plain is delimited by the 300 m contour in Shiwaliks in the north, the Peninsular boundary in the south and the course of the Yamuna river in the west. The plain is drained by the Ganga and its tributaries like the Yamuna, the Ram Ganga, the Sarda, the Gomati and the Ghaghara rivers. The western part of this plain consists of comparatively higher Ganga-Yamuna Doab. East of this doab are the low lying Rohilkhand plains which merge into the Avadh plains further east. The Ghaghara is the main stream of the Avadh Plains.

b) The Middle Ganga Plain- To the east of the Upper Ganga plain is Middle Ganga plain occupying eastern part of Uttar Pradesh and Bihar. This plain is drained by the Ghaghara, the Gandak and the Kosi rivers, all tributaries of the Ganga coming from the Himalayas. It has long been called the ‘Sorrow of Bihar’. Strenuous efforts both by India and Nepal are being made to tame this river. The major units of this plain are Ganga-Ghaghara doab, Ghaghara-Gandak doab and Gandak-Kosi doab (Mithila Plain).



Fig.4.4.4.2. River Ganga at Patna, Bihar

c) The Lower Ganga Plain- This plain includes the Kishanganj tehsil of Purnea district in Bihar, the whole of West Bengal (excluding the Purulia district and the mountainous parts of Darjeeling district) and most parts of Bangladesh. It measures about 580 km from the foot of the Darjeeling Himalaya in the north to Bay of Bengal in the south and nearly 200 km from the Chotanagpur Highlands in the West to the Bangladesh border in the east. The northern part of this plain has been formed by the sediment deposited by the Tista, Jaldhaka and Torsa. Besides, this area is marked by the Duars (Darjeeling Tarai) and the Barind plain, a tract of old alluvium between the Kosi-Mahananda corridor in the west and the river Sankosh in the east. The delta formation accounts for about two-thirds of this plain. This is the largest delta in the world. The River Ganga divides itself into several channels in the delta area. The slope of the land here is a mere 2 cm per km. Two thirds of the area is below 30 m above mean sea level. The entire land upto Kolkata would be completely submerged if the sea level rose by only 7 metre. The seaward face of the delta is studded with a large number of estuaries, mud flats, mangrove swamps, sandbanks, islands and forelands. Large part of the coastal delta is covered by thick impenetrable tidal forests. These are called the Sunderbans because of the predominance of Sundri tree here.

The Ganges is threatened by severe pollution it poses a danger not only to humans but also to animals, caused by the 400 million people who live close to the river. Sewage from many cities

along the river's course, industrial waste and religious offerings wrapped in non-degradable plastics add large amounts of pollutants to the river as it flows through densely populated areas. The problem is exacerbated by the fact that many poorer people rely on the river on a daily basis for bathing, washing, and cooking.

Data were collected for River Ganga in 33 different locations. These locations are D/S Buxar near Veer Kunwar Singh Road Bridge , Ara-Chapra Road Bridge , Maa Ambika Asthan, Gandhighat, Gulabi Ghat, Gaighat , Malsalami – Patna , Kachchi-Dargah Bidupur near Road Bridge , Triveni Ghat , Kewala Ghat , Bakhtiyarpur- Tajpur Bridge near Athmalgola , U/S Mokama Mahadeo Asthan , Barahiya Nepaltala, U/S Sultanganj, Ajgaibinath Mandir, D/S cremation Ghat at Sultanganj – Bhagalpur, Champanagar , water intake point – Bhagalpur, Bhagalpur near Bararighat, Baharampore, Dakhineswar, Diamond Harbour, Durgachak near Patikhali, Farakka, Garden Reach, Murshidabad, Shivpur, Khagra, Nawadip ghospara, Palta shitalatala, Palta, Serampore, Tribeni & Uluberiya.

Chapter 5

Result & Discussion

The water quality data (Physio-chemical and biological parameters) of River Ganga are taken from West Bengal Pollution Control Board and Bihar State Pollution Control Board. The data are furnished below:

River Ganga

This study identifies the parameters which are responsible for water quality condition of rivers. The obtained physicochemical parameters 'values were compared with the Bureau of Indian Standards. The analysis of result of physical and chemical and biological parameters of river water provides a considerable insight of water quality of the river Ganga.

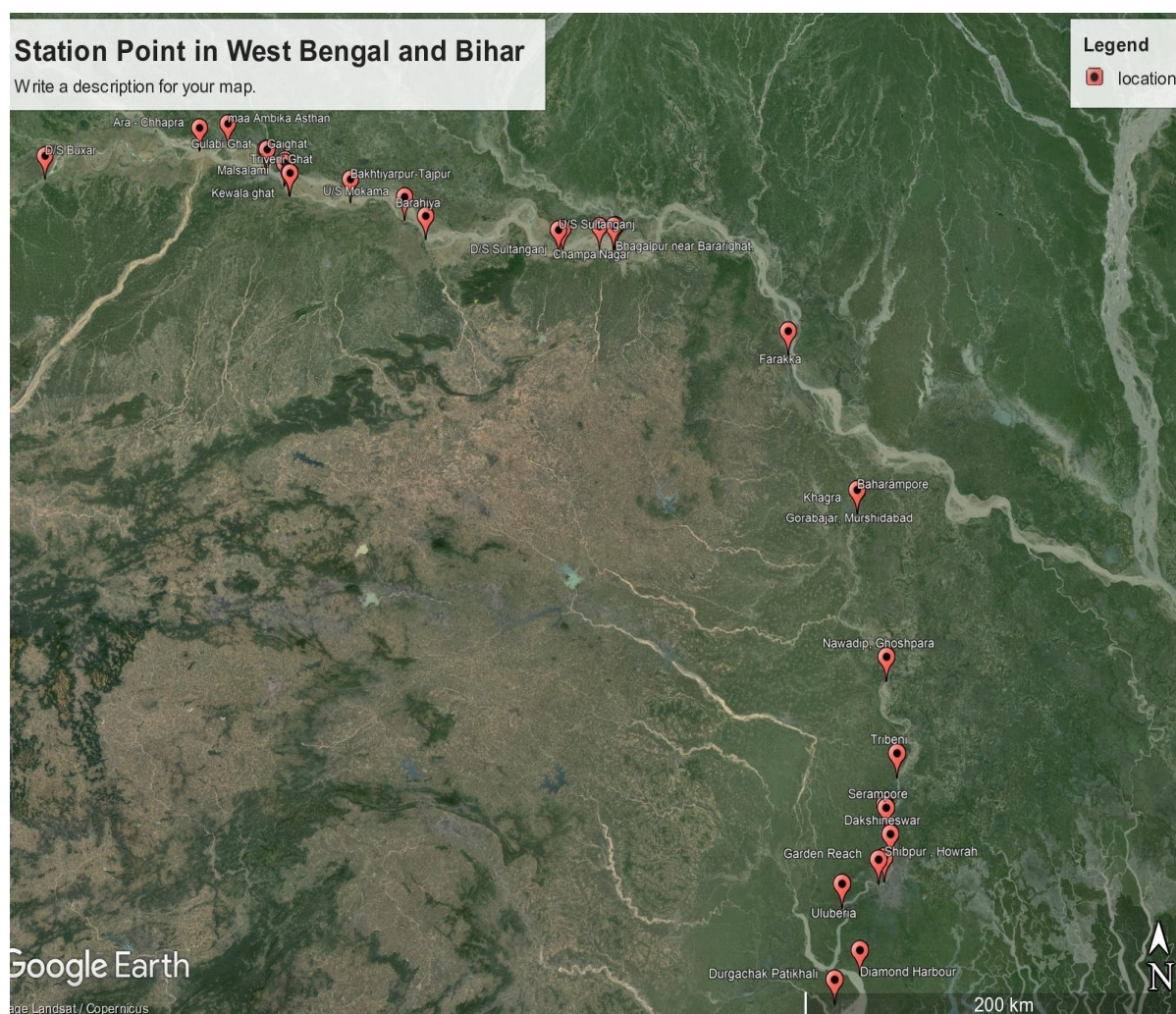


Fig.5.1. Showing all the locations of River Ganga in West Bengal and Bihar

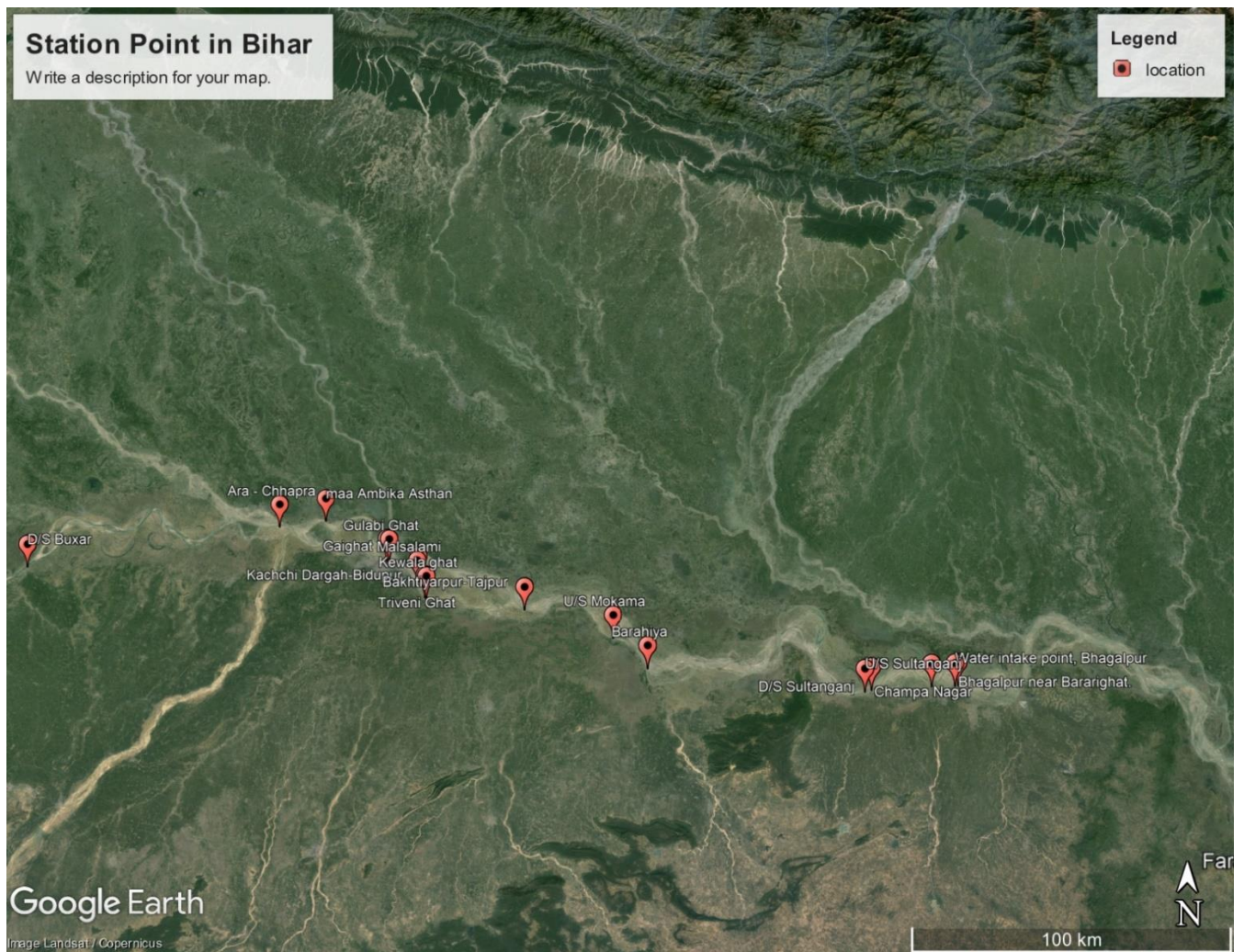


Fig.5.2. Showing all the locations of River Ganga in Bihar



Fig.5.3. Showing all the locations of River Ganga in West Bengal

Spatial Variation

There are total 33 nos of location points in West Bengal and Bihar. Data contains water quality values of four parameters (BOD, DO, pH & fecal Coliform). Analysis has been done in those stations.

January 2021:

Table 2 : Data of water quality parameter of river Ganga at different stations for January, 2021						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	08.01.2021	1.7	7.8	7.74	35000
2	Ara-Chapra Road Bridge	12.01.2021	3.0	3.70	7.62	54000
3	Maa Ambika Asthan, AAMI	08.01.2021	1.8	8.2	7.7	28000
4	Gandhighat, NIT Patna	05.01.2021	1.6	7.8	7.52	160000
5	Gulabi Ghat, Patna	05.01.2021	1.8	7.5	7.42	160000
6	Gaighat , D/S Patna	05.01.2021	1.8	9.5	7.78	92000
7	Malsalami , Patna	06.01.2021	1.2	9.5	8.2	160000
8	Kachchi-Dargah Bidupur	06.01.2021	1.4	9.5	8.25	92000
9	Triveni Ghat , Patna	06.01.2021	1.4	7.0	8.2	35000
10	Kewala Ghat , Fatuha	06.01.2021	2.0	6.0	7.75	160000
11	Bakhtiyarpur- Tajpur Bridge	15.01.2021	1.2	9.0	8.17	35000
12	U/S Mokama , Mahadeo Asthan	15.01.2021	1.7	9.4	8.39	28000
13	Barahiya ,Nepaltala, Maranchi	15.01.2021	1.70	9.50	8.28	24000
14	U/S Sultanganj, Ajgaibinath Mandir	11.01.2021	2.0	9.8	7.97	35000
15	D/S cremation Ghat at Sultanganj	11.01.2021	2.9	9.0	8.05	35000
16	Champanagar ,Bhagalpur	12.01.2021	1.8	9.0	8.12	1300
17	water intake point , Bhagalpur	12.01.2021	2.0	6.9	7.68	13000
18	Bhagalpur near Bararighat	12.01.2021	3.0	3.7	7.62	54000
19	Farakka	missing				
20	Baharampore	22/01/2021	3.3	9.8	8.12	7000
21	Khagra	22/01/2021	2.7	9.7	8.3	11000
22	Gorabajar, Murshidabad	22/01/2021	3.1	3.1	8.31	3300
23	Nawadip, Ghoshpara	22/01/2021	2.3	9.1	8.23	2300
24	Tribeni	21/01/2021	3.45	8.5	8.29	11000
25	Palta	18/01/2021	3.65	9.7	8.26	24000
26	Palta, Shitaltala	18/01/2021	3.85	9.9	8.35	110000
27	Serampore	21/01/2021	1.9	8.9	8.27	3300
28	Dakshineswar	19-01-2021	4.05	7.7	7.86	33000
29	Shibpur , Howrah	18/01/2021	3.5	7.5	7.98	49000
30	Garden Reach	20/01/2021	2.7	7.4	7.92	23000
31	Uluberia	21/01/2021	3.4	7.8	7.8	13000
32	Diamond Harbour	25/01/2021	2	6.7	7.65	6800
33	Durgachak Patikhali	19/01/2021	1.35	6	6.57	8400

Parameter 1: BOD

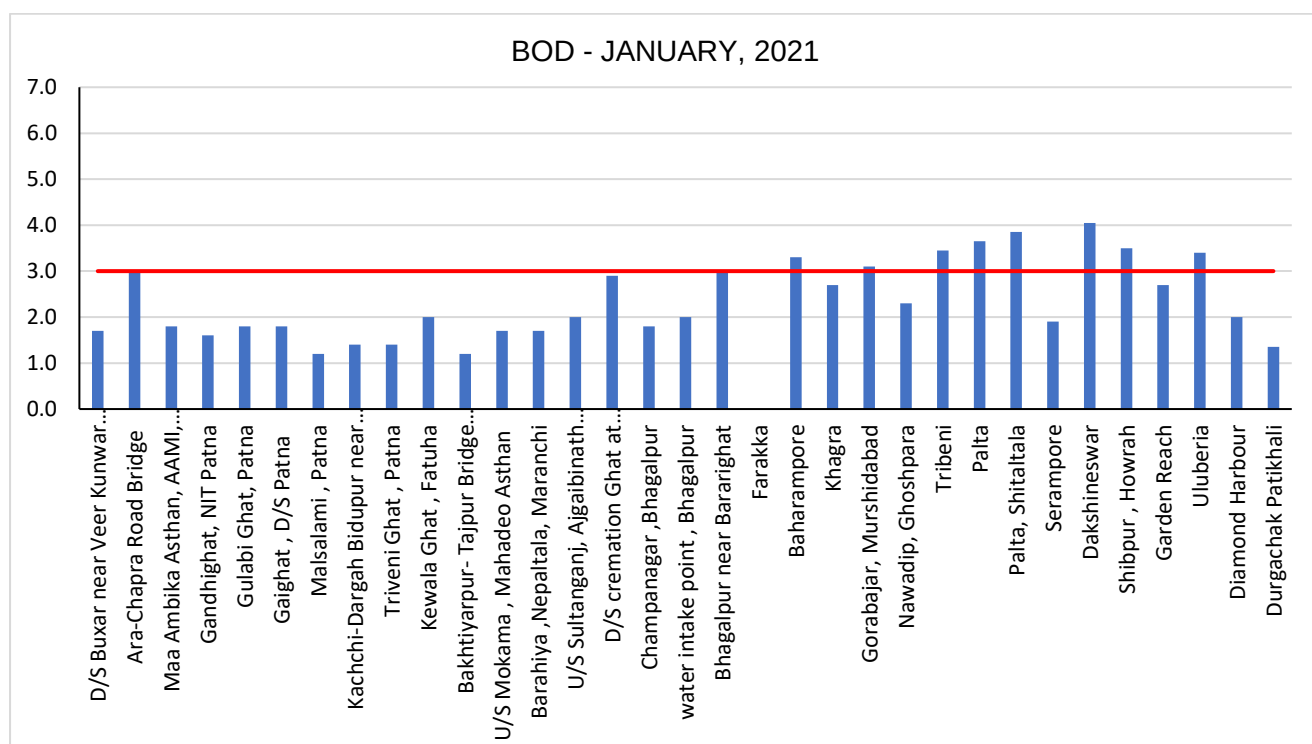


Fig.5.4. BOD value for January,2021

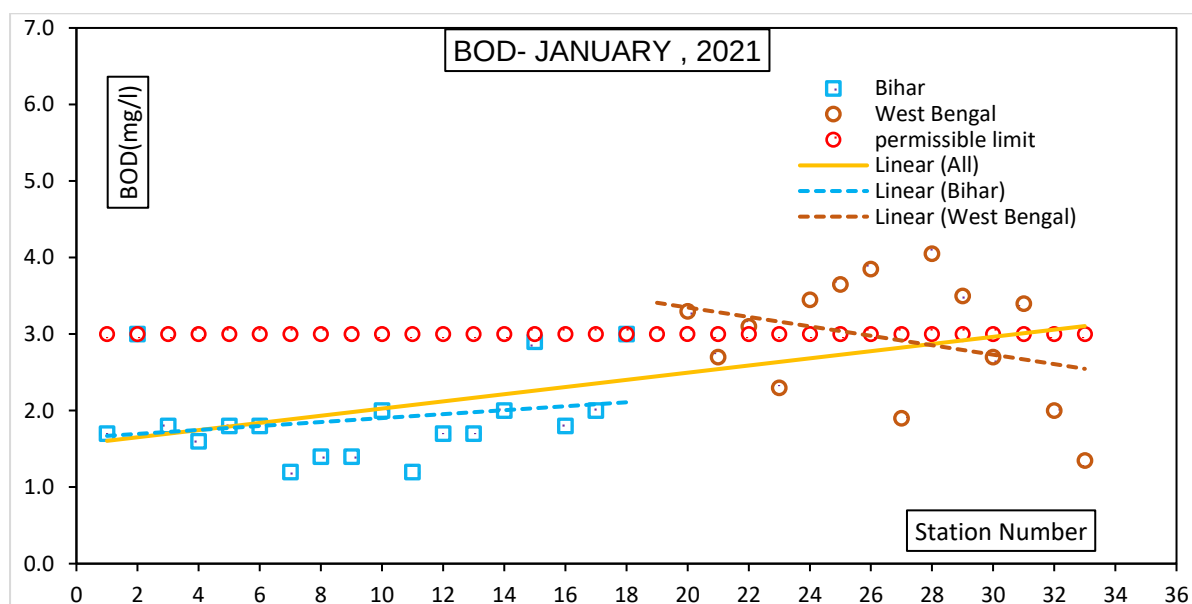


Fig.5.5. Trend Line analysis of BOD value for January,2021

The BOD values were found in the range of 1.2–4.05 mg/l. The lowest BOD value 1.2 mg/l was for Malsalami , Patna and Bakhtiyarpur- Tajpur Bridge and highest BOD value of 4.05 mg/l was for Dakshineswar for the month January, 2021. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O₂ (DO)

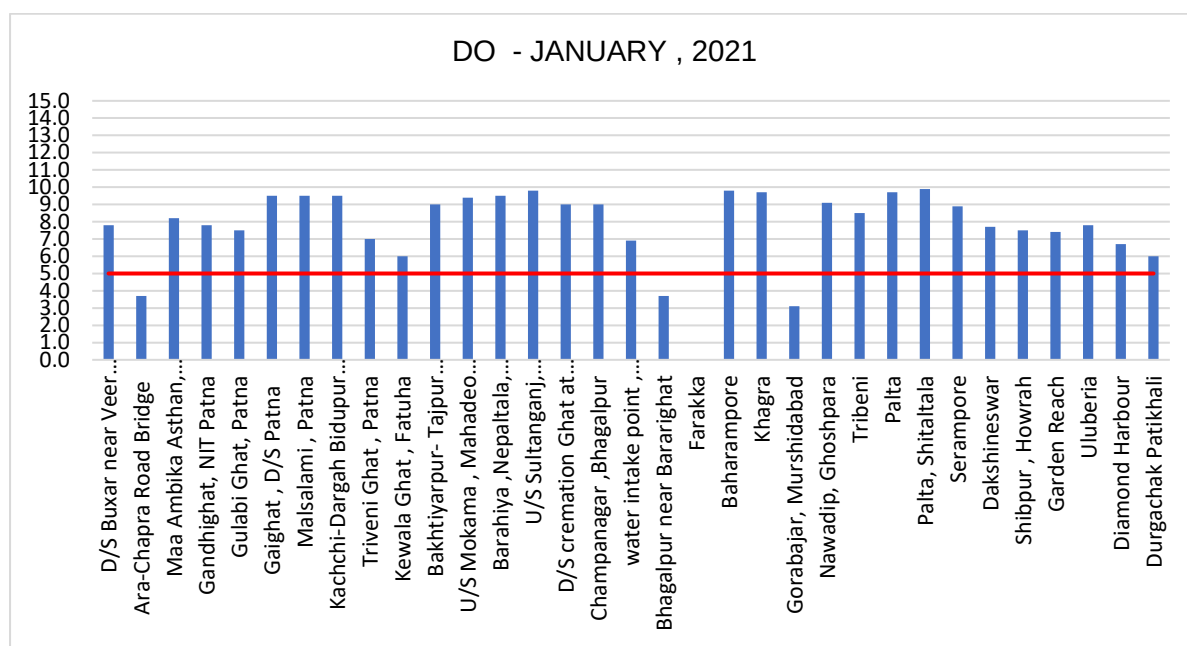


Fig.5.6. DO value for January,2021

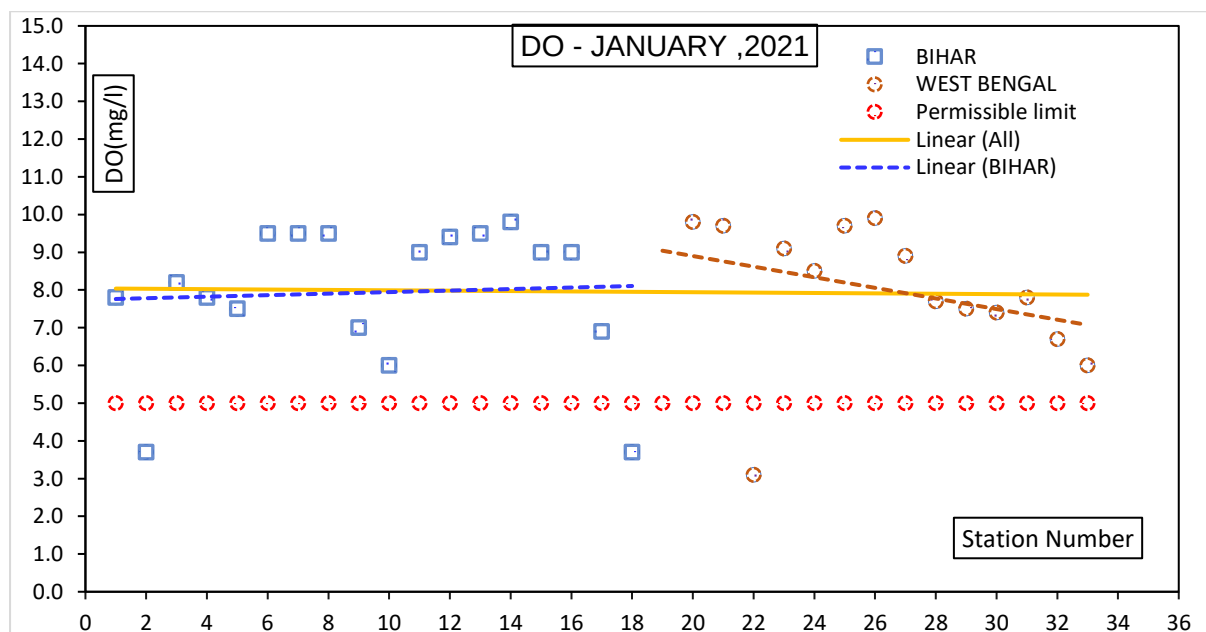


Fig.5.7. Trend Line analysis of DO value for January,2021

The DO values were found in the range of 3.1–9.9 mg/l. The lowest DO value 3.1 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.9 mg/l was for Palta, Shitaltala for the month January, 2021. The low DO suggests the poor quality of water indicating the slow rate of photosynthesis by phytoplankton present in the Ganga river at Gorabajar, Murshidabad. This makes the water unsuitable for bathing purpose. The DO values also depend on many factors like temperature, microbial population, pressure, and time of sampling. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

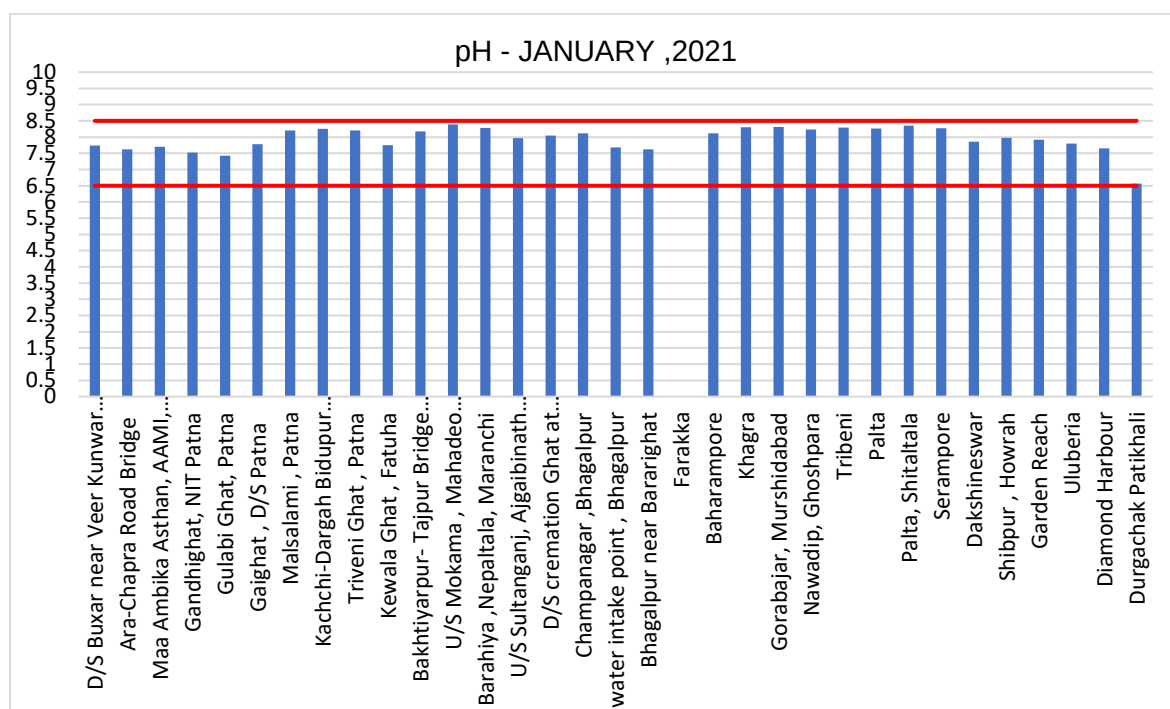


Fig.5.8. pH value for January,2021

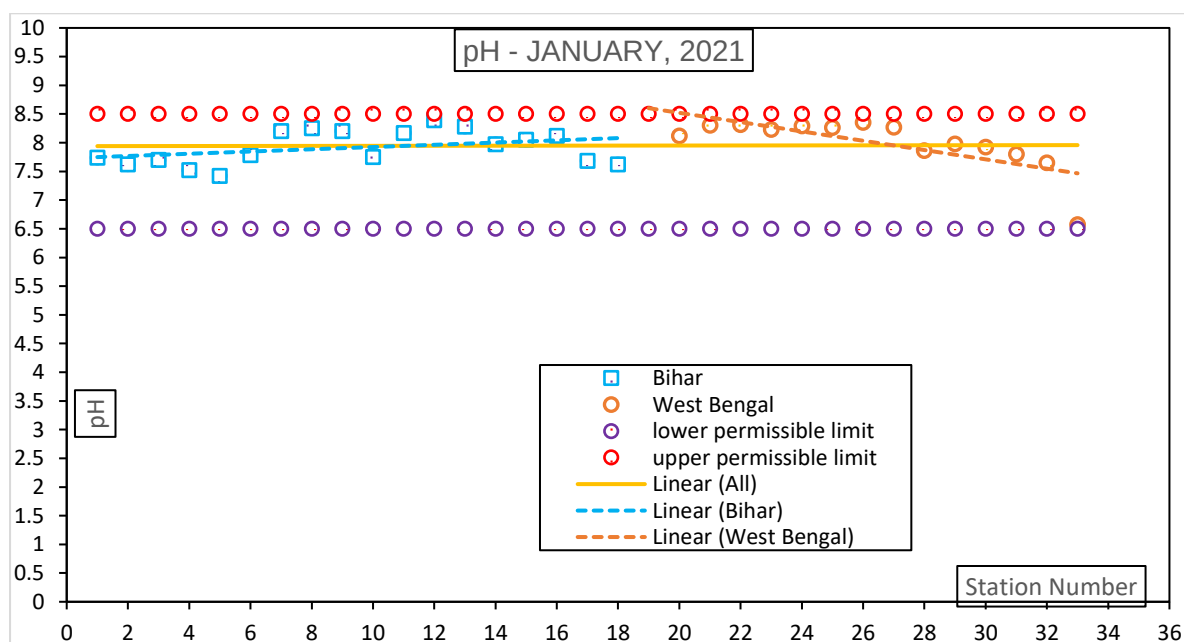


Fig.5.7. Trend Line analysis of pH value for January,2021

The pH values were found in the range of 6.57- 8.39. From the above graphs it can be seen that the pH level is within the permissible value for the month of January ,2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) within the permissible limit. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

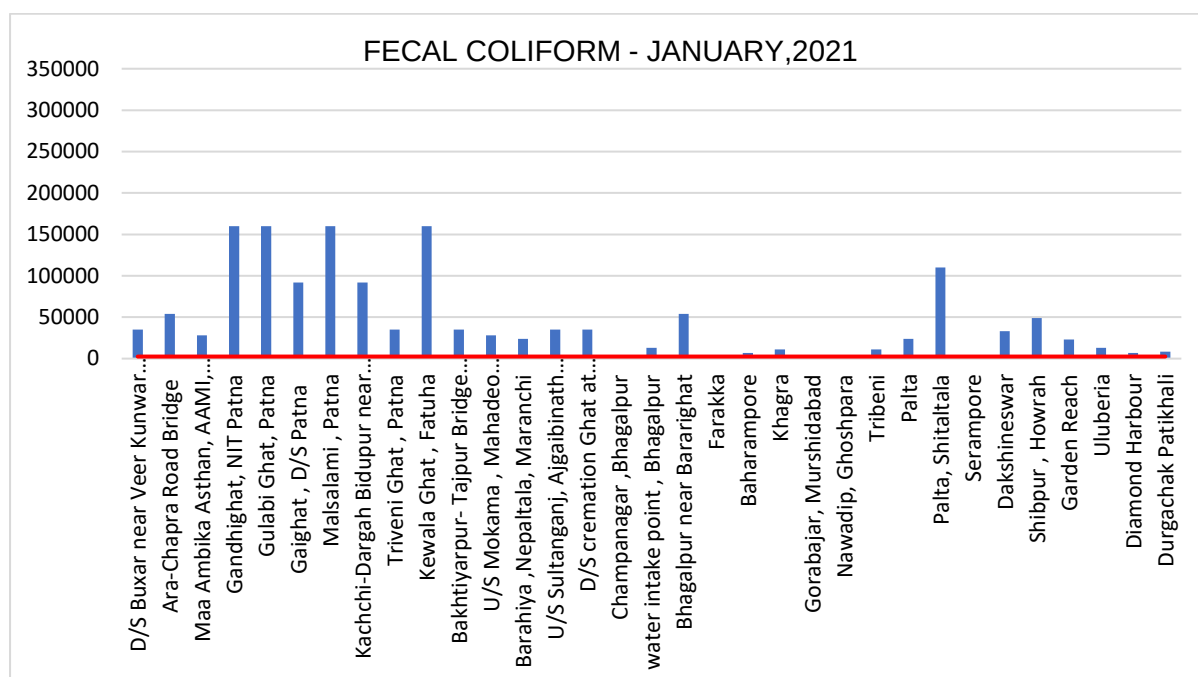


Fig.5.8. Fecal Coliform value for January, 2021

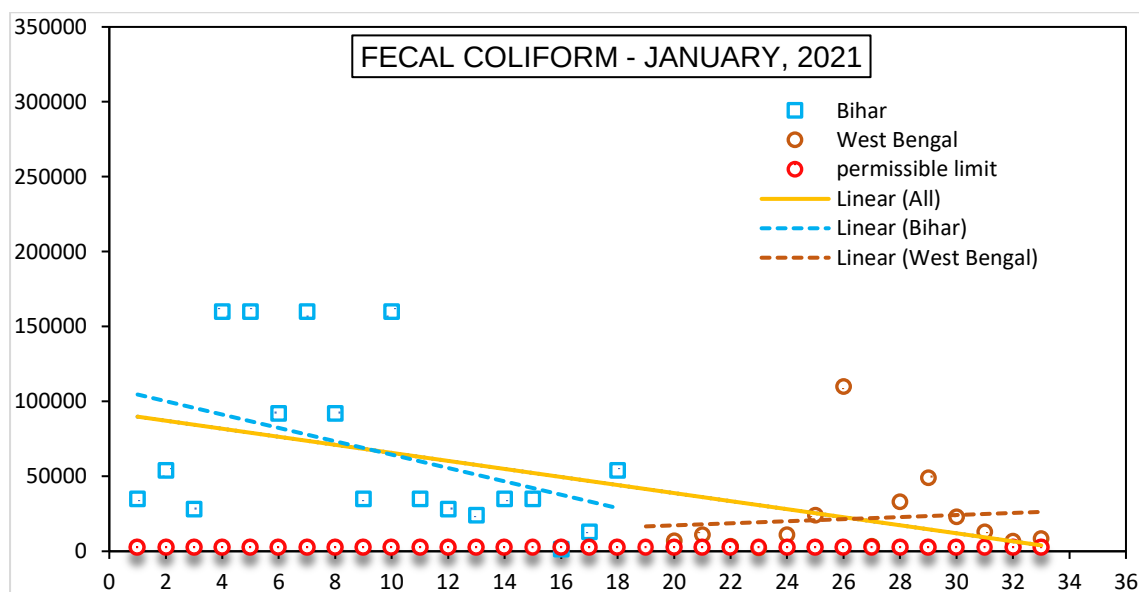


Fig.5.9. Trend Line analysis of pH value for January, 2021

The fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform was observed for the station Kewala Ghat, Fatuha and the value is 160000. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing. However, the Fecal Coliform values are less in the West Bengal locations compared to the values in Bihar.

January 2022:

Table 3 : Data of water quality parameter of river Ganga at different stations for January,2022						
			Parameters			
Sl. No.	Station Name	Date	BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	10.01.2022	2.1	6.5	8.4	14000
2	Ara-Chapra Road Bridge	03.01.2022	1.4	7.6	8.6	490
3	Maa Ambika Asthan, AAMI	20.01.2022	1.3	7.8	8.1	14000
4	Gandhighat, NIT Patna	20.01.2022	1	9.5	8.3	160000
5	Gulabi Ghat, Patna	15.01.2022	1	9.1	8.1	160000
6	Gaighat , D/S Patna	16.01.2022	1	8.1	8.2	54000
7	Malsalami , Patna	10.01.2022	1	9.0	8.4	92000
8	Kachchi-Dargah Bidupur	10.01.2022	1.9	7.0	8.2	54000
9	Triveni Ghat , Patna	10.01.2022	1	8.6	8.4	35000
10	Kewala Ghat , Fatuha	26.01.2022	1.8	7.0	7.9	160000
11	Bakhtiyarpur- Tajpur Bridge	19.01.2022	1	9.4	7.9	35000
12	U/S Mokama , Mahadeo Asthan	19.01.2022	1	8.5	8.3	7900
13	Barahiya ,Nepaltala, Maranchi	19.01.2022	1	9.2	8.2	160000
14	U/S Sultanganj, Ajgaibinath Mandir	20.01.2022	1.6	8.0	8.3	160000
15	D/S cremation Ghat at Sultanganj					
16	Champanagar ,Bhagalpur	10.01.2022	1.7	9.1	8.3	1700
17	water intake point , Bhagalpur	15.01.2022	1.9	9.0	8.2	160000
18	Bhagalpur near Bararighat	10.01.2022	2.8	6.3	8.1	24000
19	Farakka	19/01/2022	2.65	9.4	8.2	230
20	Baharampore	19/01/2022	2.8	8.6	8.14	170000
21	Khagra	19/01/2022	2.3	9	8.19	3300
22	Gorabajar, Murshidabad	19/01/2022	1.55	1.55	8.18	23000
23	Nawadip, Ghoshpara	27/01/2022	1.45	9	8.05	3300
24	Tribeni	31/01/2022	2.3	9.1	8.28	7000
25	Palta	21/01/2022	3	8.6	8.09	33000
26	Palta, Shitaltala	21/01/2022	4.5	7.7	7.62	240000
27	Serampore	20/01/2022	2.9	8.5	7.97	4900
28	Dakshineswar	20/01/2022	2.45	7.2	7.4	79000
29	Shibpur , Howrah	21/01/2022	4	7.7	7.68	49000
30	Garden Reach	25/01/2022	4.35	7.2	7.86	79000
31	Uluberia	25/01/2022	4.9	7.3	7.83	23000
32	Diamond Harbour	27/01/2022	3.2	6.8	7.93	6800
33	Durgachak Patikhali	18/01/2022	1.3	7.3	7.44	9400

Parameter 1: BOD

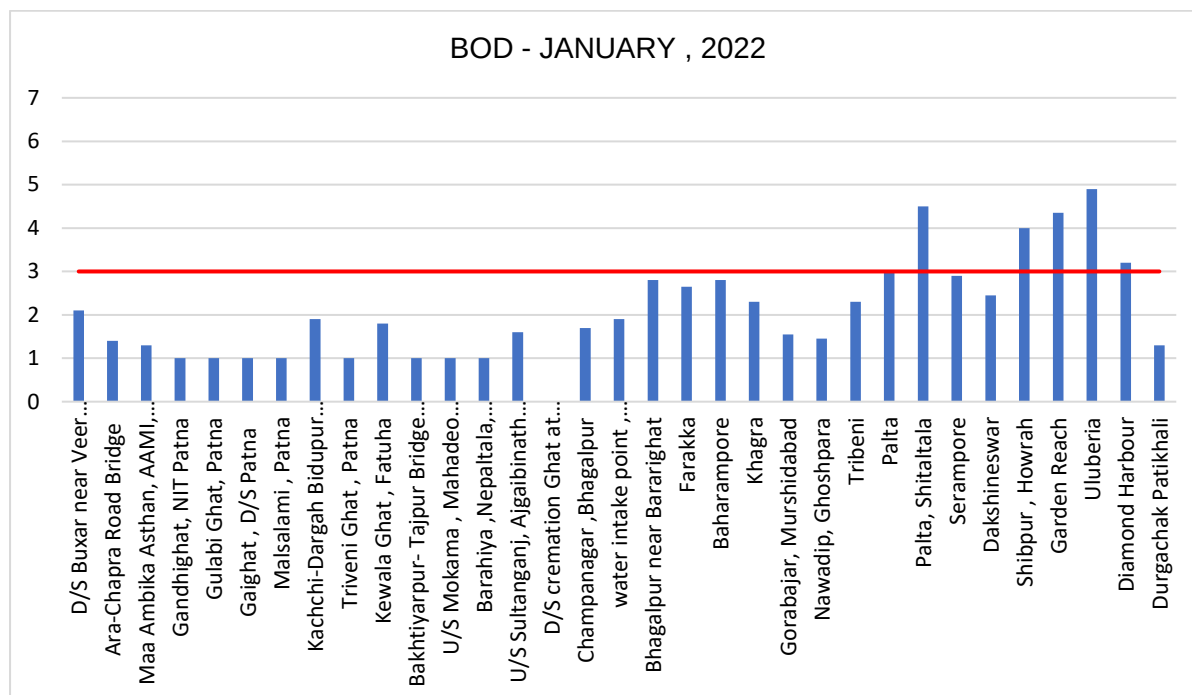


Fig.5.10. BOD value for January,2022

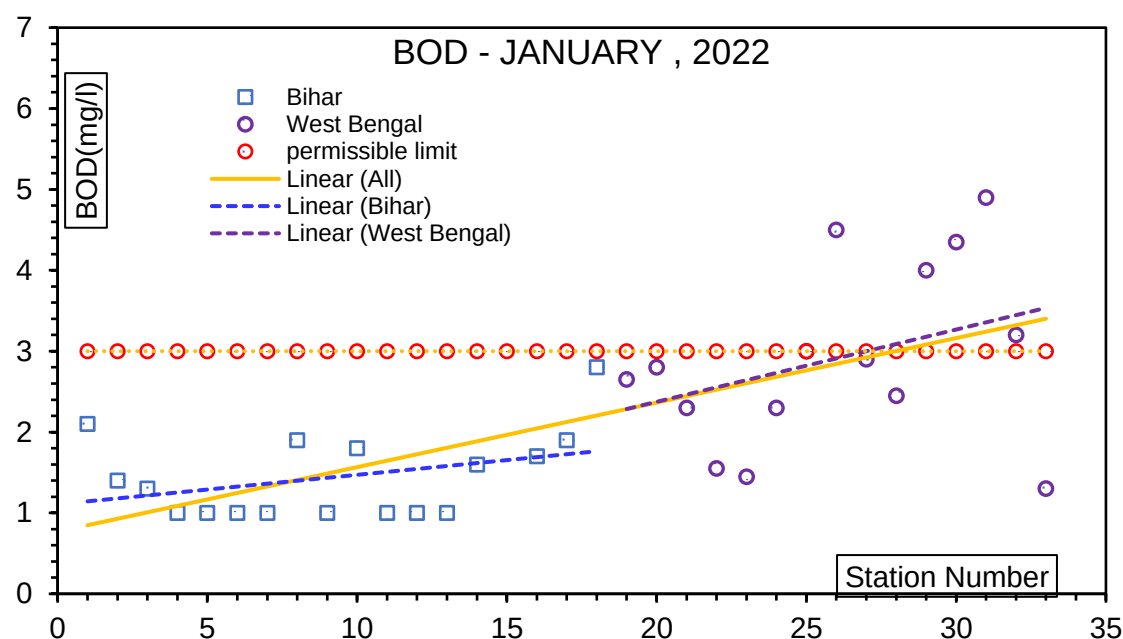


Fig.5.11. Trend Line analysis of BOD value for January,2022

The BOD values were found in the range of 1.0–4.9 mg/l. The highest BOD value of 4.9 mg/l was for Uluberia for the month January, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal also it is increasing. The overall BOD values are more in West Bengal compared to locations in Bihar.

Parameter 2: Dissolved O₂ (DO)

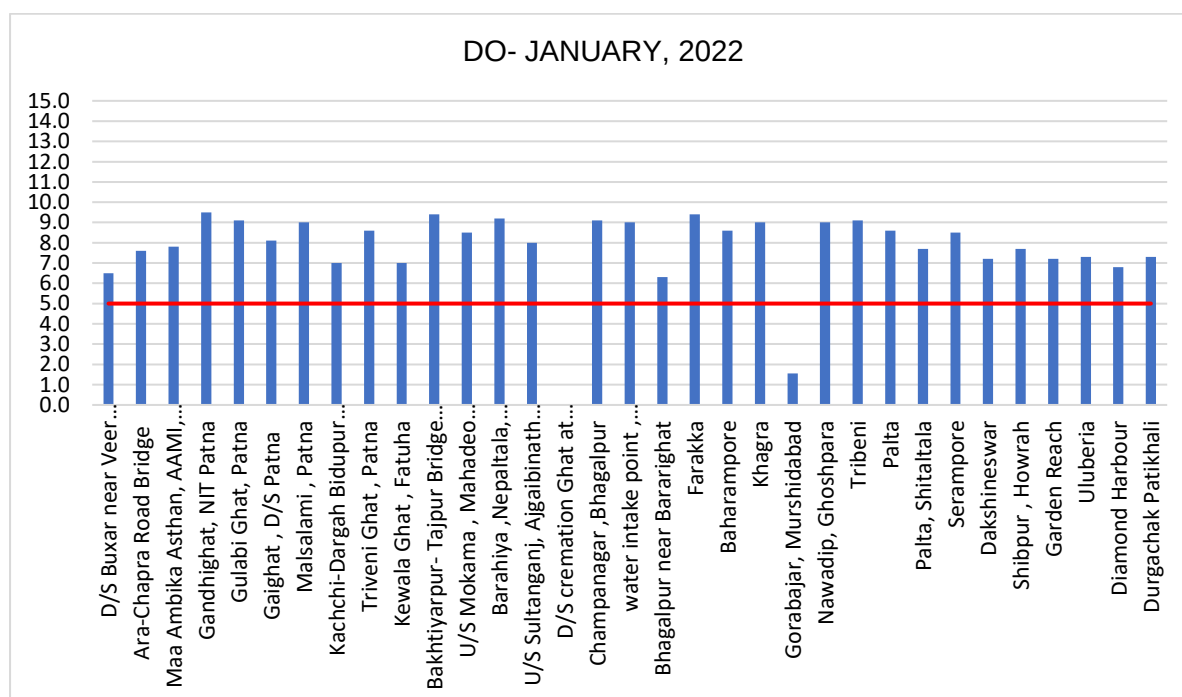


Fig.5.10. DO value for January,2022

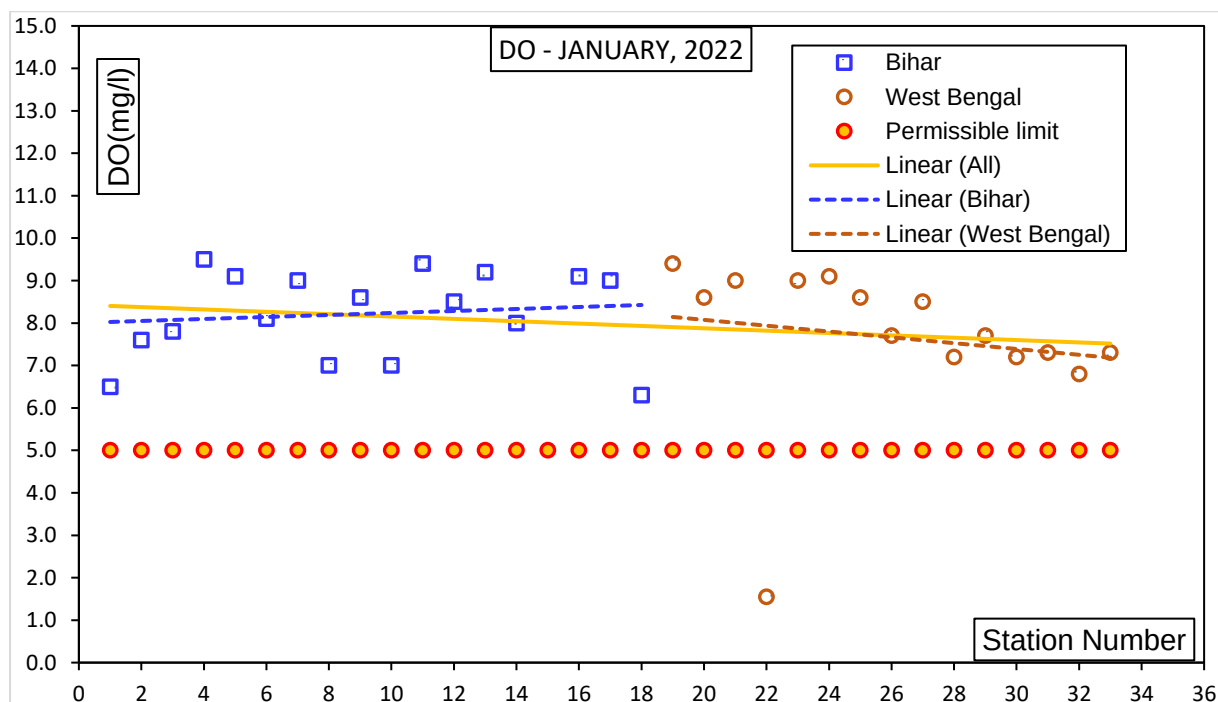


Fig.5.11. Trend Line analysis of DO value for January,2022

The DO values were found in the range of 1.55–9.5 mg/l. The lowest DO value 1.55 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.5 mg/l was for Gandhighat, NIT Patna for the month January, 2022. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

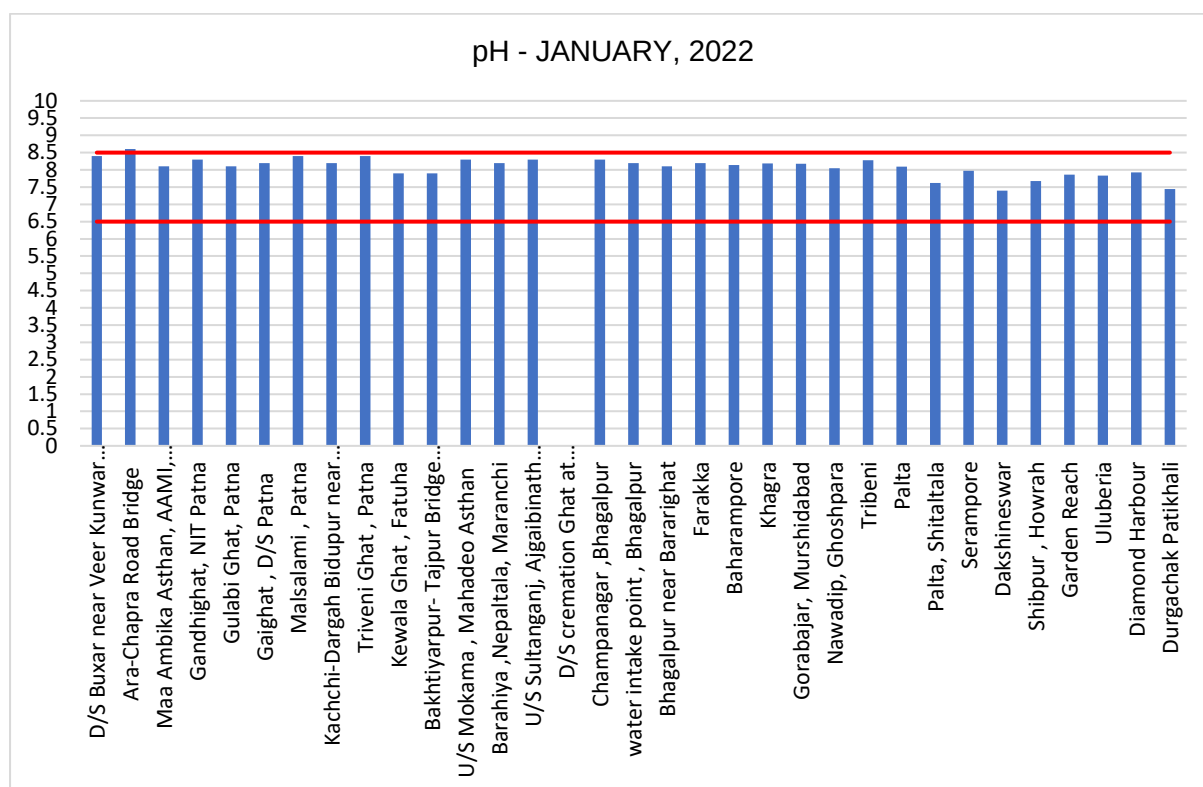


Fig.5.12. pH value for January,2022

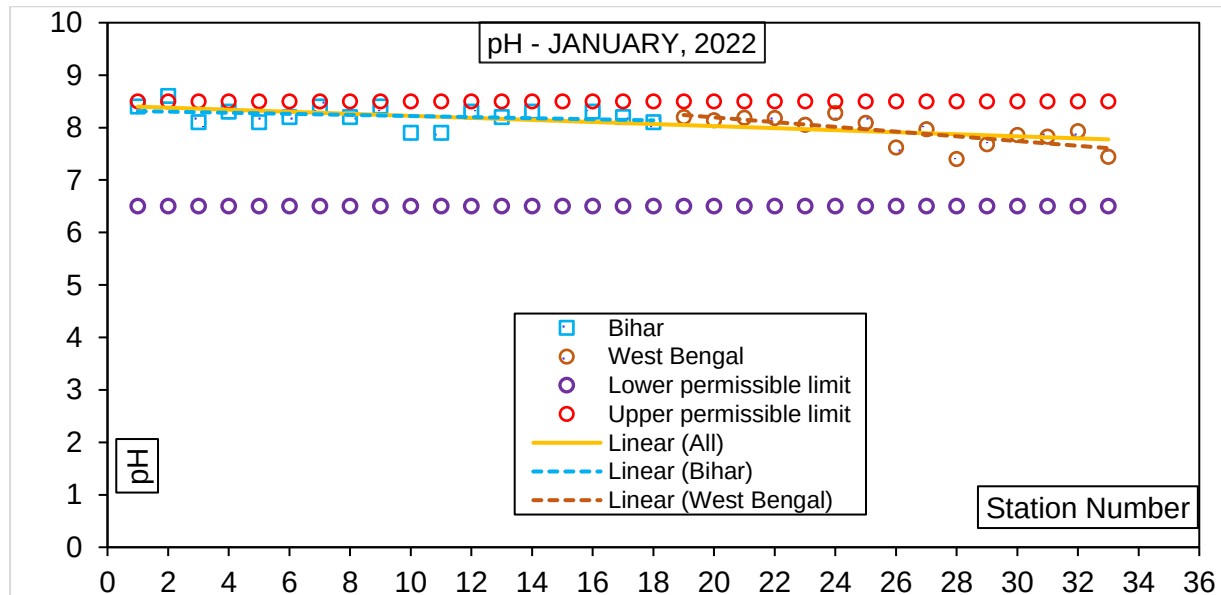


Fig.5.13. Trend Line analysis of pH value for January,2022

The pH values were found in the range of 7.4- 8.6. From the above graphs it can be seen that the pH level is within the permissible value all time for January,2022. It is seen that the permissible pH value exceeded the limit for Class B (6.5 to 8.5) for only once & for Class C (6-9) the pH level is within the permissible limit all time. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal also it is decreasing.

Parameter 4: Fecal Coliform

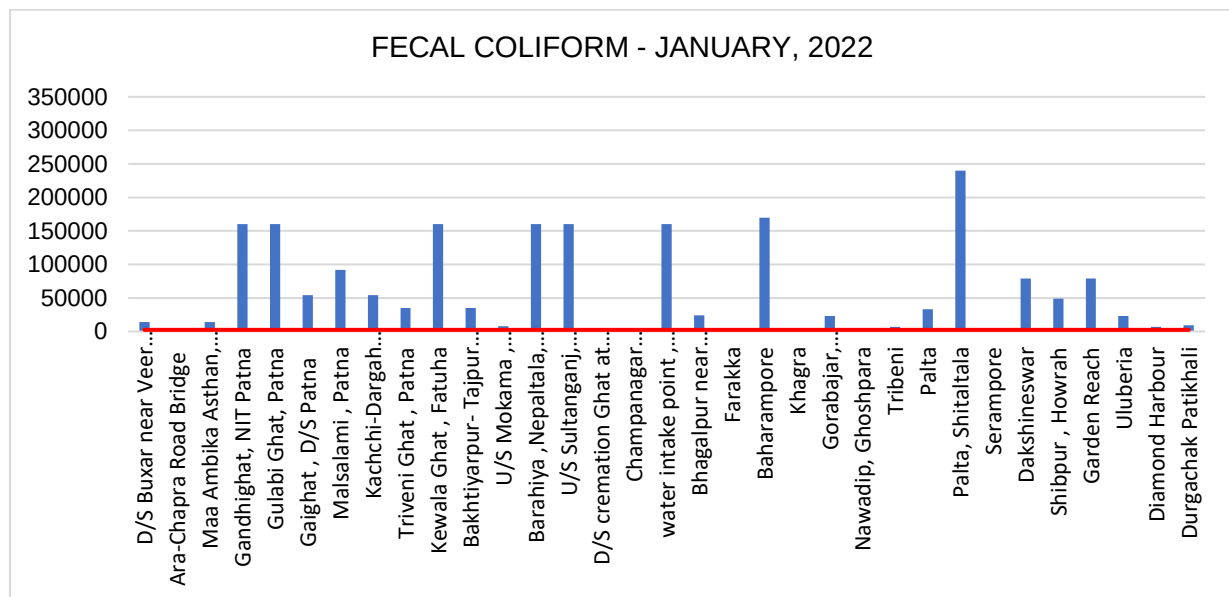


Fig.5.14. Fecal Coliform value for January,2022

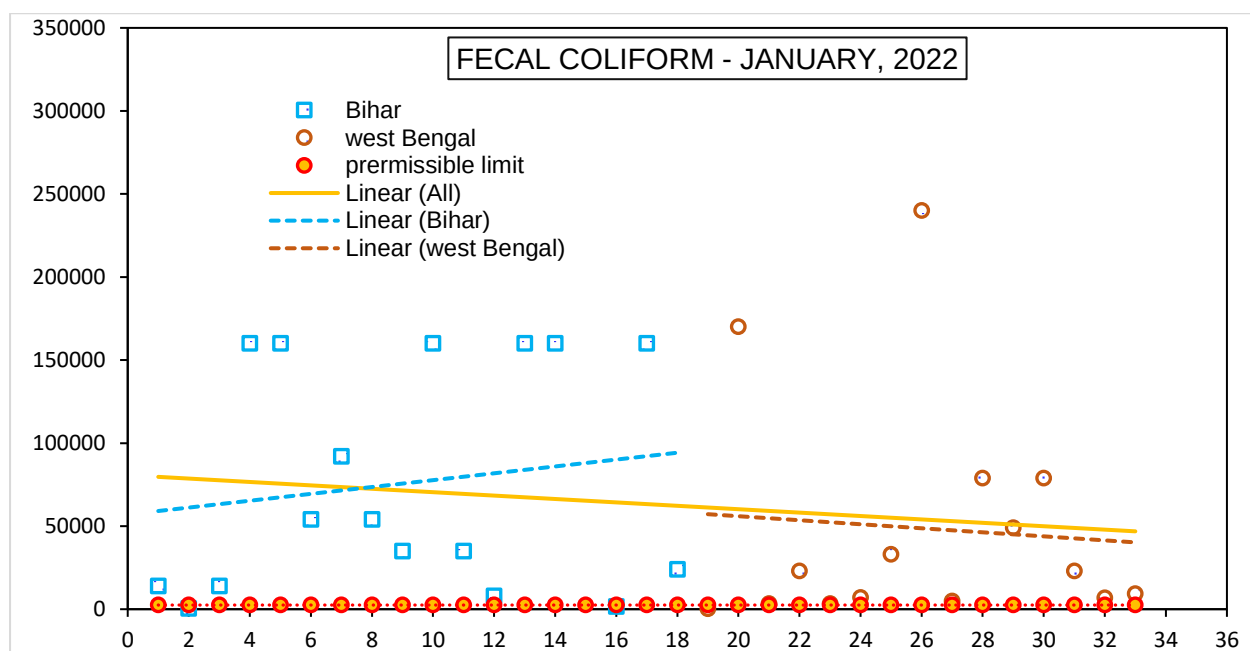


Fig.5.15. Trend Line analysis of Fecal Coliform value for January,2022

The fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform was observed for the station Palta, Shitaltala and the value is 240000. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

January 2023:

Table 4 : Data of water quality parameter of river Ganga at different stations for January, 2023						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	02.01.2023	1	8.9	7.33	54000
2	Ara-Chapra Road Bridge	03.01.2023	1	8.2	7.68	7900
3	Maa Ambika Asthan, AAMI	03.01.2023	1.3	8.4	7.43	24000
4	Gandhighat, NIT Patna	19.01.2023	1.8	7.2	8.2	92000
5	Gulabi Ghat, Patna	19.01.2023	1.6	7.4	8.12	92000
6	Gaighat , D/S Patna	19.01.2023	2.1	6.0	7.23	92000
7	Malsalami , Patna	19.01.2023	1	9.1	8.31	54000
8	Kachchi-Dargah Bidupur	19.01.2023	1	9.5	8.3	35000
9	Triveni Ghat , Patna	19.01.2023	1.5	8.0	8.36	28000
10	Kewala Ghat , Fatuha	19.01.2023	1.7	7.8	8.27	92000
11	Bakhtiyarpur- Tajpur Bridge	20.01.2023	1.7	8.9	7.35	7900
12	U/S Mokama , Mahadeo Asthan	20.01.2023	2.2	7.9	7.66	28000
13	Barahiya ,Nepaltala, Maranchi	20.01.2023	1.9	8.1	7.6	92000
14	U/S Sultanganj, Ajgaibinath Mandir	07.01.2023	1	9.6	8.31	22000
15	D/S cremation Ghat at Sultanganj	07.01.2023	1	9.4	8.34	54000
16	Champanagar ,Bhagalpur	07.01.2023	1	9.5	8.11	7900
17	water intake point , Bhagalpur	07.01.2023	1	8.8	8.07	13000
18	Bhagalpur near Bararighat	07.01.2023	1.6	8.0	8.18	35000
19	Farakka	17.01.2023	1.6	9.8	8.44	1700
20	Baharampore	18/01/2023	1.75	9.9	8.38	3500
21	Khagra	10-01-2023	1.5	9.3	8.34	320
22	Gorabajar, Murshidabad	10-01-2023	1.7	1.7	8.25	17000
23	Nawadip, Ghoshpara	16-01-2023	2.2	9.4	8.37	700
24	Tribeni	19.01.2023	1.7	9.9	8.44	13000
25	Palta	19-01-2023	1.7	9.9	8.44	13000
26	Palta, Shitaltala	19.01.2023	1.7	9.6	8.45	23000
27	Serampore	19.01.2023	1.7	9.9	8.44	13000
28	Dakshineswar	20.01.2023	3.2	7.5	7.44	70000
29	Shibpur , Howrah	05-01-2023	2.95	7.1	7.33	49000
30	Garden Reach	05-01-2023	2.8	7	7.43	46000
31	Uluberia	31.01.2023	2.4	6.5	7.99	17000
32	Diamond Harbour	31.01.2023	2.45	6.8	7.84	4500
33	Durgachak Patikhali	16.01.2023	1.35	7.3	8.39	6300

Parameter 1: BOD

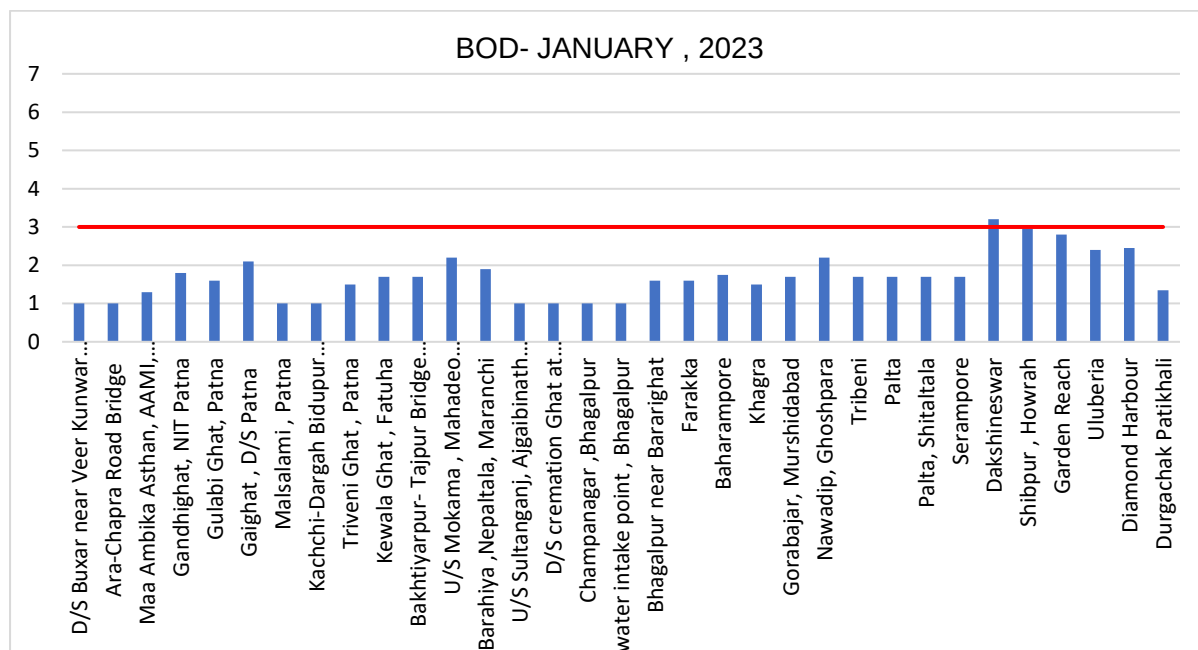


Fig.5.16. BOD value for January,2023.

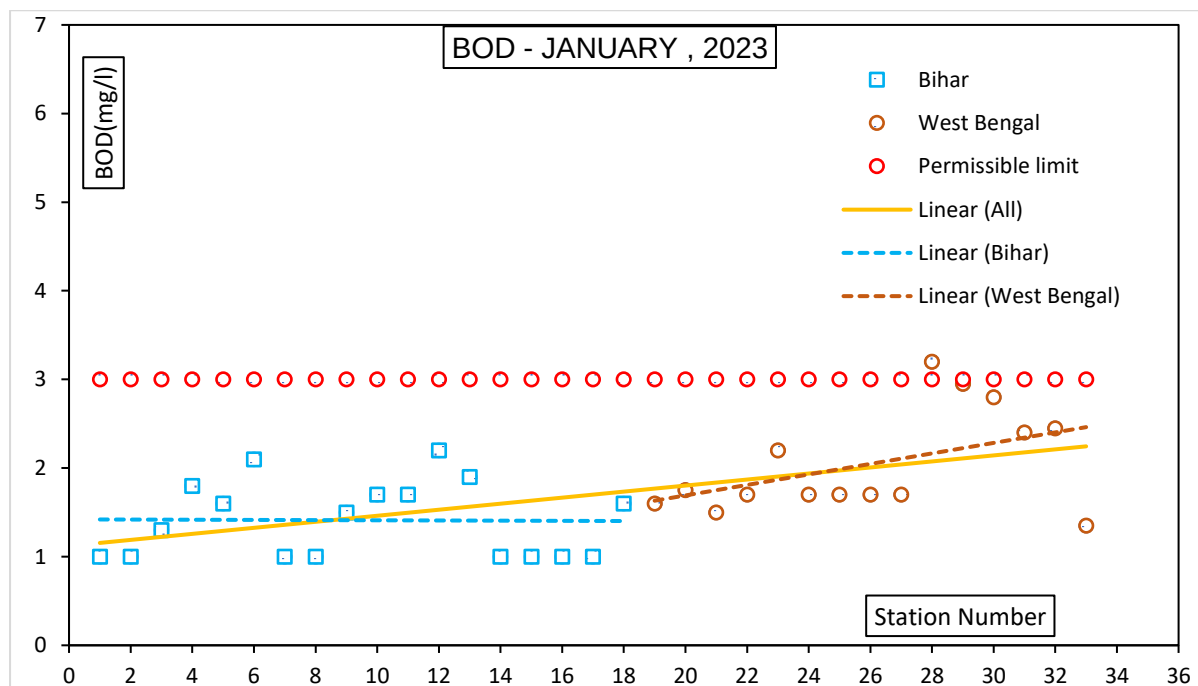


Fig.5.17. Trend Line analysis of BOD value for January,2023

The BOD values were found in the range of 1.0–3.2 mg/l. The highest BOD value of 3.2 mg/l was for Dakshineswar for the month January, 2023. From Trend Line analysis curve the BOD value for Bihar is almost same in trend line and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

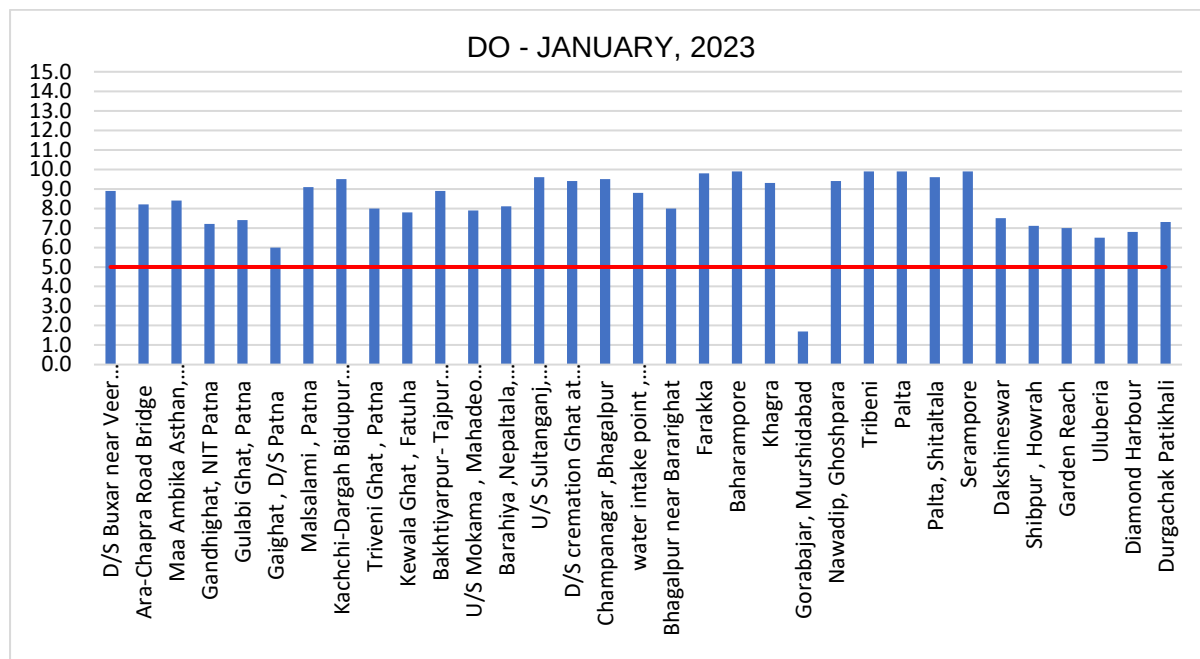


Fig.5.18. DO value for January,2023.

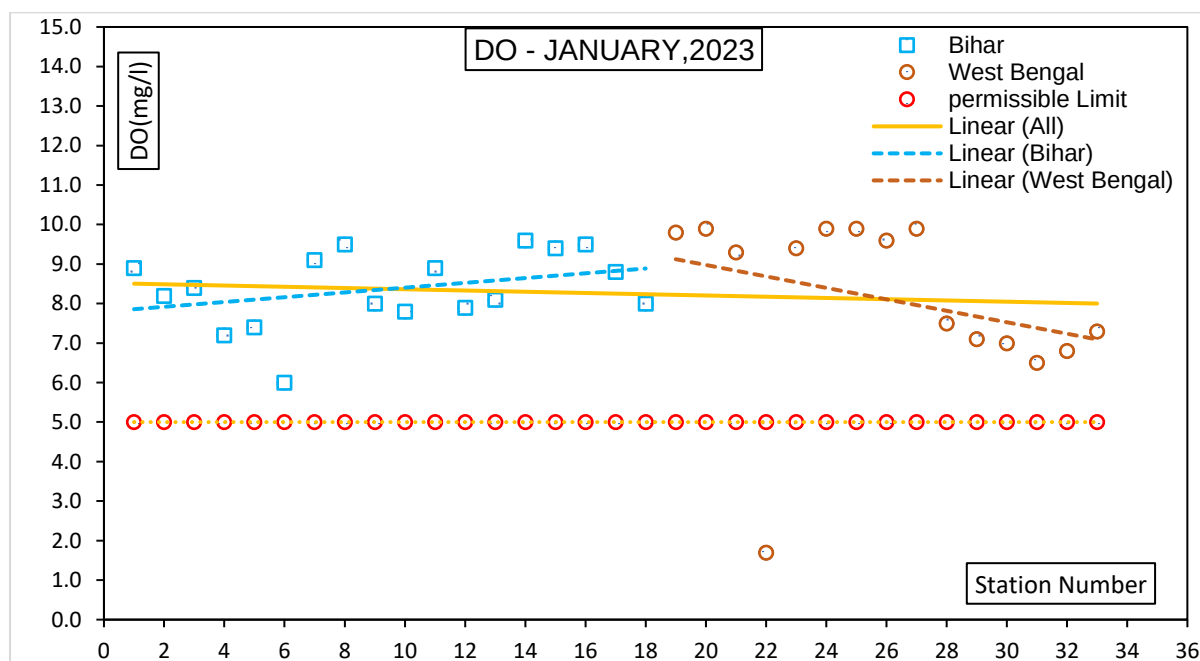


Fig.5.19. Trend Line analysis of DO value for January,2023

The DO values were found in the range of 1.7–9.9 mg/l. The lowest DO value 1.7 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.9 mg/l was for Baharampore, Tribeni, Palta and Serampore for the month January, 2023. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

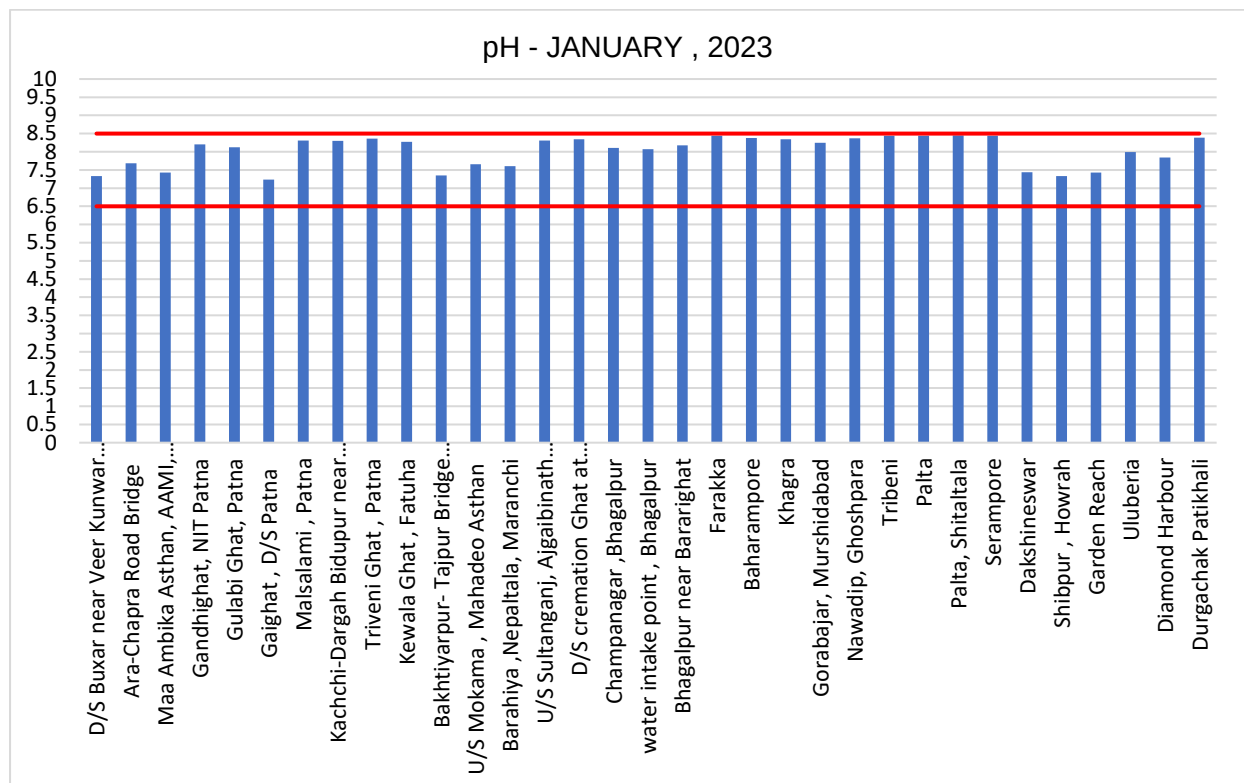


Fig.5.20. pH value for January,2023.

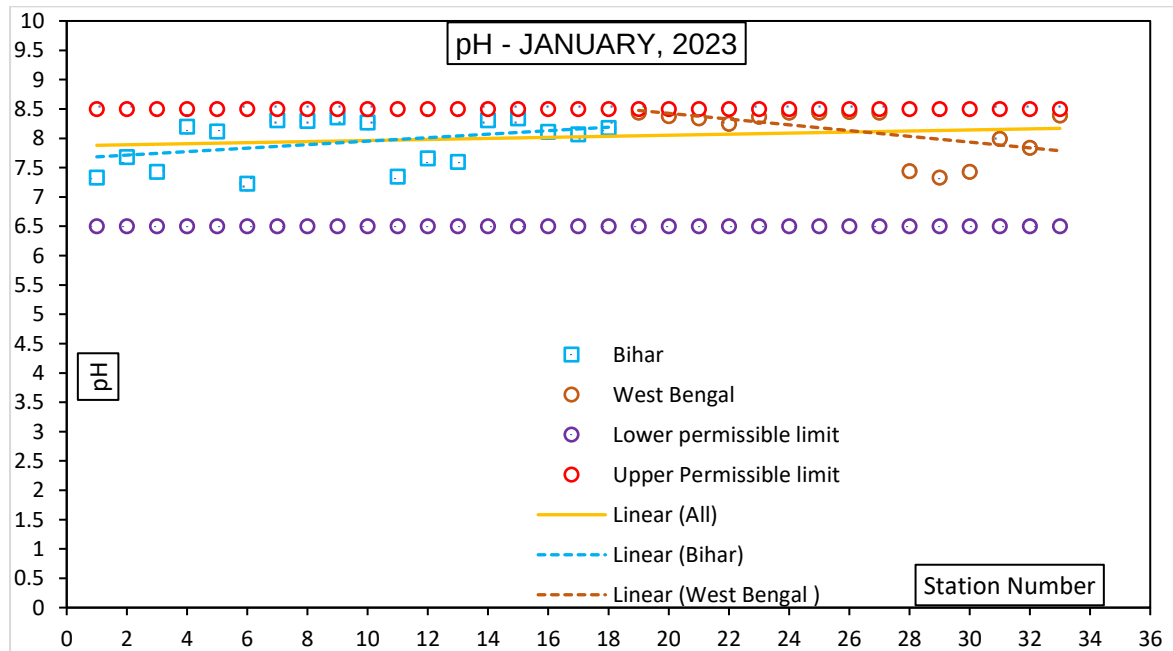


Fig.5.21. Trend Line analysis of pH value for January,2023

The pH values were found in the range of 7.23 - 8.45. It is seen that the permissible pH value for Class B (6.5 to 8.5) within the permissible limit for the month of January ,2023. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

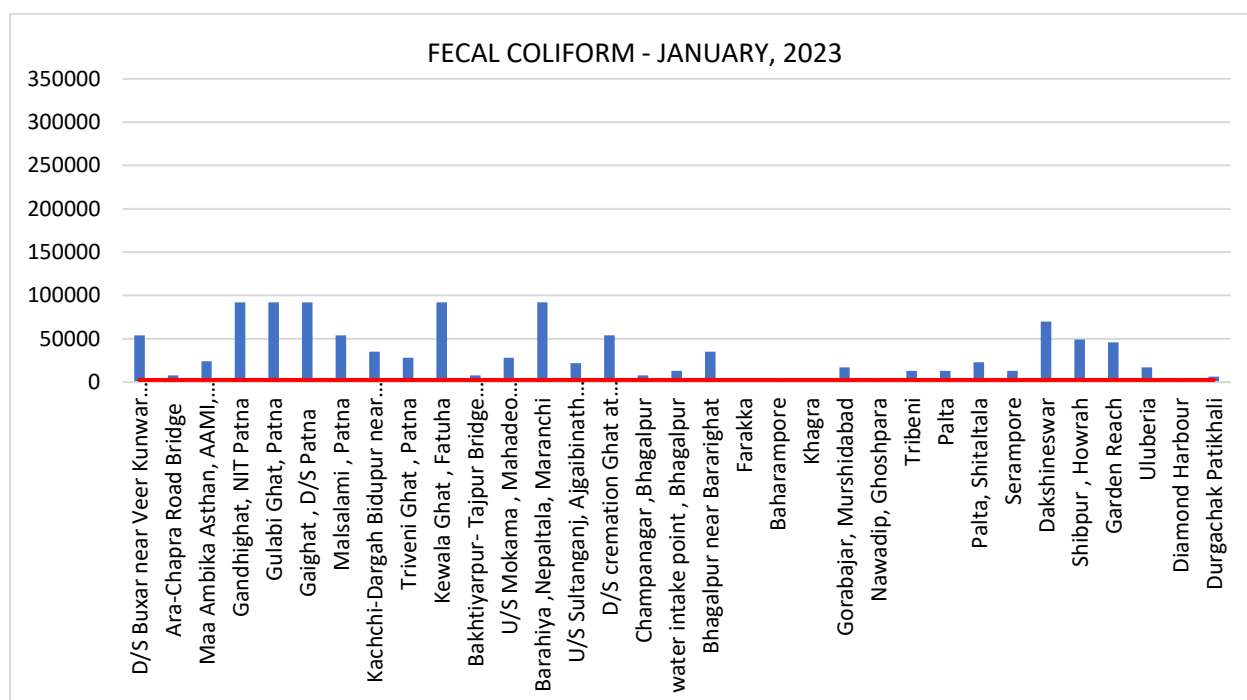


Fig.5.22. Fecal Coliform value for January,2023.

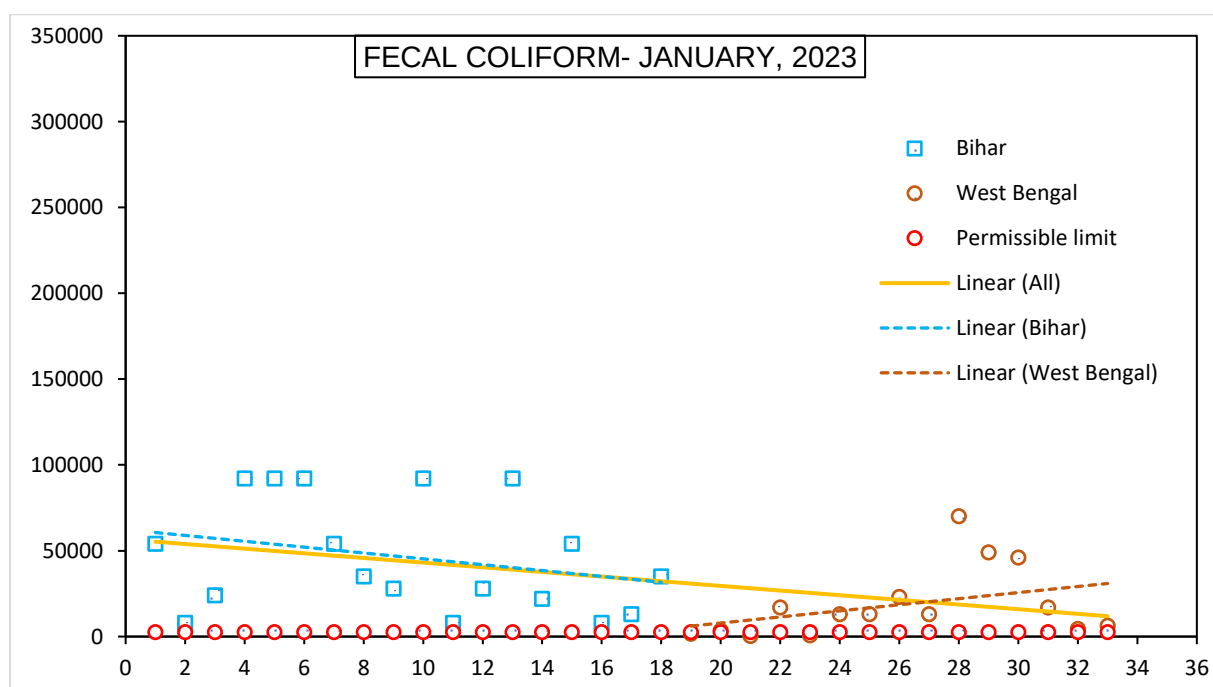


Fig.5.23. Trend Line analysis of Fecal Coliform value for January,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 92000. From Trend Line analysis curve the Fecal coliform value for Bihar is decreasing and for West Bengal it is increasing.

February 2021:

Table 5: Data of water quality parameter of river Ganga at different stations for February 2021						
Sl. No.	Station Name	Date	Parameters			
			BO D	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100 ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	05.02.2021	1.2	10.20	7.88	92000
2	Ara-Chapra Road Bridge	05.02.2021	1.1	10.20	8.21	17000
3	Maa Ambika Asthan, AAMI	05.02.2021	1.2	9.6	7.72	24000
4	Gandhighat, NIT Patna	02.02.2021	1.8	9.2	7.54	160000
5	Gulabi Ghat, Patna	02.02.2021	2.1	9.3	7.59	160000
6	Gaighat , D/S Patna	02.02.2021	1.7	9.8	7.83	92000
7	Malsalami , Patna	03.02.2021	1.3	10.0	7.91	92000
8	Kachchi-Dargah Bidupur	03.02.2021	1.6	11.6	7.98	54000
9	Triveni Ghat , Patna	03.02.2021	2.1	12.6	8.06	9400
10	Kewala Ghat , Fatuha	03.02.2021	1.8	7.7	7.69	92000
11	Bakhtiyarpur- Tajpur Bridge	08.02.2021	1.8	11.3	8.28	4900
12	U/S Mokama , Mahadeo Asthan	08.02.2021	2.3	11.2	8.59	3300
13	Barahiya ,Nepaltala, Maranchi	08.02.2021	1.30	12.80	8.55	2300
14	U/S Sultanganj, Ajgaibinath Mandir	09.02.2021	1.8	10.4	7.84	160000
15	D/S cremation Ghat at Sultanganj	09.02.2021	2.1	10.8	7.81	35000
16	Champanagar ,Bhagalpur	10.02.2021	1.3	9.5	6.02	1700
17	water intake point , Bhagalpur	10.02.2021	3.2	7.5	7.71	35000
18	Bhagalpur near Bararighat	10.02.2021	3.0	7.8	7.85	160000
19	Farakka	missing				
20	Baharampore	25.02.2021	3.2	8.4	8.19	94000
21	Khagra	25/02/2021	3.5	8.5	8.24	170000
22	Gorabajar, Murshidabad	25/02/2021	3.3	3.3	8.2	70000
23	Nawadip, Ghoshpara	24/02/2021	2.5	8.7	8.12	17000
24	Tribeni	24/02/2021	2.6	8.7	8.08	2700
25	Palta	01/02/2021	2.35	9.7	8.28	23000
26	Palta, Shitaltala	22/02/2021	2.65	8.7	8.14	49000
27	Serampore	22/02/2021	4.1	8.4	8.08	33000
28	Dakshineswar	23/02/2021	2.1	7.7	7.48	79000
29	Shibpur , Howrah	18/02/2021	2.8	7.8	7.87	33000
30	Garden Reach	19/02/2021	2.6	7.8	7.5	49000
31	Uluberia	23/02/2021	3.2	7.7	7.55	49000
32	Diamond Harbour	22/02/2021	2	6	7.1	7800
33	Durgachak Patikhali	missing				

Parameter 1: BOD

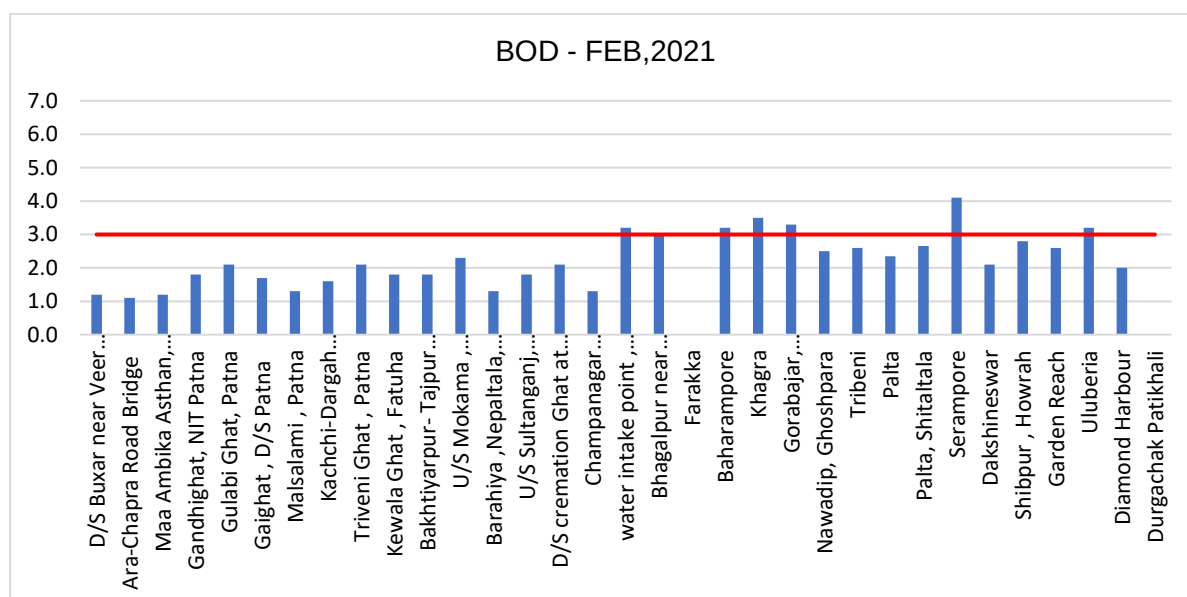


Fig.5.24. BOD value for February,2021.

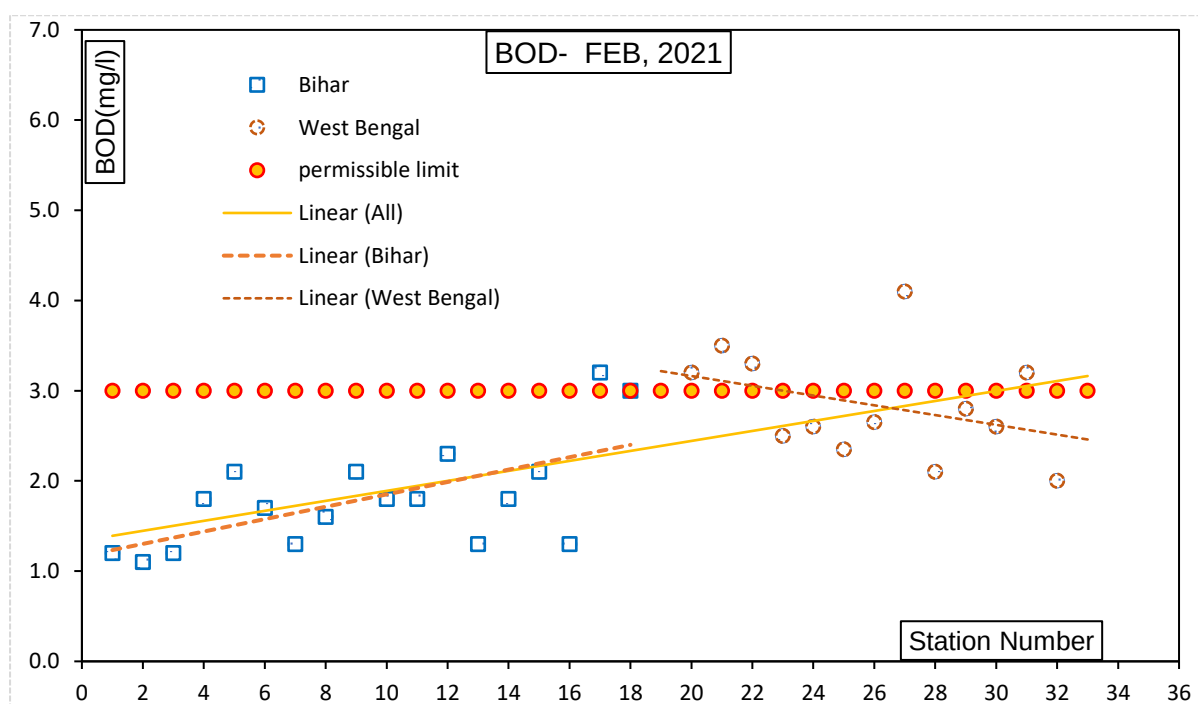


Fig.5.25. Trend Line analysis of Fecal Coliform value for February,2021

The BOD values were found in the range of 1.1–4.1 mg/l. The lowest BOD value 1.1 mg/l was for Ara-Chapra Road Bridge and highest BOD value of 4.1 mg/l was for Serampore for the month February, 2021. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing. However, the BOD values of West Bengal are more than the BOD values of Bihar.

Parameter 2: Dissolved O₂ (DO)

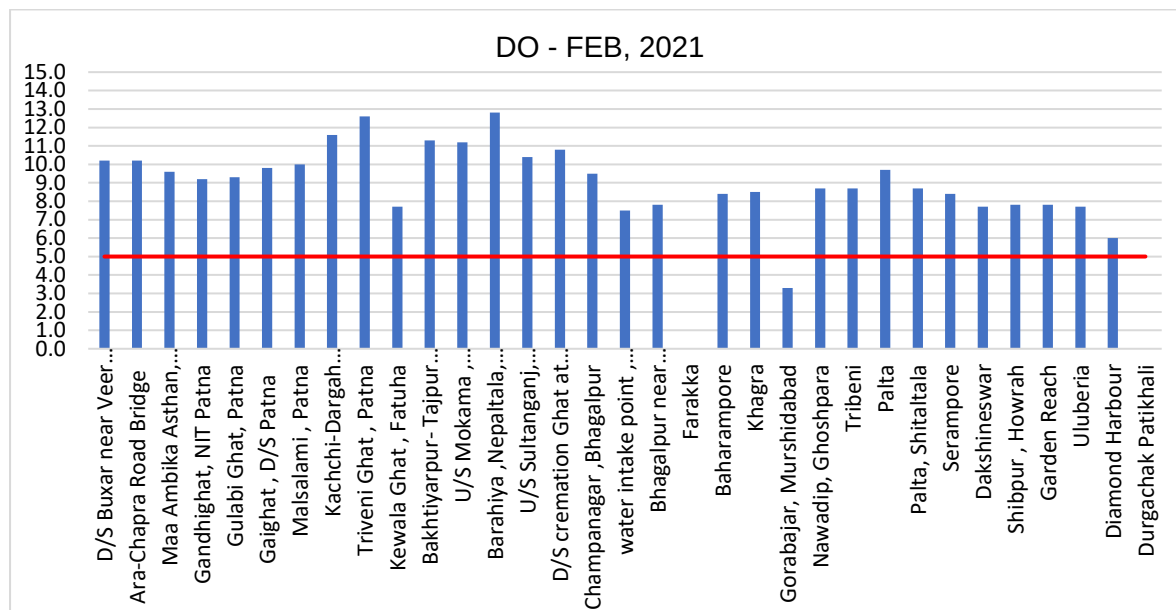


Fig.5.26. BOD value for February,2021

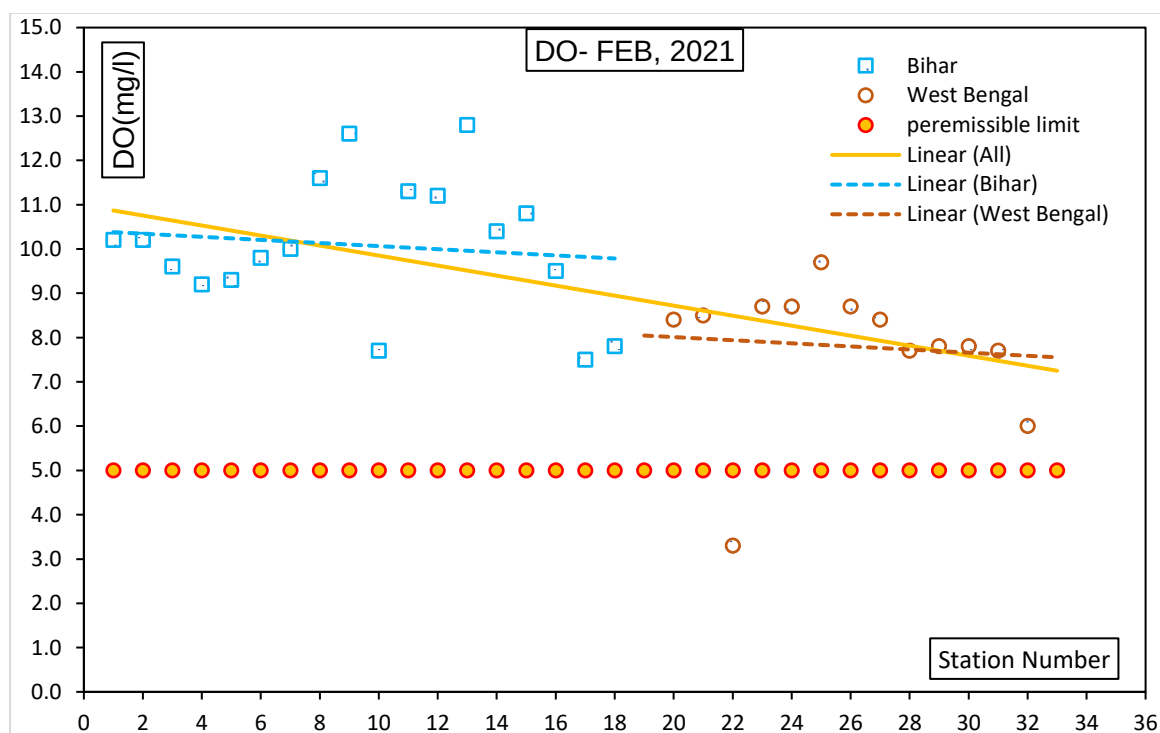


Fig.5.27. Trend Line analysis of DO value for February,2021

The DO values were found in the range of 3.3–12.8 mg/l. The lowest DO value 3.3 mg/l was for Gorabajar, Murshidabad and highest DO value of 12.8 mg/l was for Barahiya, Nepalitala, Maranchi for the month February, 2021. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal also it is decreasing.

Parameter 3: pH

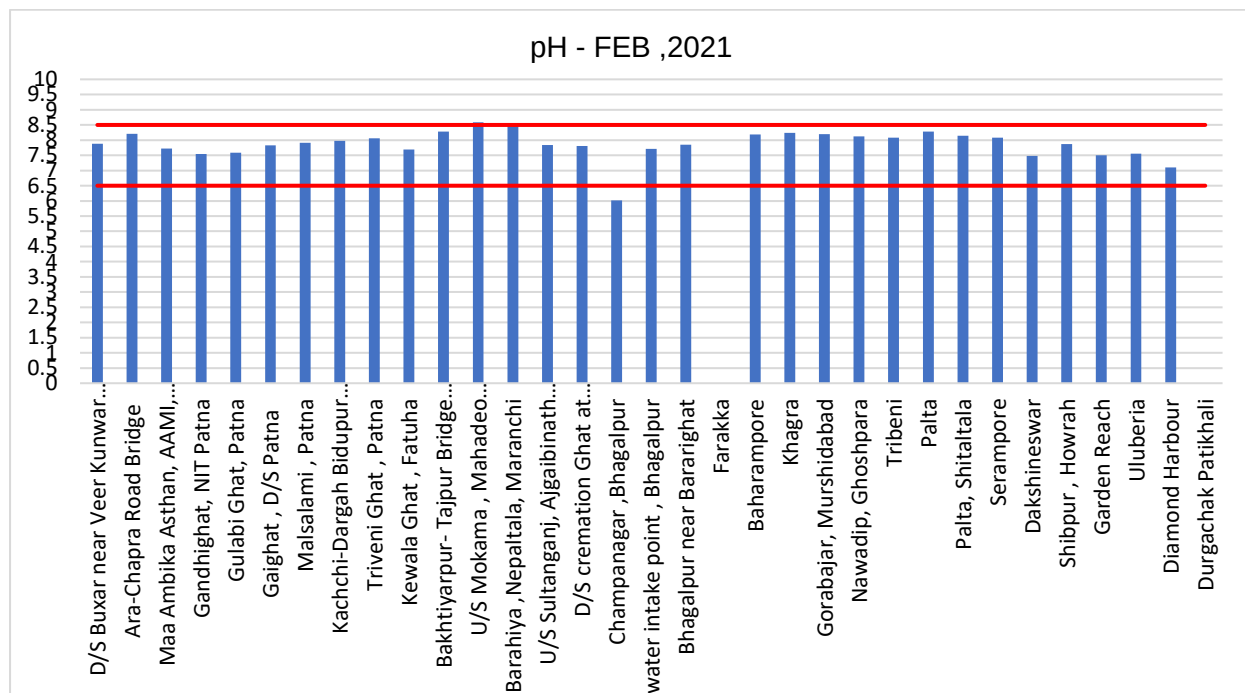


Fig.5.28. pH value for February,2021

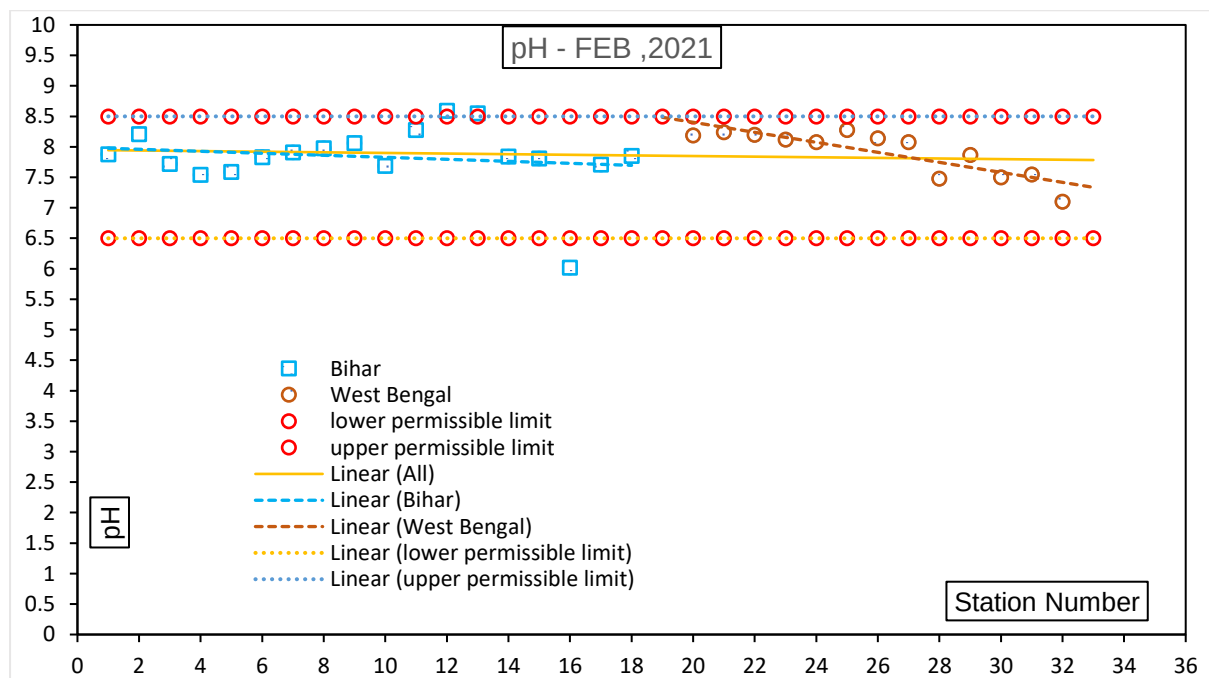


Fig.5.29. Trend Line analysis of pH value for February,2021

The pH values were found in the range of 6.02- 8.59. From the above graphs it can be seen that the pH level is within the permissible value all time for February,2021. It is seen that the permissible pH value exceeded the limit for Class B (6.5 to 8.5) for only once & for Class C (6-9) the pH level is within the permissible limit all time. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal also it is decreasing.

Parameter 4: Fecal Coliform

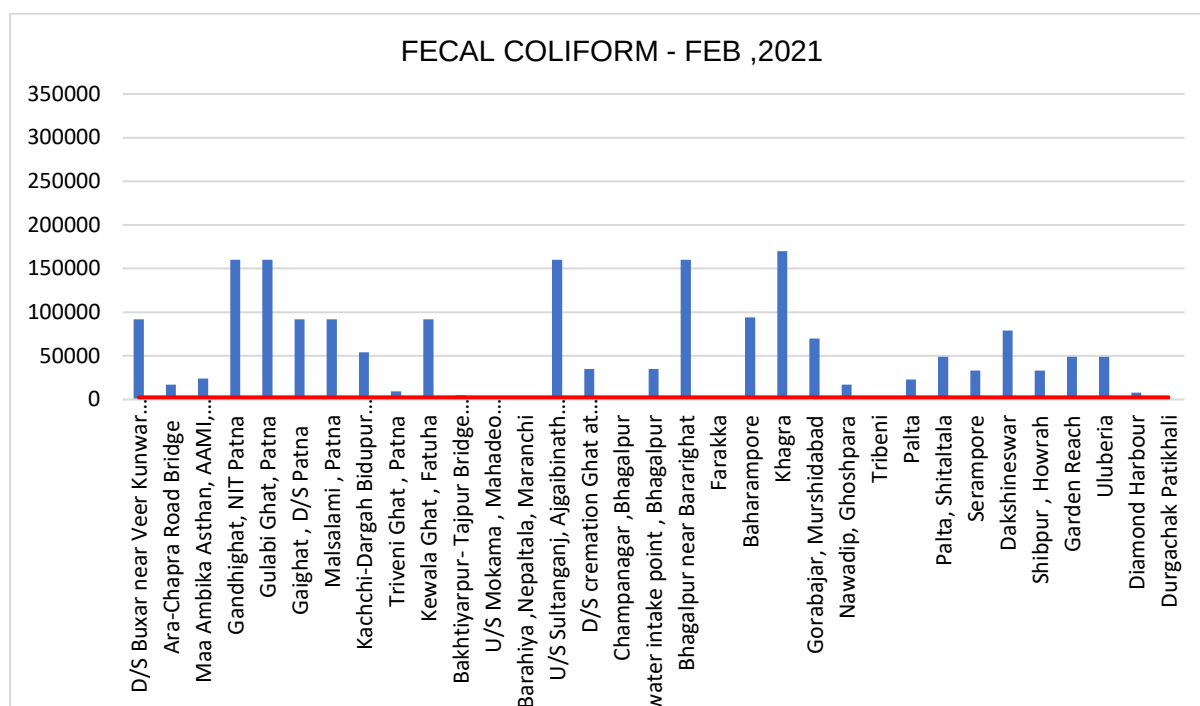


Fig.5.30. Fecal Coliform value for February,2021

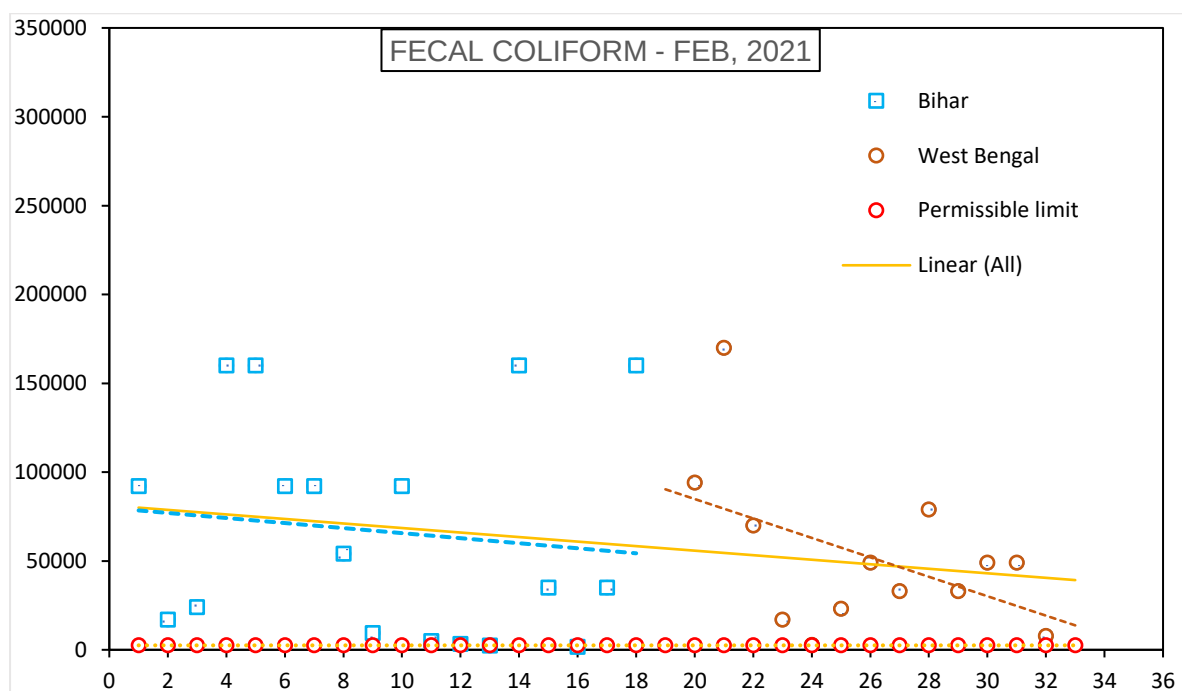


Fig.5.31. Trend Line analysis of Fecal Coliform value for February,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 170000. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal also it is decreasing.

February 2022:

Table 6: Data of water quality parameter of river Ganga at different stations for February, 2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	15.02.2022	1.2	11.9	8.4	17000
2	Ara-Chapra Road Bridge	01.02.2022	1.1	11.5	8.7	270
3	Maa Ambika Asthan, AAMI	16.02.2022	1.8	7.7	8.4	13000
4	Gandhighat, NIT Patna	11.02.2022	1.8	8.8	8.2	160000
5	Gulabi Ghat, Patna	11.02.2022	1.6	8.6	8.3	160000
6	Gaighat , D/S Patna	12.02.2022	1.3	9.1	8.2	54000
7	Malsalami , Patna	11.02.2022	1	9.3	8.3	35000
8	Kachchi-Dargah Bidupur	11.02.2022	1	9.5	8.4	54000
9	Triveni Ghat , Patna	11.02.2022	1	9.2	8.3	35000
10	Kewala Ghat , Fatuha	12.02.2022	2.3	8.1	8	92000
11	Bakhtiyarpur- Tajpur Bridge	01.02.2022	1	12.0	8.3	2800
12	U/S Mokama , Mahadeo Asthan	11.02.2022	1	13.1	8.1	14000
13	Barahiya ,Nepaltala, Maranchi	11.02.2022	1	13.4	8.2	92000
14	U/S Sultanganj, Ajgaibinath Mandir	20.02.2022	1	10.5	8.2	79
15	D/S cremation Ghat at Sultanganj					
16	Champanagar ,Bhagalpur	16.02.2022	1.3	11.0	8.2	3300
17	water intake point , Bhagalpur	16.02.2022	2	8.7	8.5	28000
18	Bhagalpur near Bararighat	11.02.2022	2.3	9.0	8.1	35000
19	Farakka	22/02/2022	1.35	8.2	8.23	230
20	Baharampore	21/02/2022	2.5	8.4	8.13	17000
21	Khagra	21/02/2022	2.5	8.4	8.36	2300
22	Gorabajar, Murshidabad	21/02/2022	2.7	2.7	8.13	7800
23	Nawadip, Ghoshpara	18/02/2022	2.7	8.4	7.91	33000
24	Tribeni	16/02/2022	2.9	7.9	7.96	4900
25	Palta	17/02/2022	3	8	8.29	33000
26	Palta, Shitaltala	17/02/2022	4.55	8.7	8.22	79000
27	Serampore	07/02/2022	2.1	8.4	7.9	4600
28	Dakshineswar	22/02/2022	3.85	7.7	7.79	49000
29	Shibpur , Howrah	22/02/2022	3.8	7.1	7.62	33000
30	Garden Reach	22/02/2022	3.1	6.9	7.68	33000
31	Uluberia	25/02/2022	2.25	6.5	7.75	17000
32	Diamond Harbour	28/02/2022	2.25	6.8	7.69	4500
33	Durgachak Patikhali	22/02/2022	1.15	5.4	7.41	22000

Parameter 1: BOD

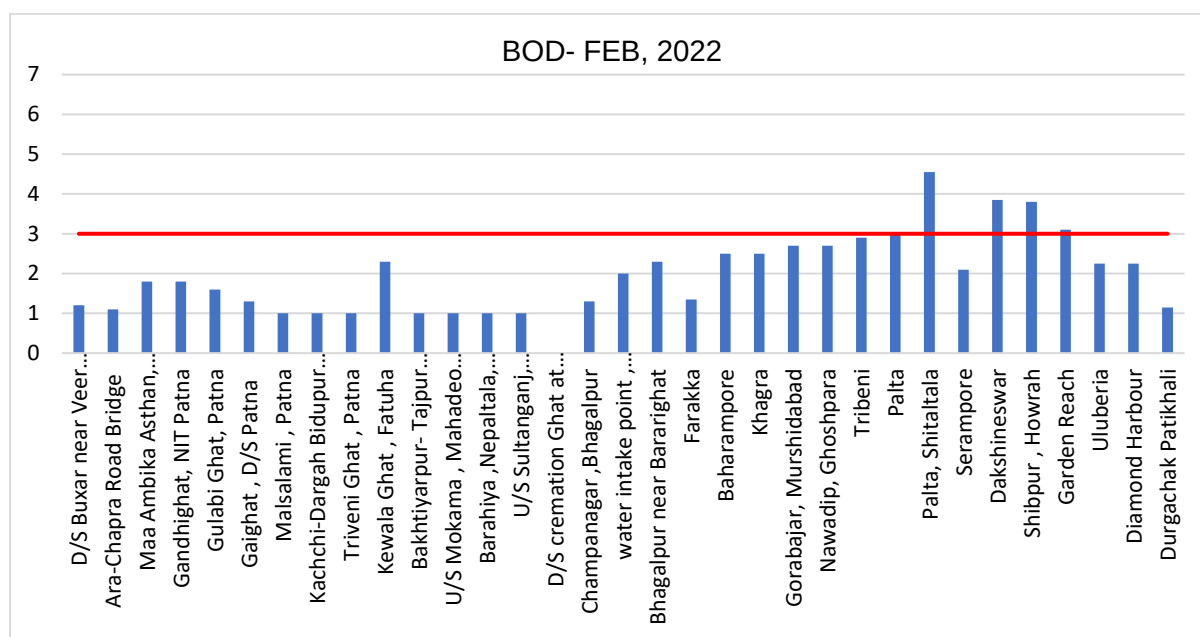


Fig.5.32. BOD value for February,2022

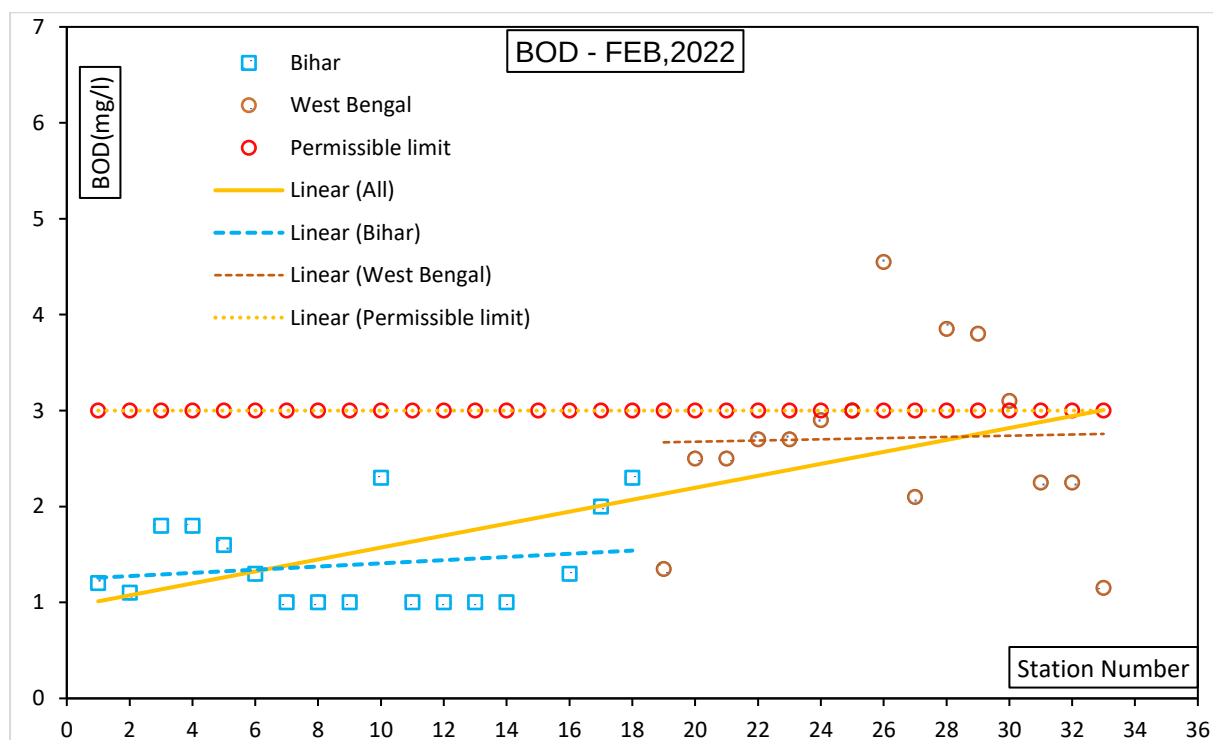


Fig.5.33. Trend Line analysis of BOD value for February,2022

The BOD values were found in the range of 1.0–4.55 mg/l. The highest BOD value of 4.55 mg/l was for Palta, Shitaltala for the month February, 2022. From Trend Line analysis curve the BOD value for Bihar is slightly increasing and for West Bengal also it is slightly increasing.

Parameter 2: Dissolved O₂ (DO)

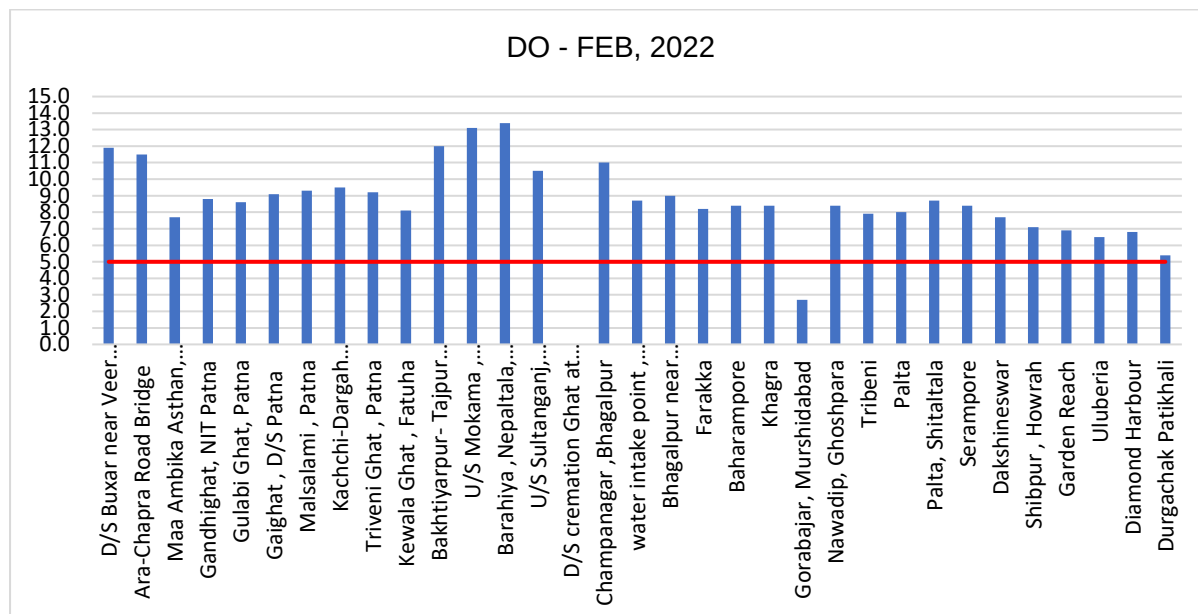


Fig.5.34. DO value for February,2022

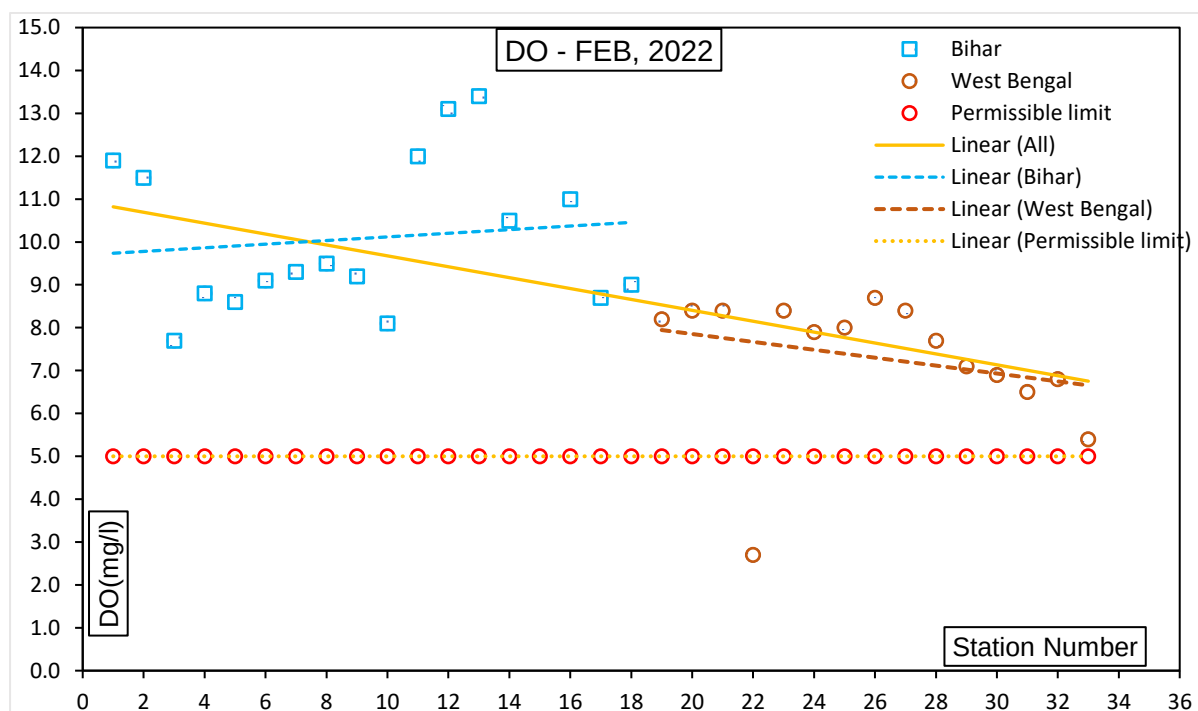


Fig.5.35. Trend Line analysis of DO value for February,2022

The DO values were found in the range of 2.7–13.4 mg/l. The lowest DO value 2.7 mg/l was for Gorabajar, Murshidabad and highest DO value of 13.4 mg/l was for Barahiya, Nepaltala, Maranchi for the month February, 2022. From Trend Line analysis curve the DO value for Bihar is slightly increasing and for West Bengal it is decreasing.

Parameter 3: pH

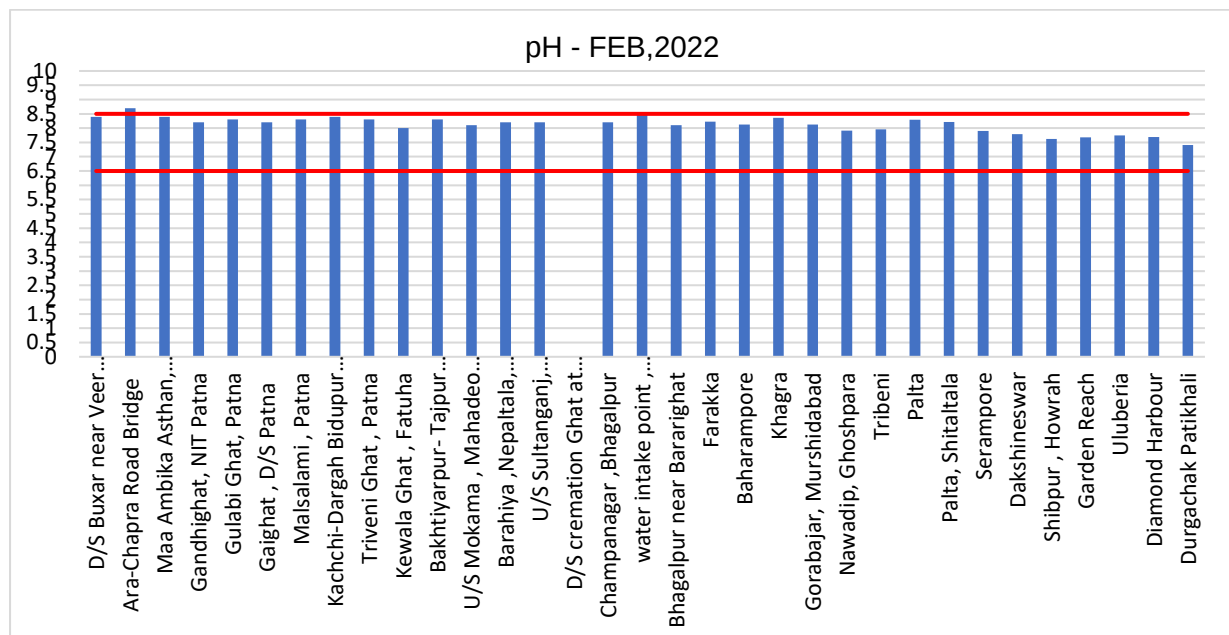


Fig.5.36. pH value for February,2022

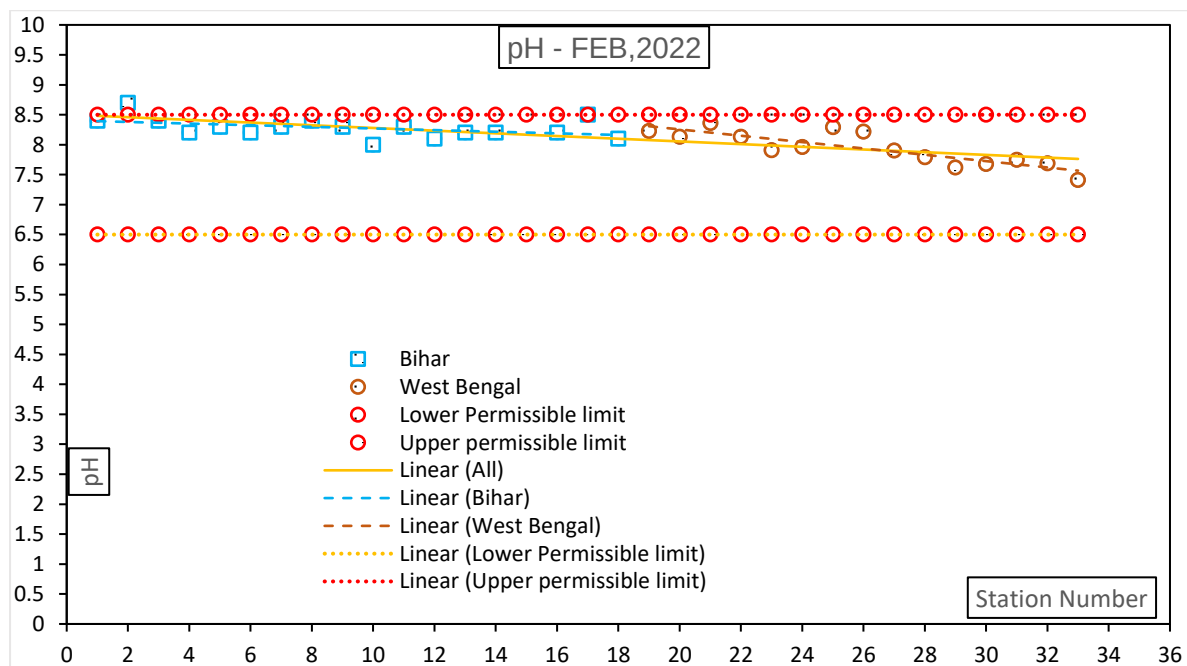


Fig.5.37. Trend Line analysis of pH value for February,2022

The pH values were found in the range of 7.41- 8.7. From the above graphs it can be seen that the pH level is within the permissible value all time for February,2022. It is seen that the permissible pH value exceeded the limit for Class B (6.5 to 8.5) for only twice & for Class C (6-9) the pH level is within the permissible limit all time. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal also it is decreasing.

Parameter 4: Fecal Coliform

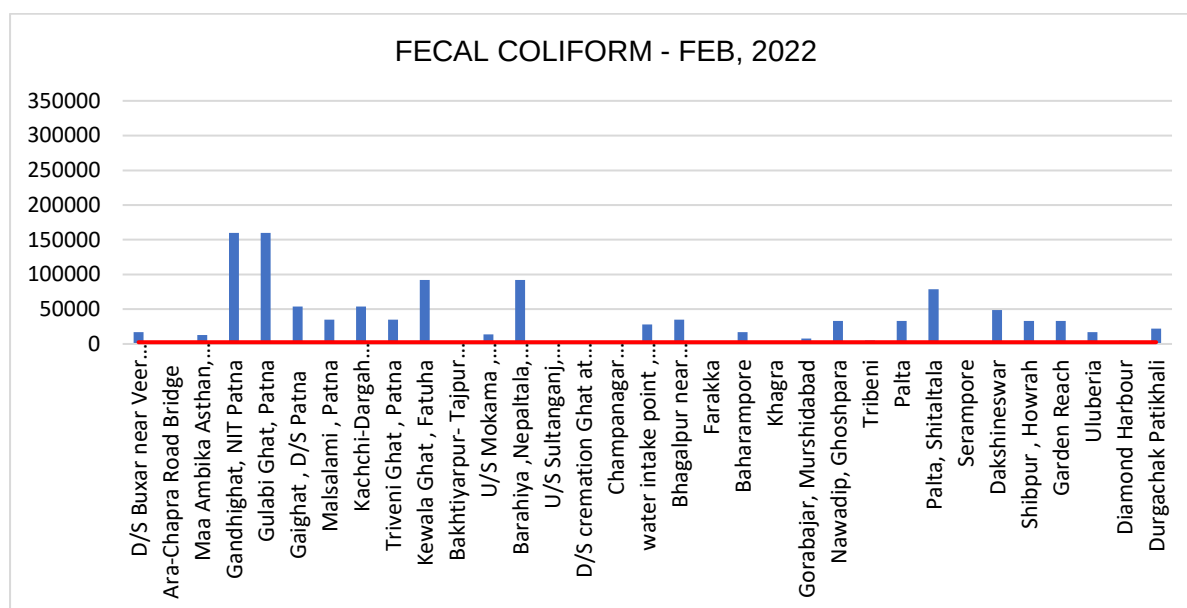


Fig.5.38. Fecal Coliform value for February,2022

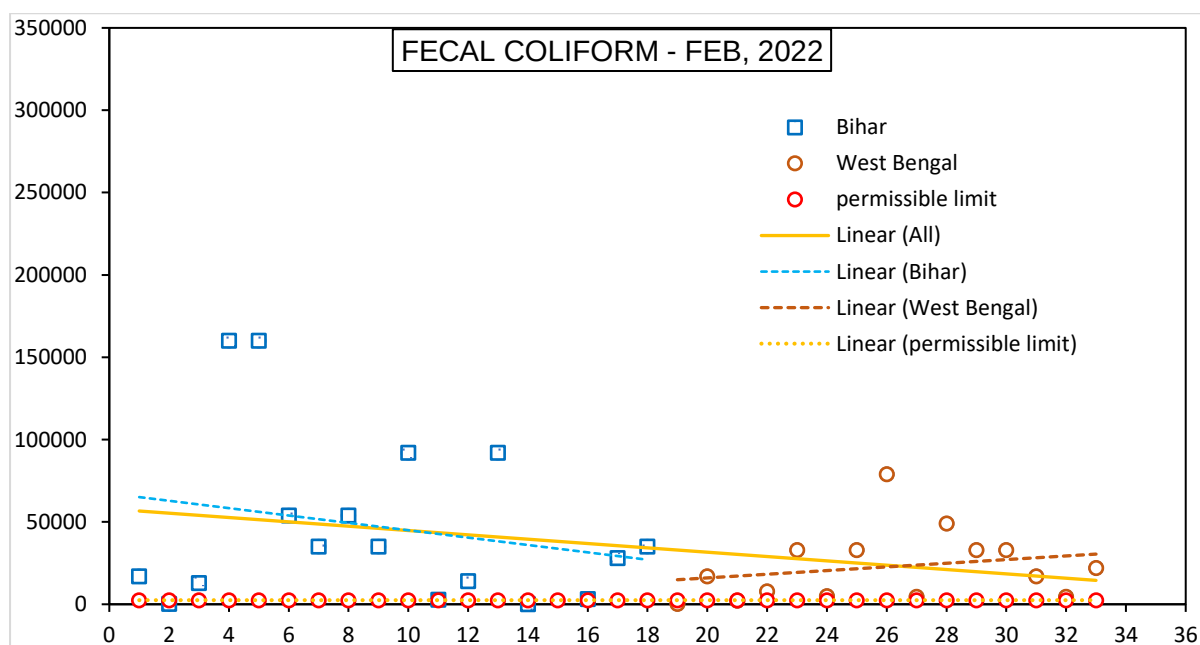


Fig.5.39. Trend Line analysis of Fecal Coliform value for February,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 160000. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

February 2023:

Table 7: Data of water quality parameter of river Ganga at different stations for February, 2023						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	23.02.2023	2.5	6.5	7.74	13000
2	Ara-Chapra Road Bridge	02.02.2023	1.3	8.1	7.58	35000
3	Maa Ambika Asthan, AAMI	02.02.2023	1.7	7.9	7.86	92000
4	Gandhighat, NIT Patna	21.02.2023	2	9.4	8.3	35000
5	Gulabi Ghat, Patna	21.02.2023	2.3	8.9	8.36	92000
6	Gaighat , D/S Patna	03.02.2023	1.6	8.4	7.32	28000
7	Malsalami , Patna	22.02.2023	2.2	8.1	8.02	2200
8	Kachchi-Dargah Bidupur	03.02.2023	1.9	8.2	7.81	54000
9	Triveni Ghat , Patna	03.02.2023	2.1	7.8	7.74	35000
10	Kewala Ghat , Fatuha	03.02.2023	2.2	7.5	7.54	92000
11	Bakhtiyarpur- Tajpur Bridge	06.02.2023	1.9	8.3	7.89	17000
12	U/S Mokama , Mahadeo Asthan	06.02.2023	1.3	8.8	8.41	54000
13	Barahiya ,Nepaltala, Maranchi	06.02.2023	1	9.3	8.26	35000
14	U/S Sultanganj, Ajgaibinath Mandir	25.02.2023	2.3	8.0	8.07	92000
15	D/S cremation Ghat at Sultanganj	06.02.2023	2.2	7.5	7.45	11000
16	Champanagar ,Bhagalpur	06.02.2023	1	10.0	7.46	92000
17	water intake point , Bhagalpur	06.02.2023	2	8.2	7.58	54000
18	Bhagalpur near Bararighat	06.02.2023	1.2	9.3	7.34	92000
19	Farakka	23.02.2023	2.95	8.9	7.74	230
20	Baharampore	22/02/2023	2.65	6.2	8.1	110000
21	Khagra	22.02.2023	1.85	8	7.77	490
22	Gorabajar, Murshidabad	22.02.2023	2.8	2.8	7.48	7900
23	Nawadip, Ghoshpara	27.02.2023	2.3	8.8	7.99	700
24	Tribeni	missing				
25	Palta	21.02.2023	2.7	8	7.83	22000
26	Palta, Shitaltala	21.02.2023	2.95	8.1	7.84	23000
27	Serampore					
28	Dakshineswar	20.02.2023	2.9	6.9	7.89	49000
29	Shibpur , Howrah	21.02.2023	2.85	6.4	7.87	70000
30	Garden Reach	21.02.2023	2.95	6.4	7.95	70000
31	Uluberia	22.02.2023	2.95	6.3	7.12	23000
32	Diamond Harbour	23.02.2023	2.9	5.9	7.29	7800
33	Durgachak Patikhali	17.02.2023	1.45	7.1	8.5	6300

Parameter 1: BOD

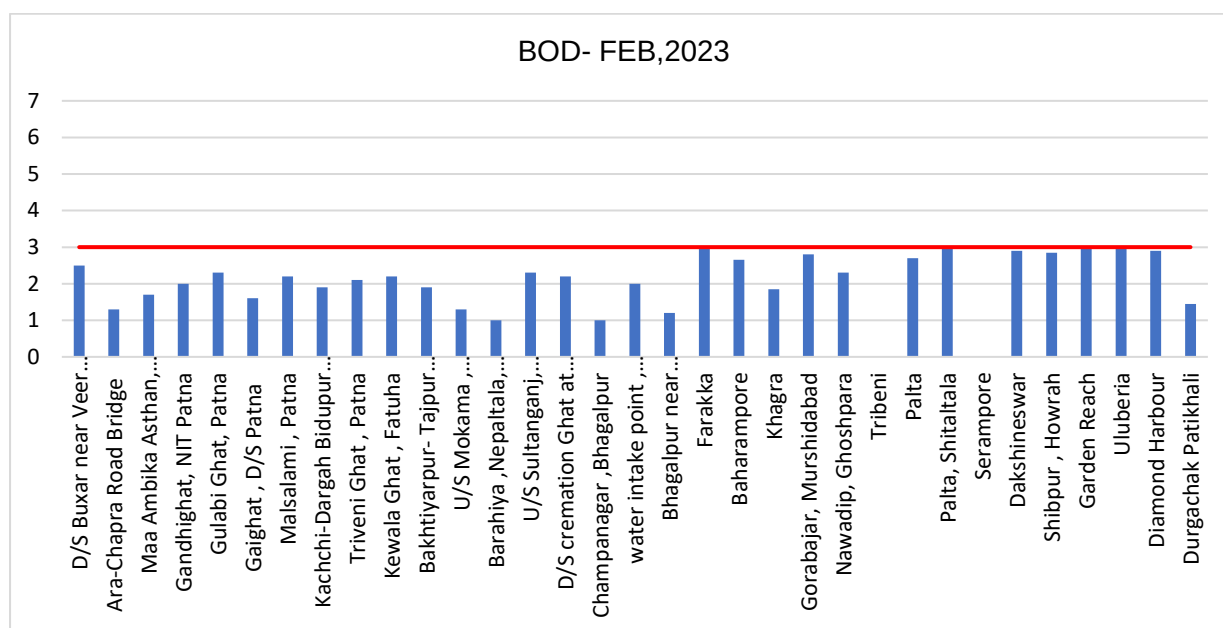


Fig.5.40. BOD value for February,2023

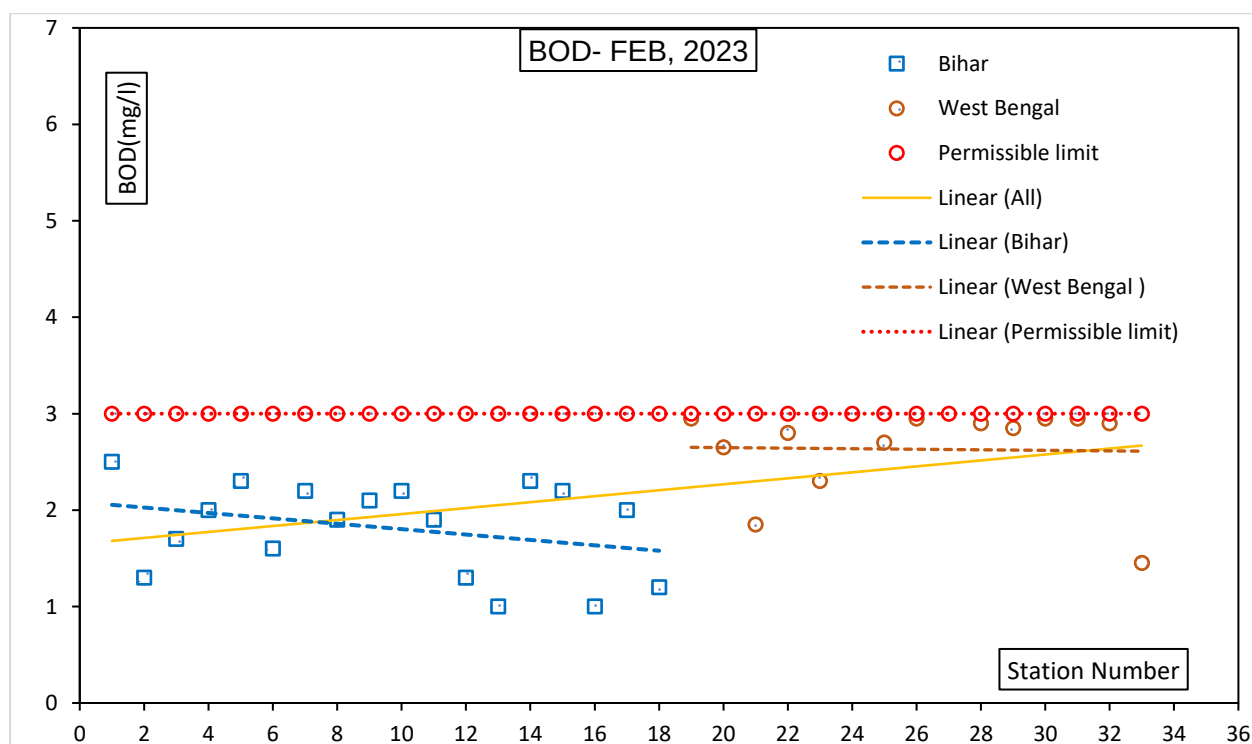


Fig.5.41. Trend Line analysis of BOD value for February,2023

The BOD values were found in the range of 1.0–2.95 mg/l. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal also it is slightly decreasing.

Parameter 2: Dissolved O₂ (DO)

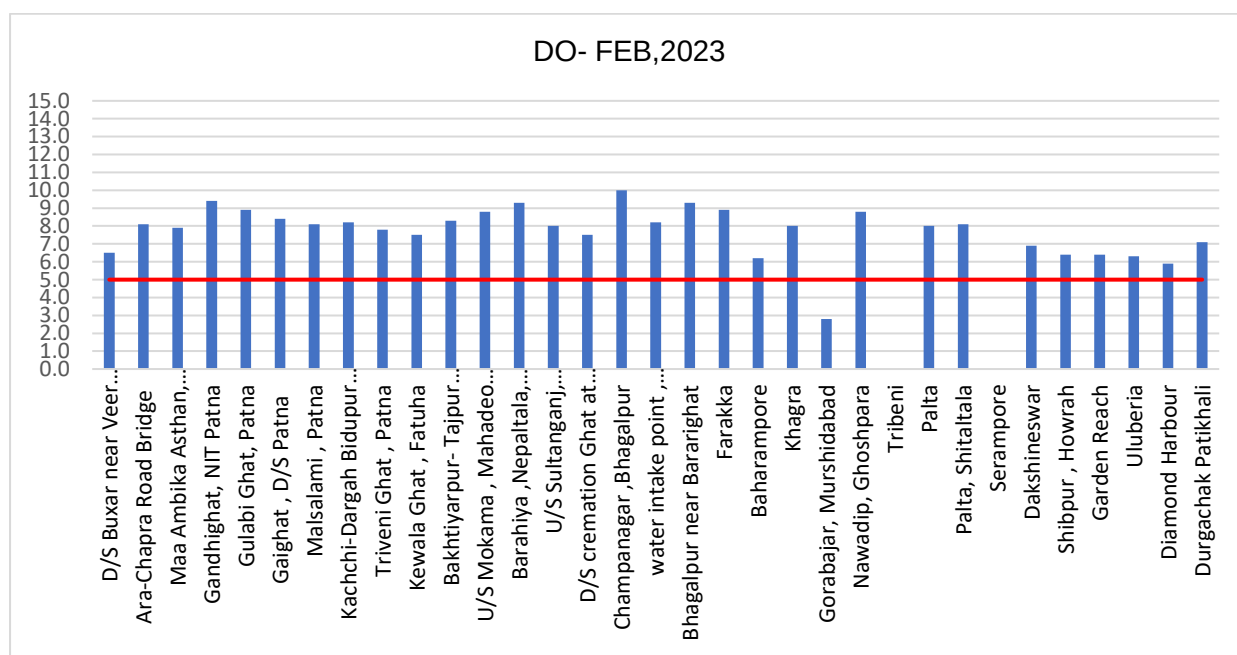


Fig.5.40. DO value for February,2023

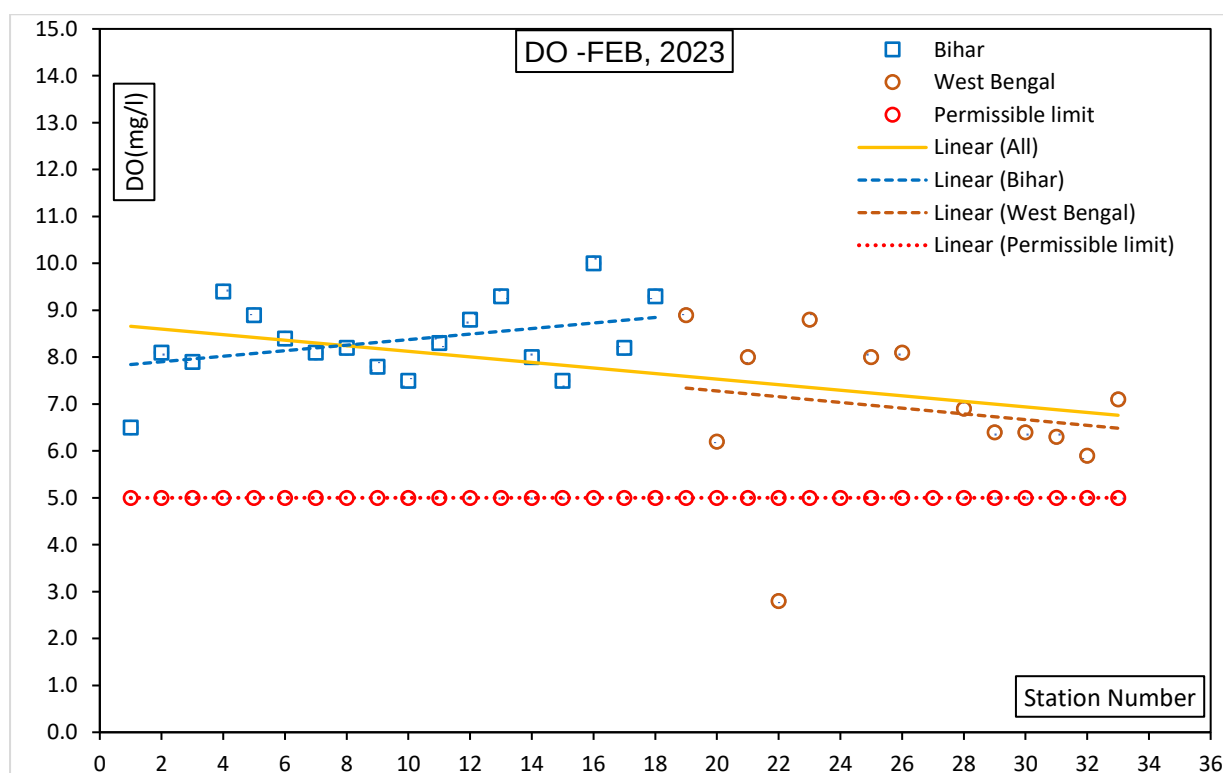


Fig.5.41. Trend Line analysis of DO value for February,2023

The DO values were found in the range of 2.8–10.0 mg/l. The lowest DO value 2.8 mg/l was for Gorabajar, Murshidabad and highest DO value of 13.4 mg/l was for Champanagar, Bhagalpur for the month February, 2023. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal also it is decreasing.

Parameter 3: pH

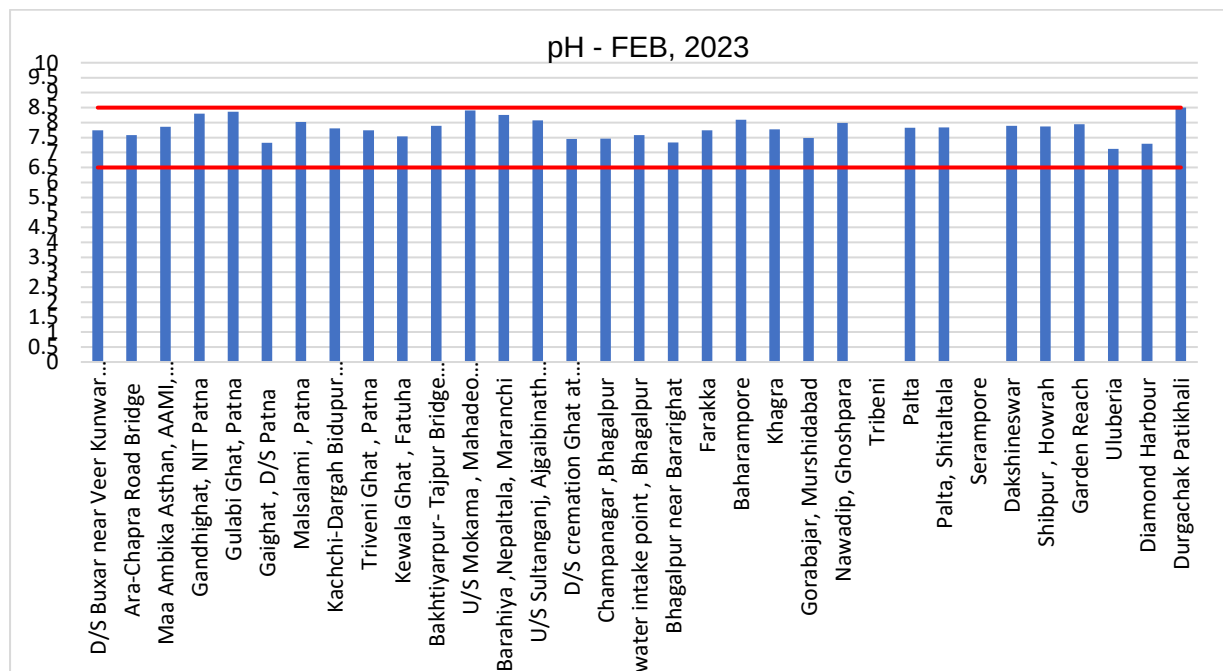


Fig.5.42. pH value for February,2023

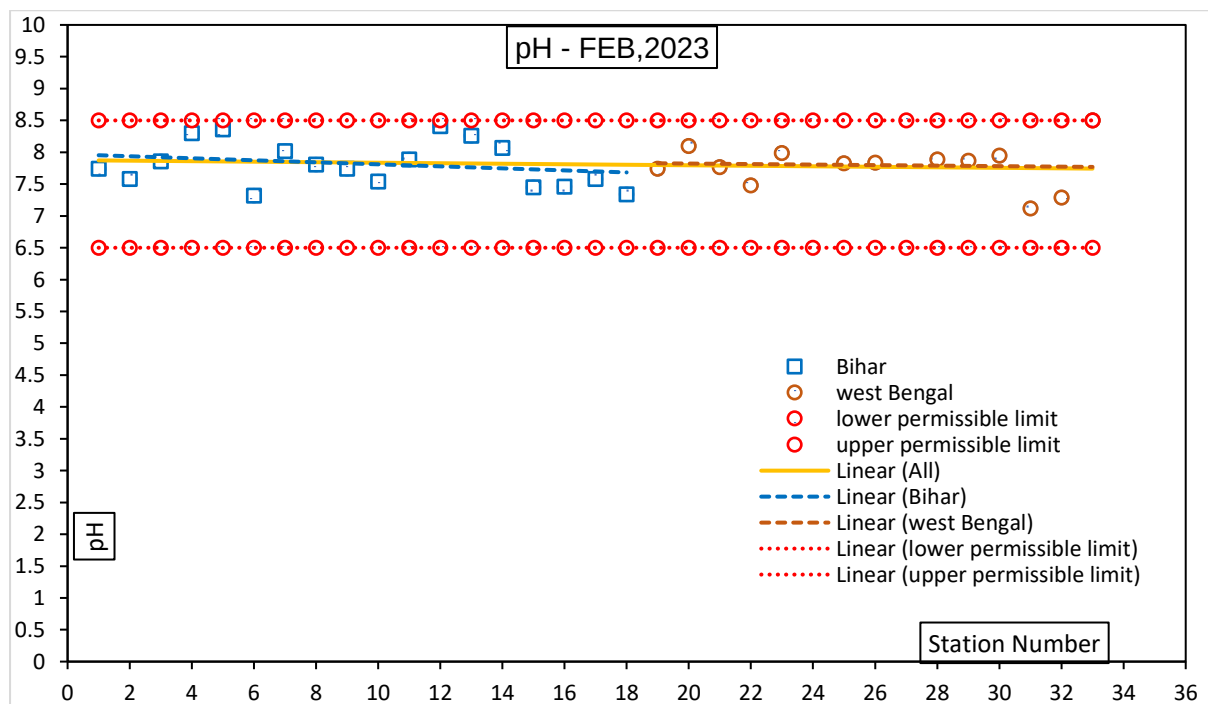


Fig.5.43. Trend Line analysis of pH value for February,2023

The pH values were found in the range of 7.12 - 8.5. From the above graphs it can be seen that the pH level is within the permissible value all time for February,2023. It is seen that the permissible pH value exceeded the limit for Class B (6.5 to 8.5) for only once & for Class C (6-9) the pH level is within the permissible limit all time. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal also it is slightly decreasing.

Parameter 4: Fecal Coliform

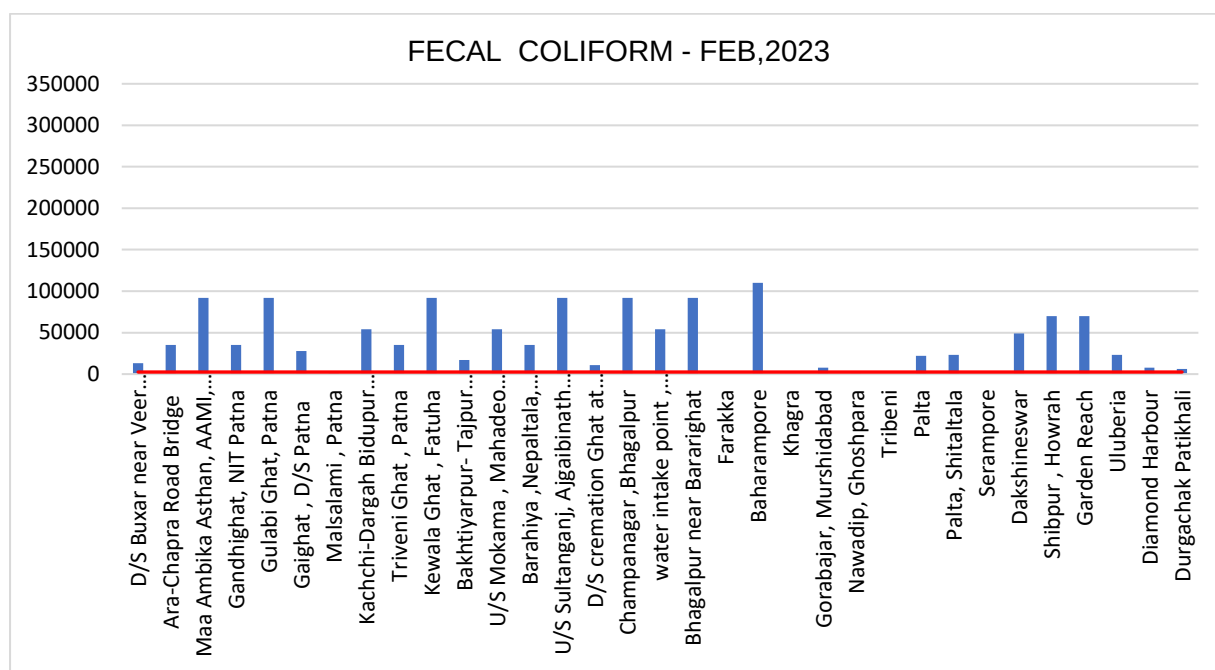


Fig.5.44. Fecal Coliform value for February,2023

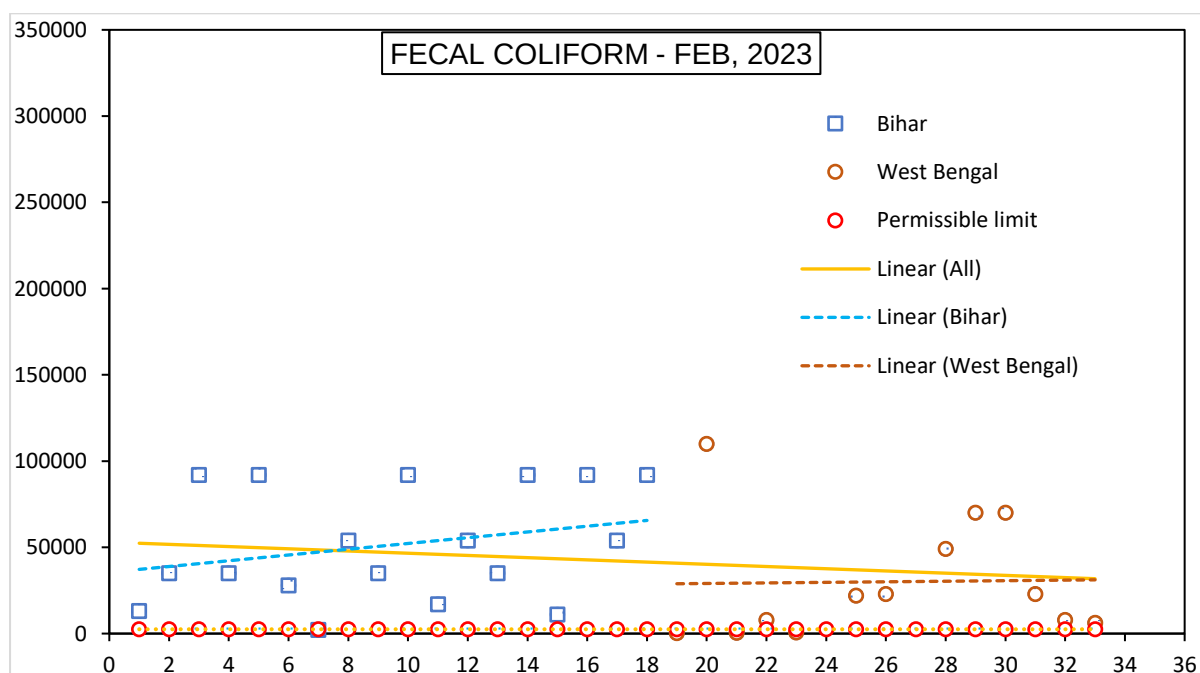


Fig.5.45. Trend Line analysis of Fecal Coliform value for February,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 110000. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is slightly decreasing.

March 2021:

Table 8: Data of water quality parameter of river Ganga at different stations for March, 2021						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	05.03.2021	0.9	7.9	7.54	160000
2	Ara-Chapra Road Bridge	06.03.2021	1.4	9.60	7.64	13000
3	Maa Ambika Asthan, AAMI	06.03.2021	1.5	9.1	7.94	2300
4	Gandhighat, NIT Patna	02.03.2021	3.0	6.6	7.51	160000
5	Gulabi Ghat, Patna	02.03.2021	2.6	7.2	7.64	160000
6	Gaighat , D/S Patna	02.03.2021	2.8	9.9	7.93	92000
7	Malsalami , Patna	23.03.2021	1.7	7.7	7.63	35000
8	Kachchi-Dargah Bidupur	23.03.2021	1.3	9.5	7.5	54000
9	Triveni Ghat , Patna	23.03.2021	2.1	7.4	7.87	22000
10	Kewala Ghat , Fatuha	23.03.2021	2.4	6.3	7.38	92000
11	Bakhtiyarpur- Tajpur Bridge	10.03.2021	1.4	9.8	7	11000
12	U/S Mokama , Mahadeo Asthan	10.03.2021	1.8	12.3	7.83	35000
13	Barahiya ,Nepaltala, Maranchi	10.03.2021	2.12	9.70	8.03	2600
14	U/S Sultanganj, Ajgaibinath Mandir	11.03.2021	1.5	10.3	7.73	54000
15	D/S cremation Ghat at Sultanganj	11.03.2021	1.8	9.8	7.7	160000
16	Champanagar, Bhagalpur	11.03.2021	1.4	9.1	7.78	92000
17	water intake point , Bhagalpur	11.03.2021	6.6	7.5	7.69	54000
18	Bhagalpur near Bararighat	11.03.2021	6.6	7.5	7.69	54000
19	Farakka	30/03/2021	1.95	7.3	8.12	470
20	Baharampore	25/03/2021	2.6	7.5	8.08	49000
21	Khagra	25/03/2021	3.1	7.7	7.77	220000
22	Gorabajar, Murshidabad	25/03/2021	1.9	1.9	8.08	49000
23	Nawadip, Ghoshpara	30/03/2021	2.65	7.4	8.1	6800
24	Tribeni	30/03/2021	3.2	7.4	7.96	8400
25	Palta	17/03/2021	1.9	6.5	7.94	79000
26	Palta, Shitaltala	17/03/2021	3	6	7.95	130000
27	Serampore	16/03/2021	1.8	7.2	8.21	79000
28	Dakshineswar	16/03/2021	3.25	5.5	7.83	79000
29	Shibpur , Howrah	17/03/2021	3.05	5.6	7.72	13000
30	Garden Reach	18/03/2021	3	5.6	7.3	23000
31	Uluberia	23/03/2021	3.4	5.8	7.44	4500
32	Diamond Harbour	25/03/2021	2.85	5.4	7.4	4500
33	Durgachak Patikhali	23/03/2021	1	6.3	8.03	9400

Parameter 1: BOD

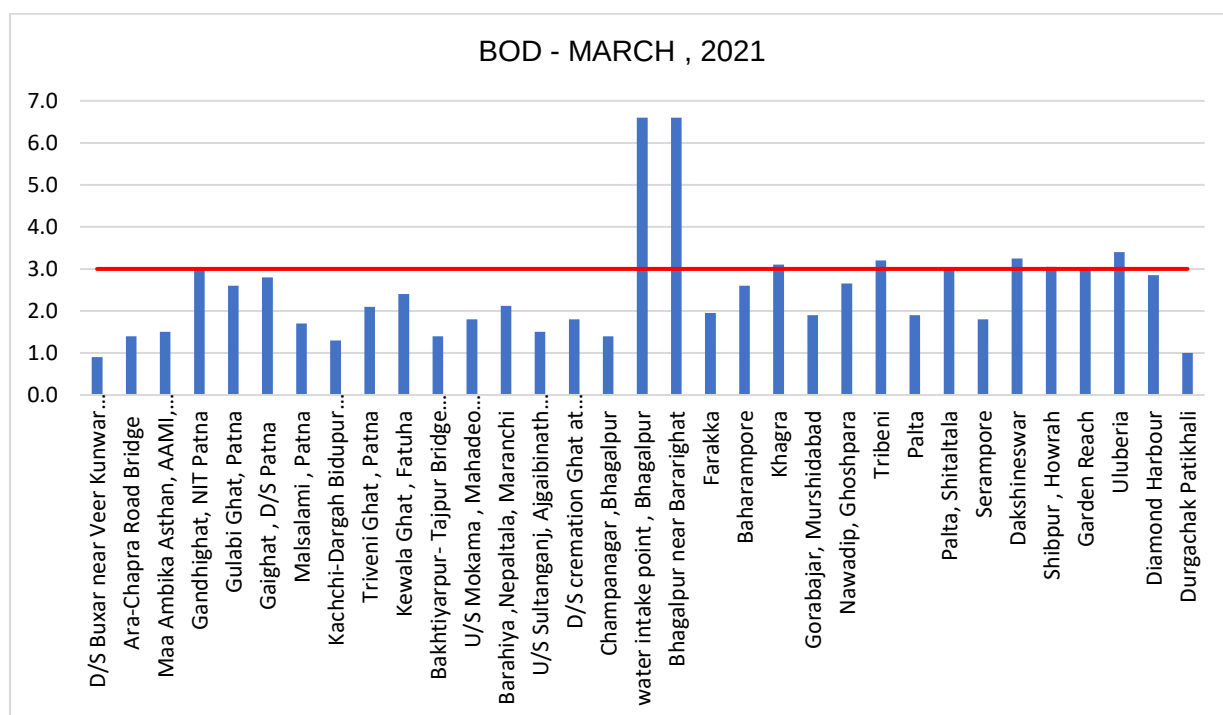


Fig.5.46. BOD value for March,2021

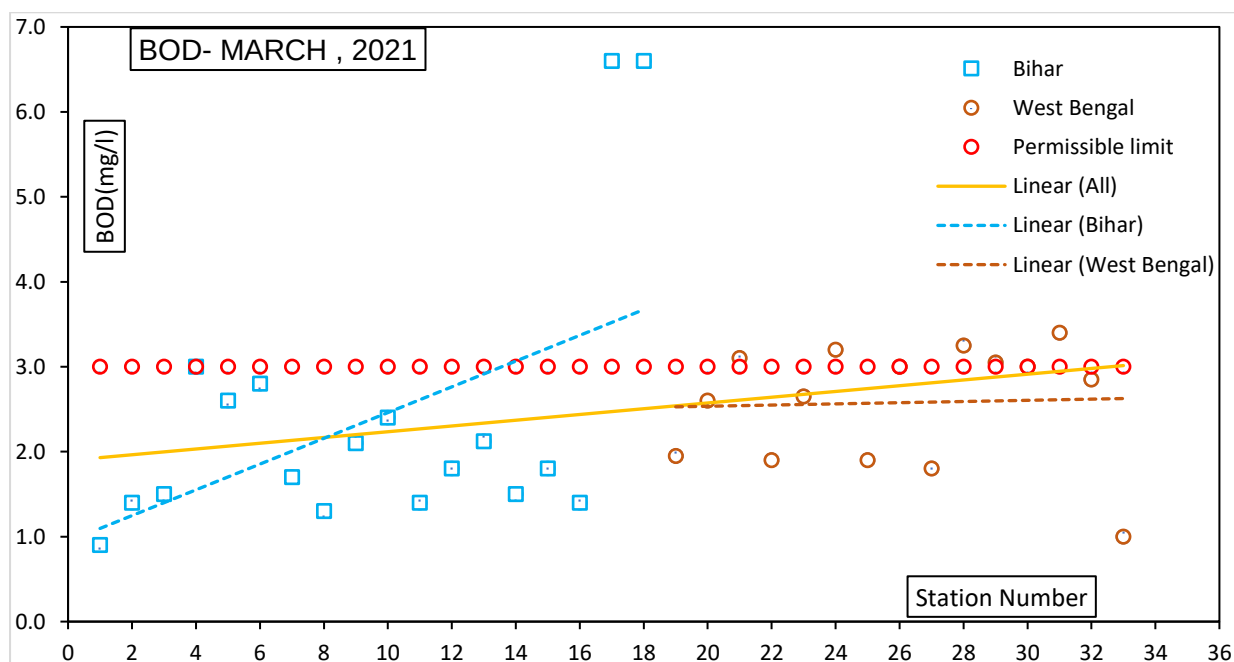


Fig.5.47. Trend Line analysis of BOD value for March,2021

The BOD values were found in the range of 0.9–6.6 mg/l. The lowest BOD value of 0.9 mg/l was for D/S Buxar near Veer Kunwar Singh Road Bridge and highest BOD value of 6.6 mg/l was for water intake point, Bhagalpur and Bhagalpur near Bararighat for the month of March, 2021. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

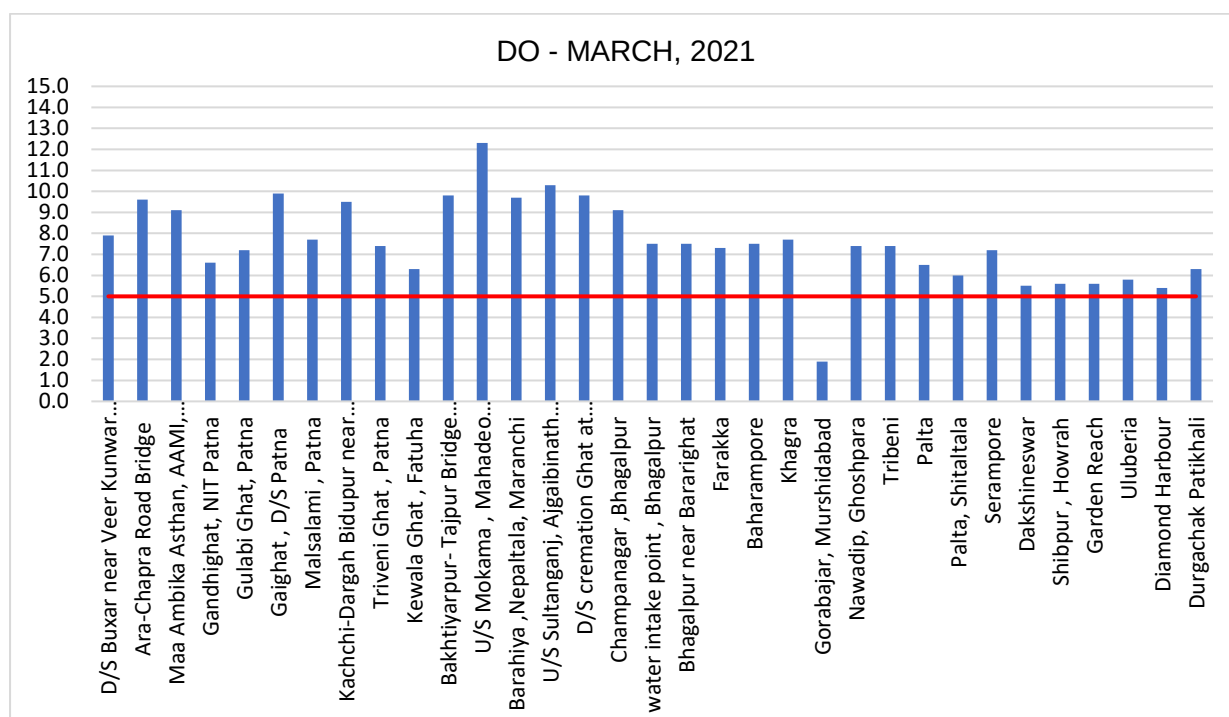


Fig.5.48. BOD value for March,2021

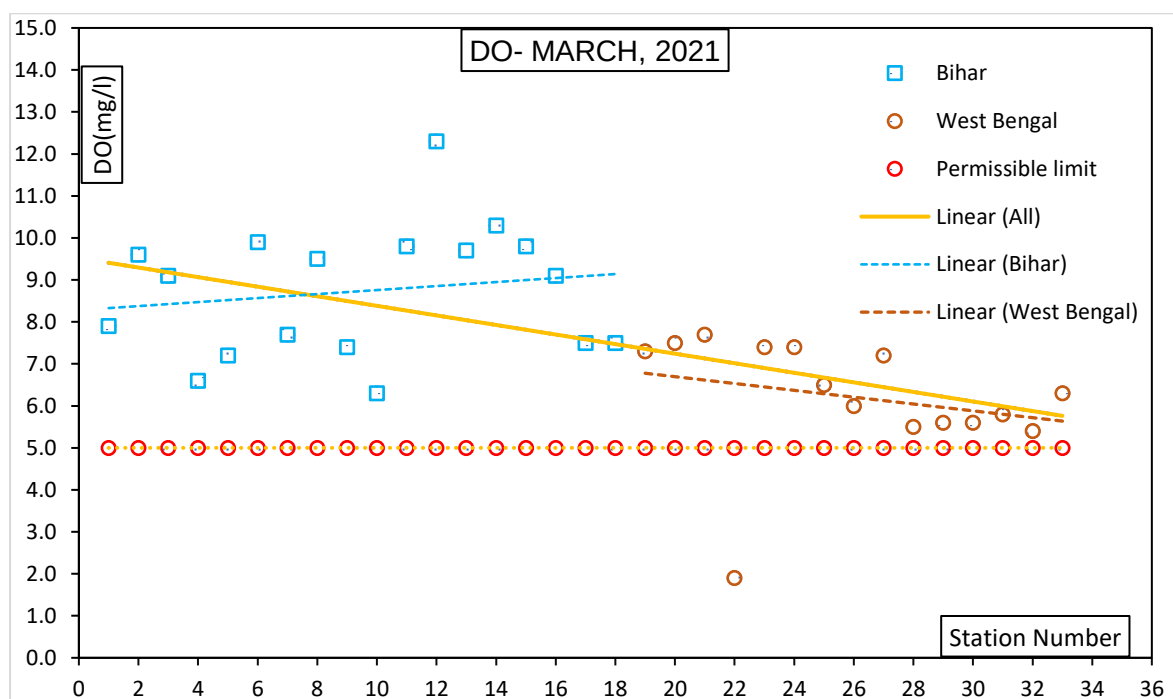


Fig.5.49. Trend Line analysis of DO value for March,2021

The DO values were found in the range of 1.9–12.3 mg/l. The lowest DO value 1.9 mg/l was for Gorabajar, Murshidabad and highest DO value of 12.3 mg/l was for U/S Mokama Mahadeo Asthan for the month March,2021. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

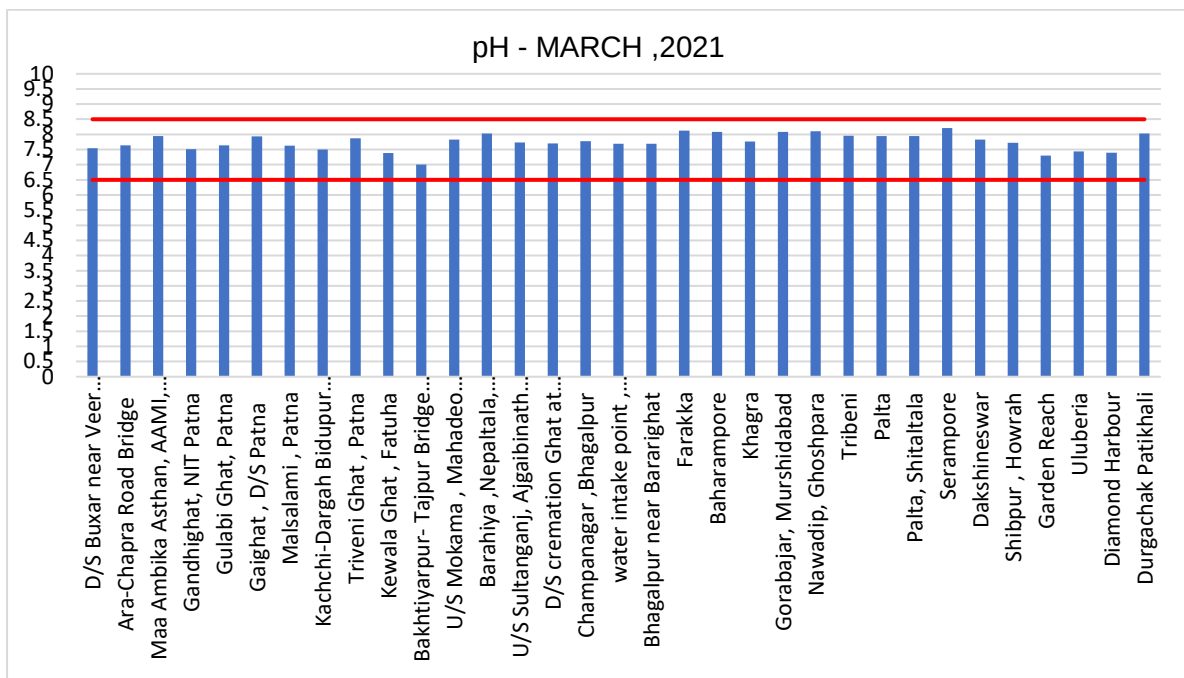


Fig.5.50. pH value for March,2021

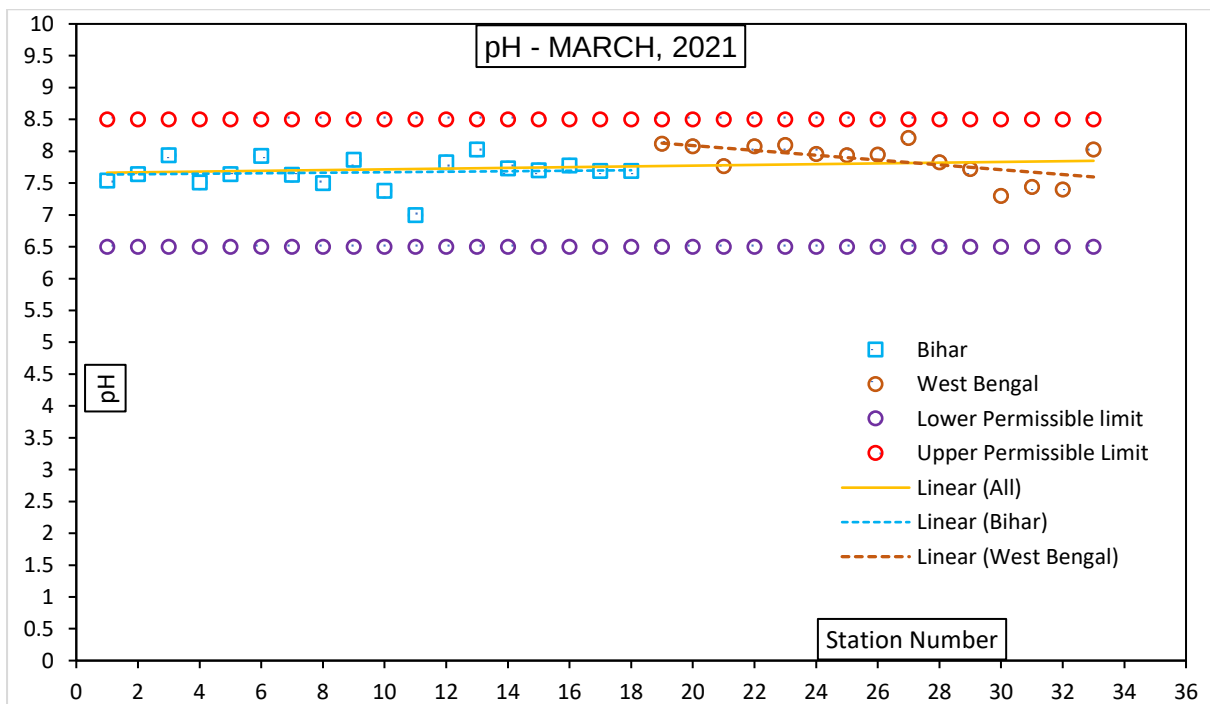


Fig.5.51. Trend Line analysis of pH value for March,2021

The pH values were found in the range of 7.0 - 8.21. From the above graphs it can be seen that the pH level is within the permissible value all time for March,2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit all time. From Trend Line analysis curve the pH value for Bihar is almost same in trend line and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

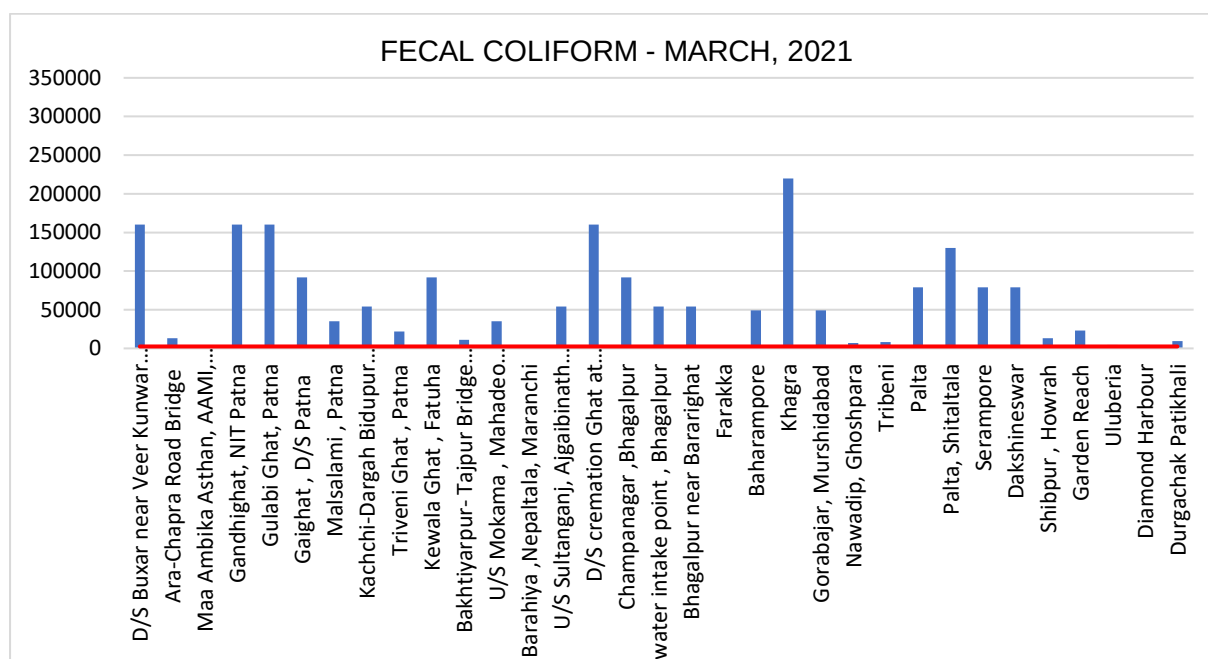


Fig.5.52. Fecal Coliform value for March,2021

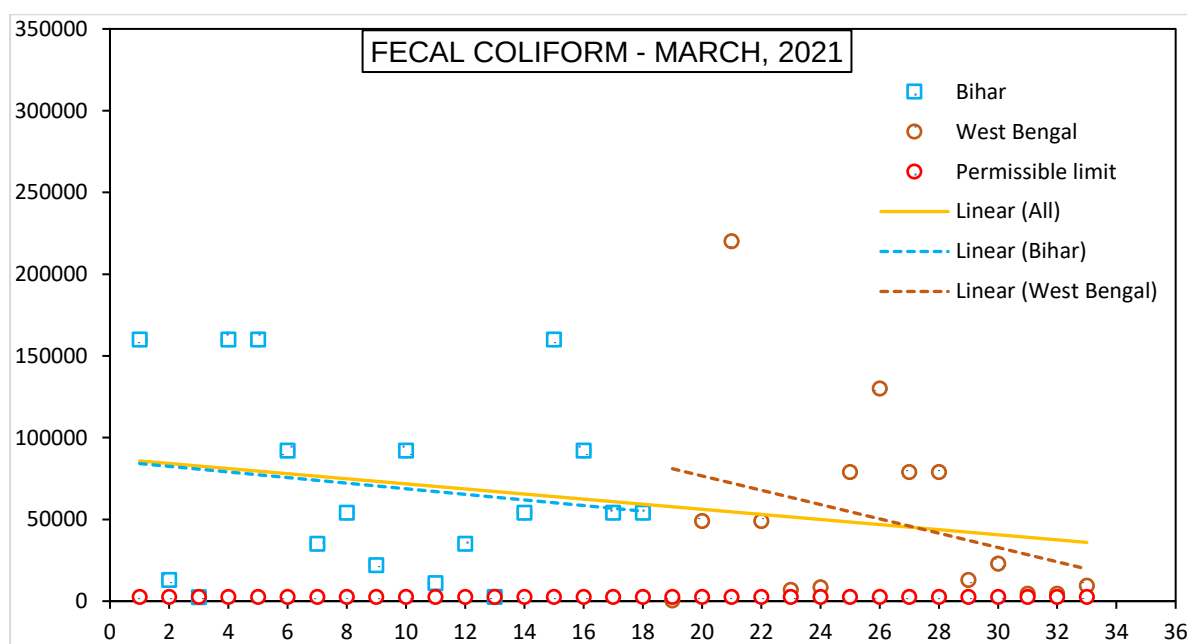


Fig.5.53. Trend Line analysis of Fecal Coliform value for March,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 220000. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

March 2022:

Table 9: Data of water quality parameter of river Ganga at different stations for March, 2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	02.03.2022	1.3	9.2	7.7	92000
2	Ara-Chapra Road Bridge	03.03.2022	1.3	9.1	8	790
3	Maa Ambika Asthan, AAMI	03.03.2022	1.5	8.8	7.5	54000
4	Gandhighat, NIT Patna	04.03.2022	1.5	9.7	7.8	160000
5	Gulabi Ghat, Patna	04.03.2022	2.1	8.0	7.5	160000
6	Gaighat , D/S Patna	04.03.2022		8.8	7.7	160000
7	Malsalami , Patna	04.03.2022	1	10.0	7.8	92000
8	Kachchi-Dargah Bidupur	04.03.2022	1.9	8.3	8	24000
9	Triveni Ghat , Patna	04.03.2022	1.3	10.0	7.4	35000
10	Kewala Ghat , Fatuha	17.03.2022	2.1	7.8	7.7	54000
11	Bakhtiyarpur- Tajpur Bridge	03.03.2022	1	8.9	7.7	1300
12	U/S Mokama , Mahadeo Asthan	03.03.2022	1.4	8.0	7.8	35000
13	Barahiya ,Nepaltala, Maranchi	15.03.2022	1.4	8.1	7.6	17000
14	U/S Sultanganj, Ajgaibinath Mandir	17.03.2022	2.1	7.5	7.8	35000
15	D/S cremation Ghat at Sultanganj	18.03.2023	1.2	7.2	7.83	11000
16	Champanagar ,Bhagalpur	04.03.2022	1.9	7.2	7.9	5400
17	water intake point , Bhagalpur	04.03.2022	2	6.4	7.8	9200
18	Bhagalpur near Bararighat	04.03.2022	2.1	6.5	8	92000
19	Farakka	30/03/2022	2.8	7	8.2	330
20	Baharampore	30/03/2022	2.45	7.1	8.19	22000
21	Khagra	30/03/2022	2.9	7.1	8.18	1300
22	Gorabajar, Murshidabad	30/03/2022	3	3	8.18	7900
23	Nawadip, Ghoshpara	24/03/2022	2.9	7.5	8.18	11000
24	Tribeni	21/03/2022	2.9	9.1	8.28	1300
25	Palta	23/03/2022	3	7.9	8.18	46000
26	Palta, Shitaltala	23/03/2022	4.4	7.5	8.07	280000
27	Serampore	23/03/2022	2.9	7.9	8.22	11000
28	Dakshineswar	21/03/2022	4.15	7	7.87	49000
29	Shibpur , Howrah	22/03/2022	2.4	5.8	7.74	33000
30	Garden Reach	22/03/2022	2.45	5.7	7.68	46000
31	Uluberia	25/03/2022	2	5.6	7.54	23000
32	Diamond Harbour	28/03/2022	2.1	6.2	7.56	7800
33	Durgachak Patikhali	10/03/2022	1.25	6.8	7.94	11000

Parameter 1: BOD

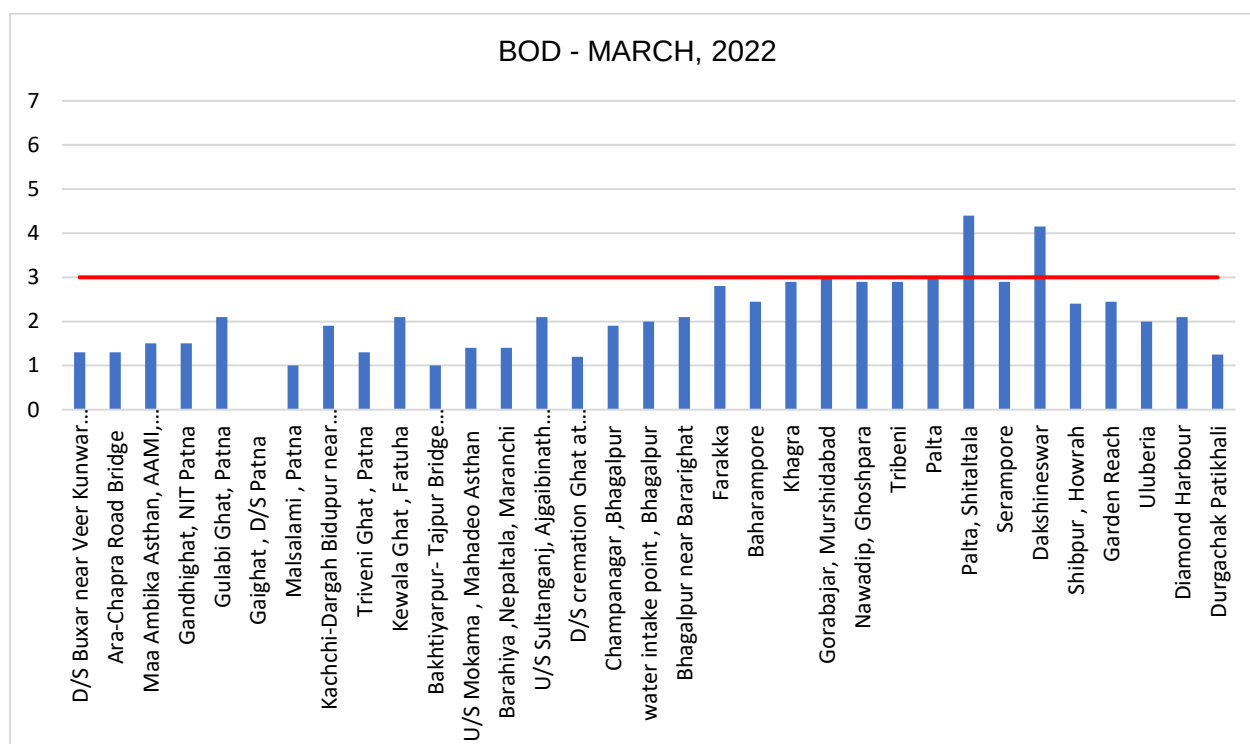


Fig.5.54 BOD value for March,2022

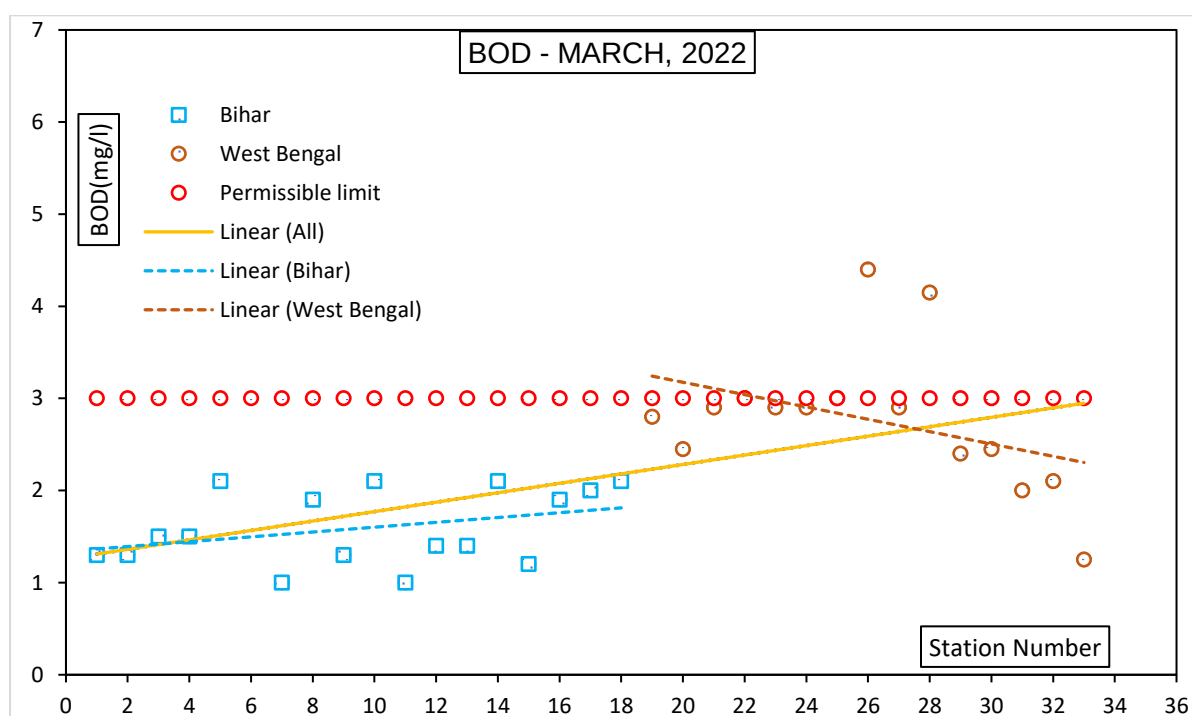


Fig.5.55. Trend Line analysis of BOD value for March,2022

The BOD values were found in the range of 1.0–4.4 mg/l. The highest BOD value of 4.4 mg/l was for Palta, Shitaltala for the month of March, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O₂ (DO)

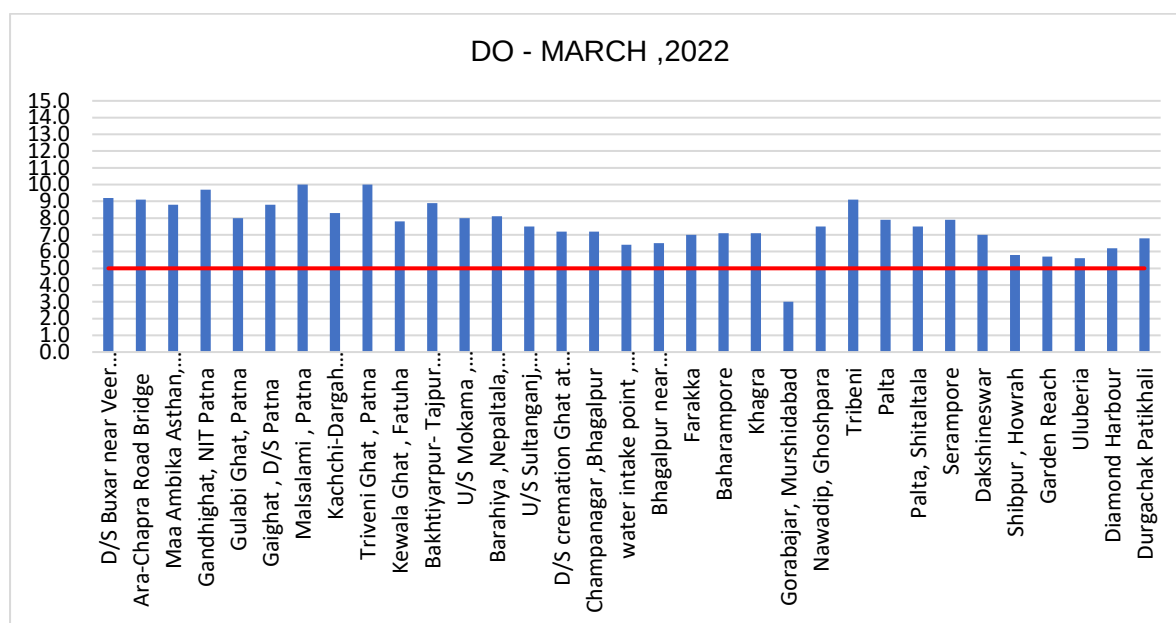


Fig.5.56. DO value for March,2022

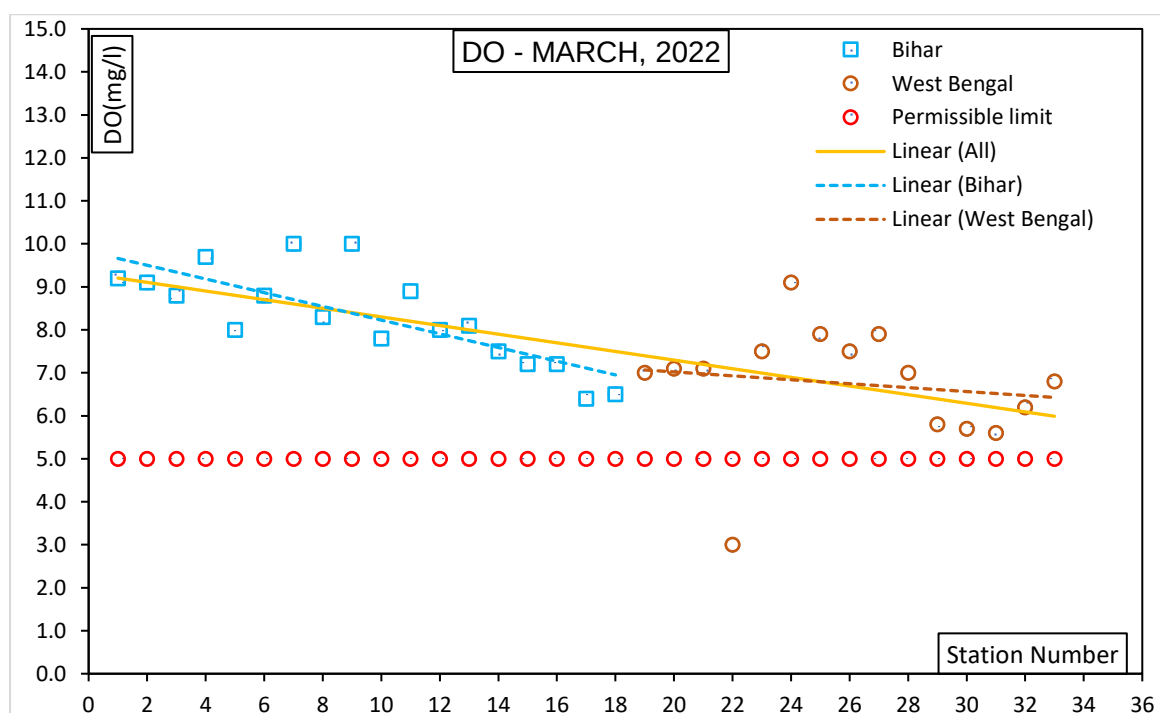


Fig.5.57. Trend Line analysis of DO value for March,2022

The DO values were found in the range of 5.6–10.0 mg/l. The lowest DO value 5.6 mg/l was for Uluberia and highest DO value of 10.0 mg/l was for Malsalami , Patna for the month March,2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

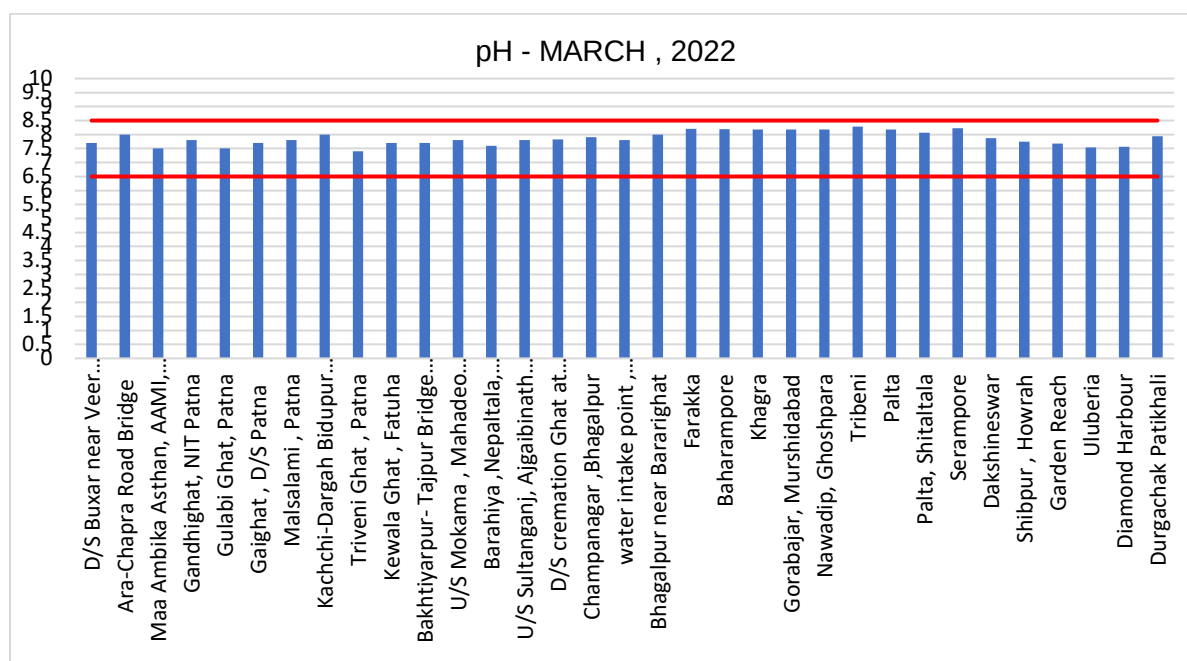


Fig.5.58. pH value for March,2022

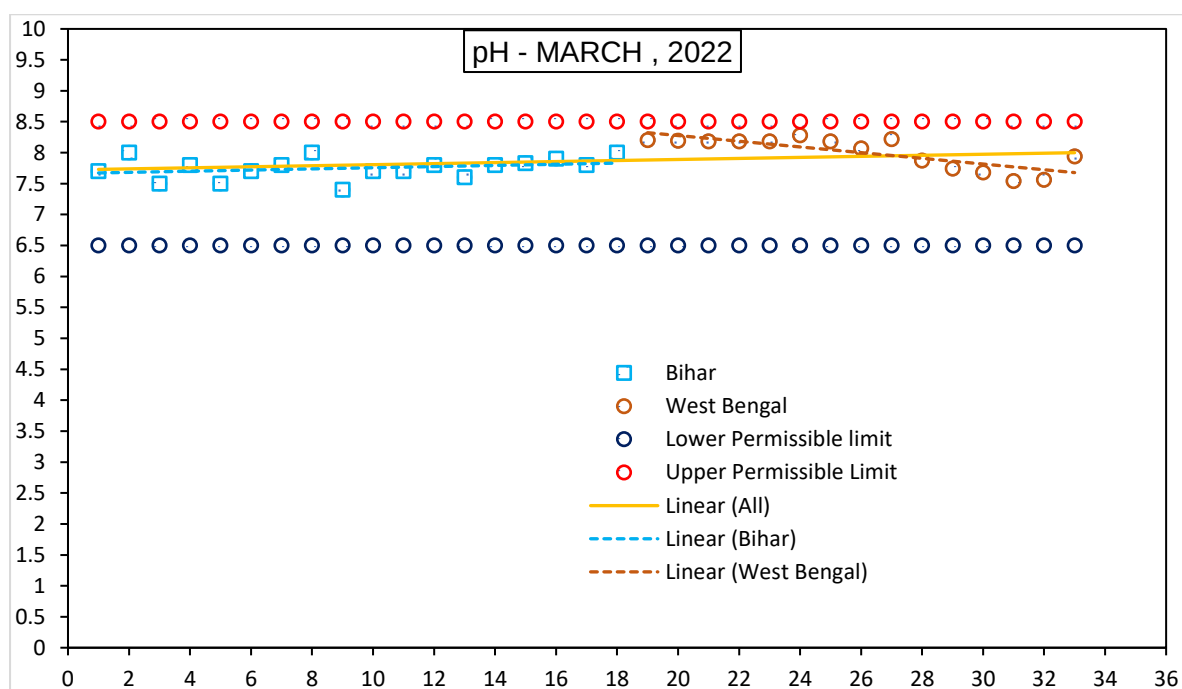


Fig.5.59. Trend Line analysis of pH value for March,2022

The pH values were found in the range of 7.4 - 8.28. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit all time for March,2022. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

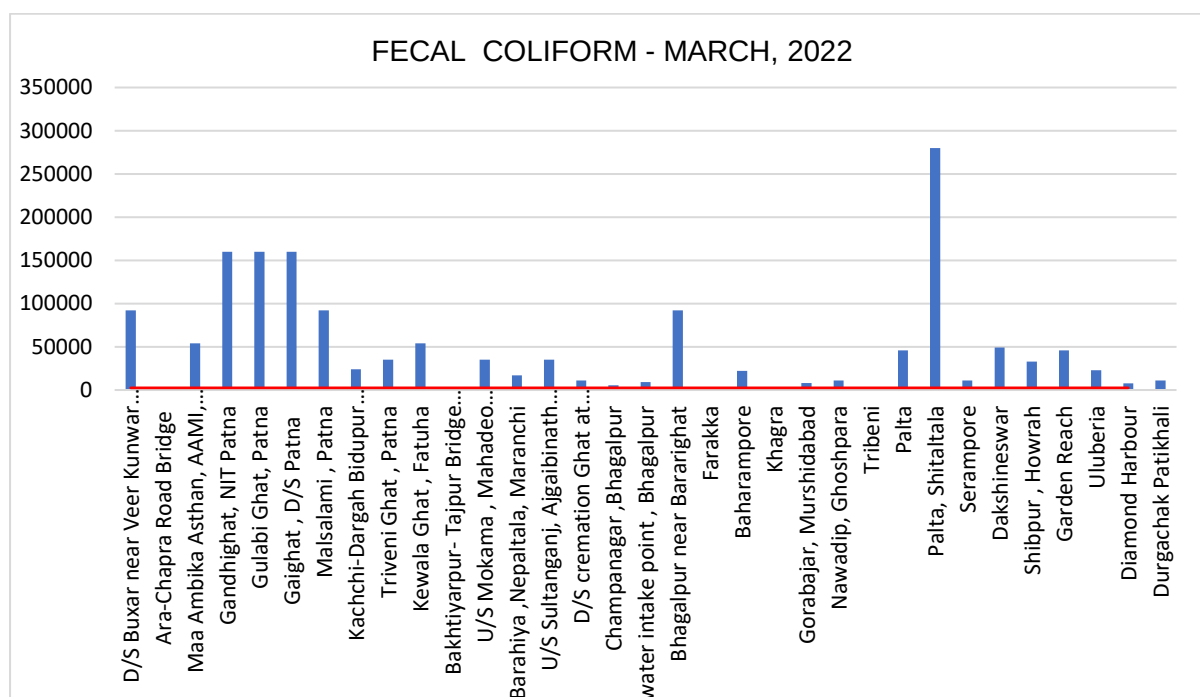


Fig.5.60. Fecal Coliform value for March,2022

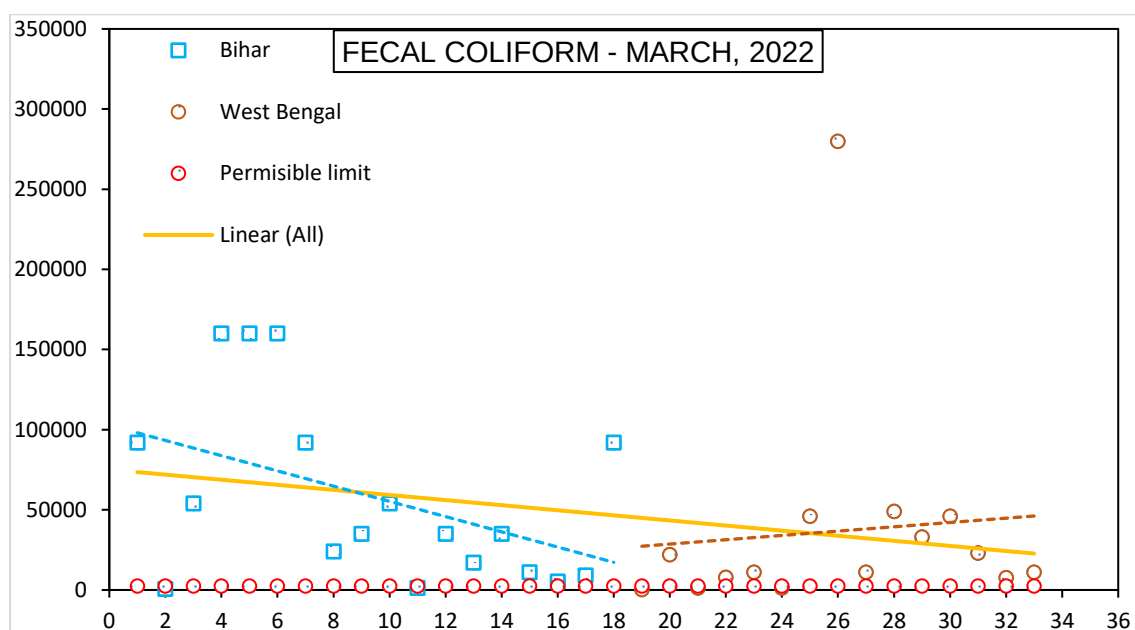


Fig.5.61. Trend Line analysis of Fecal Coliform value for March,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 280000. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

March 2023:

Table 10: Data of water quality parameter of river Ganga at different stations for March, 2023						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	02.03.2023	1.6	7.4	7.9	13000
2	Ara-Chapra Road Bridge	16.03.2023	1.4	8.5	7.56	22000
3	Maa Ambika Asthan, AAMI	16.03.2023	2.1	7.8	7.87	54000
4	Gandhighat, NIT Patna	03.03.2023	1	9.5	7.62	92000
5	Gulabi Ghat, Patna	03.03.2023	1.2	8.8	7.54	92000
6	Gaighat , D/S Patna	17.03.2023	1.8	8.7	8.26	54000
7	Malsalami , Patna	03.03.2023	1.2	8.9	7.59	92000
8	Kachchi-Dargah Bidupur	03.03.2023	1	9.2	7.8	35000
9	Triveni Ghat , Patna	03.03.2023	1.3	8.8	7.61	11000
10	Kewala Ghat , Fatuha	03.03.2023	1.3	8.5	7.34	92000
11	Bakhtiyarpur- Tajpur Bridge	01.03.2023	1.8	8.0	8.09	22000
12	U/S Mokama, Mahadeo Asthan	01.03.2023	2	7.9	7.98	22000
13	Barahiya ,Nepaltala, Maranchi	01.03.2023	2	7.3	8.15	17000
14	U/S Sultanganj, Ajgaibinath Mandir	18.03.2023	1.3	7.3	8	4900
15	D/S cremation Ghat at Sultanganj	18.03.2023	1.2	7.2	7.83	11000
16	Champanagar ,Bhagalpur	31.03.2023	1.8	7.6	8.01	92000
17	water intake point , Bhagalpur	31.03.2023	2.1	7.0	8.04	54000
18	Bhagalpur near Bararighat	31.03.2023	2.3	6.7	8.11	28000
19	Farakka	22.03.2023	2.75	7.6	7.62	490
20	Baharampore	23.03.2023	1.45	7.3	7.81	1700
21	Khagra	23.03.2023	1.55	7.4	7.65	330
22	Gorabajar, Murshidabad	23.03.2023	1.9	1.9	7.86	2200
23	Nawadip, Ghoshpara	22.03.2023	1.7	7.9	7.98	790
24	Tribeni					
25	Palta	21.03.2023	1.4	6.9	7.8	49000
26	Palta, Shitaltala	21.03.2023	1.45	7	7.82	21000
27	Serampore					
28	Dakshineswar	20.03.2023	2.63	5.26	7.27	46000
29	Shibpur , Howrah	21.03.2023	3.1	5.19	7.75	46000
30	Garden Reach	21.03.2023	2.95	5.19	7.79	70000
31	Uluberia	24.03.2023	3.11	5.14	7.67	21000
32	Diamond Harbour	13.03.2023	2.6	5.6	7.12	3500
33	Durgachak Patikhali	22.03.2023	1.35	5.9	8.4	4900

Parameter 1: BOD

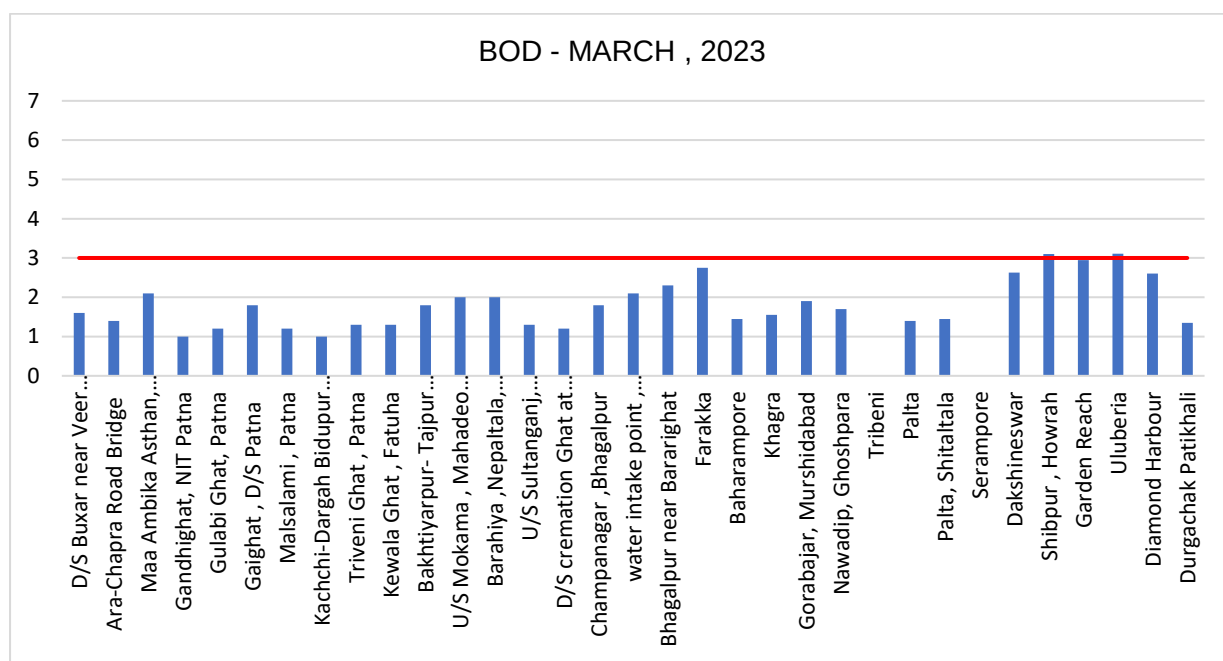


Fig.5.62. BOD value for March,2023

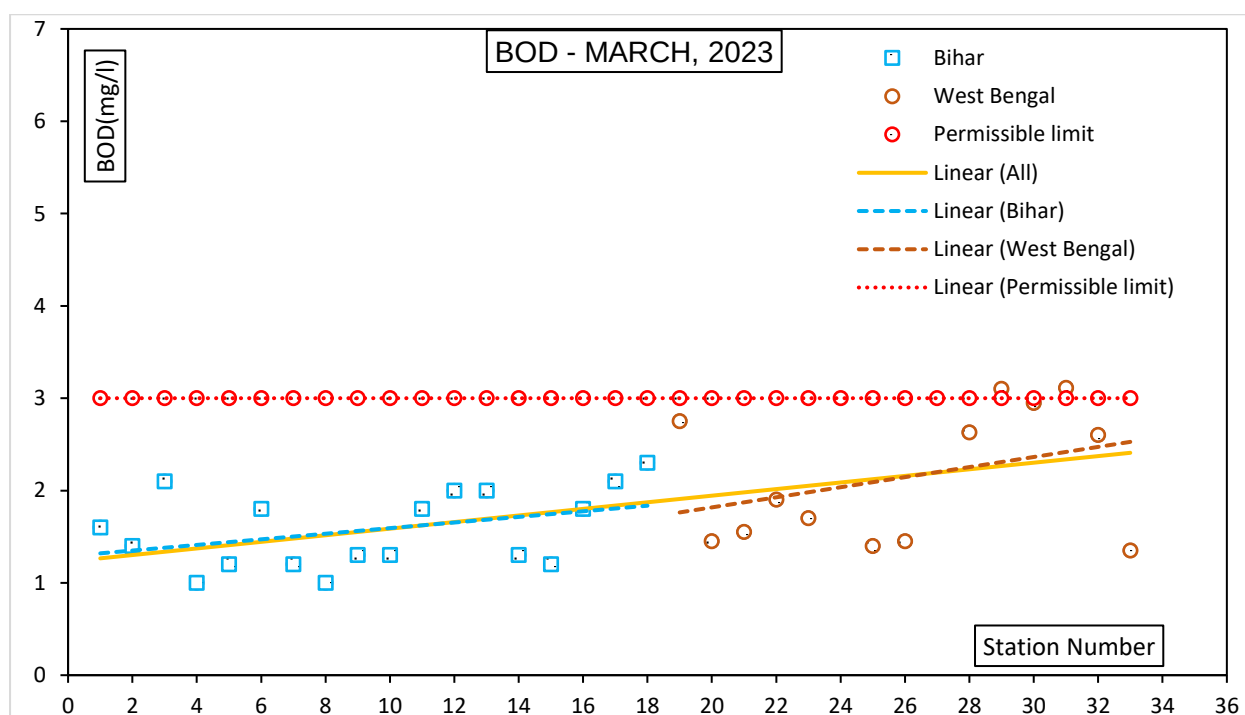


Fig.5.63. Trend Line analysis of BOD value for March,2023

The BOD values were found in the range of 1.0–3.11 mg/l. The highest BOD value of 3.11mg/l was for Uluberia for the month of March, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

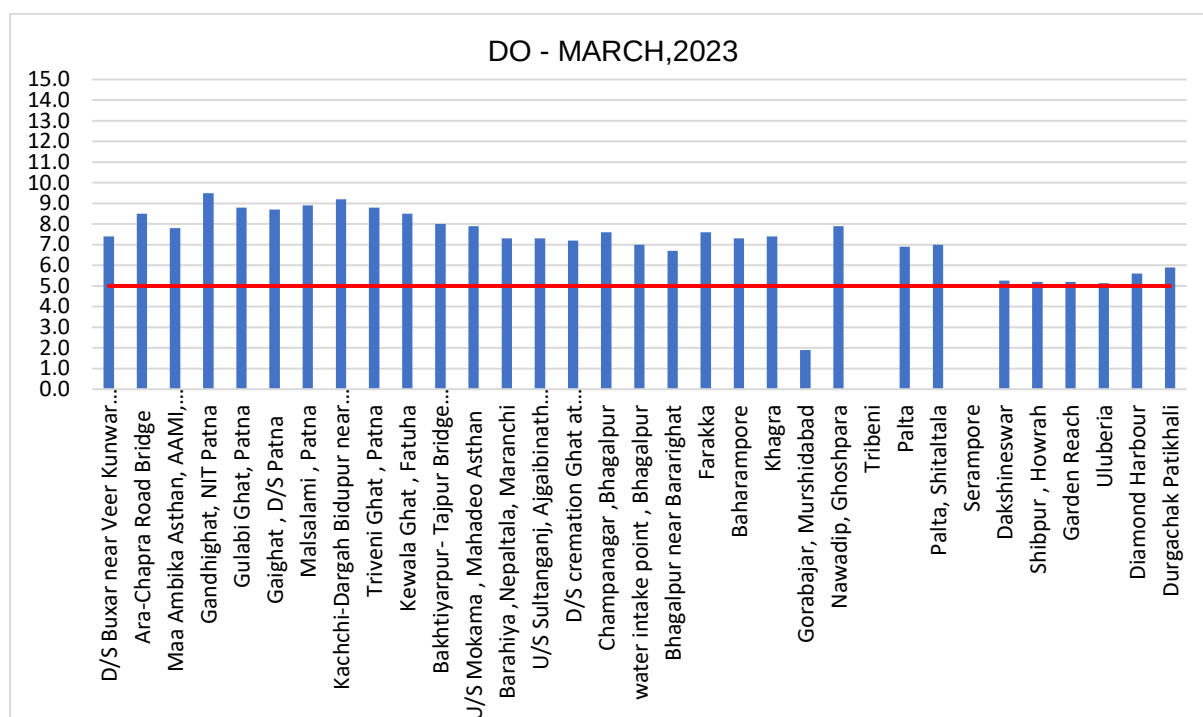


Fig.5.64. DO value for March,2023

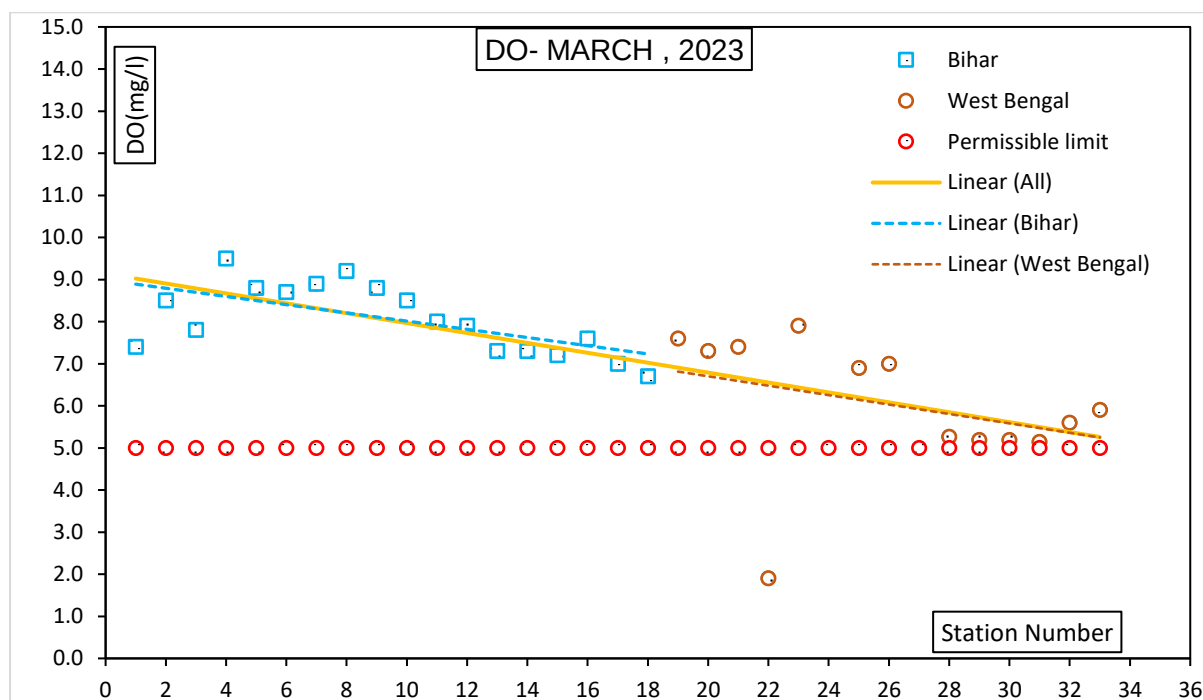


Fig.5.65. Trend Line analysis of DO value for March,2023

The DO values were found in the range of 1.9–9.5 mg/l. The lowest DO value 1.9 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.5 mg/l was for Gandhighat, NIT Patna for the month March,2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

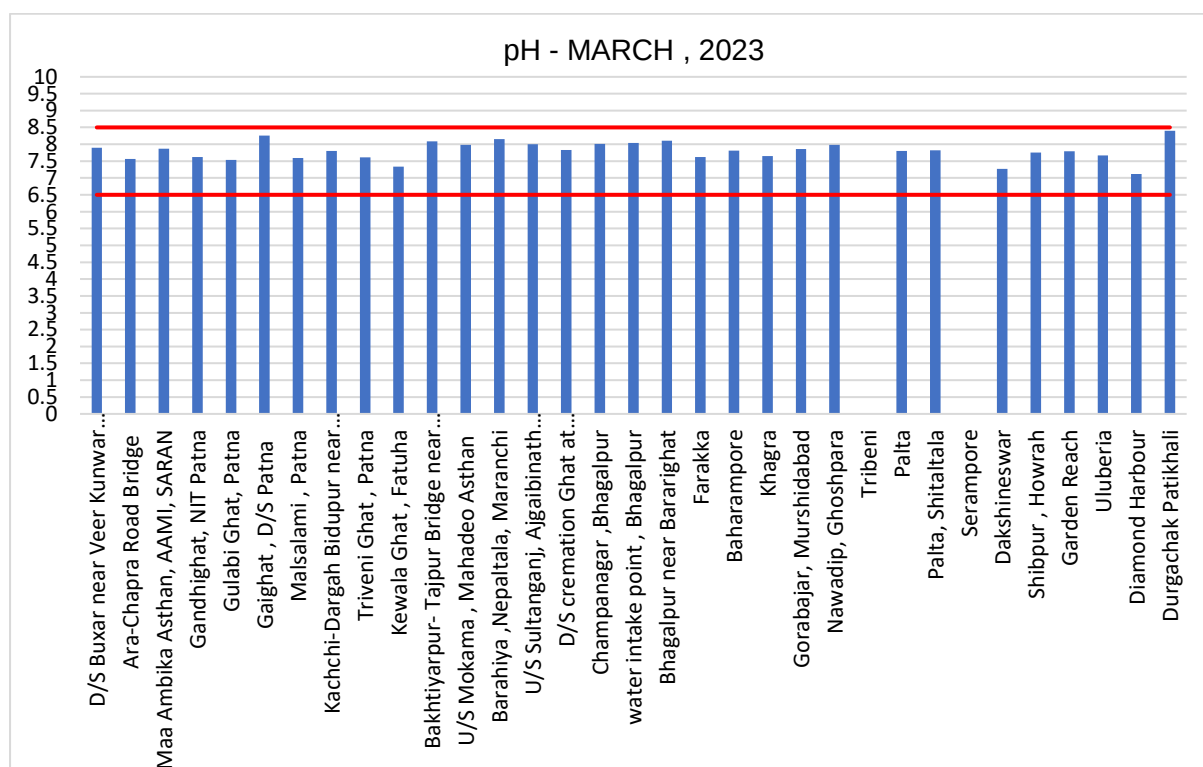


Fig.5.66. pH value for March,2023

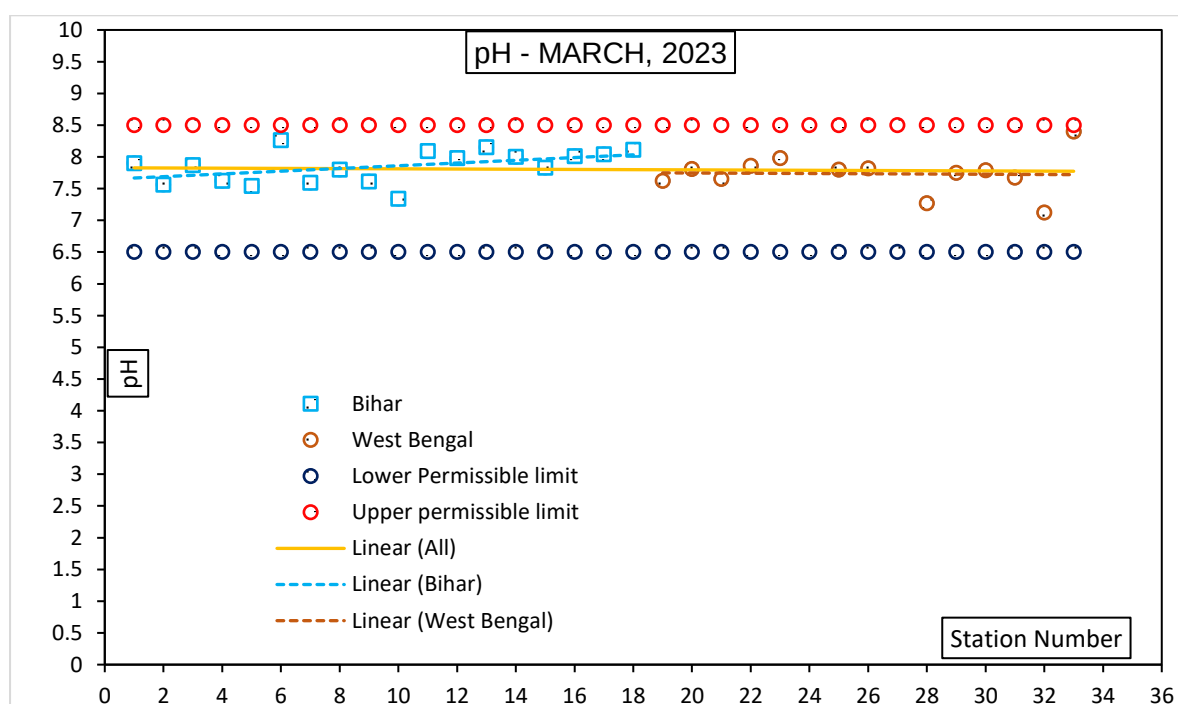


Fig.5.67. Trend Line analysis of pH value for March,2023

The pH values were found in the range of 7.12 - 8.4. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit all time for March, 2023. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

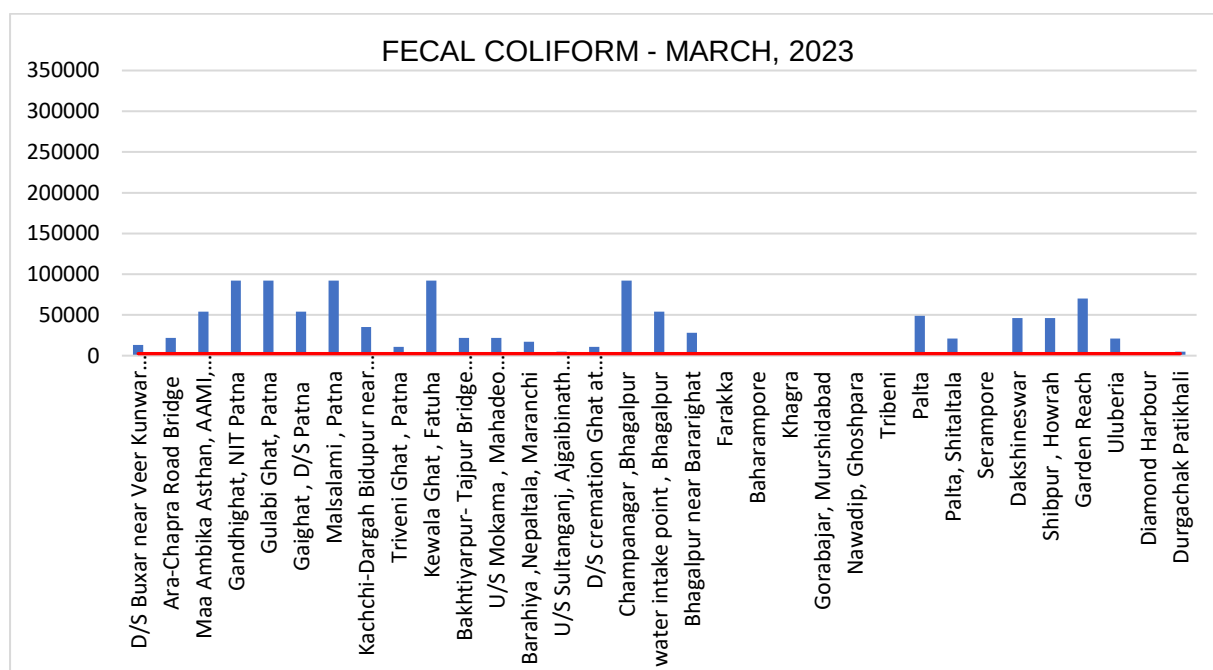


Fig.5.68. Fecal Coliform value for March,2023

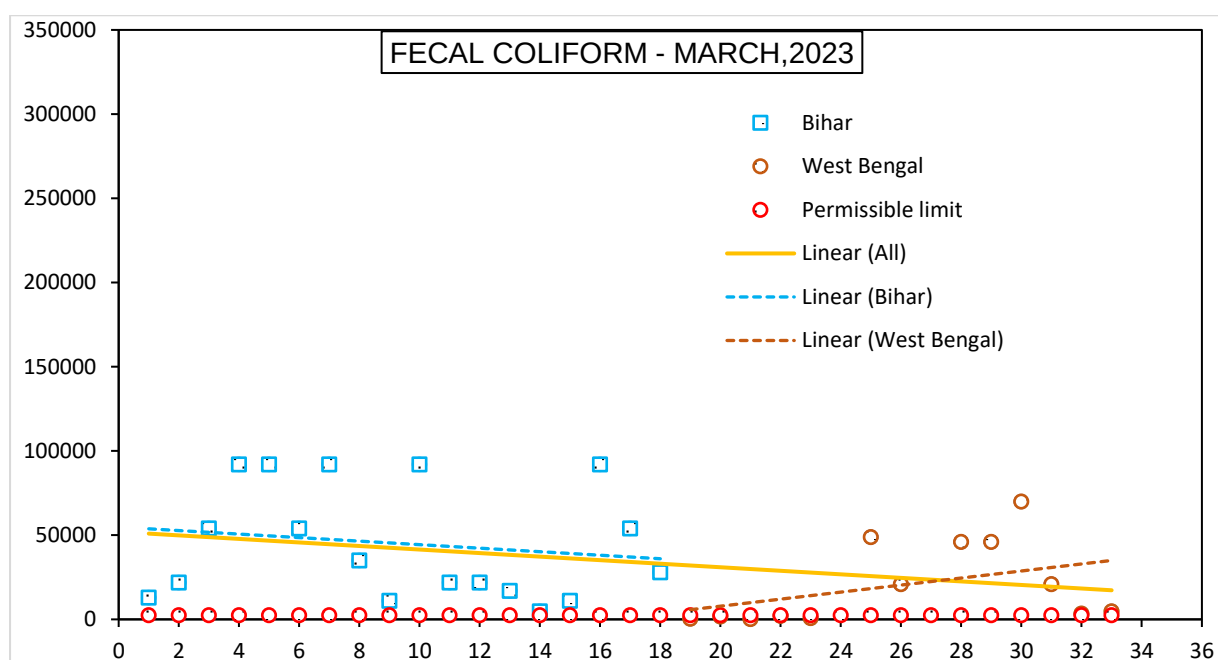


Fig.5.69. Trend Line analysis of Fecal Coliform value for March,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 92000. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

April 2021:

Table 11: Data of water quality parameter of river Ganga at different stations for April, 2021

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	01.04.2021	2.1	7.9	7.83	17000
2	Ara-Chapra Road Bridge	02.04.2021	1.2	8.13	8.13	14000
3	Maa Ambika Asthan, AAMI	23.04.2021	1.6	8.1	7.79	22000
4	Gandhighat, NIT Patna	missing				
5	Gulabi Ghat, Patna	01.04.2021	2.2	8.1	7.79	92000
6	Gaighat , D/S Patna	01.04.2021	2.1	8.4	7.87	54000
7	Malsalami , Patna	02.04.2021	1.6	9.0	8.04	35000
8	Kachchi-Dargah Bidupur	02.04.2021	1.3	9.2	7.79	17000
9	Triveni Ghat , Patna	02.04.2021	1.8	8.0	7.9	1100
10	Kewala Ghat , Fatuha	02.04.2021	1.8	7.1	7.6	54000
11	Bakhtiyarpur- Tajpur Bridge	missing				
12	U/S Mokama , Mahadeo Asthan	05.04.2021	2.1	8.8	8.12	35000
13	Barahiya ,Nepaltala, Maranchi	05.04.2021	2.2	8.0	7.7	7900
14	U/S Sultanganj, Ajgaibinath Mandir	06.04.2021	2.2	8.5	8.18	35000
15	D/S cremation Ghat at Sultanganj	06.04.2021	2.7	8.5	8.04	54000
16	Champanagar ,Bhagalpur	07.04.2021	1.4	6.0	8.53	3300
17	water intake point , Bhagalpur	07.04.2021	3.1	9.5	8.55	24000
18	Bhagalpur near Bararighat	07.04.2021	3.0	10.0	8.54	54000
19	Farakka	23/04/2021	2.3	6.5	8.47	330
20	Baharampore	28/04/2021	1.4	7.2	8.46	46000
21	Khagra	28/04/2021	2.4	7.4	8.38	33000
22	Gorabajar, Murshidabad	28/04/2021	1.2	1.2	8.39	49000
23	Nawadip, Ghoshpara	26/04/2021	1.45	7.2	8.35	2200
24	Tribeni	21/04/2021	3.35	7.5	8.32	13000
25	Palta	19/04/2021	2.65	6.5	8.32	23000
26	Palta, Shitaltala	19/04/2021	2.85	6.5	8.26	170000
27	Serampore	20/04/2021	2.2	6.6	8.48	240000
28	Dakshineswar	20/04/2021	3.2	6.2	7.73	31000
29	Shibpur , Howrah	19/04/2021	2.5	5.3	7.65	21000
30	Garden Reach	21/04/2021	2.95	5.5	7.84	46000
31	Uluberia	22/04/2021	2.9	5.9	7.7	17000
32	Diamond Harbour	23/04/2021	3.3	6.2	7.84	2300
33	Durgachak Patikhali	23/04/2021	1	6.3	8.03	9400

Parameter 1: BOD

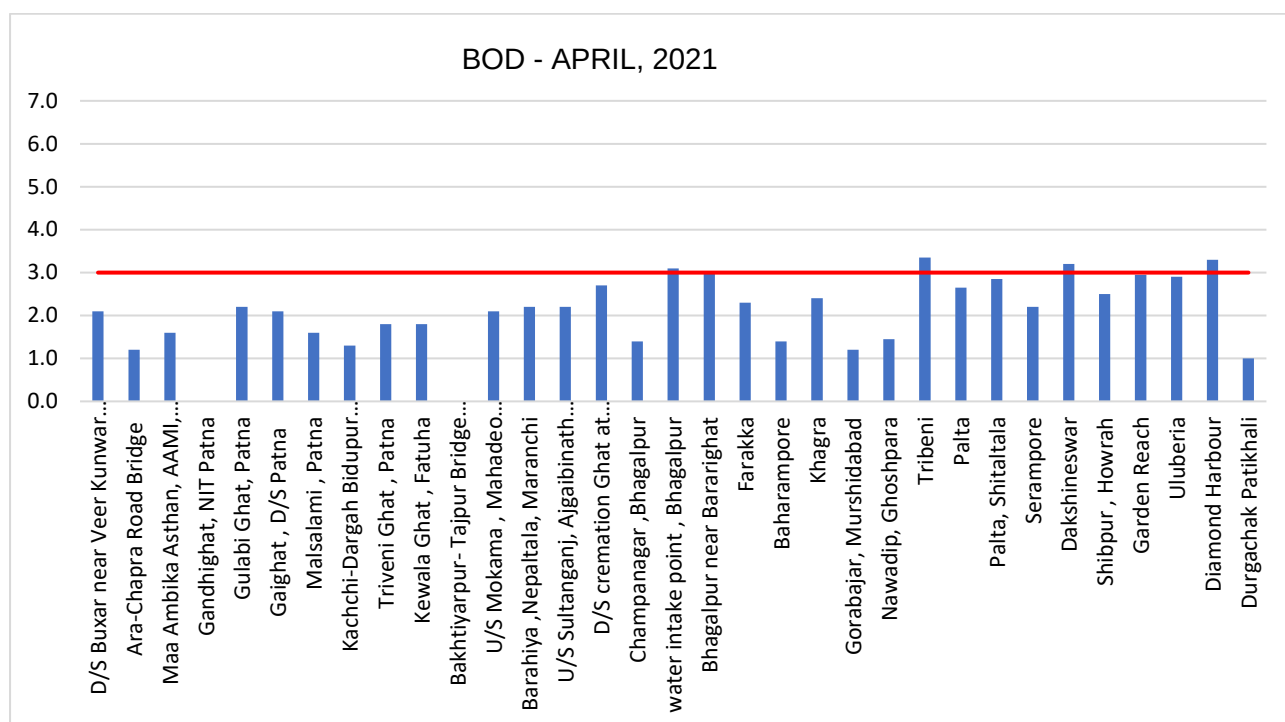


Fig.5.70. BOD value for April,2021

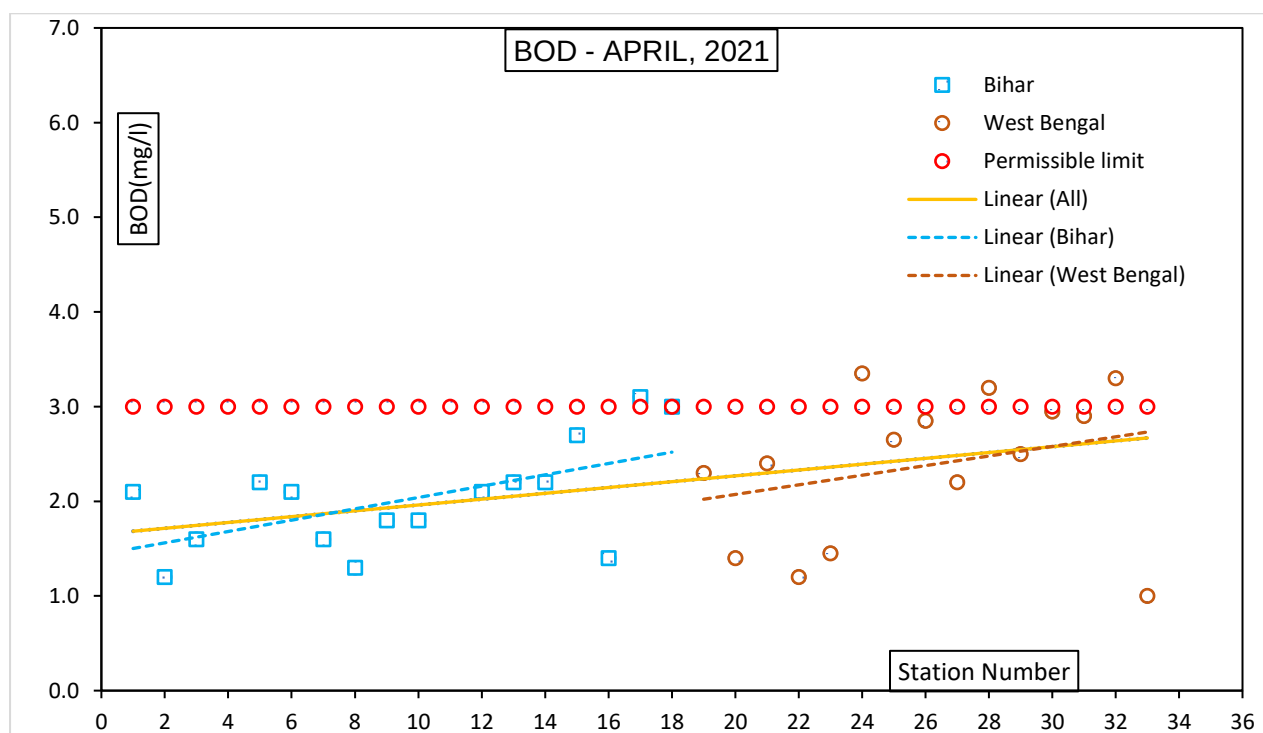


Fig.5.71. Trend Line analysis of BOD value for April,2021

The BOD values were found in the range of 1.0–3.35 mg/l. The highest BOD value of 3.35 mg/l was for Tribeni for the month of April, 2021. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

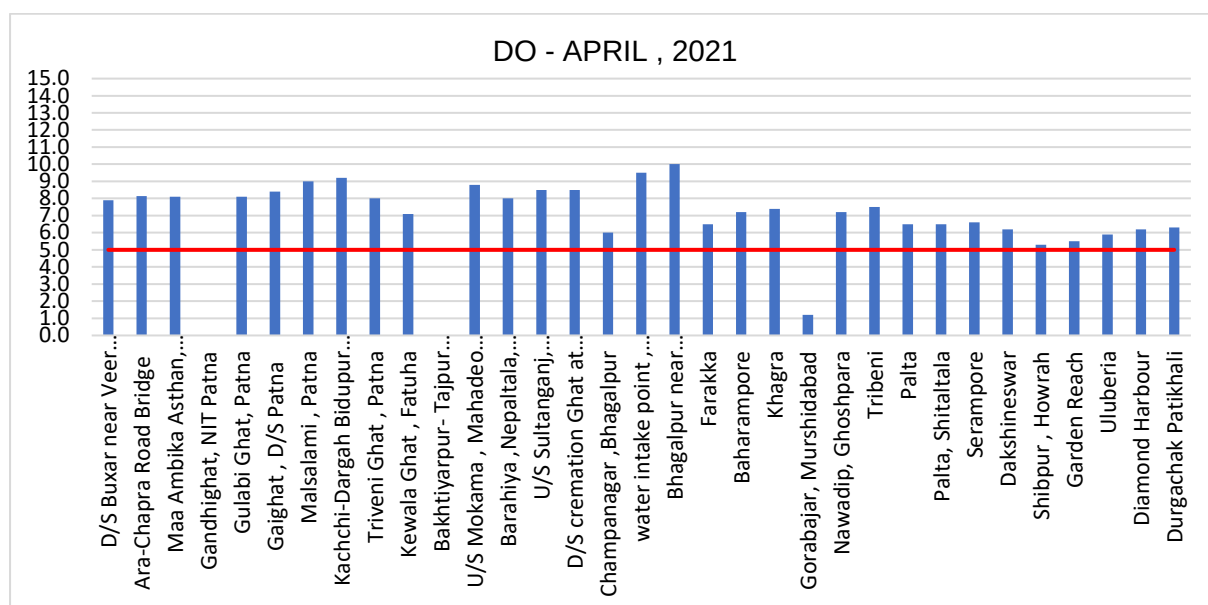


Fig.5.72. DO value for April,2021

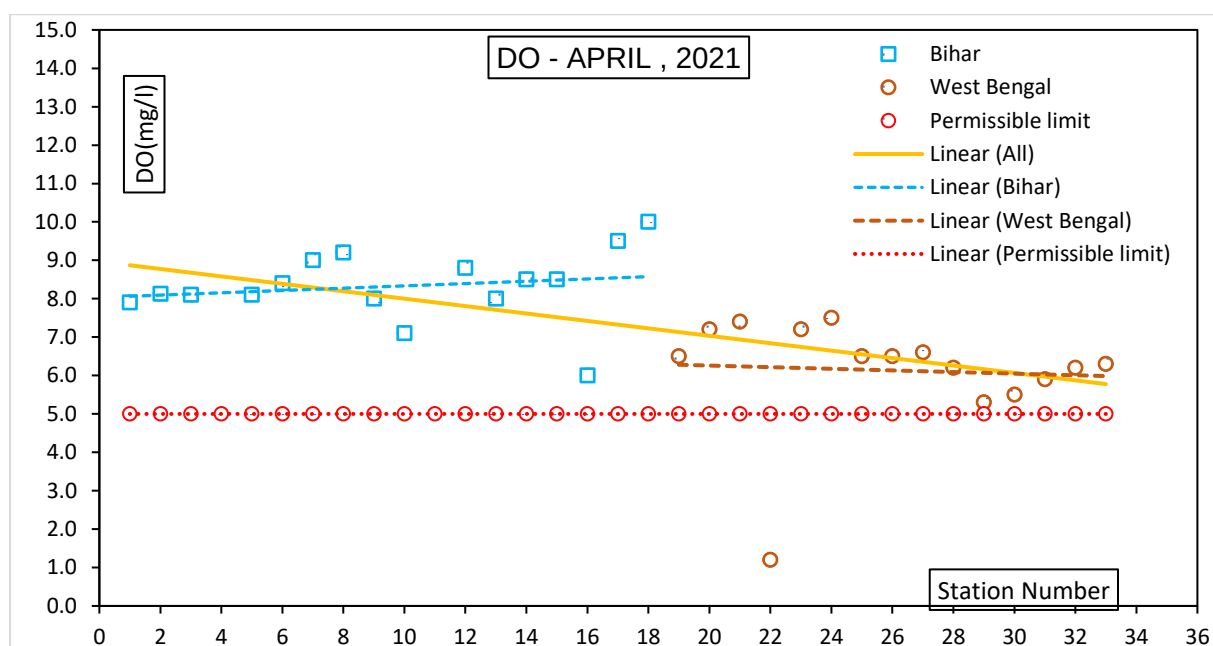


Fig.5.73. Trend Line analysis of DO value for April,2021

The DO values were found in the range of 1.2–10.0mg/l. The lowest DO value 1.2 mg/l was for Gorabajar, Murshidabad and highest DO value of 10.0 mg/l was for Bhagalpur near Bararighat for the month April,2021. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

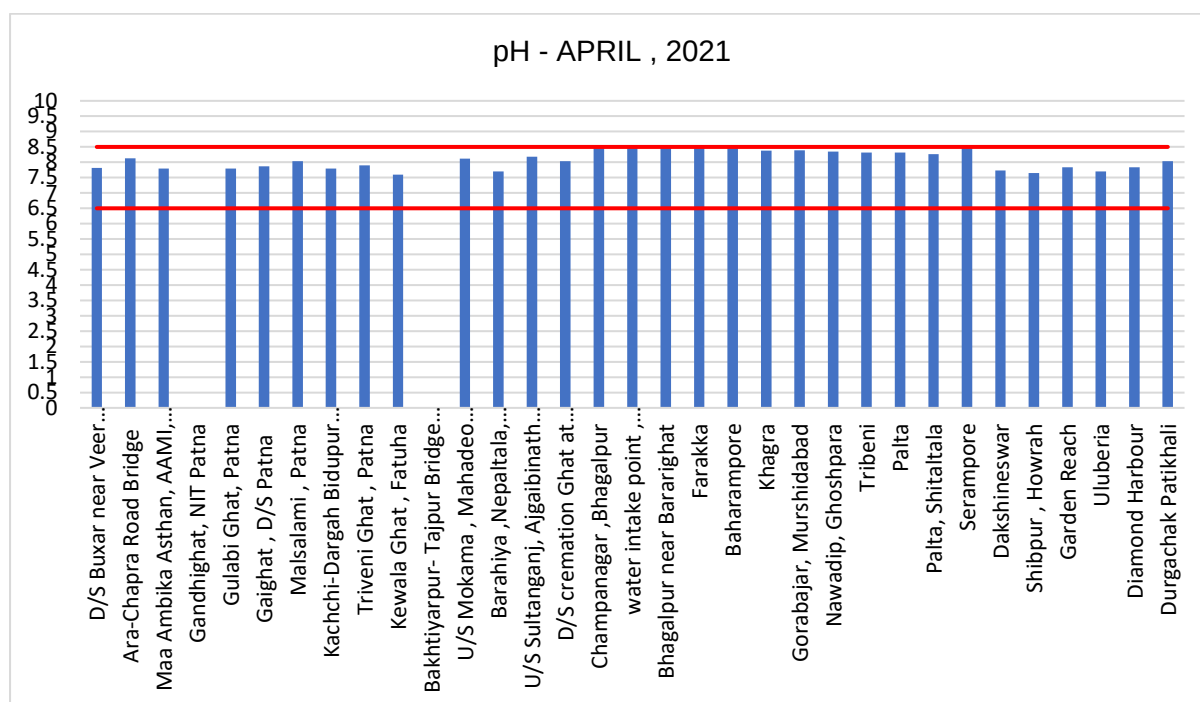


Fig.5.74. pH value for April,2021

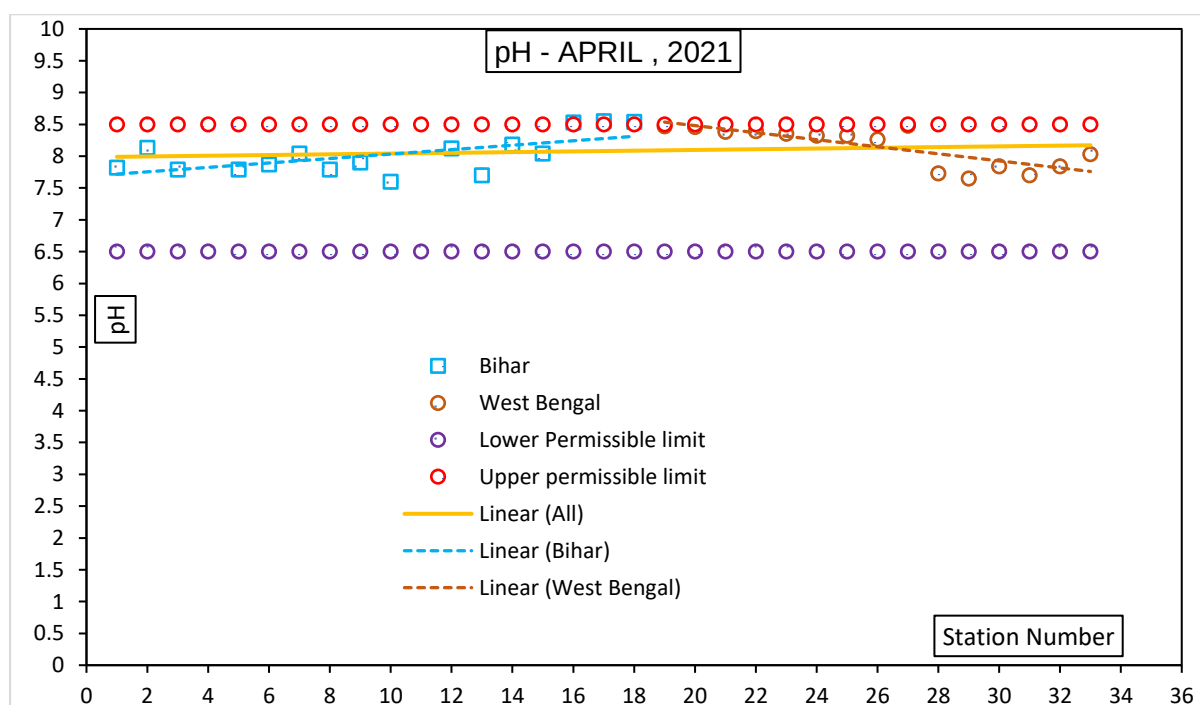


Fig.5.75. Trend Line analysis of pH value for April,2021

The pH values were found in the range of 7.6 - 8.55. It is seen that the permissible pH value exceeded the limit for Class B (6.5 to 8.5) for only twice for April,2021. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

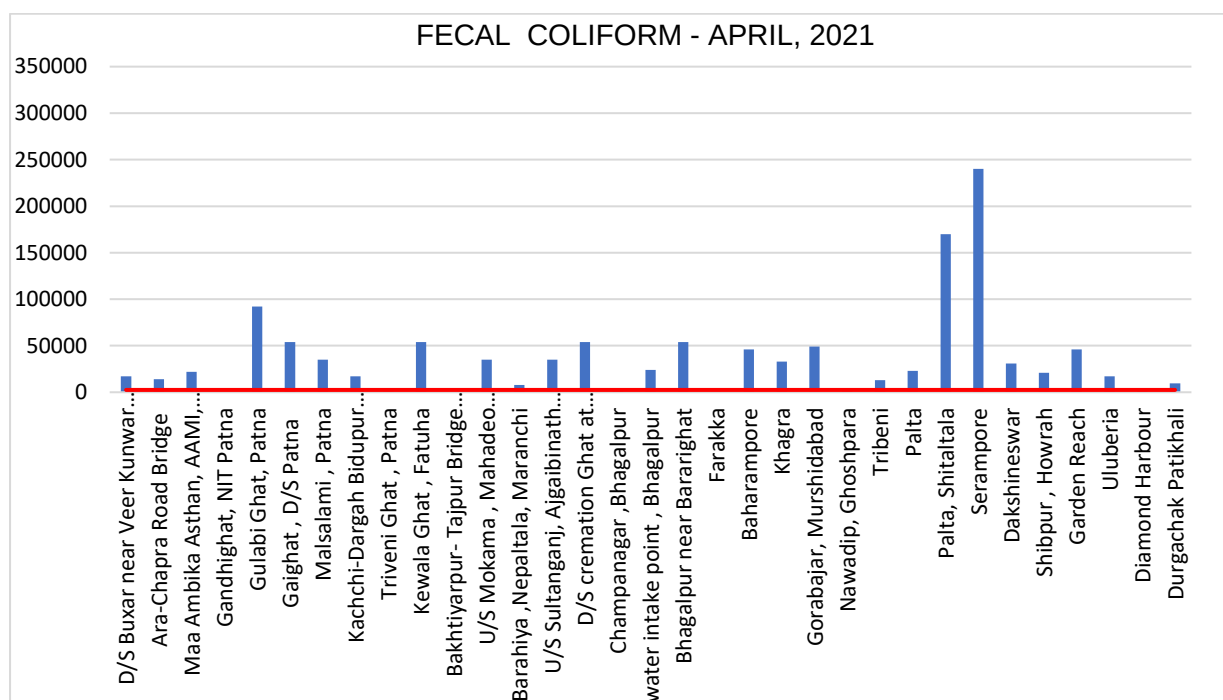


Fig.5.76. Fecal Coliform value for April,2021

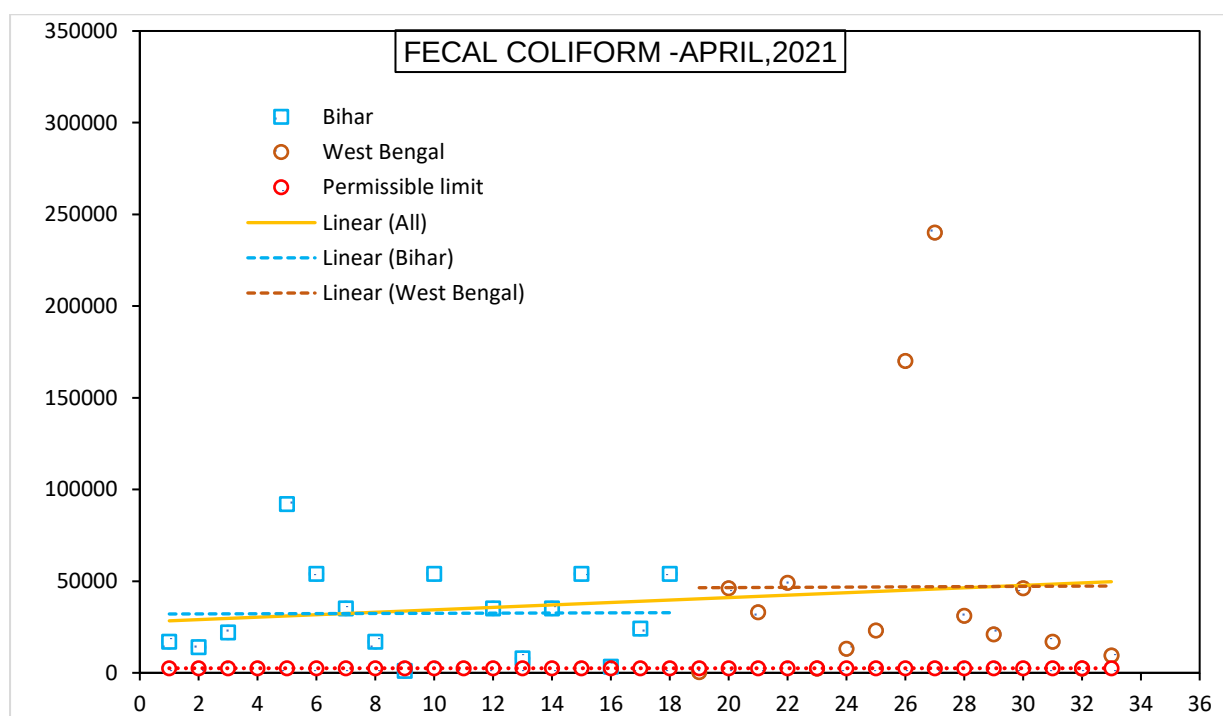


Fig.5.77. Trend Line analysis of Fecal Coliform value for April,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

April 2022:

Table 12: Data of water quality parameter of river Ganga at different stations for April,2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	19.04.2022	1	8.9	7.91	92000
2	Ara-Chapra Road Bridge	05.04.2022	1.5	8.9	8.46	230
3	Maa Ambika Asthan, AAMI	05.04.2022	1.7	8.7	7.52	24000
4	Gandhighat, NIT Patna	missing	-	-	-	-
5	Gulabi Ghat, Patna	04.04.2022	1.5	9.3	8.34	92000
6	Gaighat , D/S Patna	04.04.2022	1.3	9.0	8.4	92000
7	Malsalami , Patna	04.04.2022	1	9.6	8.48	160000
8	Kachchi-Dargah Bidupur	04.04.2022	1.4	9.4	8.52	35000
9	Triveni Ghat , Patna	04.04.2022	1.3	9.5	8.38	24000
10	Kewala Ghat , Fatuha	04.04.2022	1.4	9.2	7.98	92000
11	Bakhtiyarpur- Tajpur Bridge	08.04.2022	1	9.4	7.89	9200
12	U/S Mokama , Mahadeo Asthan	21.04.2022	1.7	8.0	8.18	3300
13	Barahiya ,Nepaltala, Maranchi	missing	-	-	-	-
14	U/S Sultanganj, Ajgaibinath Mandir	07.04.2022	1.5	9.3	7.8	160000
15	D/S cremation Ghat at Sultanganj	07.04.2022	1.5	8.5	7.75	11000
16	Champanagar ,Bhagalpur	07.04.2022	1.3	8.7	8.58	2100
17	water intake point , Bhagalpur	07.04.2022	1.7	9.9	8.39	790
18	Bhagalpur near Bararighat	07.04.2022	2.1	7.7	8.29	14000
19	Farakka	28/04/2022	2.8	6.6	7.89	2300
20	Baharampore	27/04/2022	2.45	6.6	7.88	110000
21	Khagra	28/04/2022	2.9	6.7	7.87	7900
22	Gorabajar, Murshidabad	27/04/2022	2.9	2.9	7.81	17000
23	Nawadip, Ghoshpara	20/04/2022	2.95	6.5	8.16	24000
24	Tribeni	21/04/2022	2.8	6.4	8	7800
25	Palta	19/04/2022	1.5	6	8.23	49000
26	Palta, Shitaltala	19/04/2022	3.1	5.8	8.18	240000
27	Serampore	20/04/2022	2.8	6.2	8.18	14000
28	Dakshineswar	19/04/2022	2	5	7.69	46000
29	Shibpur , Howrah	20/04/2022	2.35	5.2	7.66	46000
30	Garden Reach	21/04/2022	2.95	5.3	7.49	49000
31	Uluberia	25/04/2022	2.55	5.2	7.53	23000
32	Diamond Harbour	26/04/2022	2.3	5.9	7.98	4500
33	Durgachak Patikhali	20/04/2022	1.55	6.1	8.67	9400

Parameter 1: BOD

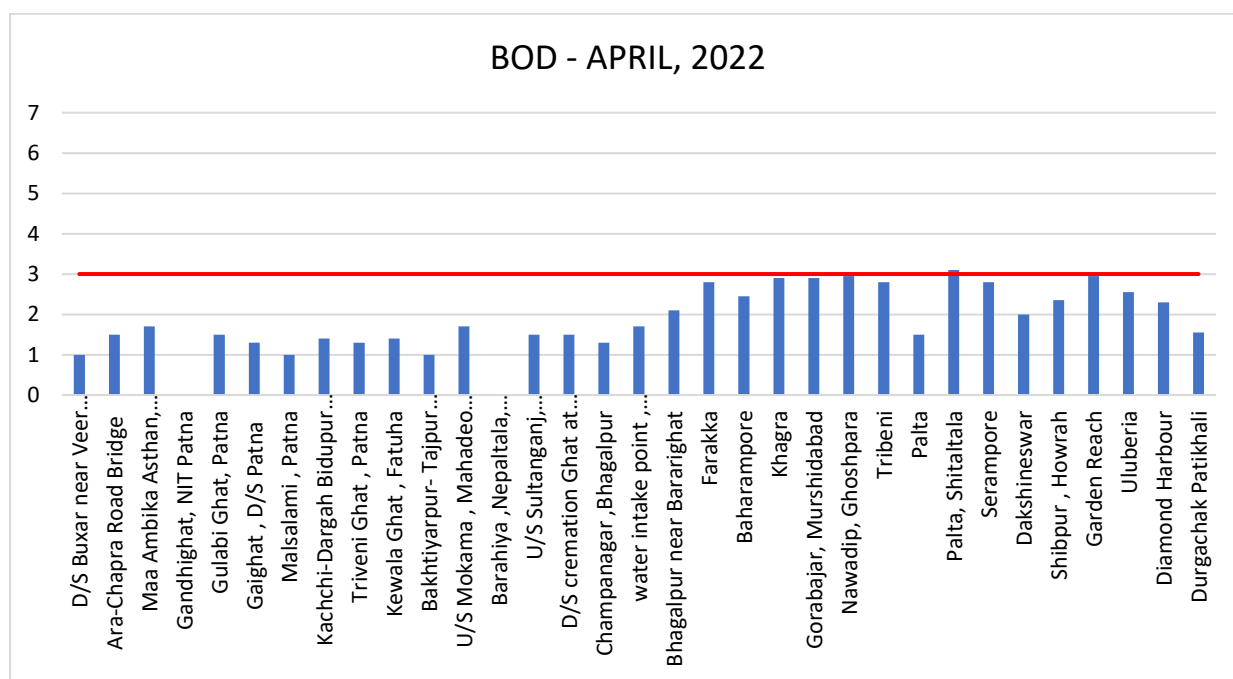


Fig.5.78. BOD value for April,2022

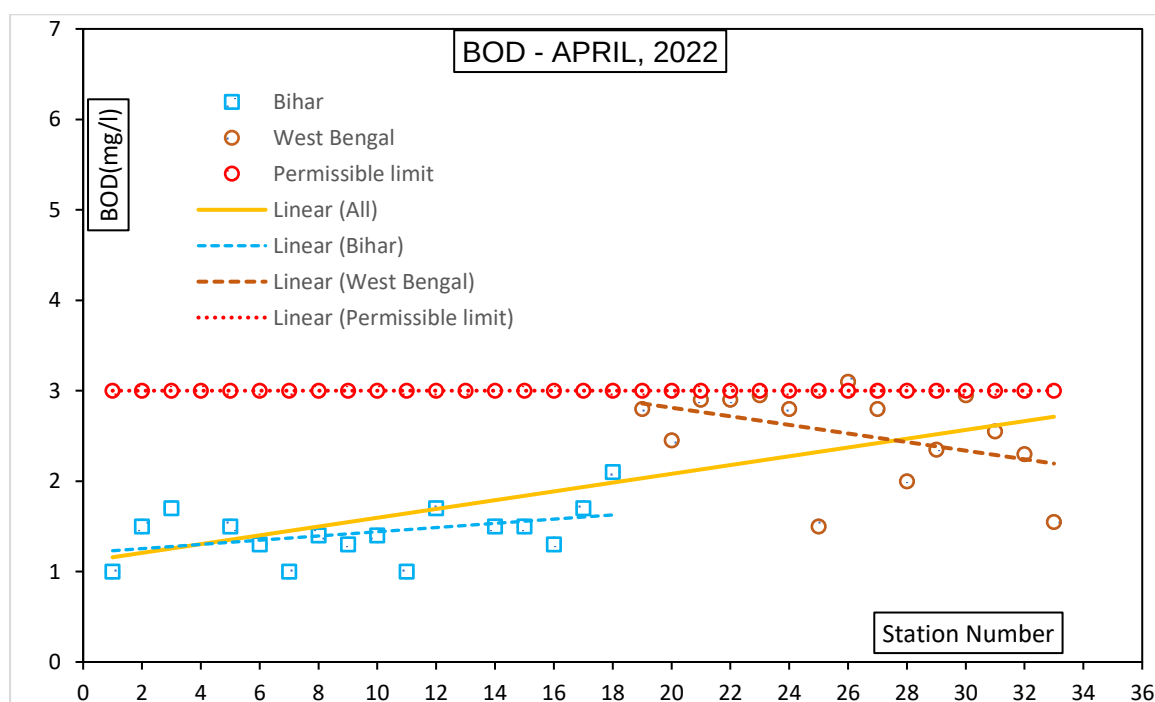


Fig.5.79. Trend Line analysis of BOD value for April,2022

The BOD values were found in the range of 1.0–2.95 mg/l. The highest BOD value of 2.95 mg/l was for Nawadip, Ghoshpara and Garden Reach for the month of April, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing. Similarly like previous years the BOD values are more in West Bengal.

Parameter 2: Dissolved O₂ (DO)

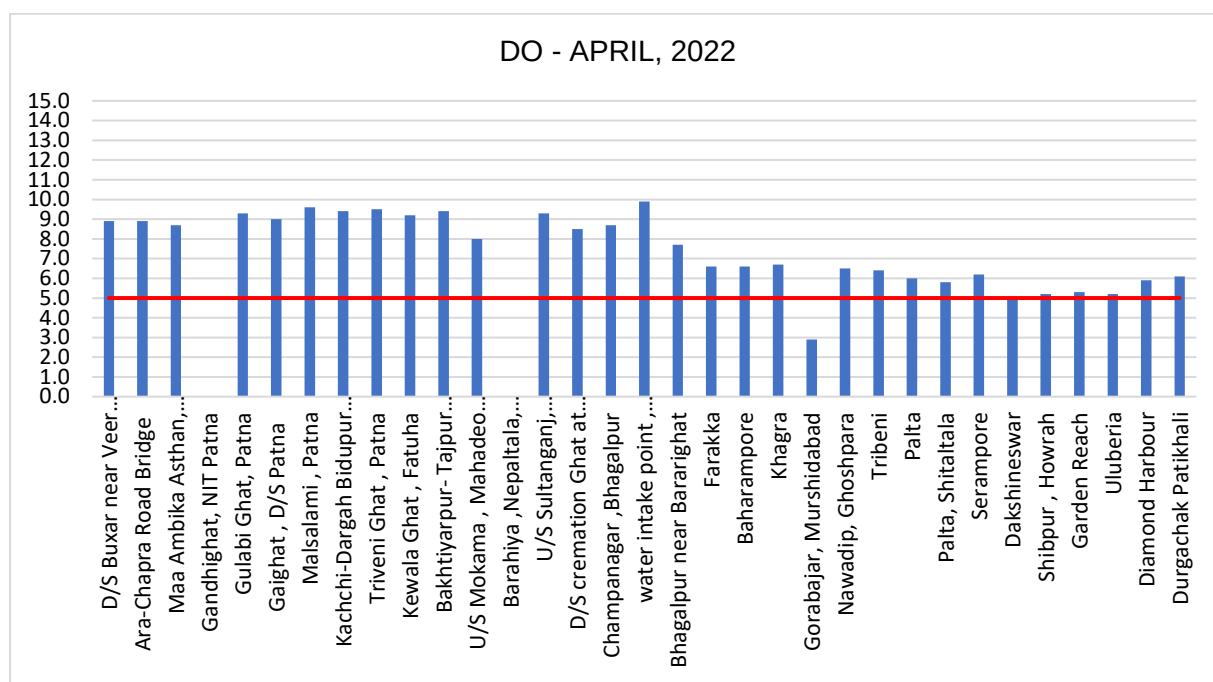


Fig.5.80. DO value for April,2022

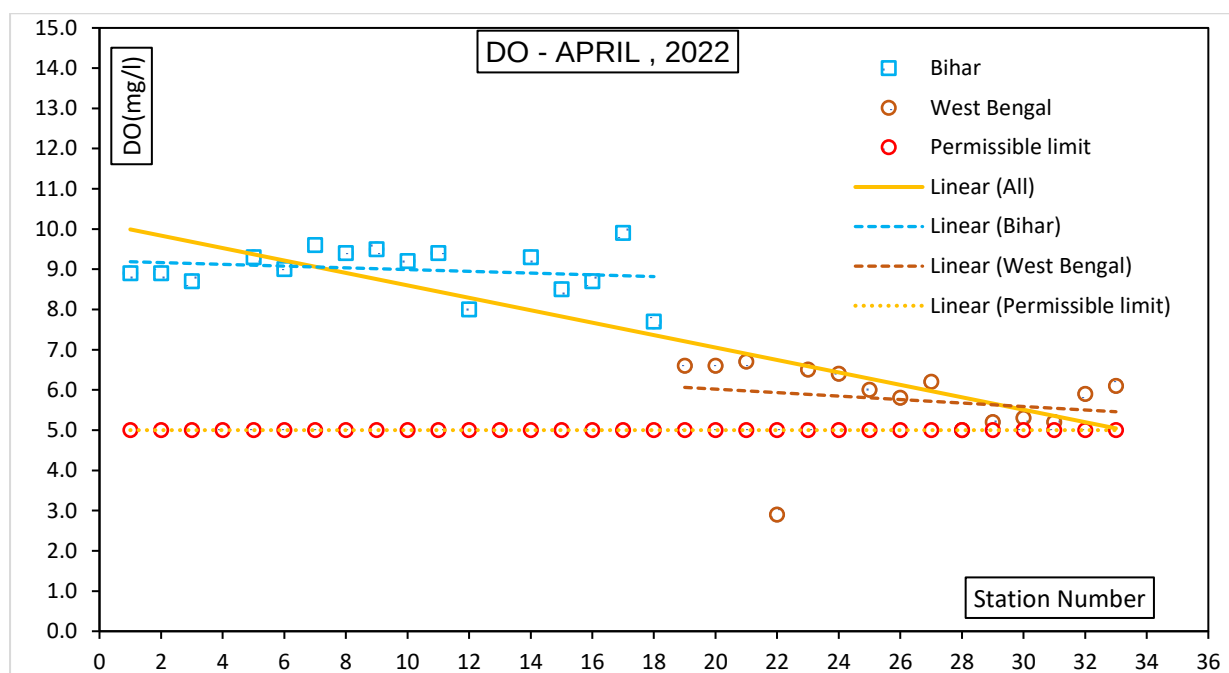


Fig.5.81. Trend Line analysis of DO value for April,2022

The DO values were found in the range of 2.9–9.9mg/l. The lowest DO value 2.9 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.9 mg/l was for water intake point, Bhagalpur for the month April,2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

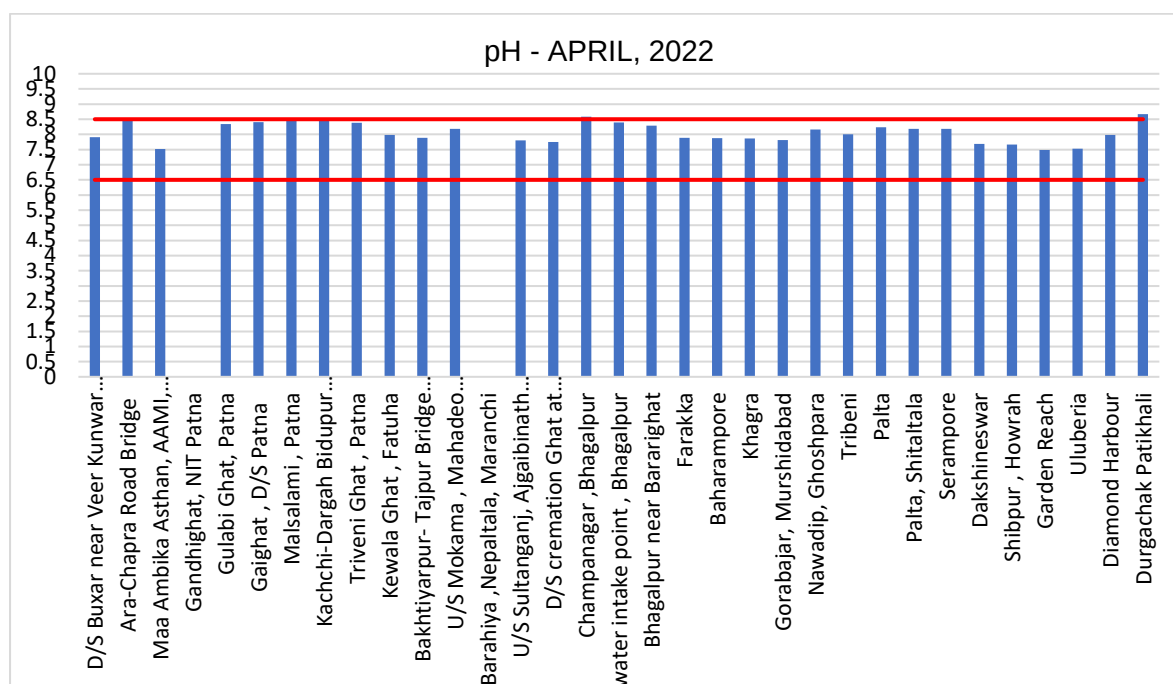


Fig.5.82. pH value for April,2022

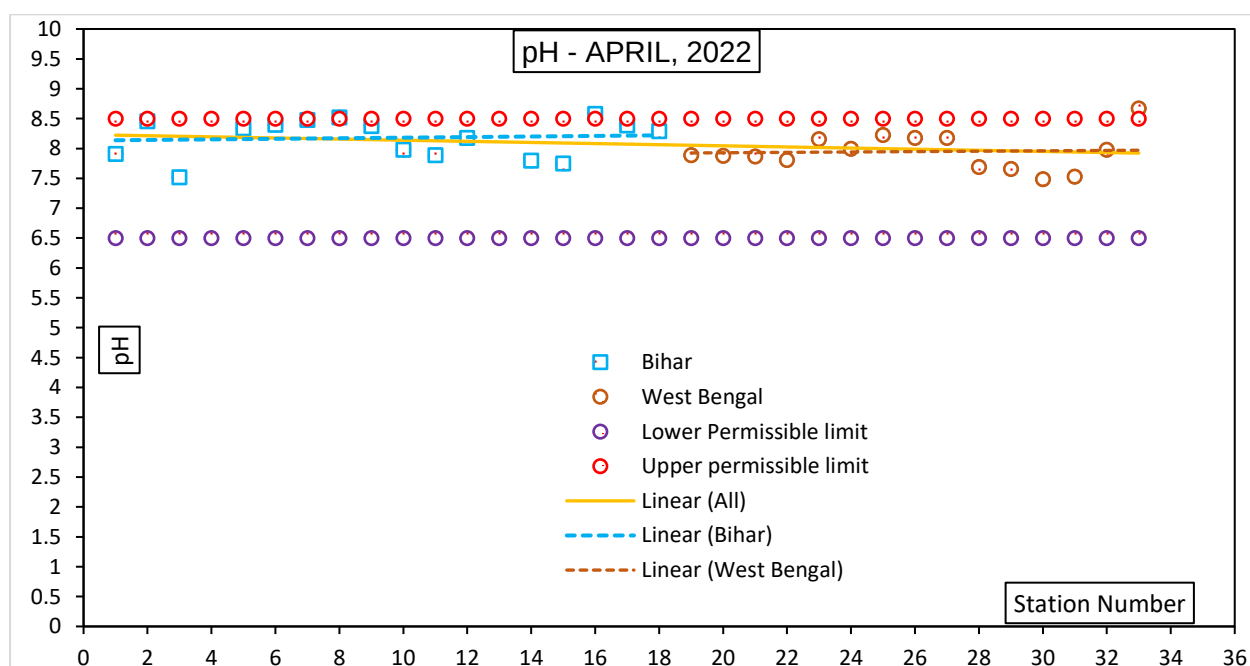


Fig.5.83. Trend Line analysis of pH value for April,2022

The pH values were found in the range of 7.49 - 8.67. for April ,2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) exceeded the permissible limit for three times for the month April ,2022. From Trend Line analysis curve the pH value for Bihar is slightly increasing and for West Bengal it is slightly increasing.

Parameter 4: Fecal Coliform

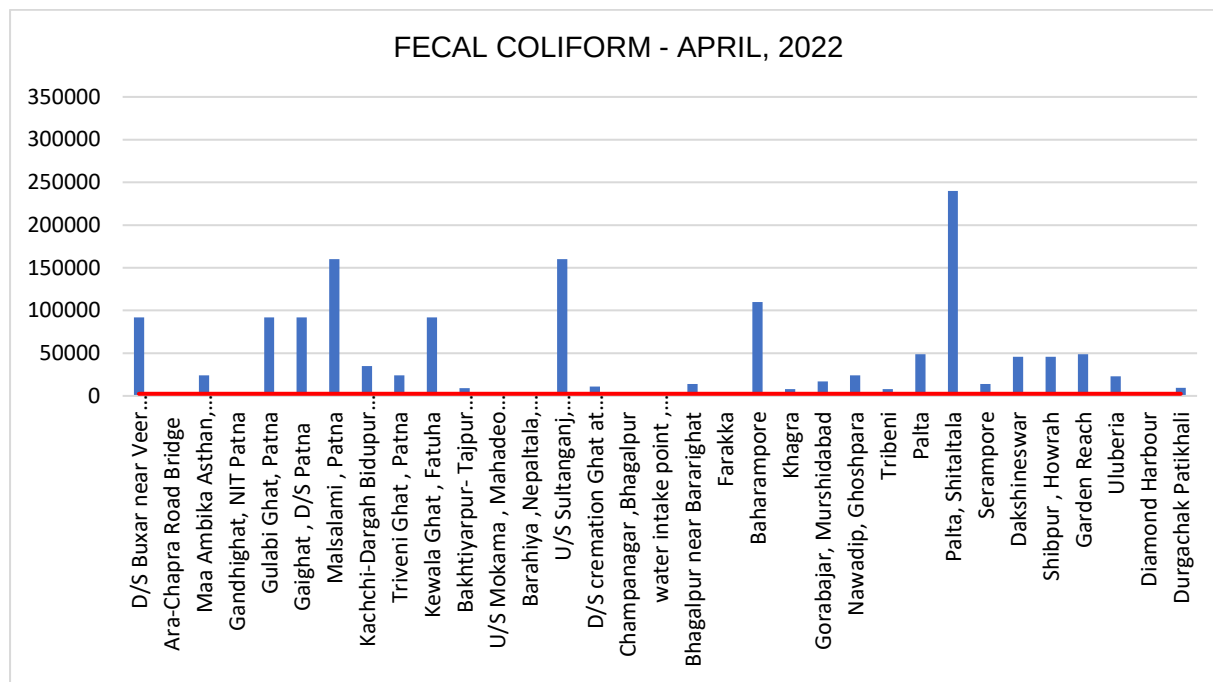


Fig.5.84. Fecal Coliform value for April,2022

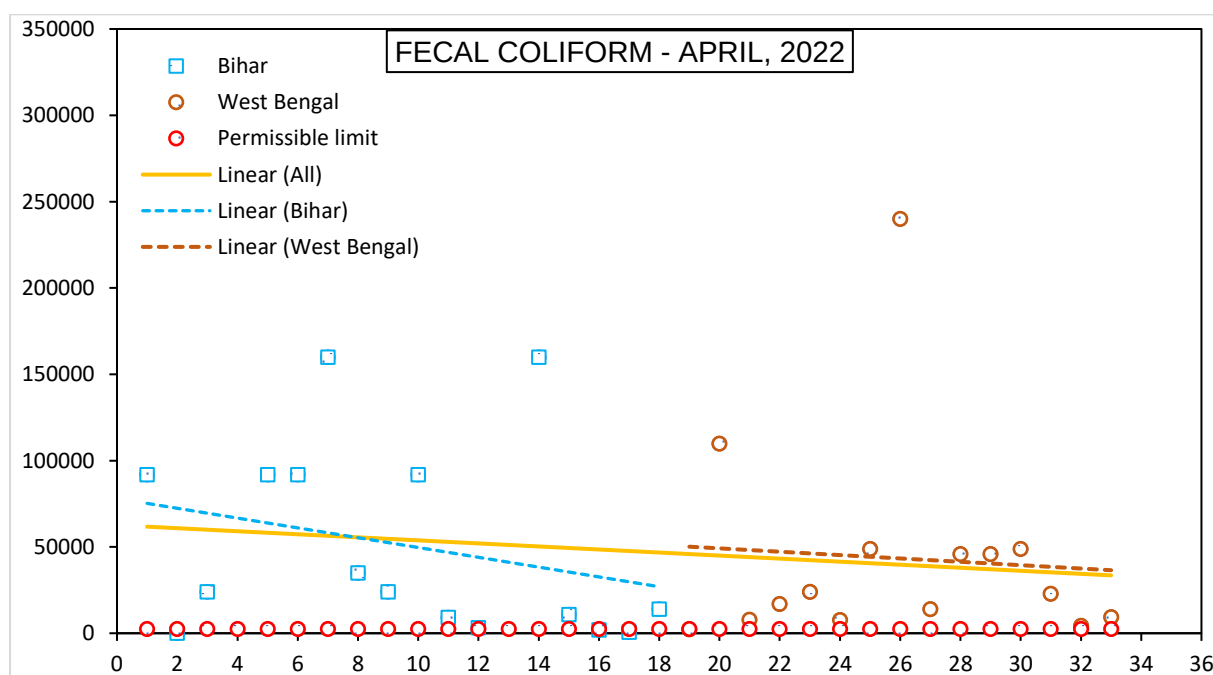


Fig.5.85. Trend Line analysis of Fecal Coliform value for April,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

April 2023:

Table 13: Data of water quality parameter of river Ganga at different stations for April, 2023

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	20.04.2023	1.3	8.6	7.54	13000
2	Ara-Chapra Road Bridge	05.04.2023	2.2	7.7	7.77	13000
3	Maa Ambika Asthan, AAMI	05.04.2023	1.8	8.1	7.67	28000
4	Gandhighat, NIT Patna	17.04.2023	1.8	7.9	7.82	17000
5	Gulabi Ghat, Patna	17.04.2023	1.9	7.8	7.88	54000
6	Gaighat , D/S Patna	17.04.2023	2	7.6	8.06	22000
7	Malsalami , Patna	17.04.2023	2	7.5	7.69	54000
8	Kachchi-Dargah Bidupur	17.04.2023	1.7	8.0	7.96	28000
9	Triveni Ghat , Patna	17.04.2023	2	7.4	7.99	17000
10	Kewala Ghat , Fatuha	03.04.2023	1.9	7.0	7.65	92000
11	Bakhtiyarpur- Tajpur Bridge	17.04.2023	1.4	8.4	7.58	17000
12	U/S Mokama , Mahadeo Asthan	17.04.2023	1.7	8.0	7.82	17000
13	Barahiya ,Nepaltala, Maranchi	17.04.2023	1.7	8.2	7.89	28000
14	U/S Sultanganj, Ajgaibinath Mandir	08.04.2023	1.5	8.2	7.88	28000
15	D/S cremation Ghat at Sultanganj	08.04.2023	1.6	8.1	7.99	92000
16	Champanagar ,Bhagalpur	missing				
17	water intake point , Bhagalpur	08.04.2023	2.7	6.7	7.97	14000
18	Bhagalpur near Bararighat	08.04.2023	1.9	8.7	7.78	3300
19	Farakka	24.04.2023	2.25	7.5	8.46	540
20	Baharampore	25.04.2023	2.8	6.8	8.45	4900
21	Khagra	25.04.2023	2.1	6.4	8.36	540
22	Gorabajar, Murshidabad	25.04.2023	2.5	2.5	8.32	4900
23	Nawadip, Ghoshpara	25.04.2023	1.95	7.5	8.58	210
24	Tribeni					
25	Palta	24.04.2023	2.15	7.8	8.42	11000
26	Palta, Shitaltala	24.04.2023	2.5	7.9	8.71	13000
27	Serampore					
28	Dakshineswar	18.04.2023	3.25	5.9	7	49000
29	Shibpur , Howrah	19.04.2023	3.15	5.75	7.15	33000
30	Garden Reach	19.04.2023	2.95	5.65	7.2	43000
31	Uluberia	24.04.2023	2.82	5.67	7.58	34000
32	Diamond Harbour	25.04.2023	2.12	6.48	7.65	4600
33	Durgachak Patikhali	25.04.2023	1.35	6.2	8.4	4900

Parameter 1: BOD

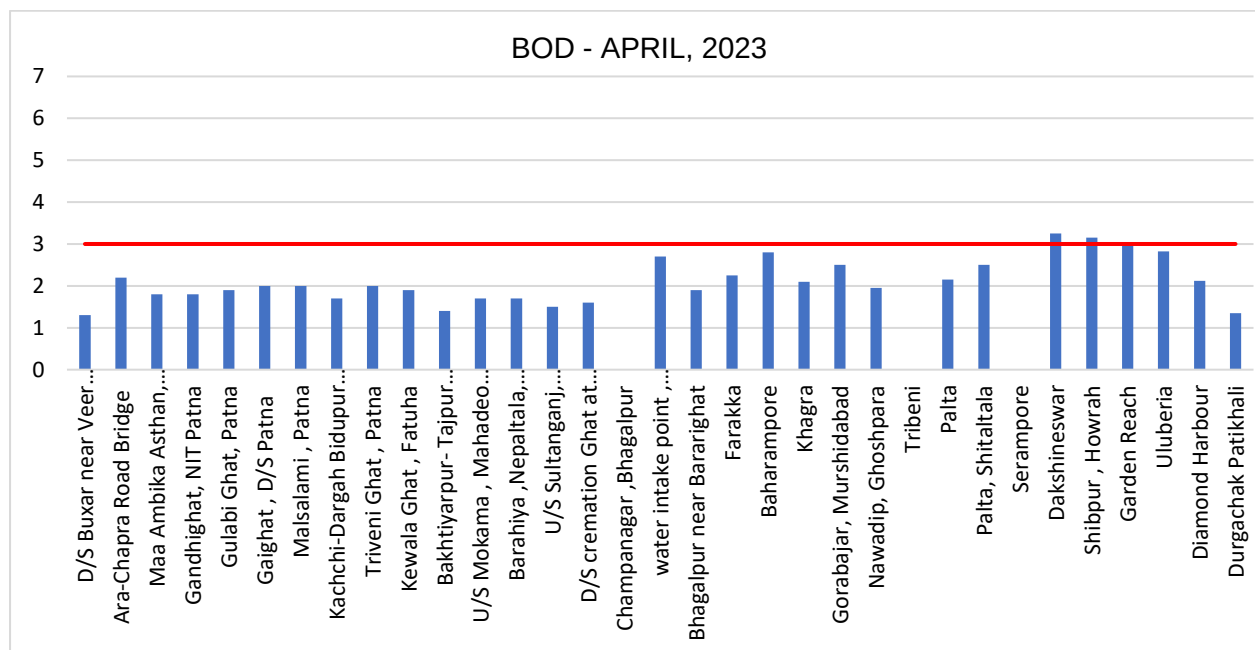


Fig.5.86. BOD value for April,2023

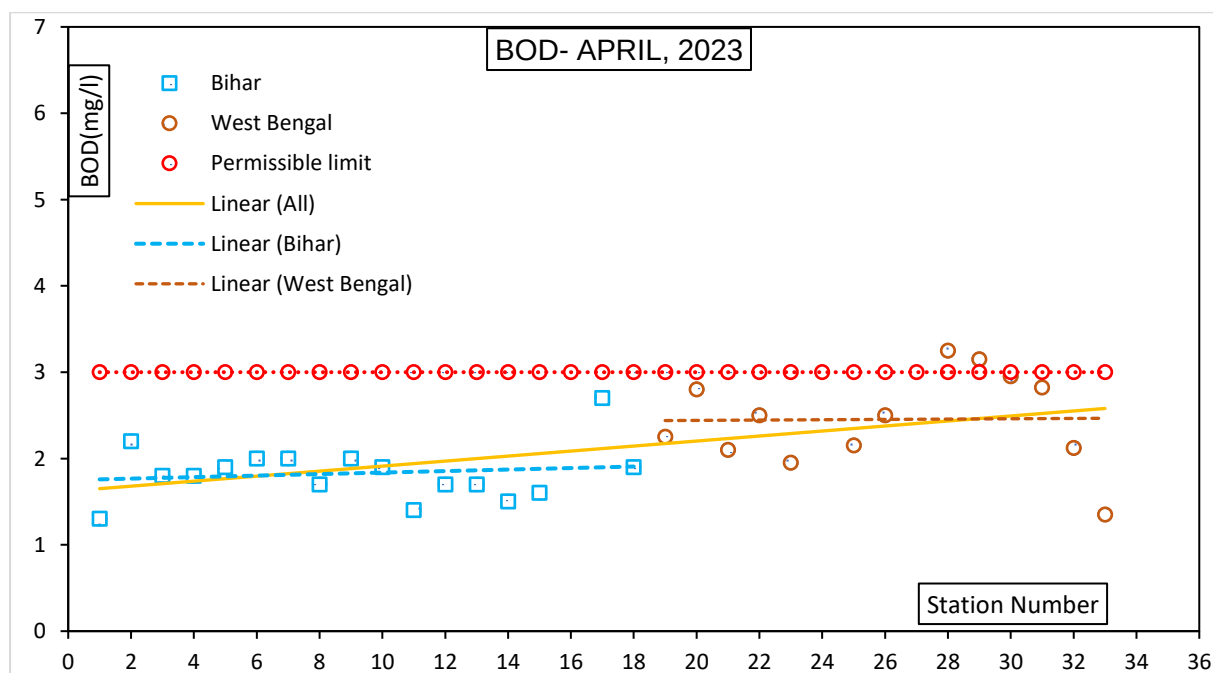


Fig.5.87. Trend Line analysis of BOD value for April,2023

The BOD values were found in the range of 1.3–3.25 mg/l. The highest BOD value of 3.25 mg/l was for Dakshineswar for the month of April, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

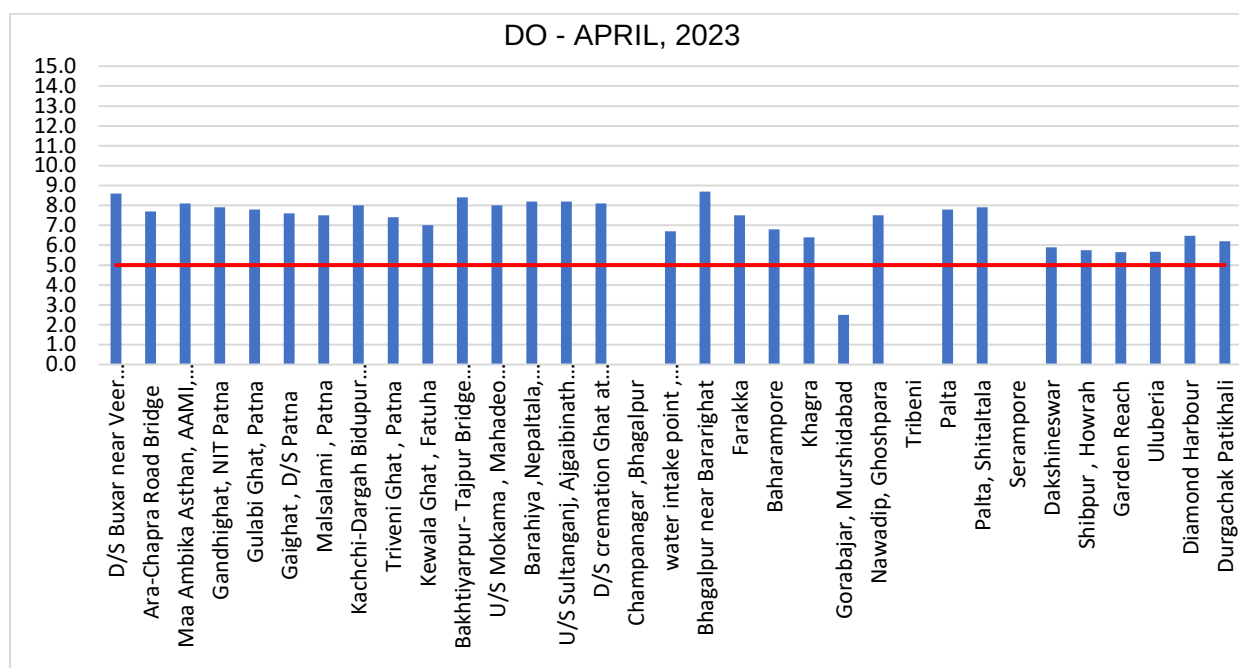


Fig.5.88. DO value for April,2023

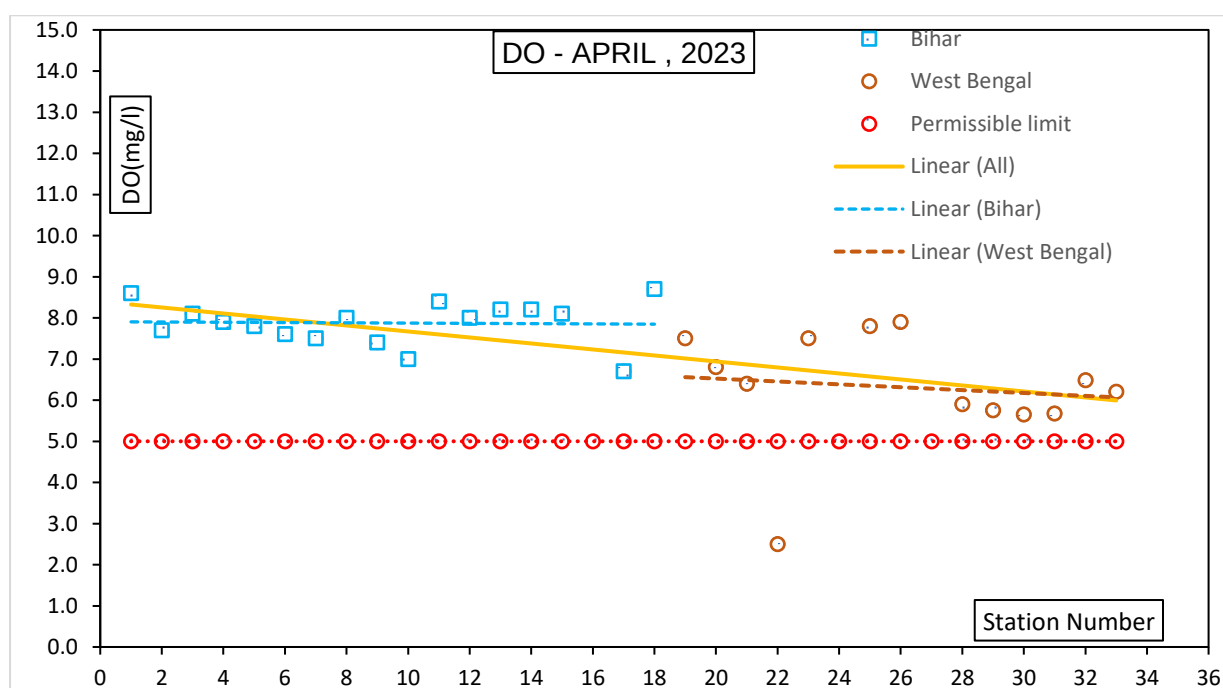


Fig.5.89. Trend Line analysis of DO value for April,2023

The DO values were found in the range of 2.5–8.6mg/l. The lowest DO value 2.5 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.6 mg/l was for D/S Buxar near Veer Kunwar Singh Road Bridge for the month April,2023. From Trend Line analysis curve the DO value for Bihar is slightly decreasing and for West Bengal it is decreasing.

Parameter 3: pH

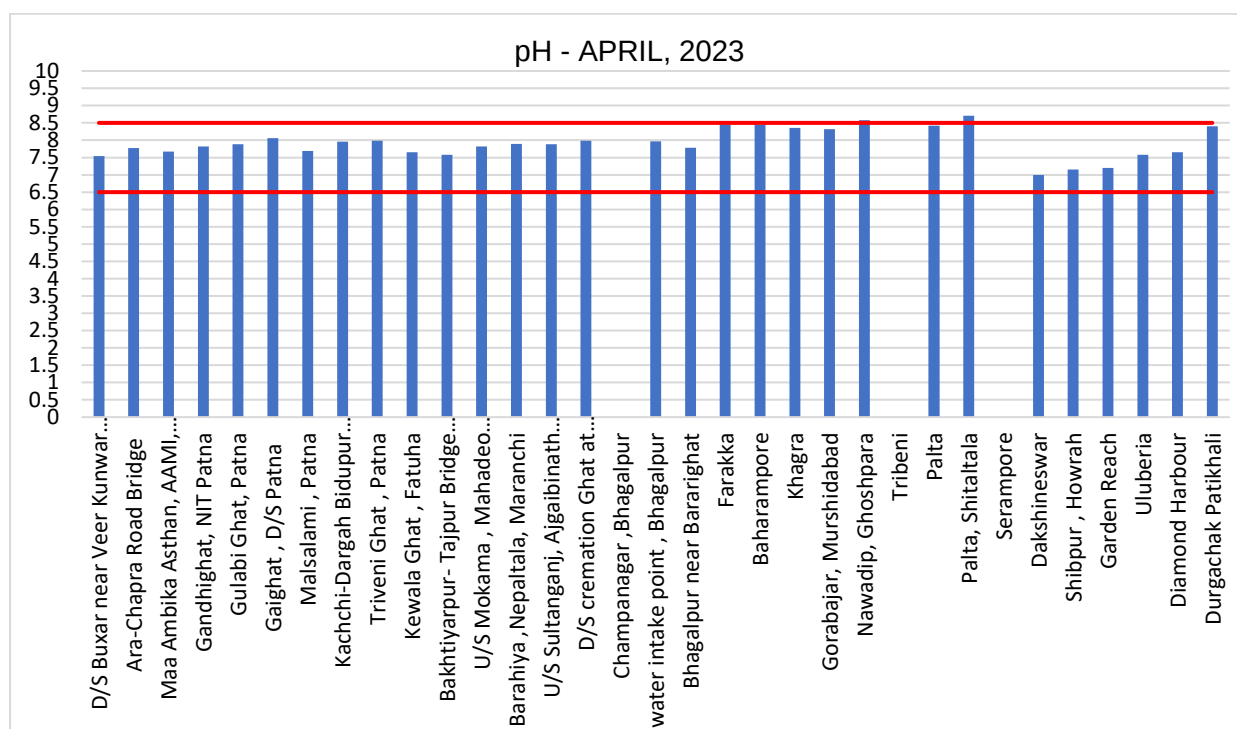


Fig.5.90. pH value for April,2023

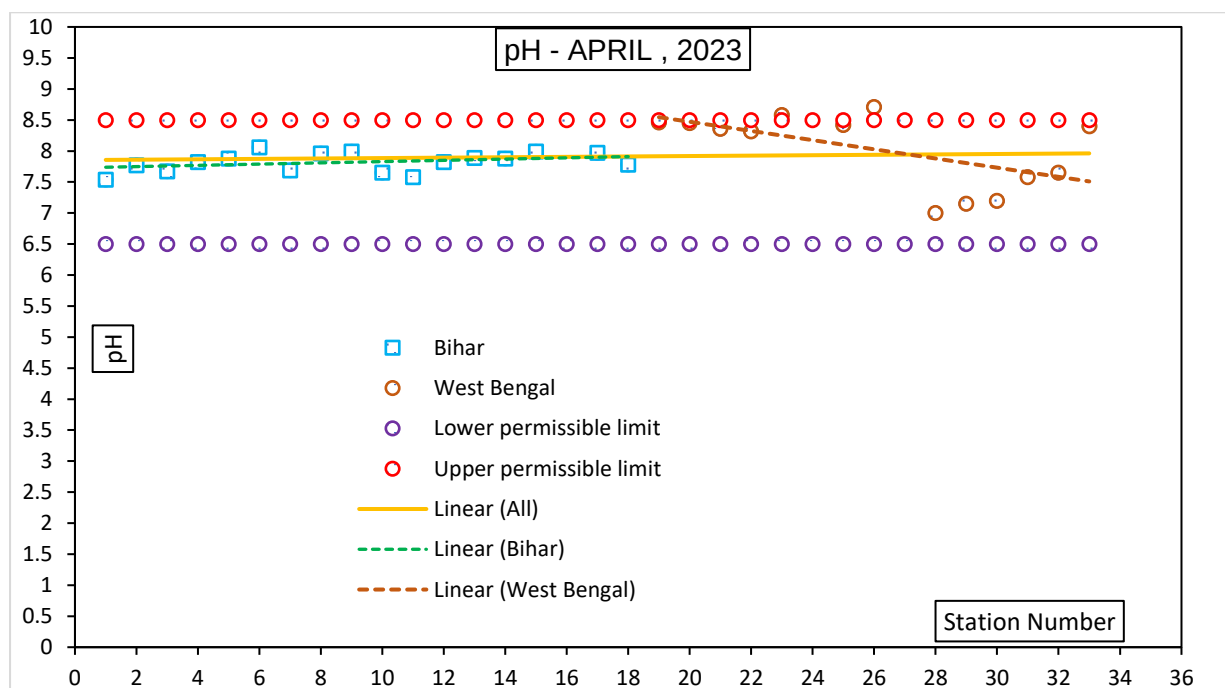


Fig.5.91. Trend Line analysis of pH value for April,2023

The pH values were found in the range of 7.0 – 8.71. for April ,2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) exceeded the permissible limit for once for the month April ,2023. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

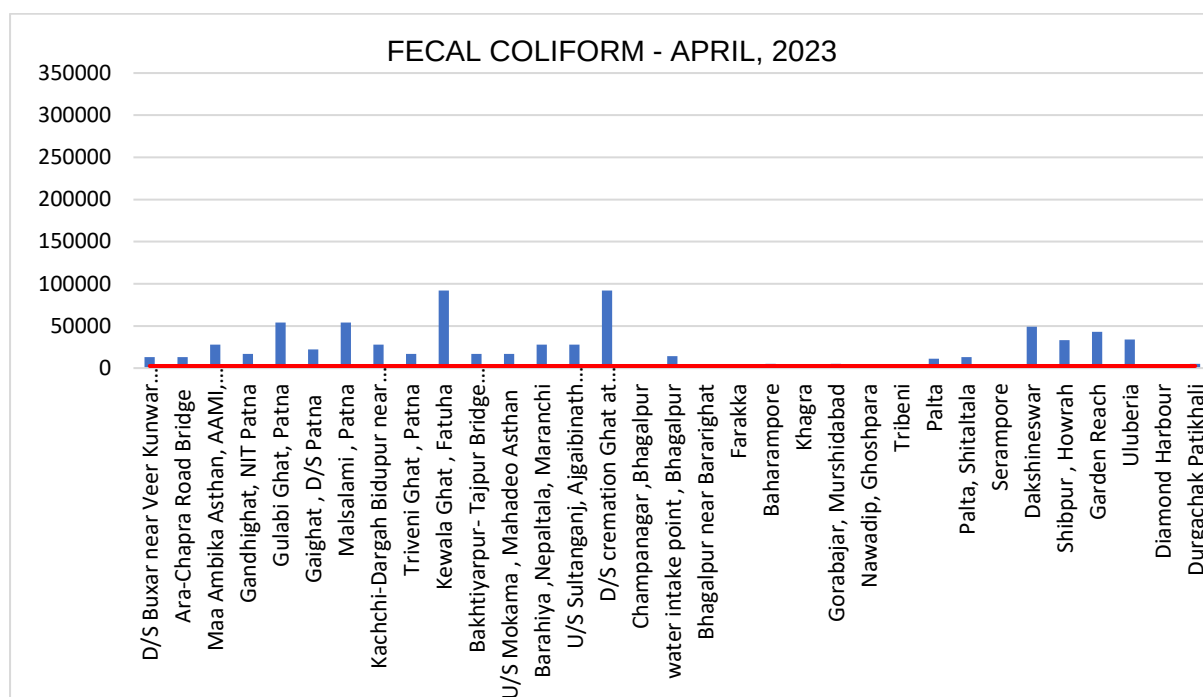


Fig.5.92. Fecal Coliform value for April,2023

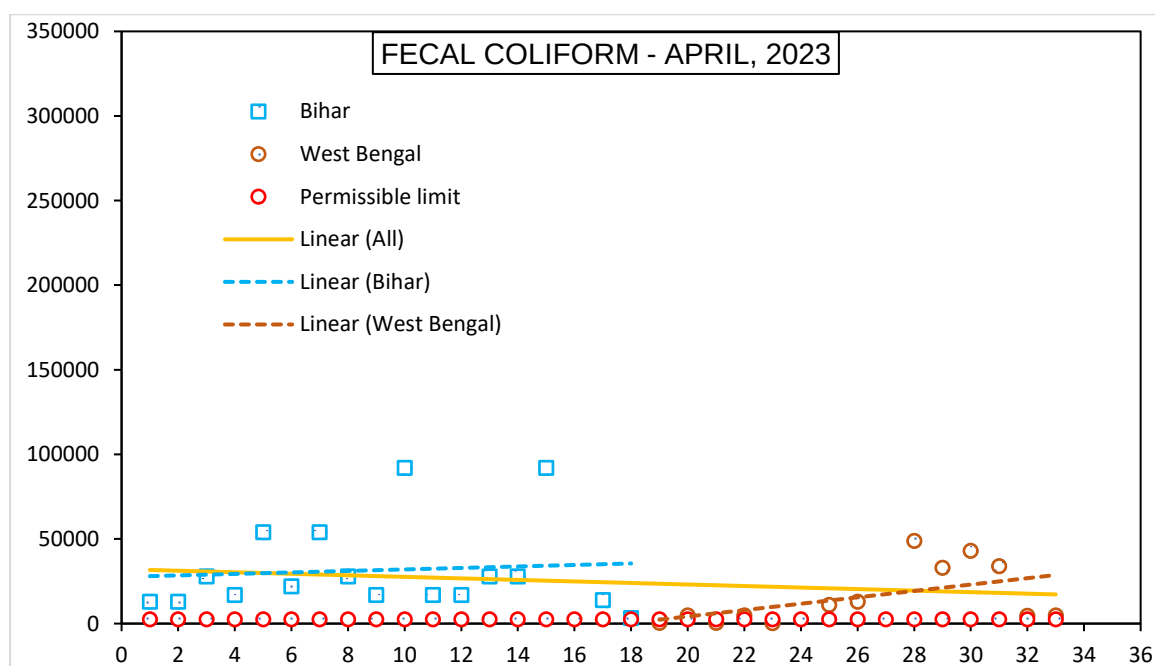


Fig.5.93. Trend Line analysis of Fecal Coliform value for April,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 92000. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

May 2021:

Table 14: Data of water quality parameter of river Ganga at different stations for May, 2021						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	05.05.2021	1.8	6.6	7.55	92000
2	Ara-Chapra Road Bridge	06.05.2021	0.8	8.70	7.79	3300
3	Maa Ambika Asthan, AAMI	06.05.2021	0.7	9.1	7.71	11000
4	Gandhighat, NIT Patna	04.05.2021	2.4	8.0	8.04	160000
5	Gulabi Ghat, Patna	04.05.2021	2.8	8.14	8.14	160000
6	Gaighat , D/S Patna	03.05.2021	1.9	7.95	7.95	92000
7	Malsalami , Patna	03.05.2021	1.4	9.1	7.94	54000
8	Kachchi-Dargah Bidupur	03.05.2021	1.2	8.6	7.92	13000
9	Triveni Ghat , Patna	03.05.2021	1.5	7.5	8.19	15000
10	Kewala Ghat , Fatuha	03.05.2021	2.1	7.6	7.99	160000
11	Bakhtiyarpur- Tajpur Bridge	10.05.2021	1.1	8.8	7.91	3400
12	U/S Mokama , Mahadeo Asthan	10.05.2021	1.2	8.5	7.86	92000
13	Barahiya ,Nepaltala, Maranchi	10.05.2021	1.1	9.0	7.79	35000
14	U/S Sultanganj, Ajgaibinath Mandir	11.05.2021	1.2	8.3	7.51	7000
15	D/S cremation Ghat at Sultanganj	11.05.2021	2.1	7.9	7.71	92000
16	Champanagar ,Bhagalpur	12.05.2021	1.6	7.4	8.12	24000
17	water intake point , Bhagalpur	12.05.2021	1.6	7.4	8.12	24000
18	Bhagalpur near Bararighat	12.05.2021	2.1	6.1	8.27	92000
19	Farakka	12/05/2021	2.15	6.9	8.06	
20	Baharampore	11/05/2021	3	6.5	7.95	
21	Khagra	11/05/2021	2.8	6.4	8.26	
22	Gorabajar, Murshidabad	11/05/2021	2.2	2.2	7.65	
23	Nawadip, Ghoshpara	06/05/2021	2.55	6.4	8.05	7800
24	Tribeni	11/05/2021	3.35	6.3	8.6	11000
25	Palta	04/05/2021	3	5.6	8.19	49000
26	Palta, Shitaltala	04/05/2021	3.45	5.9	8.07	130000
27	Serampore	05/05/2021	3.1	6.2	7.94	130000
28	Dakshineswar	04/05/2021	2.5	5.3	7.83	110000
29	Shibpur , Howrah	04/05/2021	3.5	5.5	7.13	46000
30	Garden Reach	03/05/2021	2.8	5.2	7.23	79000
31	Uluberia	05/05/2021	1.25	4.1	7.18	17000
32	Diamond Harbour	06/05/2021	1.8	6.4	7.48	3300
33	Durgachak Patikhali	07/05/2021	1.2	5.9	8.16	24000

Parameter 1: BOD

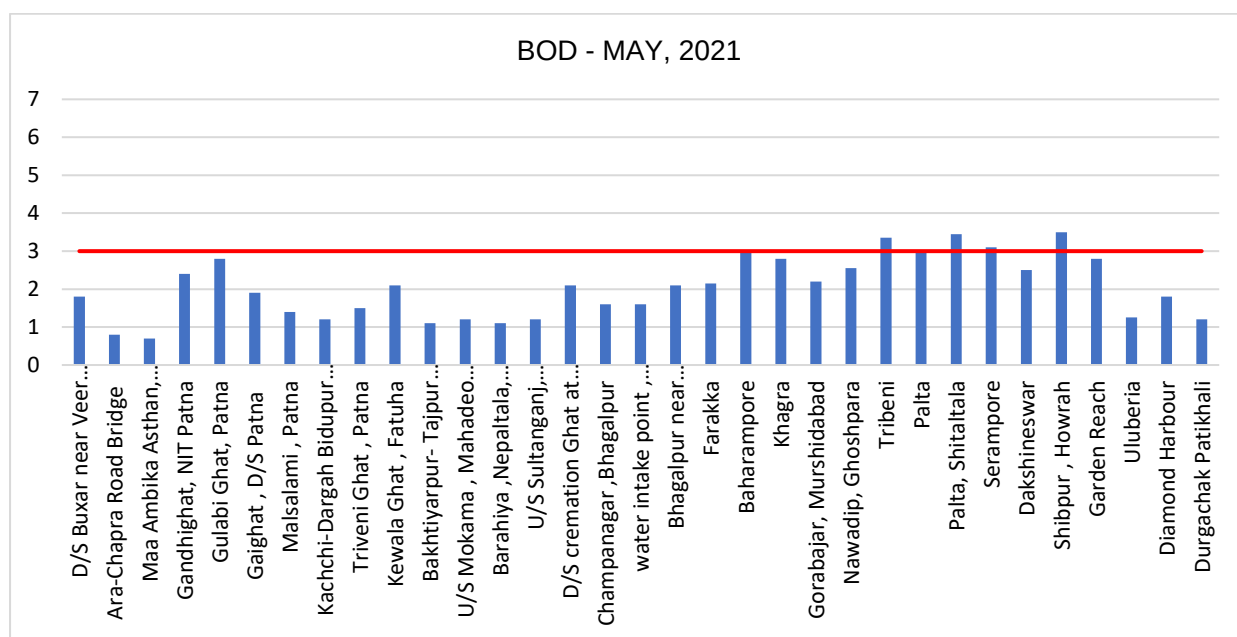


Fig.5.94. BOD value for May,2021

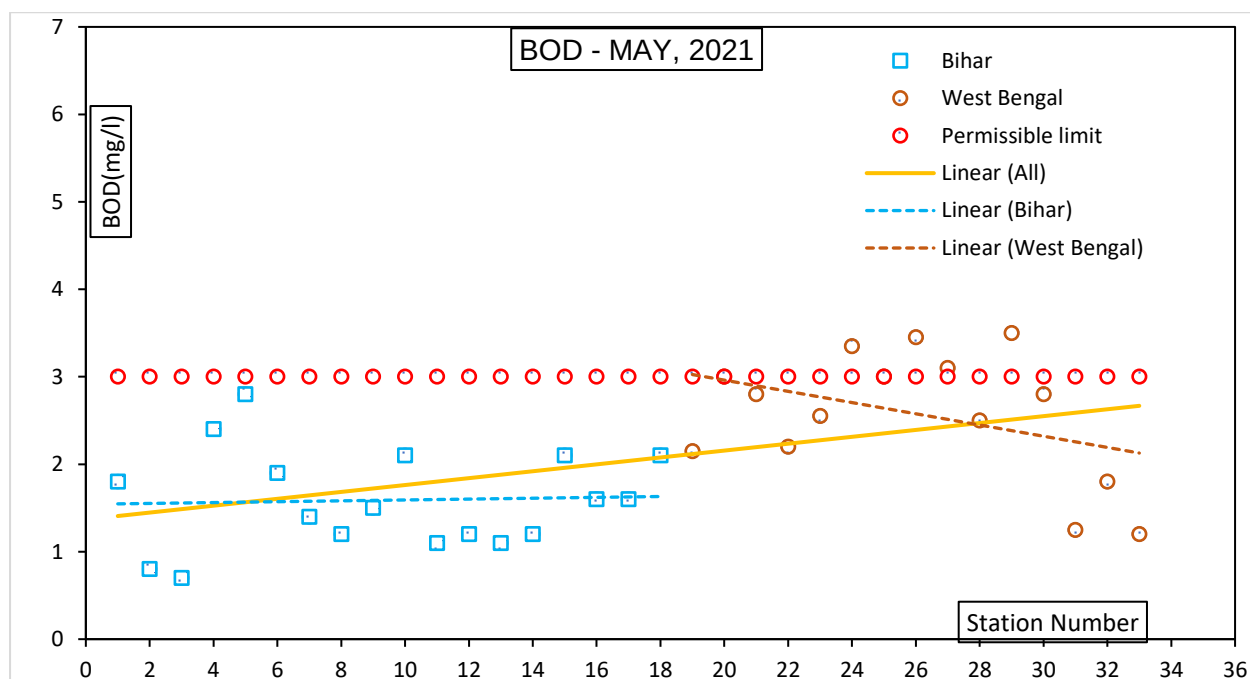


Fig.5.95. Trend Line analysis of BOD value for May,2021

The BOD values were found in the range of 0.7–3.5 mg/l. The highest BOD value of 3.5 mg/l was for Shibpur, Howrah for the month of May, 2021. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O2 (DO)

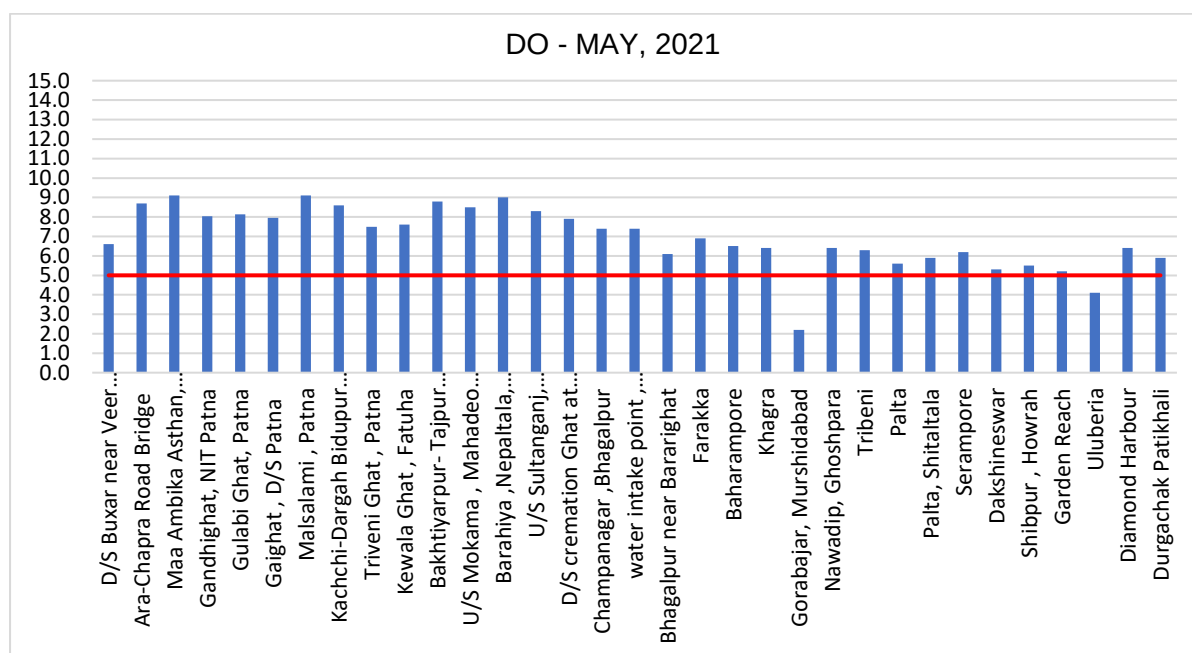


Fig.5.94. DO value for May,2021

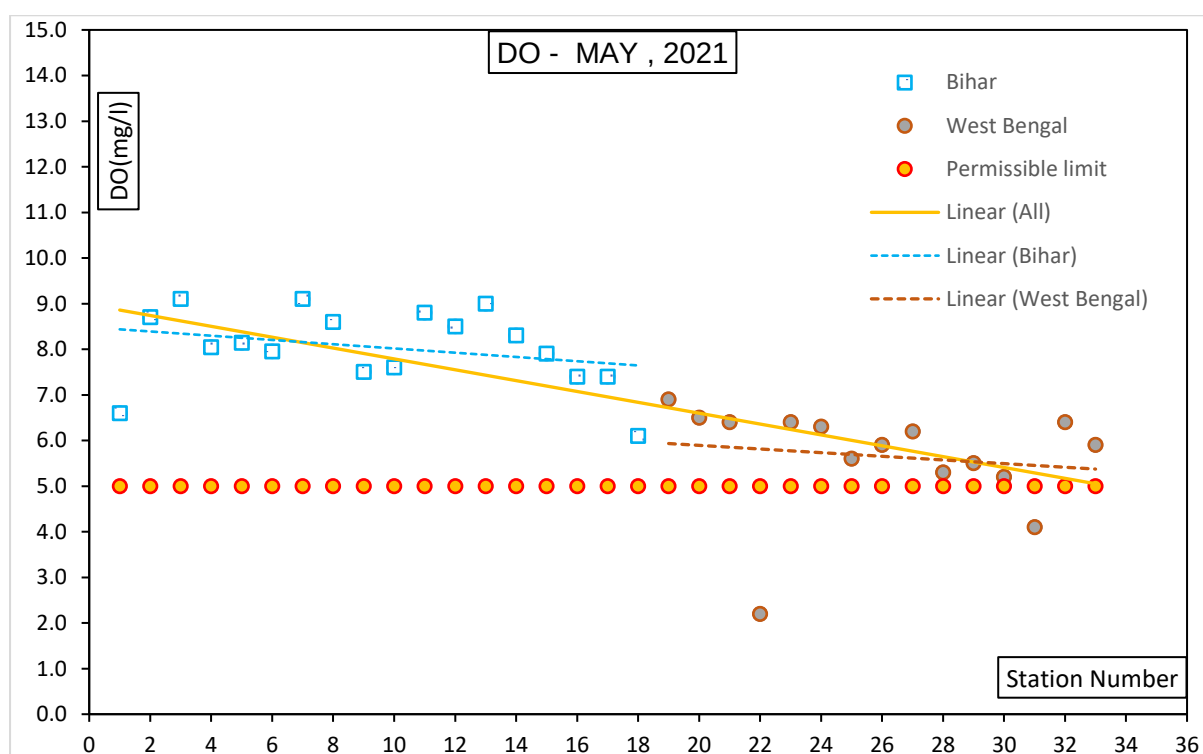


Fig.5.95. Trend Line analysis of DO value for May,2021

The DO values were found in the range of 2.2–9.1 mg/l. The lowest DO value 2.2 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.1 mg/l was for Maa Ambika Asthan, AAMI and Malsalami, Patna for the month May, 2021. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

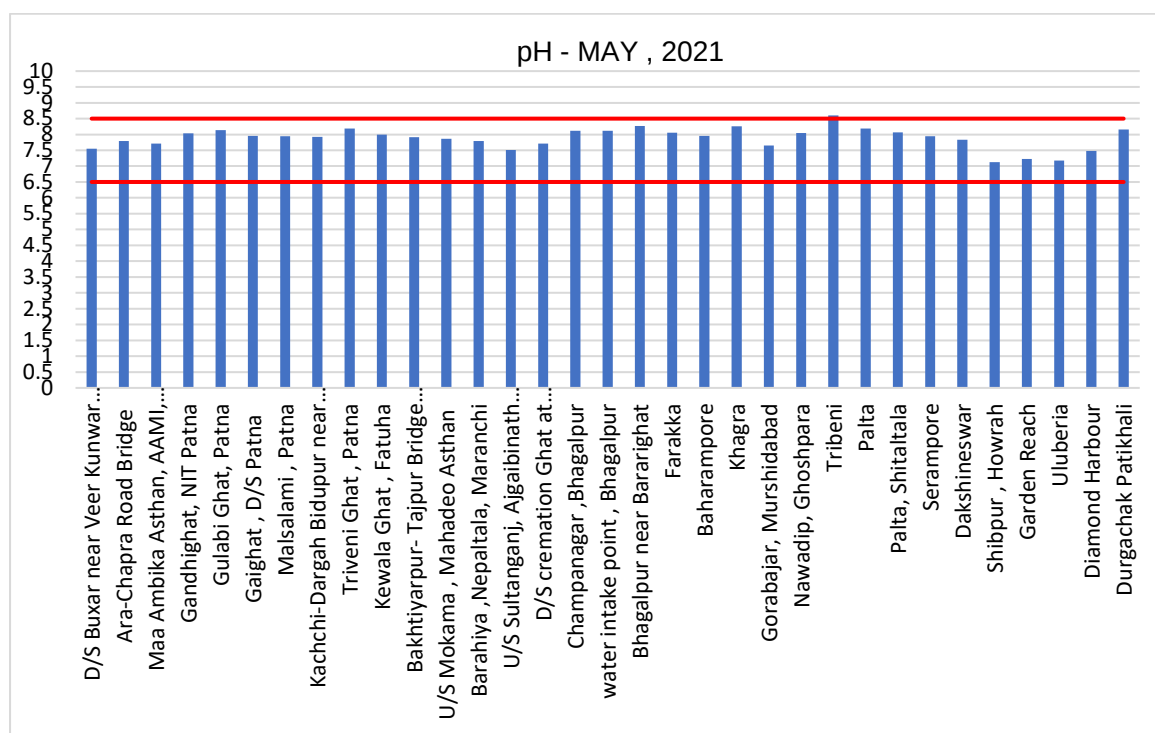


Fig.5.96. pH value for May,2021

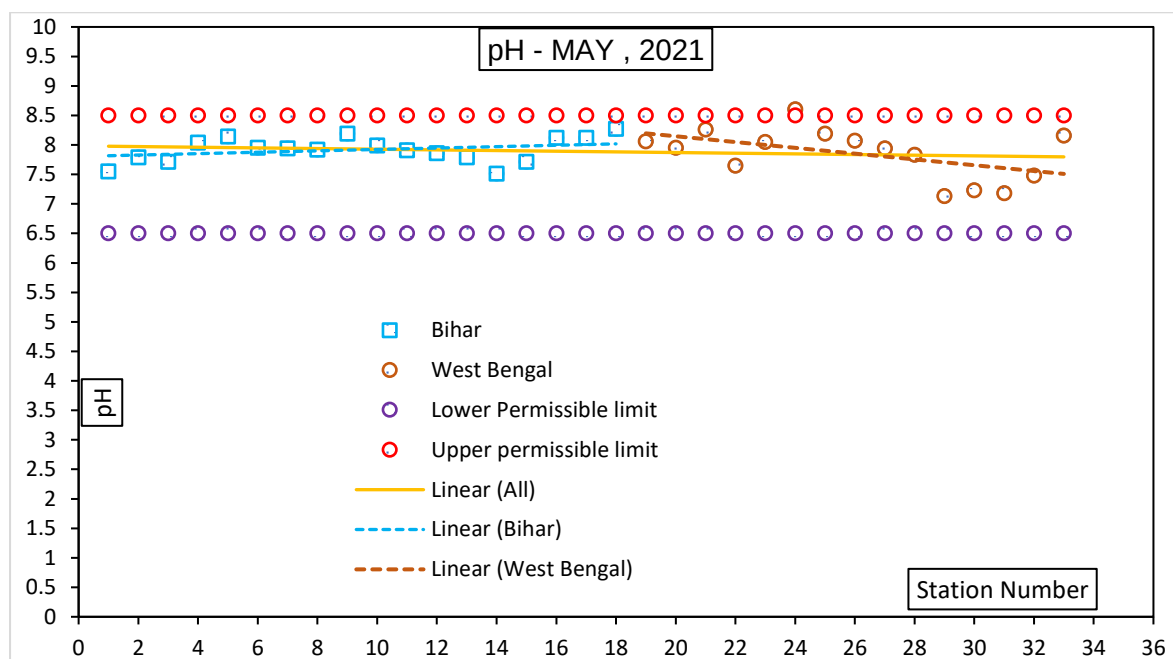


Fig.5.97. Trend Line analysis of pH value for May,2021

The pH values were found in the range of 7.13 – 8.27. for May, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month May, 2021. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

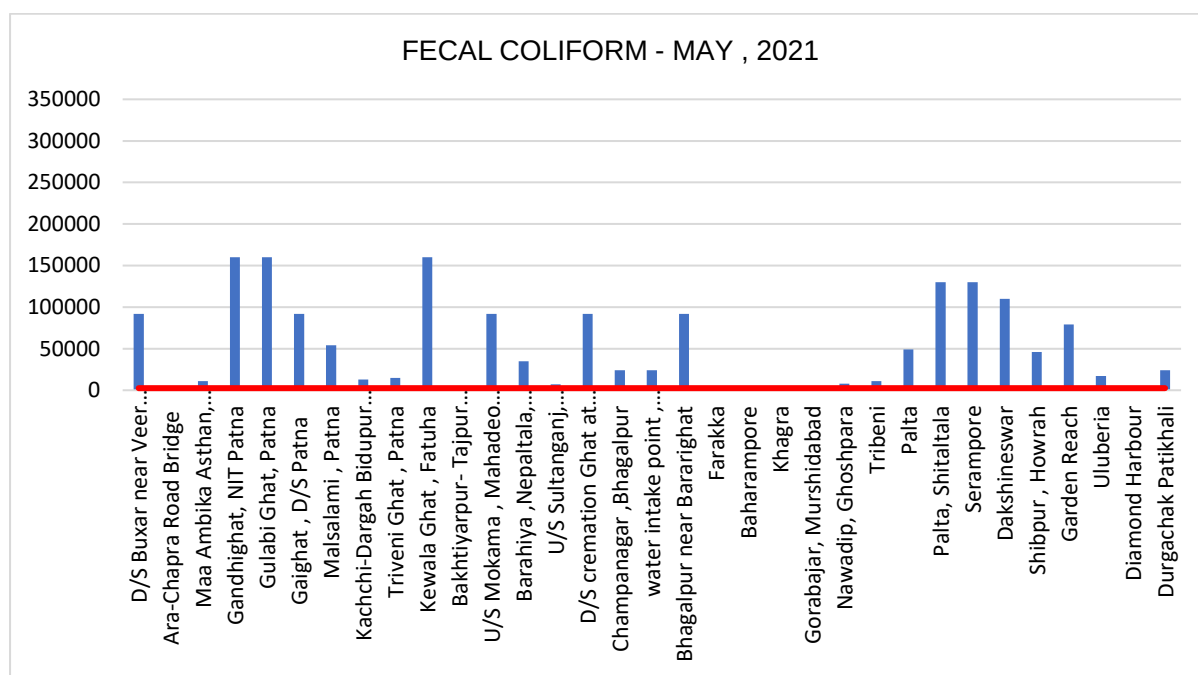


Fig.5.98. Fecal Coliform value for May,2021

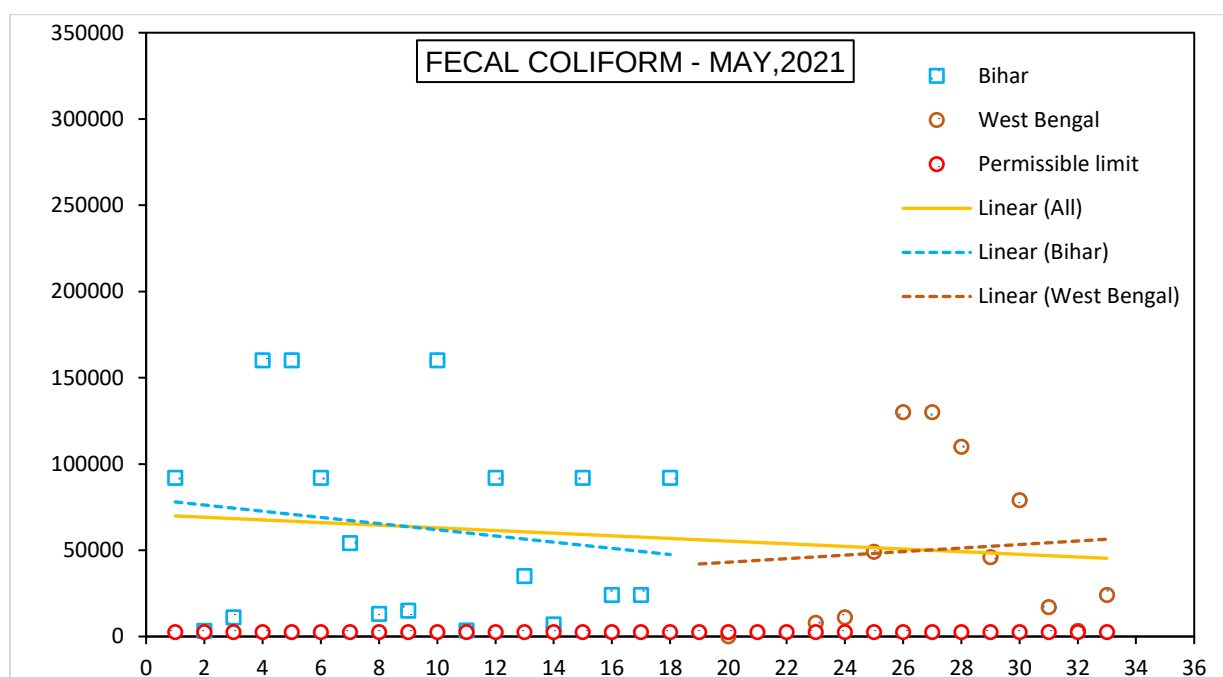


Fig.5.99. Trend Line analysis of Fecal Coliform value for May,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 160000 for May, 2021. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is increasing.

May 2022:

Table 15: Data of water quality parameter of river Ganga at different stations						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	20/05/2022	2.1	7.0	8.02	35000
2	Ara-Chapra Road Bridge	18.05.2022	1.9	8.5	7.87	170
3	Maa Ambika Asthan, AAMI	18.05.2022	1.6	8.3	7.85	28000
4	Gandhighat, NIT Patna	03.05.2022	1.8	7.8	7.5	92000
5	Gulabi Ghat, Patna	03.05.2022	2	7.6	7.76	35000
6	Gaighat , D/S Patna	03.05.2022	2	7.9	8.05	54000
7	Malsalami , Patna	03.05.2022	1.9	7.9	7.88	54000
8	Kachchi-Dargah Bidupur	17.05.2022	1.6	8.9	7.78	28000
9	Triveni Ghat , Patna	03.05.2022	1.6	7.3	7.8	24000
10	Kewala Ghat , Fatuha	03.05.2022	2.2	6.9	8.13	24000
11	Bakhtiyarpur- Tajpur Bridge	04.05.2022	1	8.0	7.45	1700
12	U/S Mokama , Mahadeo Asthan	17.05.2022	2.1	7.9	7.75	3500
13	Barahiya ,Nepaltala, Maranchi	17.05.2022	1.6	8.0	8.16	28000
14	U/S Sultanganj, Ajgaibinath Mandir	06.05.2022	1.6	8.2	7.91	92000
15	D/S cremation Ghat at Sultanganj	05.05.2022	2.1	8.1	7.51	12000
16	Champanagar ,Bhagalpur	05.05.2022	1.9	8.2	8.01	1300
17	water intake point , Bhagalpur	05.05.2022	1.8	7.8	7.68	28000
18	Bhagalpur near Bararighat	05.05.2022	1.7	8.2	7.63	99000
19	Farakka	25/05/2022	1.85	5.9	7.82	930
20	Baharampore	25/05/2022	2.25	6.4	7.85	130000
21	Khagra	25/05/2022	2.1	6.3	7.83	13000
22	Gorabajar, Murshidabad	25/05/2022	1.4	1.4	7.76	17000
23	Nawadip, Ghoshpara	24/05/2022	1.9	6	7.78	2300
24	Tribeni					
25	Palta	19/05/2022	2.7	6.9	8	49000
26	Palta, Shitaltala	19/05/2022	4	6.4	7.87	79000
27	Serampore	missing				
28	Dakshineswar	19/05/2022	2.85	5.6	7.48	110000
29	Shibpur , Howrah	20/05/2022	2.45	5.3	7.15	46000
30	Garden Reach	23/05/2022	2.3	5.2	7.62	49000
31	Uluberia	24/05/2022	2.2	5.3	7.48	23000
32	Diamond Harbour	25/05/2022	3	6.6	7.08	7800
33	Durgachak Patikhali	24/05/2022	1.95	6.3	8.46	11000

Parameter 1: BOD

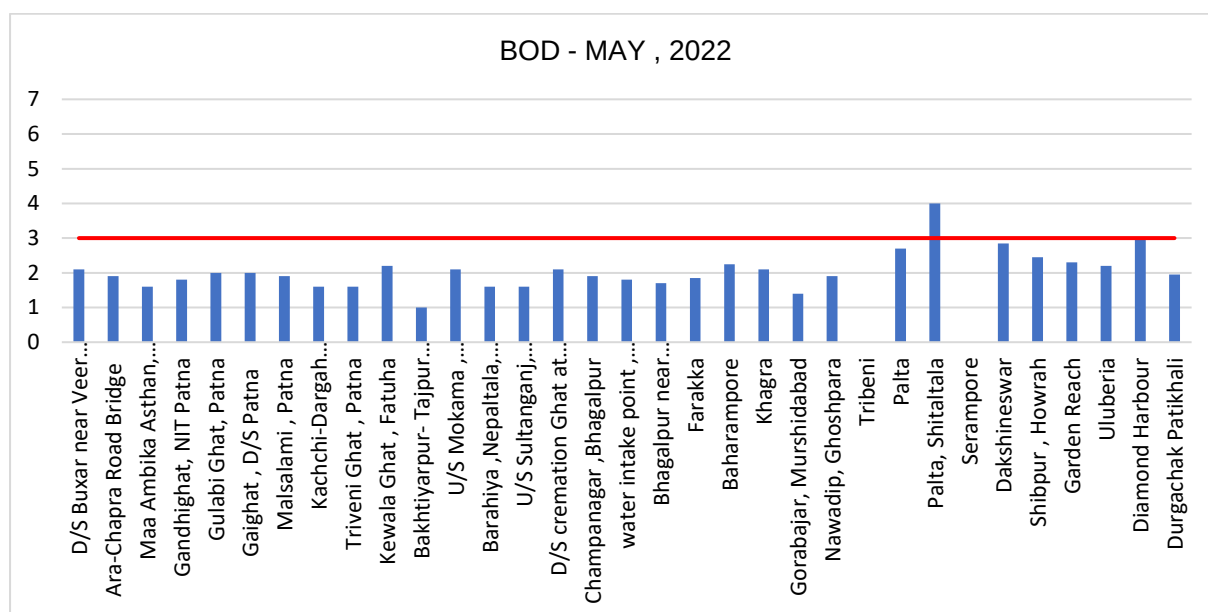


Fig.5.100. BOD value for May,2022

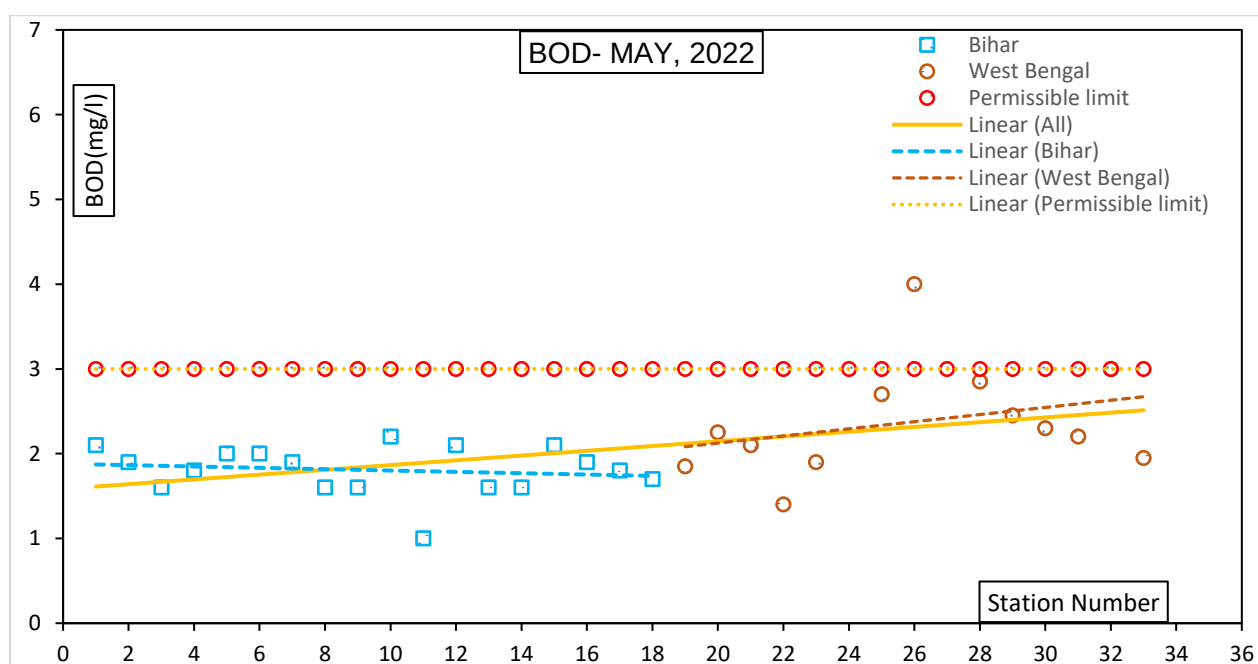


Fig.5.101. Trend Line analysis of BOD value for May,2022

The BOD values were found in the range of 1.0–2.85 mg/l. The highest BOD value of 2.85 mg/l was for Dakshineswar for the month of May,2022. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

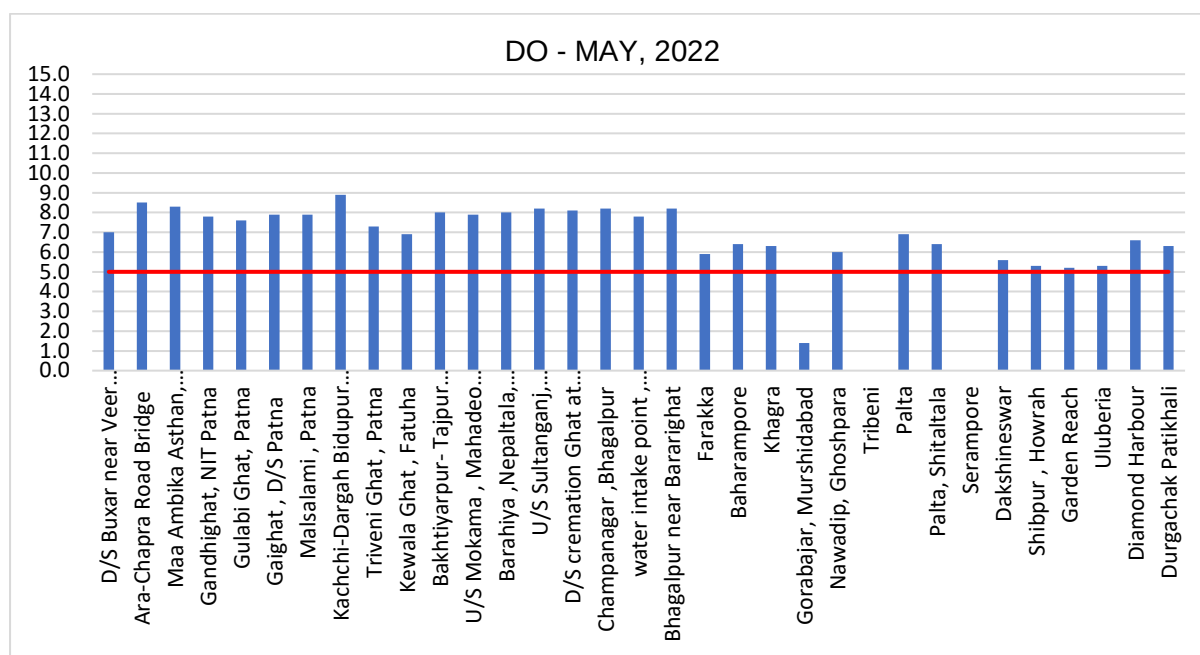


Fig.5.102. DO value for May,2022

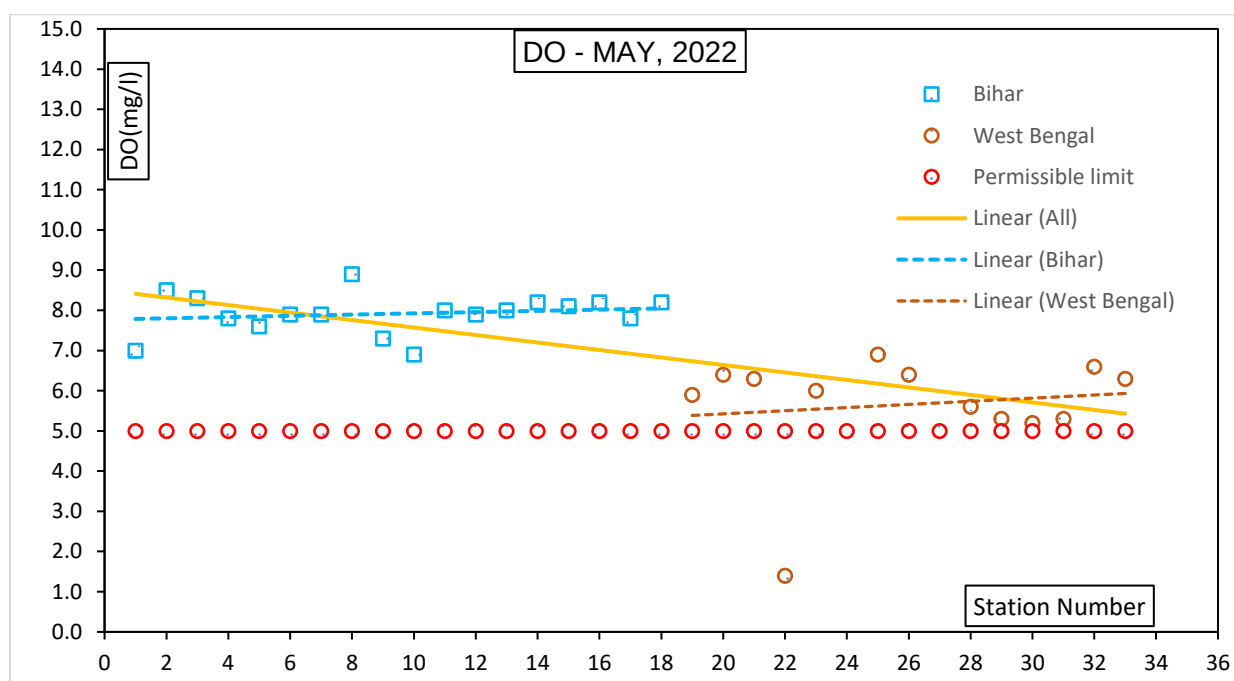


Fig.5.103. Trend Line analysis of DO value for May,2022

The DO values were found in the range of 1.4–8.9 mg/l. The lowest DO value 1.4 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.9 mg/l was for Kachchi-Dargah Bidupur for the month May, 2022. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is increasing.

Parameter 3: pH

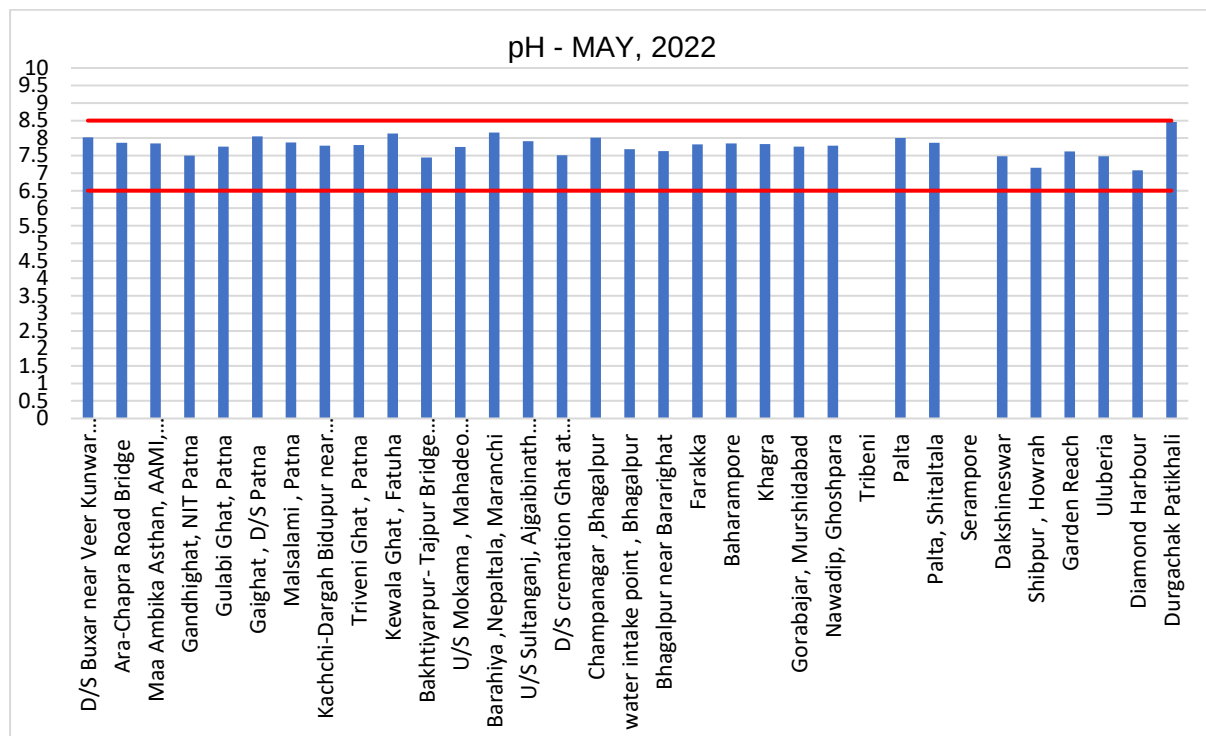


Fig.5.104. pH value for May,2022

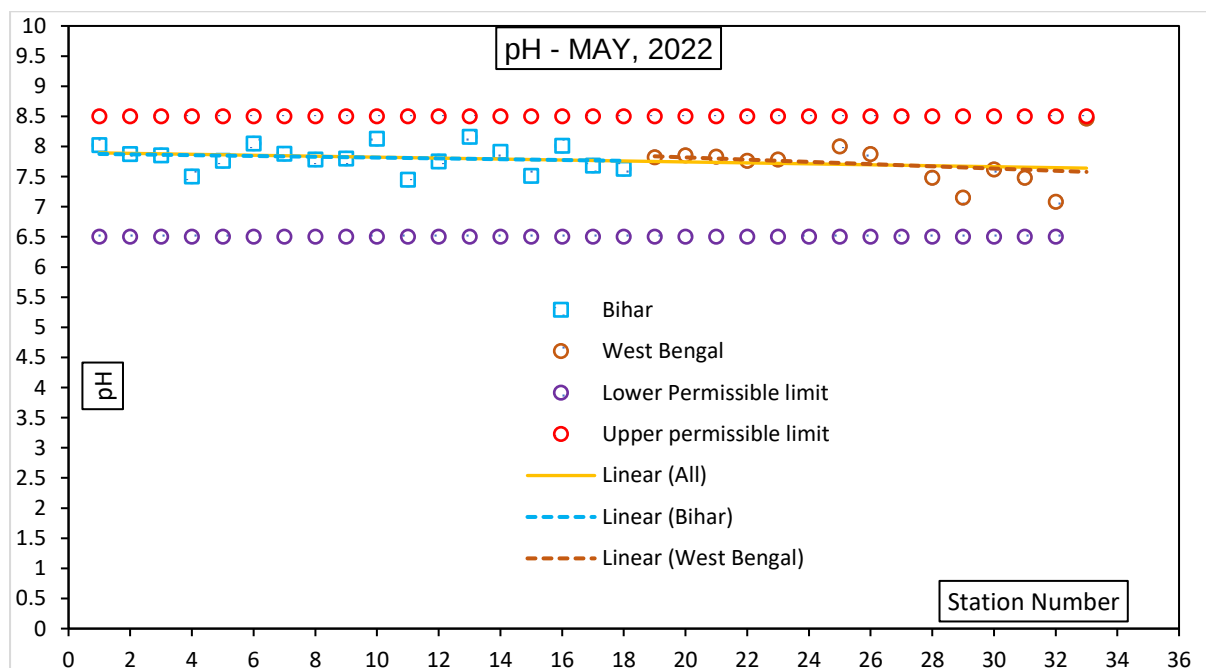


Fig.5.105. Trend Line analysis of pH value for May,2022

The pH values were found in the range of 7.08 – 8.46. for May, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month May, 2022. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

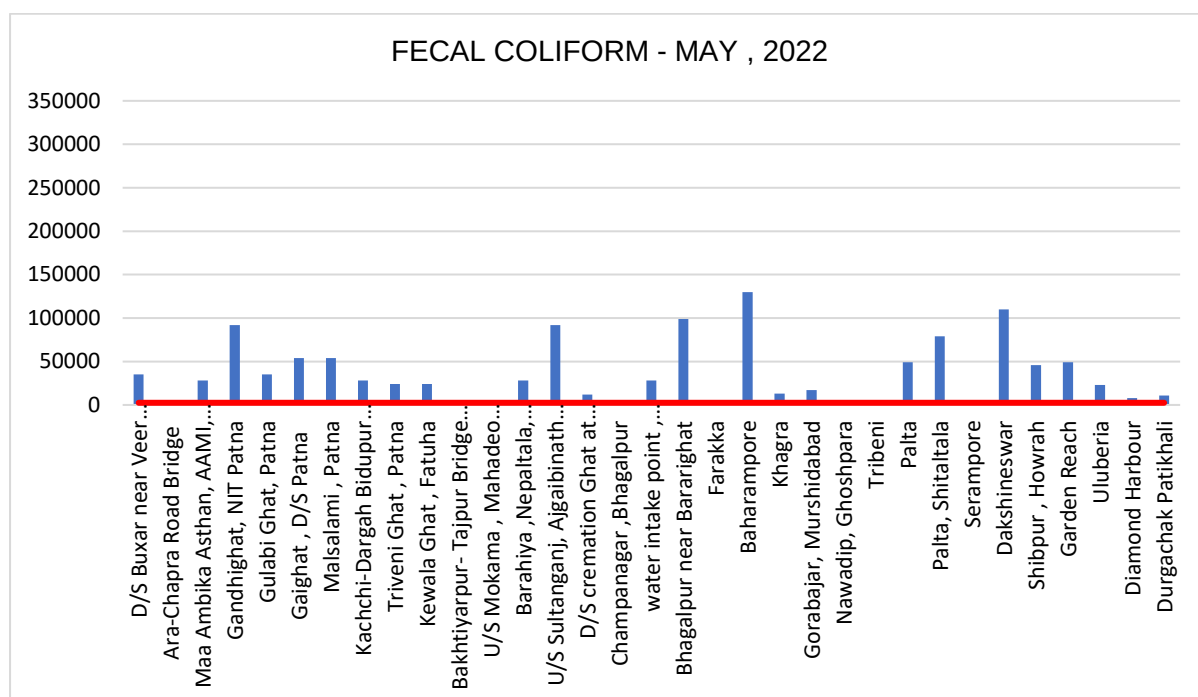


Fig.5.106. Fecal Coliform value for May,2022

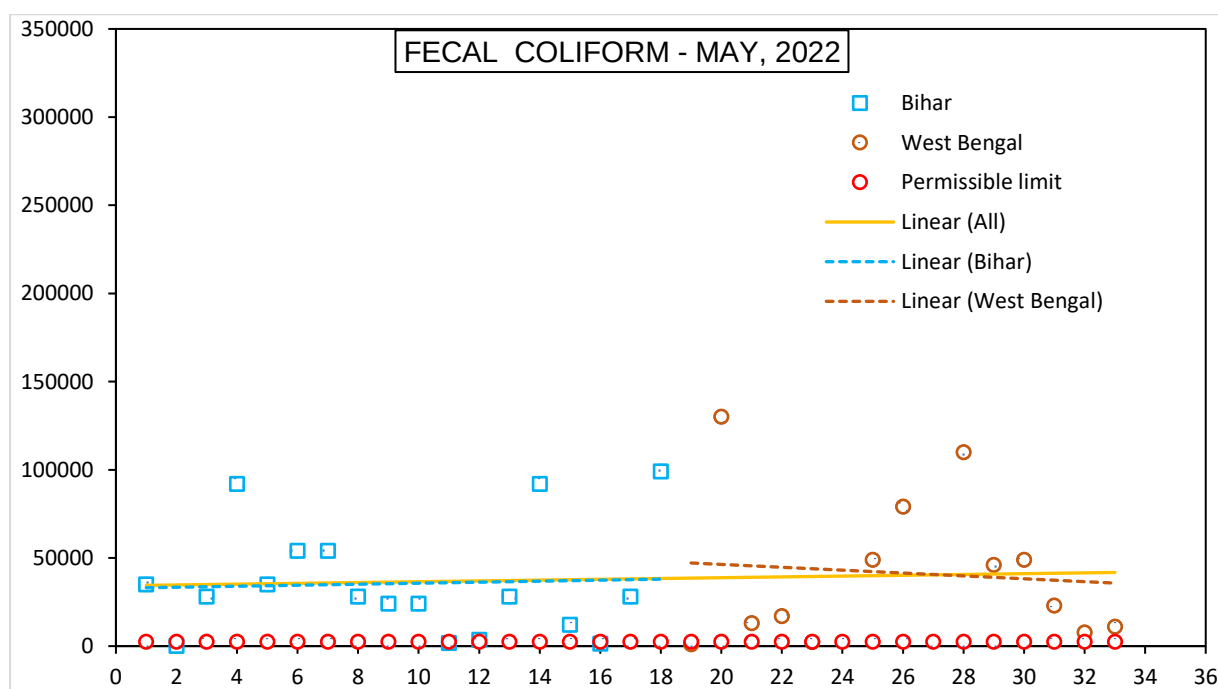


Fig.5.107. Trend Line analysis of Fecal Coliform value for May,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 130000 for May, 2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

May 2023:

Table 16: Data of water quality parameter of river Ganga at different stations for May, 2023						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	02.05.2023	2.6	7.7	7.55	13000
2	Ara-Chapra Road Bridge	03.05.2023	2.1	8.8	7.62	7900
3	Maa Ambika Asthan, AAMI	03.05.2023	1.9	8.3	7.52	17000
4	Gandhighat, NIT Patna	04.05.2023	1.5	8.4	8.25	54000
5	Gulabi Ghat, Patna	04.05.2023	1.6	8.4	8.13	35000
6	Gaighat , D/S Patna	04.05.2023	2.1	8.3	8.02	35000
7	Malsalami , Patna	04.05.2023	1.8	8.9	7.77	54000
8	Kachchi-Dargah Bidupur	04.05.2023	1.7	8.7	7.92	11000
9	Triveni Ghat , Patna	04.05.2023	2	8.2	8.27	7900
10	Kewala Ghat , Fatuha	04.05.2023	2.3	8.3	7.81	92000
11	Bakhtiyarpur- Tajpur Bridge	03.05.2023	1	9.4	8.1	24000
12	U/S Mokama , Mahadeo Asthan	03.05.2023	1.5	9.1	8.3	92000
13	Barahiya ,Nepaltala, Maranchi	03.05.2023	1.6	9.2	7.9	7900
14	U/S Sultanganj, Ajgaibinath Mandir	09.05.2023	1.9	8.1	8.13	4900
15	D/S cremation Ghat at Sultanganj	09.05.2023	1.8	8.3	8.2	3300
16	Champanagar ,Bhagalpur	missing				
17	water intake point , Bhagalpur	missing				
18	Bhagalpur near Bararighat	20.05.2023	1.6	9.7	7.32	28000
19	Farakka	24.05.2023	1.9	7.2	7.96	130
20	Baharampore	25.05.2023	1.75	6.5	7.99	5400
21	Khagra	25.05.2023	2	6.4	7.65	1600
22	Gorabajar, Murshidabad	25.05.2023	1.7	1.7	7.43	5400
23	Nawadip, Ghoshpara	24.05.2023	1.1	6.8	7.88	920
24	Tribeni					
25	Palta	29.05.2023	2.8	7.2	8.04	5400
26	Palta, Shitaltala	29.05.2023	2.9	7.5	8.01	2400
27	Serampore					
28	Dakshineswar	17.05.2023	2.79	5.29	7.94	49000
29	Shibpur , Howrah	04.05.2023	2.96	5.46	7.55	46000
30	Garden Reach	18.05.2023	2.76	5.16	7.57	63000
31	Uluberia	22.05.2023	2.72	5.1	7.44	22000
32	Diamond Harbour	23.05.2023	2.31	5.95	7.21	1300
33	Durgachak Patikhali	23.05.2023	1.35	6.3	8.4	4900

Parameter 1: BOD

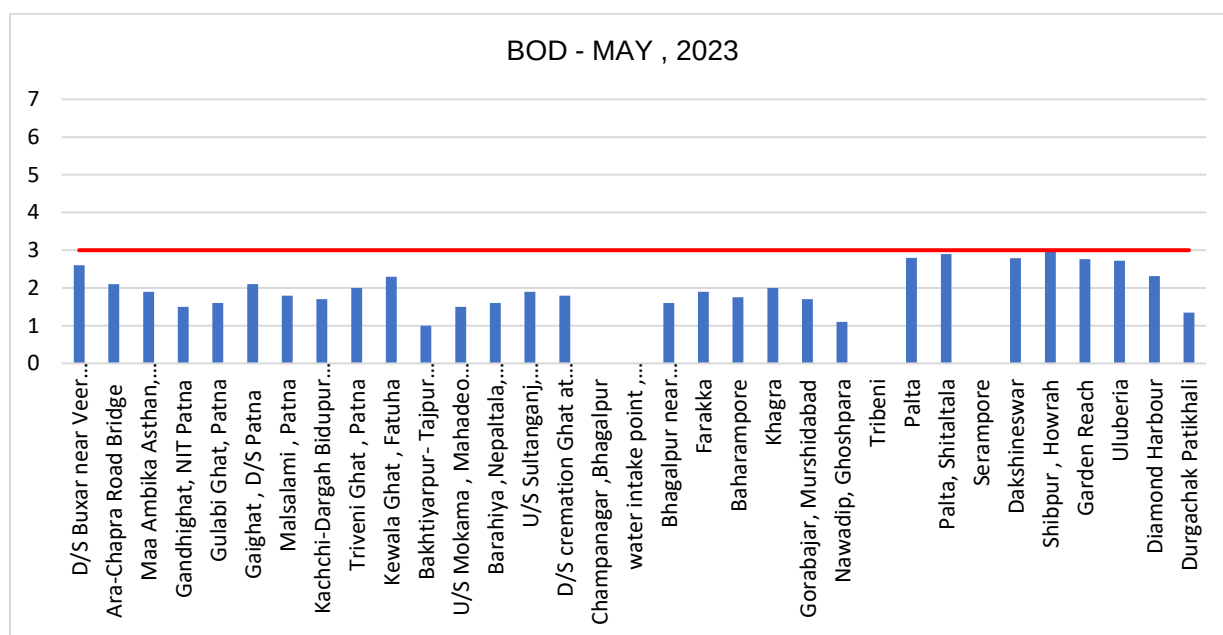


Fig.5.108. BOD value for May,2023

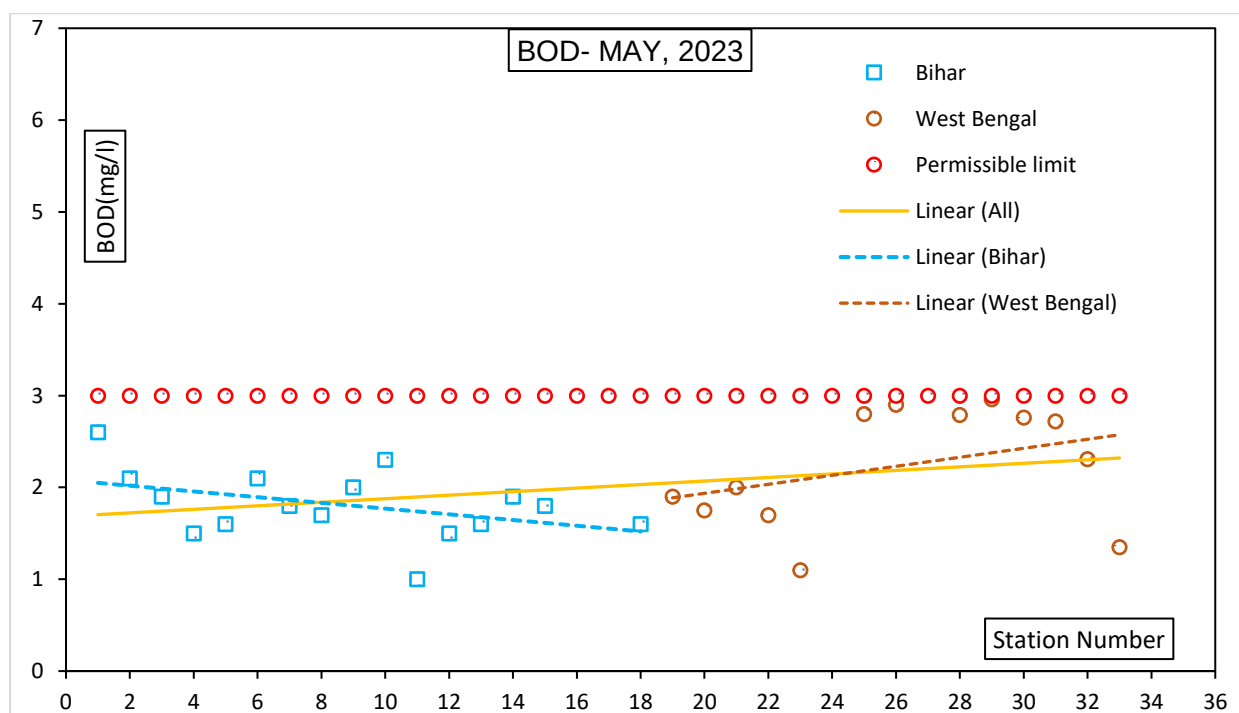


Fig.5.109. Trend Line analysis of BOD value for May,2023

The BOD values were found in the range of 1.0–2.96 mg/l. The highest BOD value of 2.96 mg/l was for Shibpur , Howrah for the month of May,2023. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

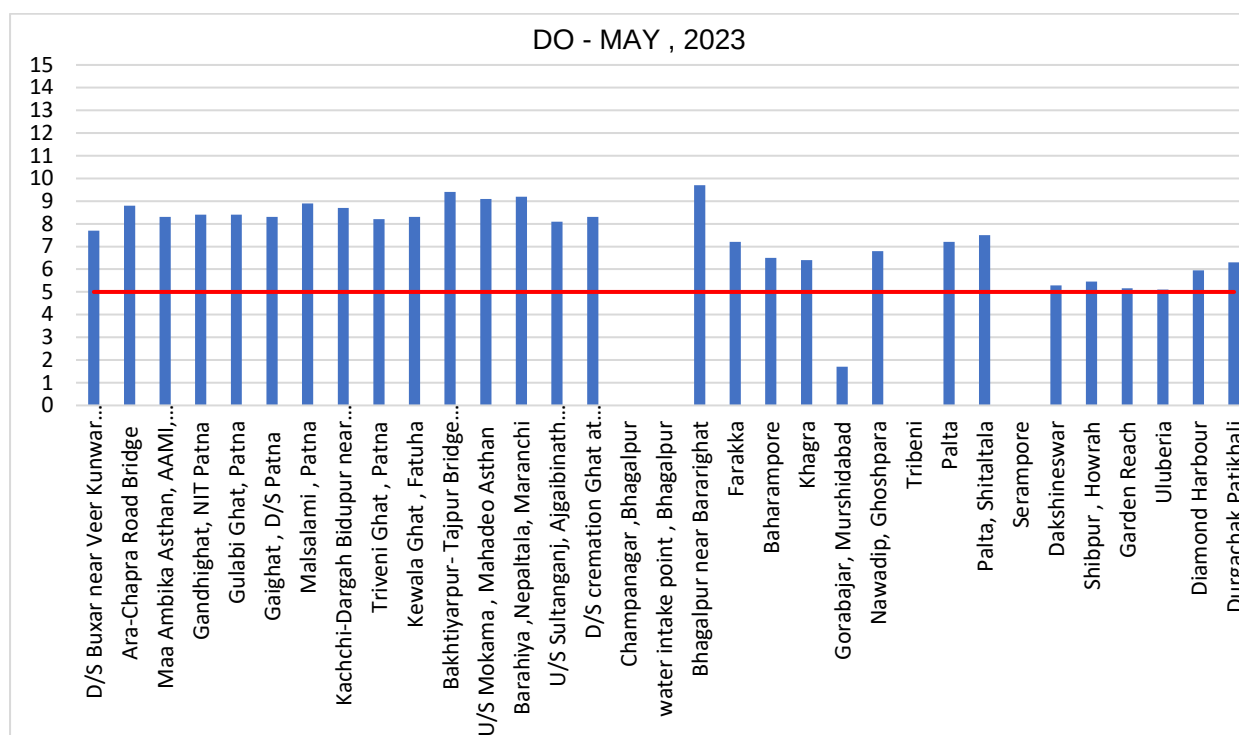


Fig.5.110. DO value for May,2023

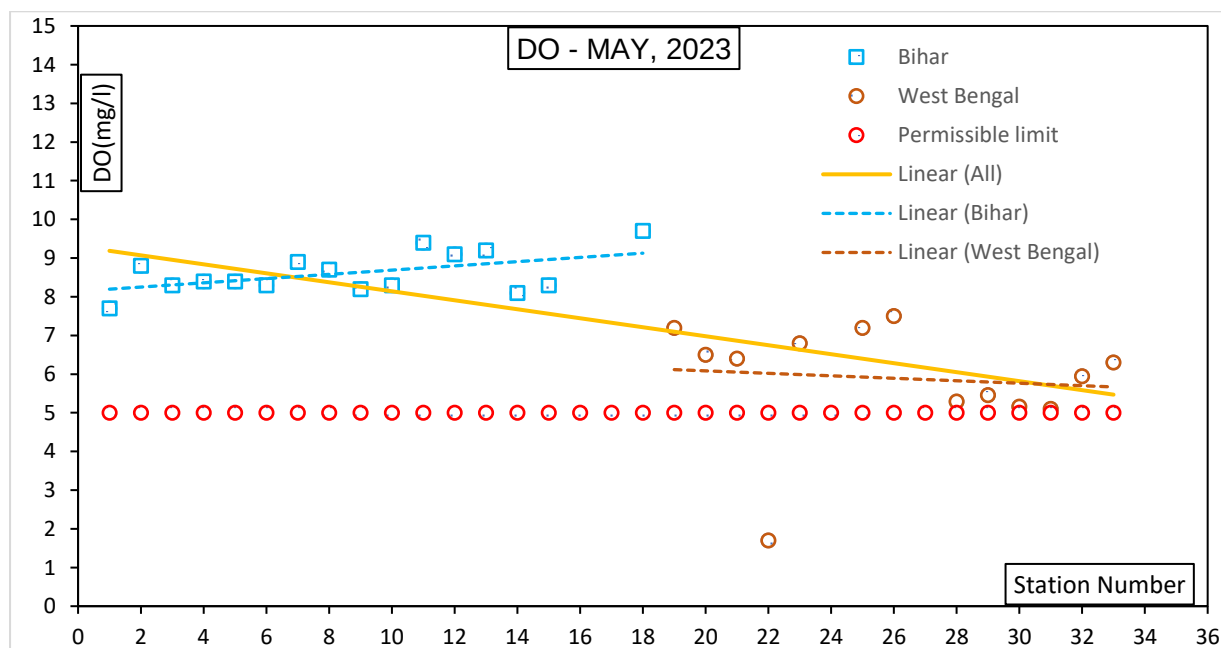


Fig.5.111. Trend Line analysis of DO value for May,2023

The DO values were found in the range of 1.7–9.7 mg/l. The lowest DO value 1.7 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.7 mg/l was for Bhagalpur near Bararighat for the month May, 2023. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

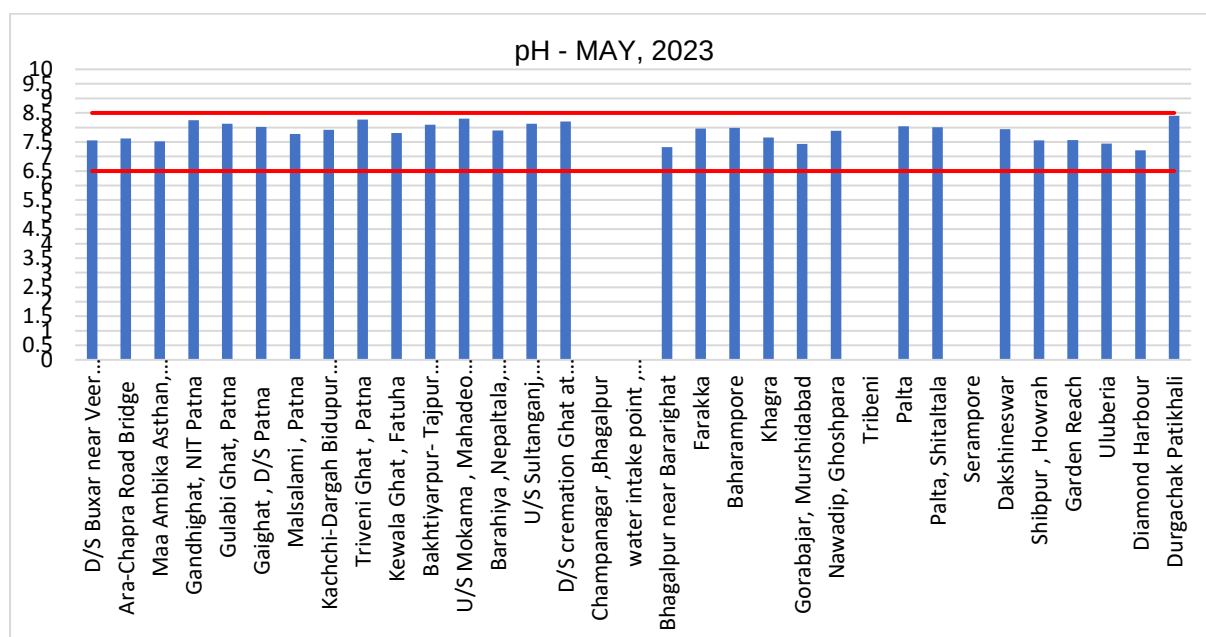


Fig.5.112. pH value for May,2023

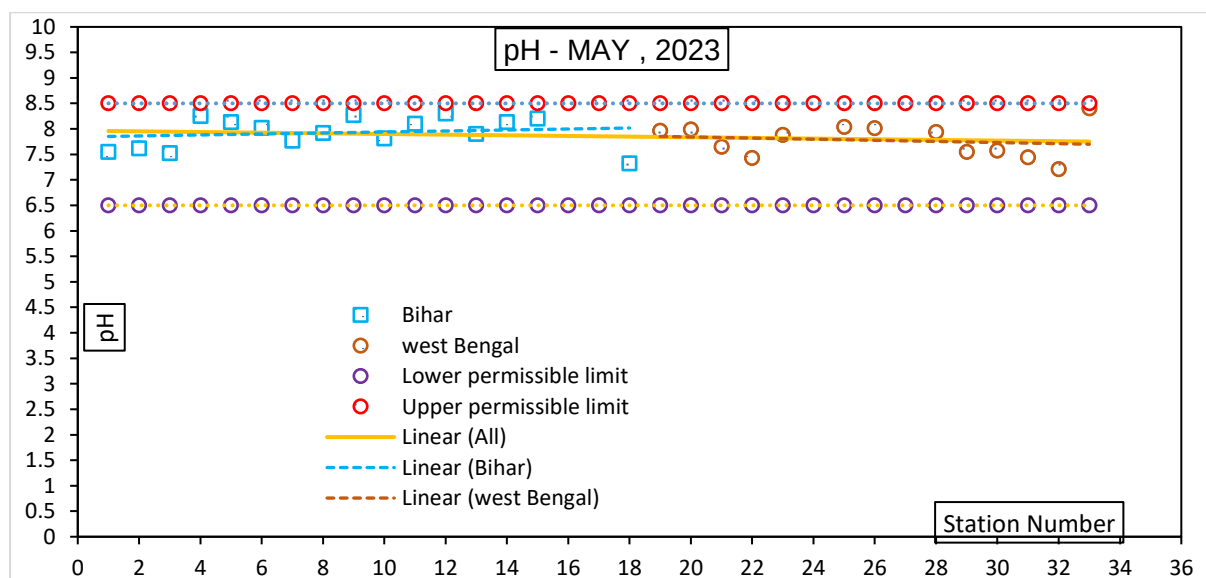


Fig.5.113. Trend Line analysis of pH value for May,2023

The pH values were found in the range of 7.21 – 8.4. for May, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month May, 2023. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

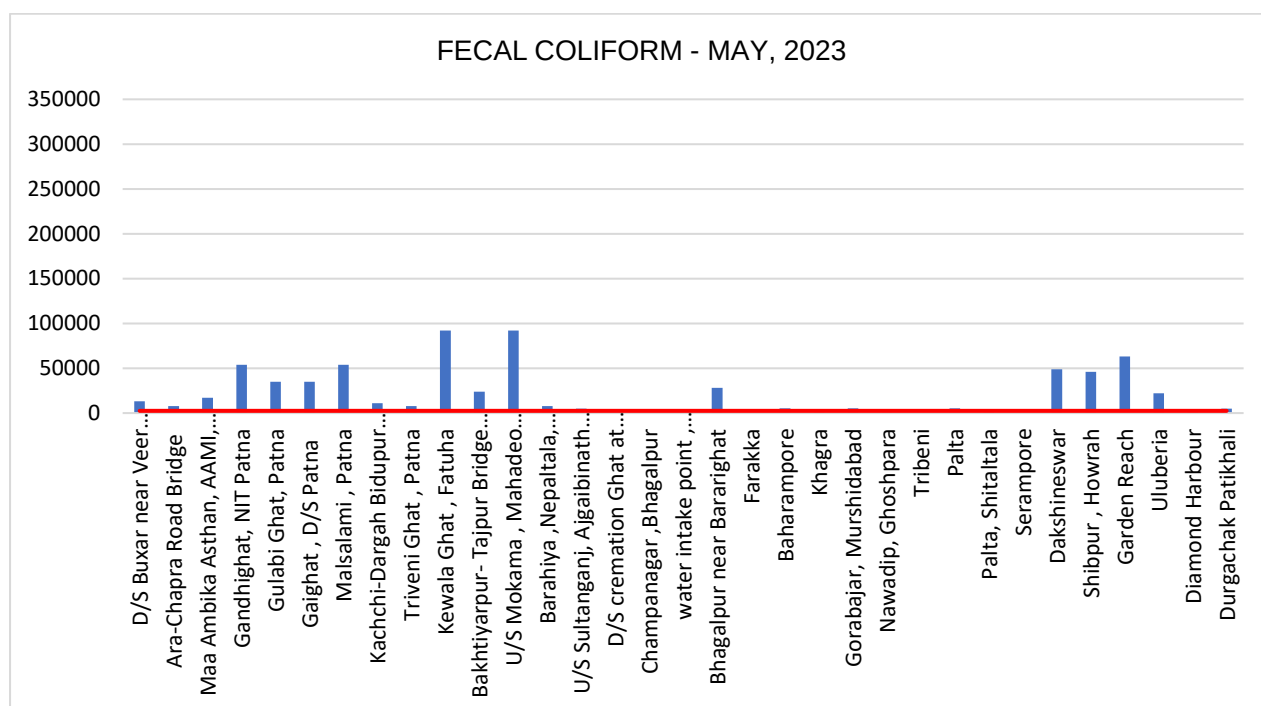


Fig.5.114. Fecal Coliform value for May,2023

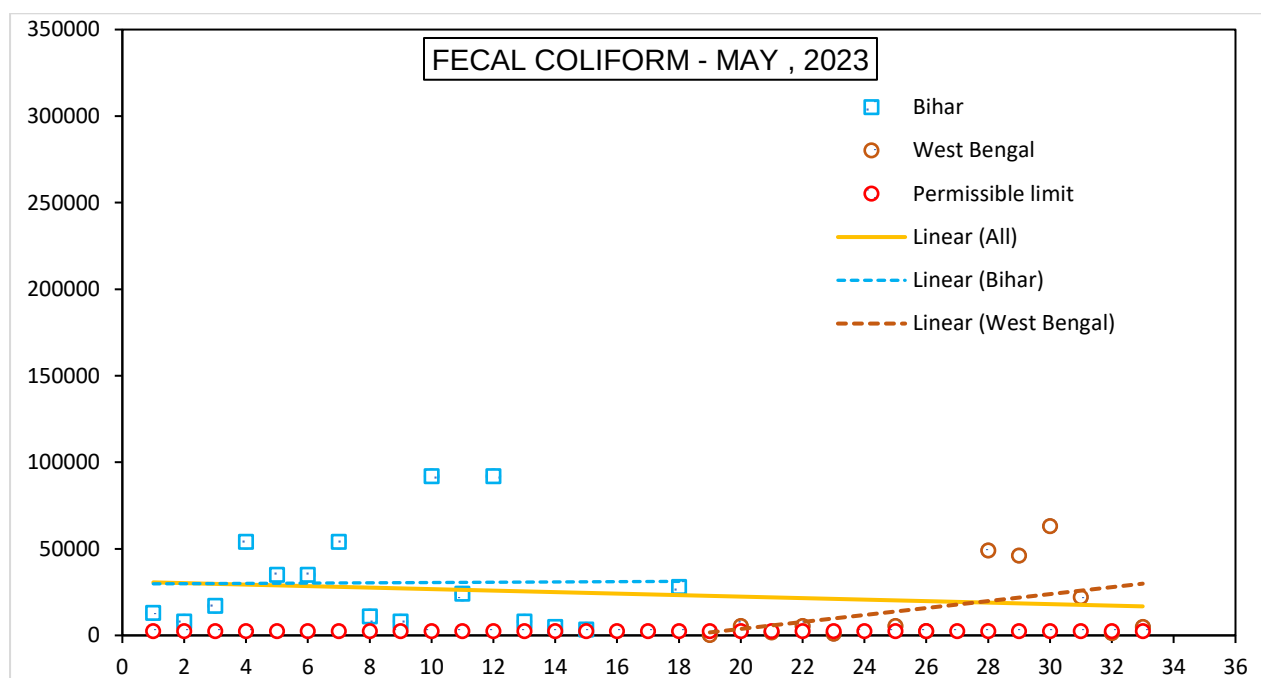


Fig.5.115. Trend Line analysis of Fecal Coliform value for May,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 92000 for May, 2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

June 2021:

Table 17: Data of water quality parameter of river Ganga at different stations for June , 2021

			Parameters			
Sl. No.	Station Name	Date	BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	01.06.2021	6.4	10.7	8.37	35000
2	Ara-Chapra Road Bridge	01.06.2021	3.9	7.80	7.73	11000
3	Maa Ambika Asthan, AAMI	01.06.2021	2.6	8.9	7.96	2100
4	Gandhighat, NIT Patna	03.06.2021	2.2	6.3	7.58	160000
5	Gulabi Ghat, Patna	03.06.2021	2.5	6.1	7.6	160000
6	Gaighat , D/S Patna	03.06.2021	1.7	7.1	7.76	160000
7	Malsalami , Patna	03.06.2021	1.1	7.5	7.98	160000
8	Kachchi-Dargah Bidupur	04.06.2021	1.4	7.8	7.51	35000
9	Triveni Ghat , Patna	04.06.2021	1.6	6.9	7.75	35000
10	Kewala Ghat , Fatuha	04.06.2021	2.3	6.4	7.43	160000
11	Bakhtiyarpur- Tajpur Bridge	09.06.2021	0.8	7.9	7.91	3300
12	U/S Mokama , Mahadeo Asthan	09.06.2021	2.6	7.4	7.54	4900
13	Barahiya ,Nepaltala, Maranchi	09.06.2021	2.3	7.6	7.81	92000
14	U/S Sultanganj, Ajgaibinath Mandir	10.06.2021	1.7	7.8	8.44	54000
15	D/S cremation Ghat at Sultanganj	10.06.2021	2.3	7.4	8.52	21000
16	Champanagar ,Bhagalpur	07.06.2021	1.1	7.9	8.42	24000
17	water intake point , Bhagalpur	07.06.2021	1.8	7.3	7.74	160000
18	Bhagalpur near Bararighat	07.06.2021	1.9	7.1	7.55	160000
19	Farakka	28/06/2021	2.05	5.5	7.99	4900
20	Baharampore	23/06/2021	2.3	5.1	7.89	79000
21	Khagra	23/06/2021	1.95	5.5	7.88	79000
22	Gorabajar, Murshidabad	23/06/2021	2	2	7.96	130000
23	Nawadip, Ghoshpara	30/06/2021	3	5.4	7.88	13000
24	Tribeni	29/06/2021	3.85	4.6	7.39	7900
25	Palta	28/06/2021	2.2	4.3	7.72	49000
26	Palta, Shitaltala	28/06/2021	3.8	4.1	7.62	140000
27	Serampore	29/06/2021	3.9	5.5	7.18	79000
28	Dakshineswar	23/06/2021	2.3	4.6	7.46	110000
29	Shibpur , Howrah	24/06/2021	2.4	4.4	7.39	49000
30	Garden Reach	25/06/2021	2.25	4.7	7.28	79000
31	Uluberia	24/06/2021	3.25	5.3	7.41	27000
32	Diamond Harbour	25/06/2021	2.8	5.6	7.17	6800
33	Durgachak Patikhali	missing				

Parameter 1: BOD

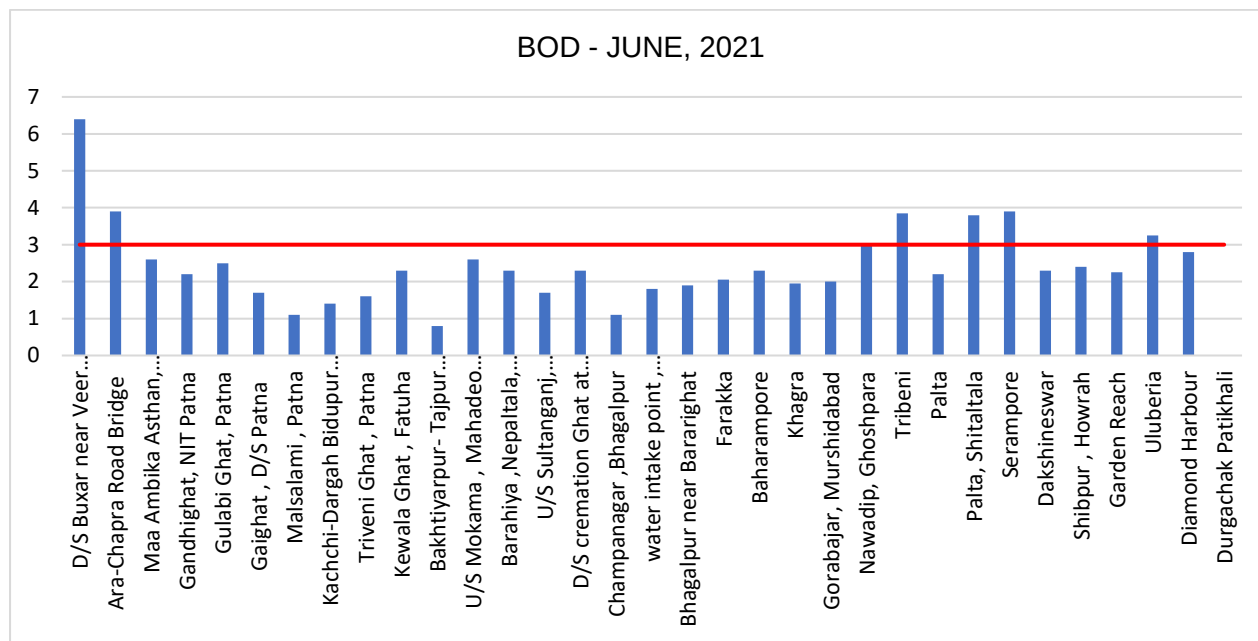


Fig.5.116. BOD value for June,2021

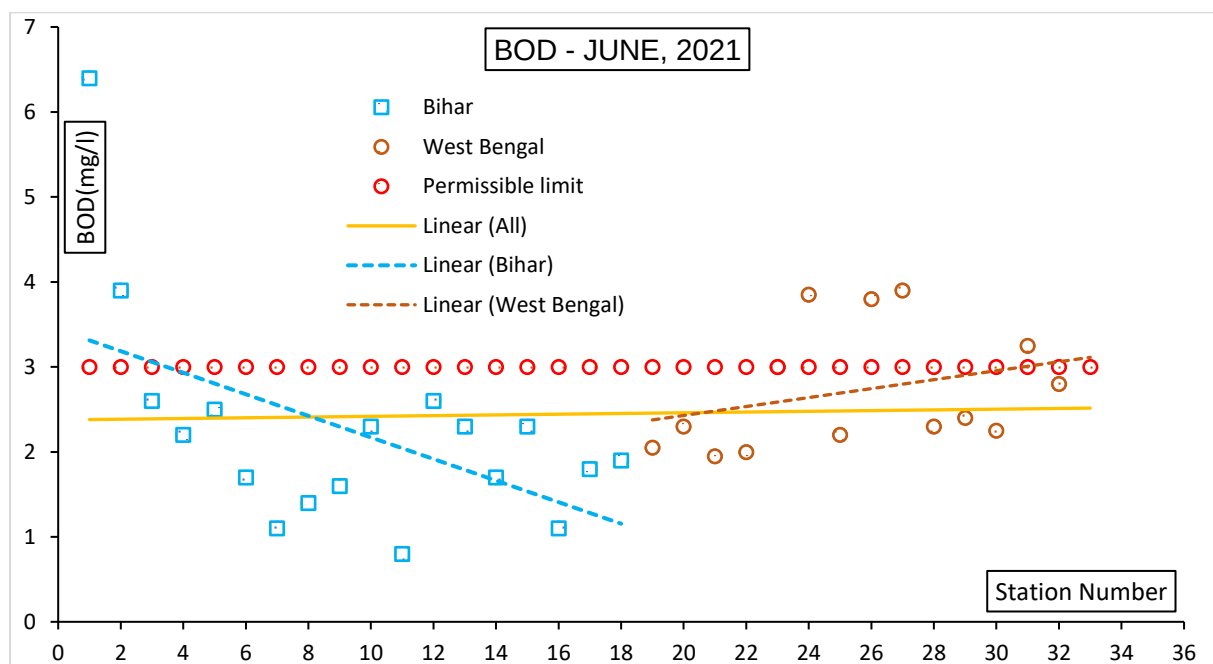


Fig.5.117. Trend Line analysis of BOD value for June,2021

The BOD values were found in the range of 0.8–6.4 mg/l. The highest BOD value of 6.4 mg/l was for D/S Buxar near Veer Kunwar Singh Road Bridge for the month of June, 2021. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

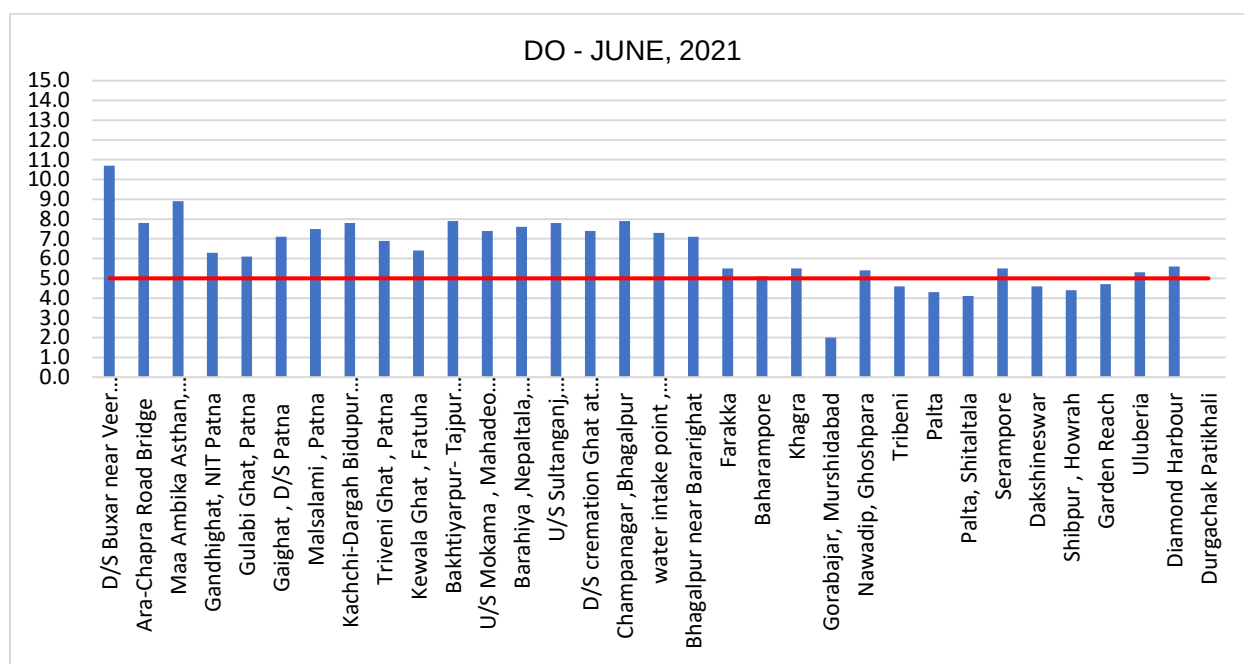


Fig.5.118. DO value for June,2021

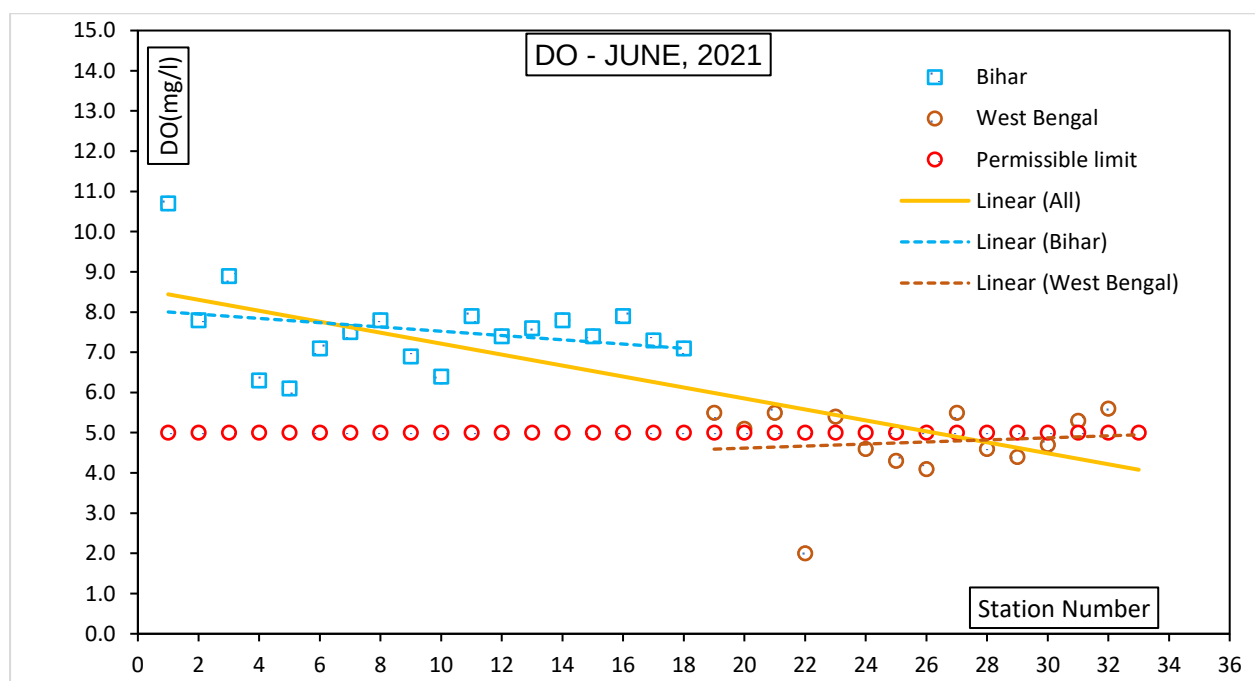


Fig.5.119. Trend Line analysis of DO value for June,2021

The DO values were found in the range of 2.0–10.7 mg/l. The lowest DO value 2.0 mg/l was for Gorabajar, Murshidabad and highest DO value of 10.7 mg/l was for D/S Buxar near Veer Kunwar Singh Road Bridge for the month June, 2021. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 3: pH

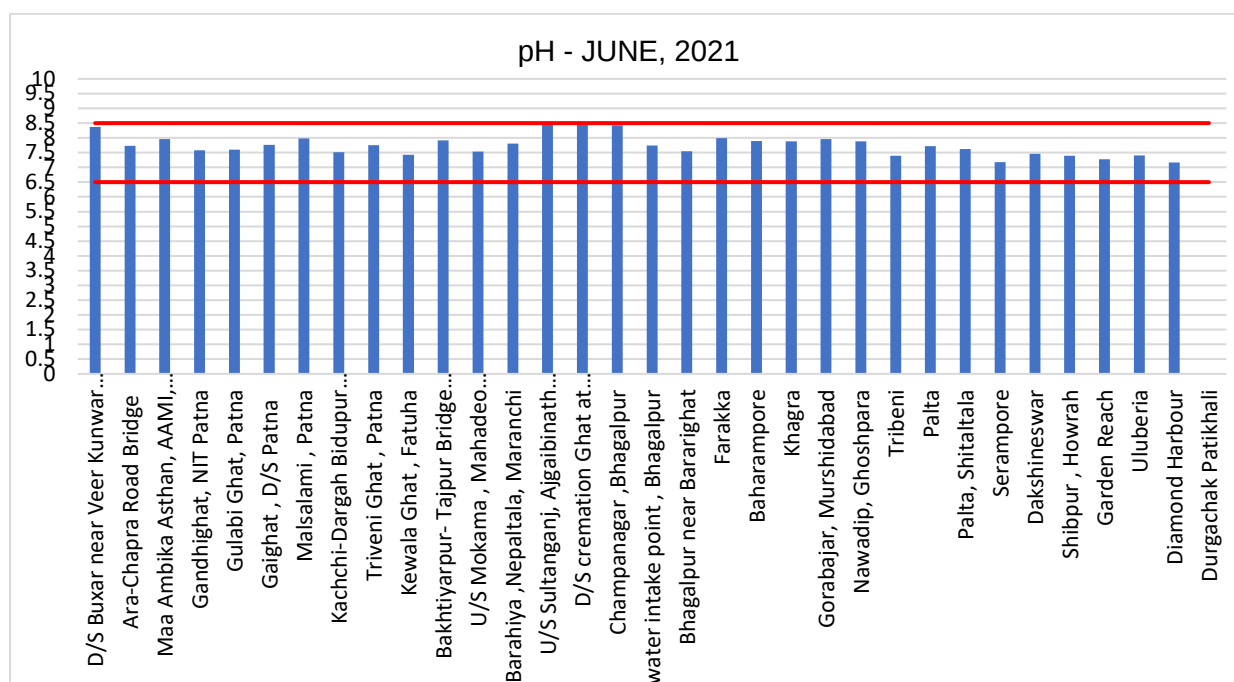


Fig.5.120. pH value for June,2021

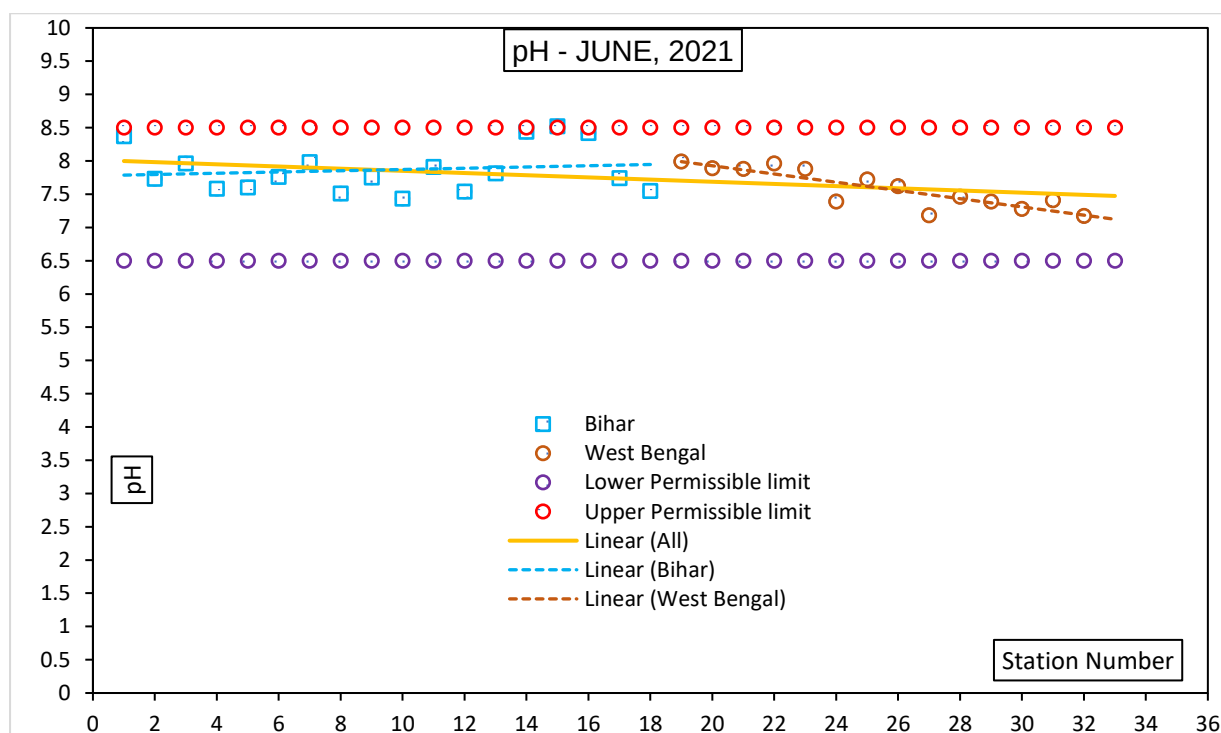


Fig.5.121. Trend Line analysis of pH value for June,2021

The pH values were found in the range of 7.17 – 8.52. for June, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) exceeded the permissible limit for once for the month June, 2021. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

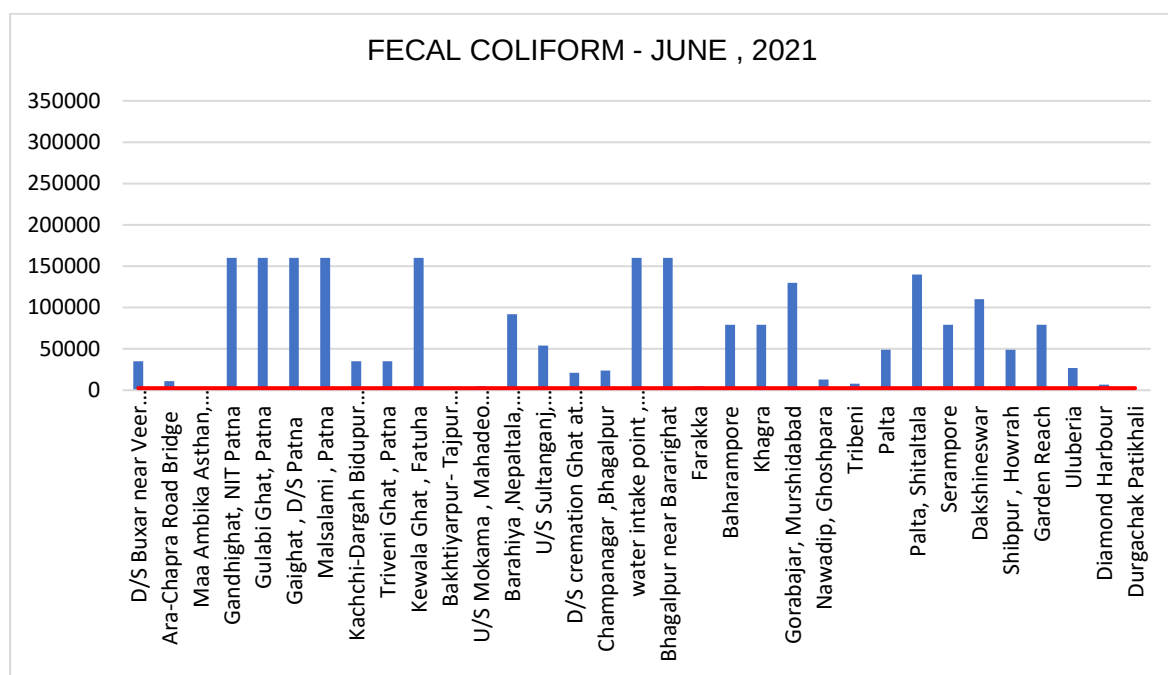


Fig.5.122. Fecal Coliform value for June,2021

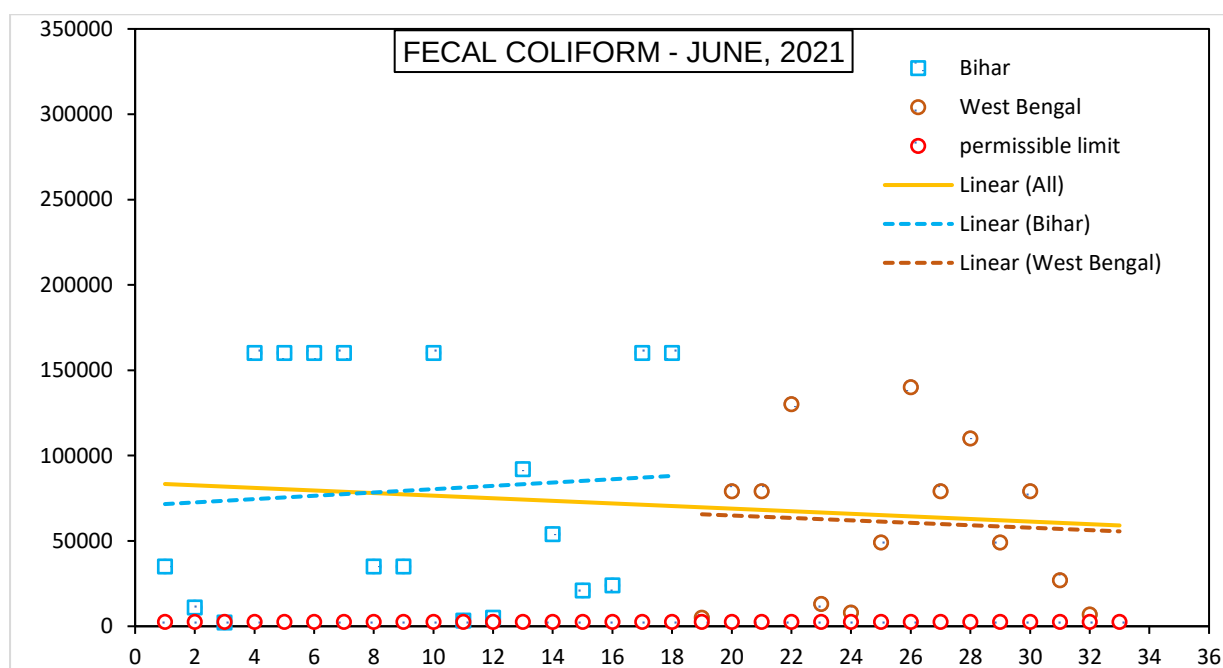


Fig.5.123. Trend Line analysis of Fecal Coliform value for June,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 160000 for June ,2021. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

June 2022:

Table 18: Data of water quality parameter of river Ganga at different stations for June, 2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	06.06.2022	1.9	7.3	7.6	4900
2	Ara-Chapra Road Bridge	07.06.2022	1.8	8.9	7.8	230
3	Maa Ambika Asthan, AAMI	07.06.2022	2.8	6.7	7.7	240000
4	Gandhighat, NIT Patna	missing	-	-	-	-
5	Gulabi Ghat, Patna	missing	-	-	-	-
6	Gaighat , D/S Patna	missing	-	-	-	-
7	Malsalami , Patna	08.06.2022	2.1	7.8	8.2	17000
8	Kachchi-Dargah Bidupur	09.06.2022	1.6	8.4	7.8	54000
9	Triveni Ghat , Patna	09.06.2022	2.7	6.9	7.9	24000
10	Kewala Ghat , Fatuha	09.06.2022	3	5.8	7.9	35000
11	Bakhtiyarpur- Tajpur Bridge	01.06.2022	1	9.0	7.4	3500
12	U/S Mokama , Mahadeo Asthan	15.06.2022	2.1	6.8	8	4900
13	Barahiya ,Nepaltala, Maranchi	01.06.2022	1.8	9.2	8	24000
14	U/S Sultanganj, Ajgaibinath Mandir	02.06.2022	1.4	8.9	8.2	35000
15	D/S cremation Ghat at Sultanganj	10.06.2022	2.7	6.4	8	7900
16	Champanagar ,Bhagalpur	missing	-	-	-	-
17	water intake point , Bhagalpur	02.06.2022	2.6	7.3	7.6	2400
18	Bhagalpur near Bararighat	02.06.2022	2.5	7.5	7.2	35000
19	Farakka	22/06/2022	1.9	5.7	7.95	1300
20	Baharampore	21/06/2022	1.6	6.1	7.99	49000
21	Khagra	21/06/2022	1.1	6.1	8.02	4600
22	Gorabajar, Murshidabad	21/06/2022	1.6	1.6	7.94	17000
23	Nawadip, Ghoshpara	27/06/2022	3.1	5.9	7.97	13000
24	Tribeni	missing	-	-	-	-
25	Palta	20/06/2022	2.9	6.3	7.95	31000
26	Palta, Shitaltala	20/06/2022	3.2	5.9	7.88	49000
27	Serampore		-	-	-	-
28	Dakshineswar	17/06/2022	2.6	5.3	7.3	170000
29	Shibpur , Howrah	17/06/2022	2.4	5.6	7.11	70000
30	Garden Reach	17/06/2022	2.5	5.6	7.03	130000
31	Uluberia	22/06/2022	2.15	5.2	7.08	23000
32	Diamond Harbour	24/06/2022	2.05	5.7	7.05	6800
33	Durgachak Patikhali	17/06/2022	0.75	6.9	8.32	9400

Parameter 1: BOD

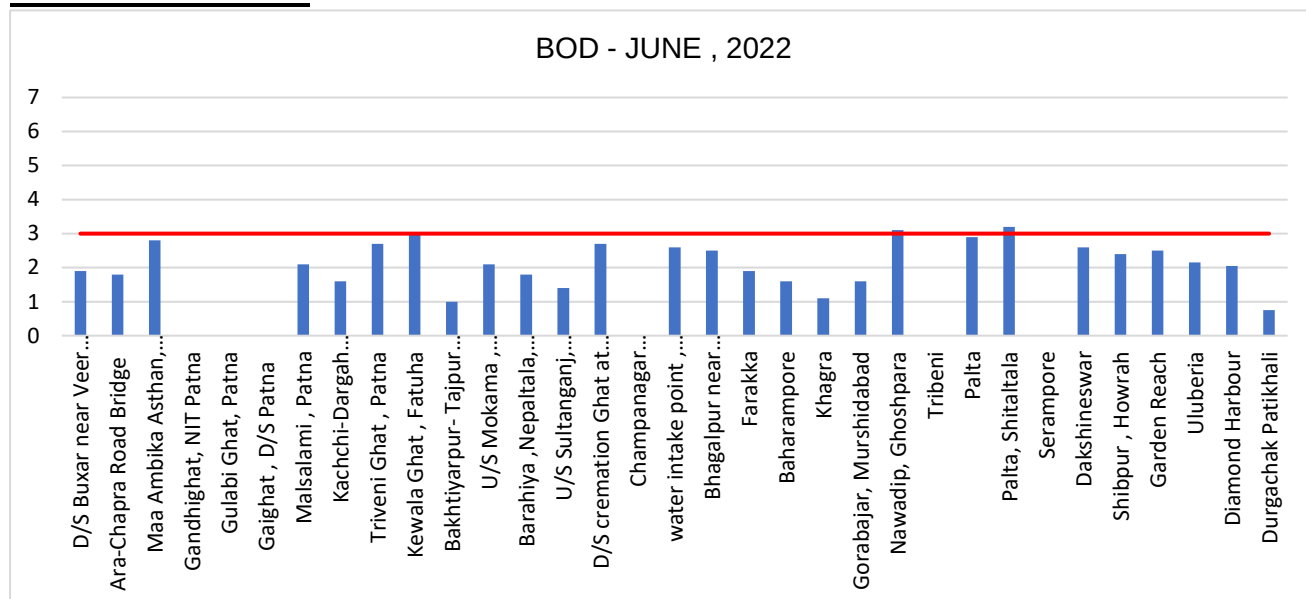


Fig.5.124. BOD value for June,2022

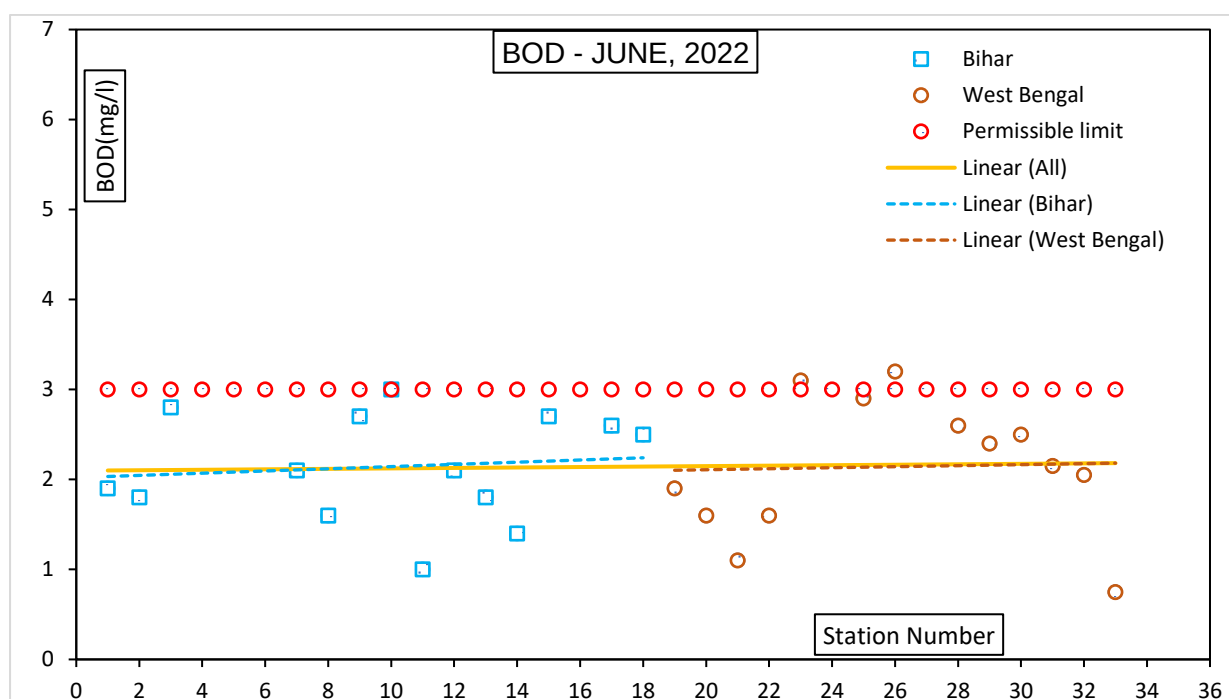


Fig.5.125. Trend Line analysis of BOD value for June,2022

The BOD values were found in the range of 0.75–3.2 mg/l. The highest BOD value of 3.2 mg/l was for Palta, Shitaltala for the month of June, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

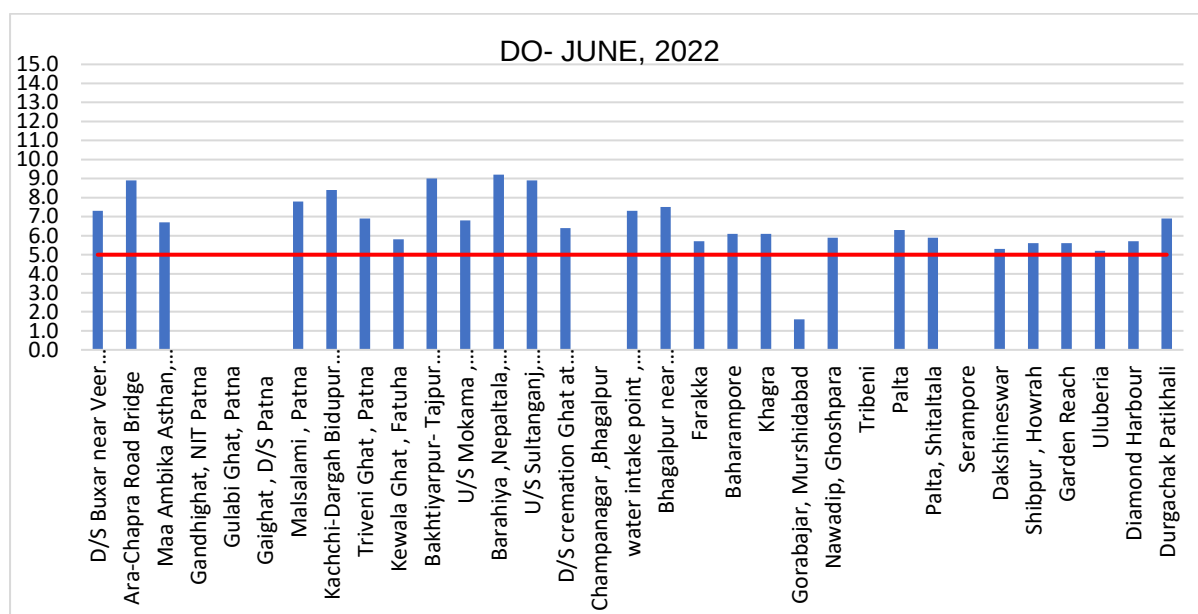


Fig.5.126. DO value for June,2022

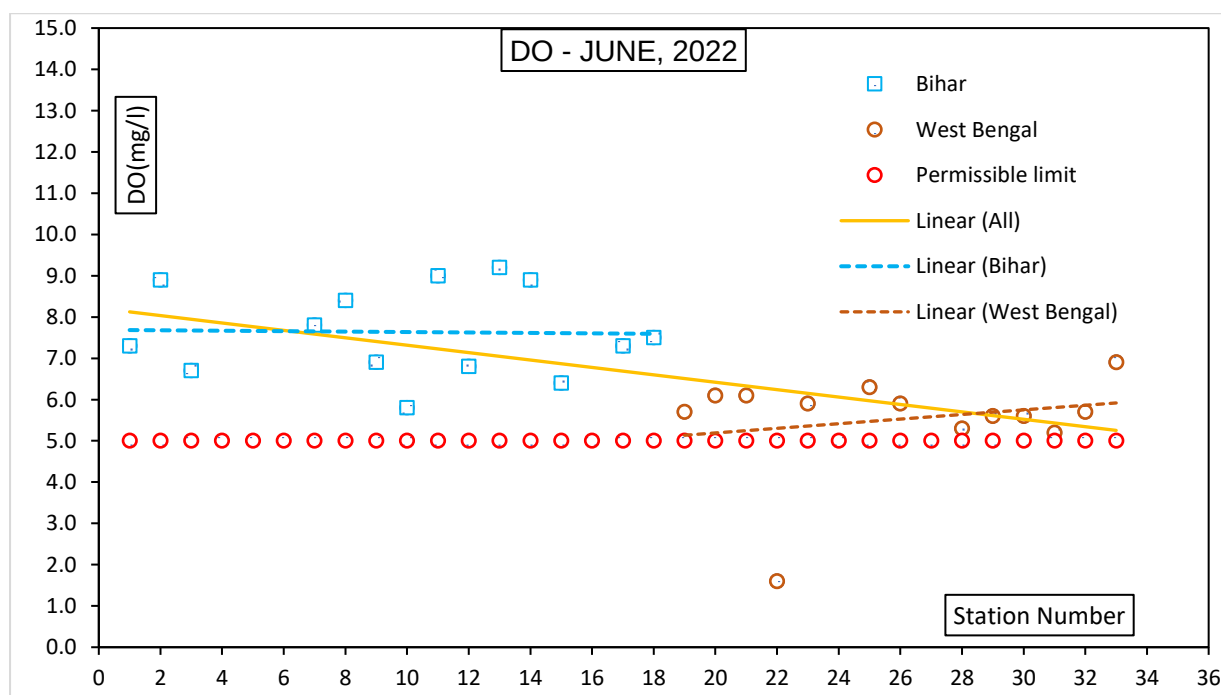


Fig.5.127. Trend Line analysis of DO value for June,2022

The DO values were found in the range of 1.6–9.2 mg/l. The lowest DO value 1.6 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.2 mg/l was for Barahiya, Nepaltala, Maranchi for the month June, 2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 3: pH

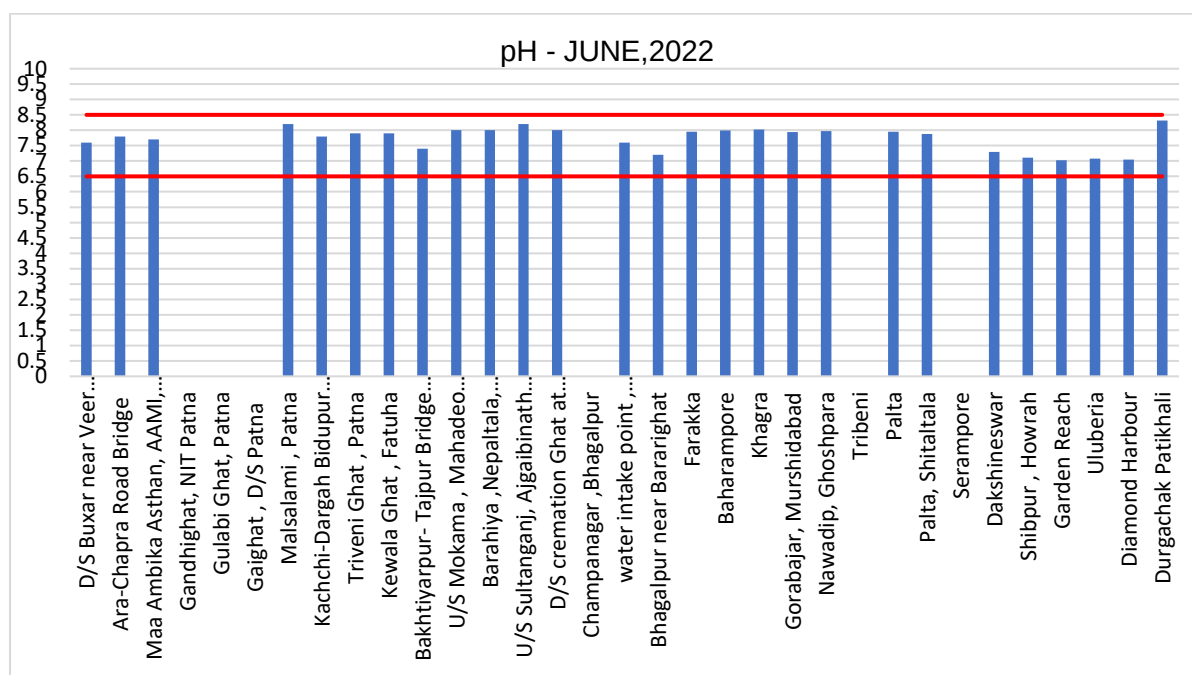


Fig.5.128. pH value for June,2022

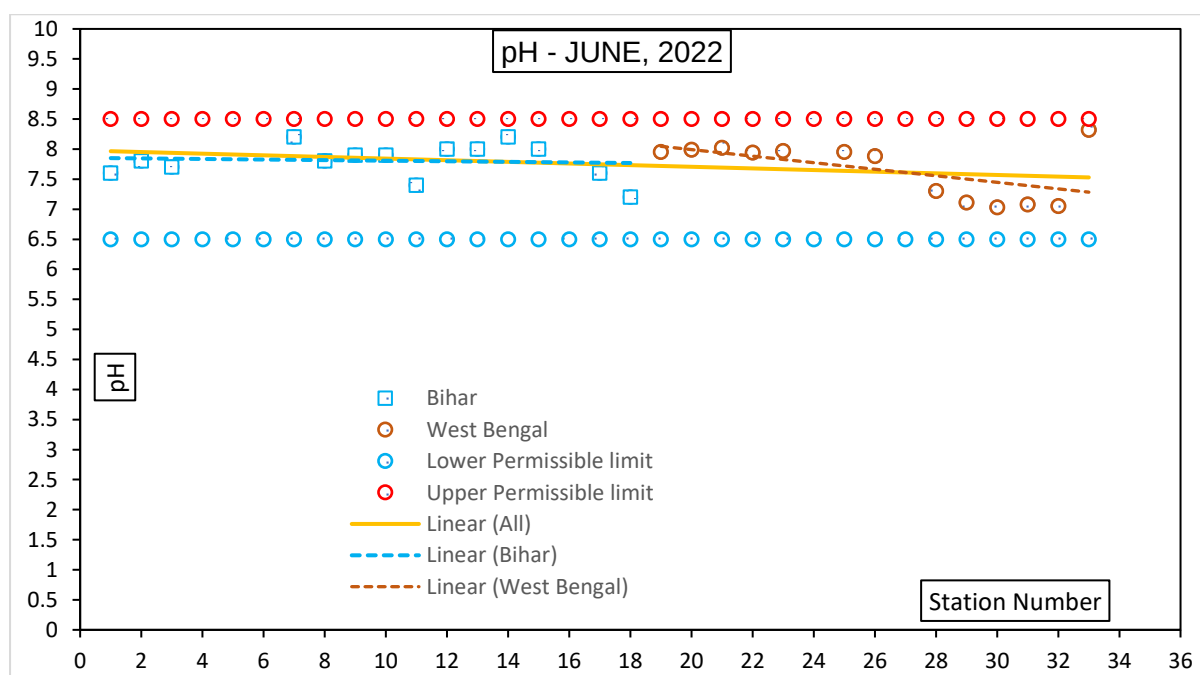


Fig.5.129. Trend Line analysis of pH value for June,2022

The pH values were found in the range of 7.05 – 8.32. for June, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month June, 2022. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

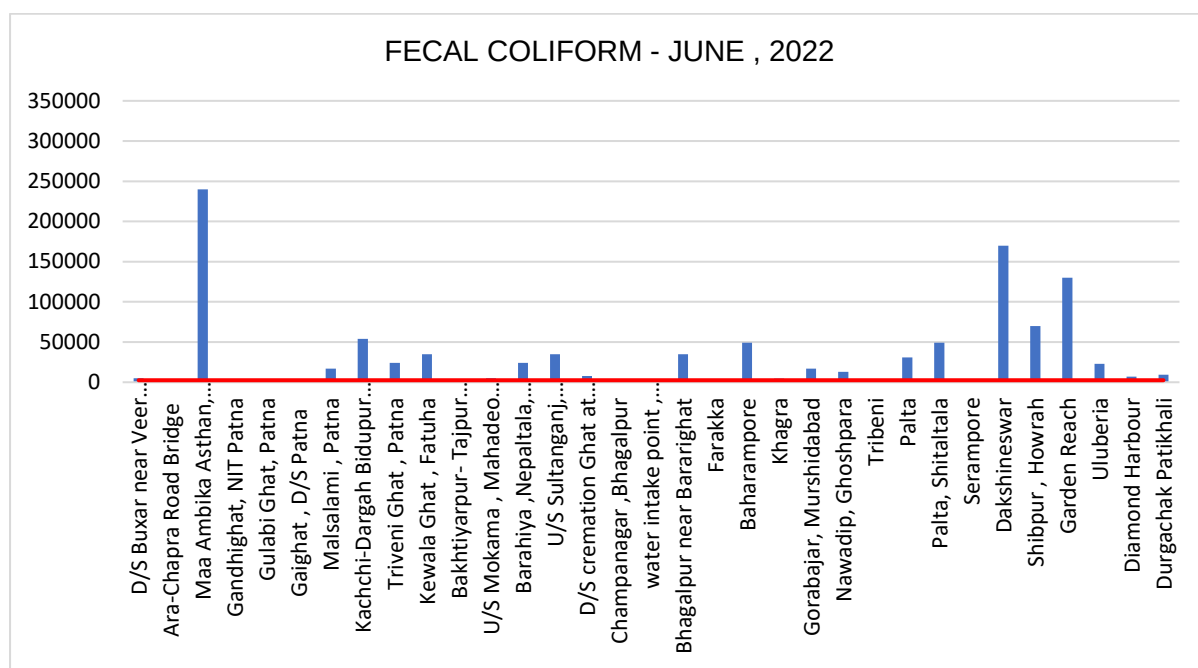


Fig.5.130. Fecal Coliform value for June,2022

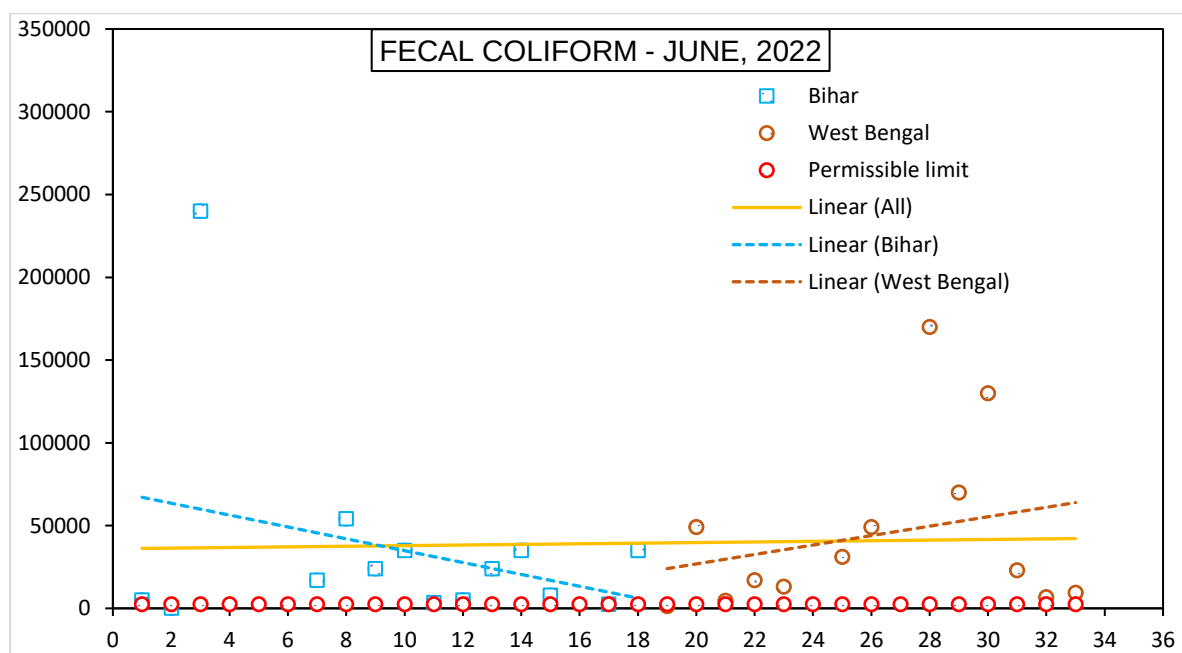


Fig.5.131. Trend Line analysis of Fecal Coliform value for June,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000 for June ,2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

June 2023:

Table 19: Data of water quality parameter of river Ganga at different stations for June, 2023

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	21.06.2023	1	8	7.81	2300
2	Ara-Chapra Road Bridge	20.06.2023	2	7.9	7.59	1300
3	Maa Ambika Asthan, AAMI	20.06.2023	2.6	6.9	7.82	17000
4	Gandhighat, NIT Patna	15.06.2023	2.1	7.0	8.05	92000
5	Gulabi Ghat, Patna	01.06.2023	1.5	8.1	7.21	92000
6	Gaighat , D/S Patna	15.06.2023	2.6	6.4	8.07	54000
7	Malsalami , Patna	15.06.2023	2.9	7.2	8.15	14000
8	Kachchi-Dargah Bidupur	15.06.2023	1.9	7.8	8.17	7900
9	Triveni Ghat , Patna	15.06.2023	2.1	7.5	8.2	7900
10	Kewala Ghat , Fatuha	15.06.2023	2.5	6.5	7.9	24000
11	Bakhtiyarpur- Tajpur Bridge	22.06.2023	2.1	7.8	7.86	17000
12	U/S Mokama , Mahadeo Asthan	08.06.2023	2.8	7.4	7.59	2300
13	Barahiya ,Nepaltala, Maranchi	22.06.2023	2.5	7.8	7.9	4900
14	U/S Sultanganj, Ajsaibinath Mandir	14.06.2023	2.5	6.7	7.69	54000
15	D/S cremation Ghat at Sultanganj	14.06.2023	2.4	6.5	7.73	92000
16	Champanagar ,Bhagalpur	missing	-	-	-	-
17	water intake point , Bhagalpur	missing	-	-	-	-
18	Bhagalpur near Bararighat	14.06.2023	2.7	5.9	7.74	92000
19	Farakka	26.06.2023	2.9	6.8	7.3	240
20	Baharampore	27.06.2023	2.2	5.9	7.02	3500
21	Khagra	27.06.2023	2.5	6	6.94	920
22	Gorabajar, Murshidabad	07.06.2023	1.8	1.8	7.34	790
23	Nawadip, Ghoshpara	23.06.2023	1.7	6.5	7.44	700
24	Tribeni	23.06.2023	2.8	6.3	8.01	5400
25	Palta	23.06.2023	2.5	6.4	8.06	9200
26	Palta, Shitaltala	23.06.2023	2.8	6	8.14	3500
27	Serampore	23.06.2023	2.8	6.3	8.01	5400
28	Dakshineswar	16.06.2023	2.79	5.75	7.13	46000
29	Shibpur , Howrah	19.06.2023	2.66	5.44	7.08	63000
30	Garden Reach	19.06.2023	2.47	5.35	7.03	79000
31	Uluberia	21.06.2023	2.33	5.64	7.1	27000
32	Diamond Harbour	23.06.2023	2.16	6.05	7.16	4500
33	Durgachak Patikhali	22.06.2023	1.4	6.6	8.4	4900

Parameter 1: BOD

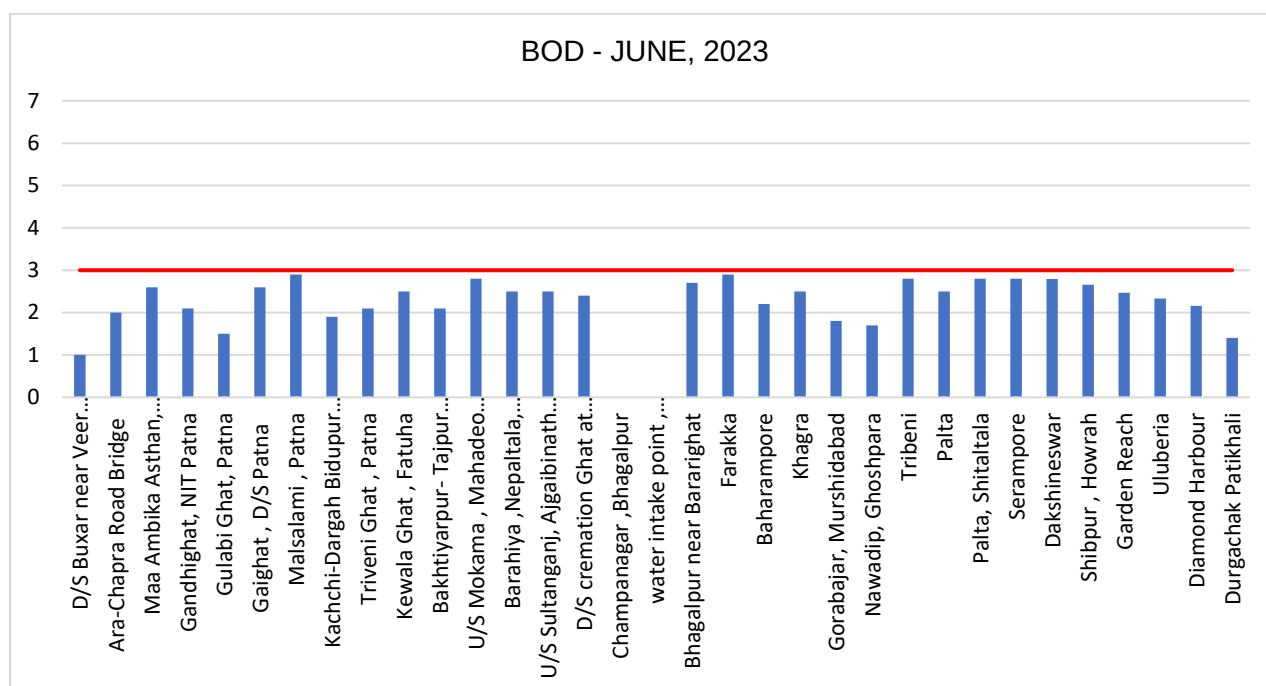


Fig.5.132. BOD value for June,2023

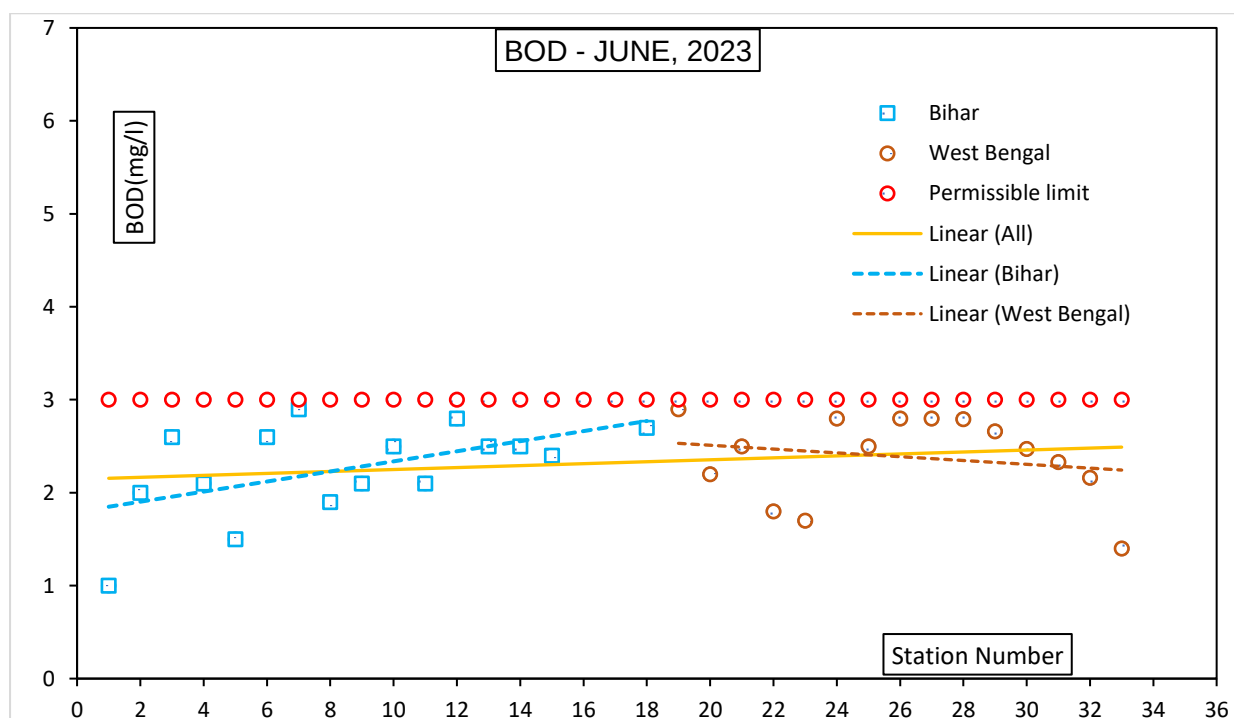


Fig.5.133. Trend Line analysis of BOD value for June,2023

The BOD values were found in the range of 1.0–2.9 mg/l. The highest BOD value of 2.9 mg/l was for Malsalami, Patna and Farakka for the month of June, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O₂ (DO)

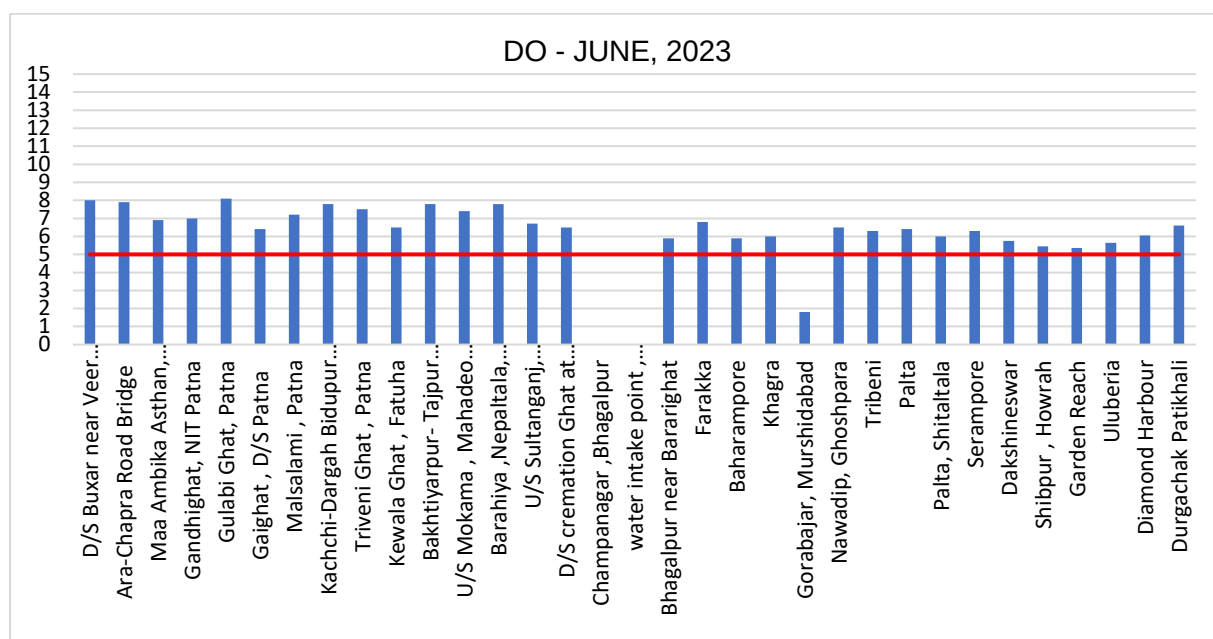


Fig.5.134. DO value for June,2023

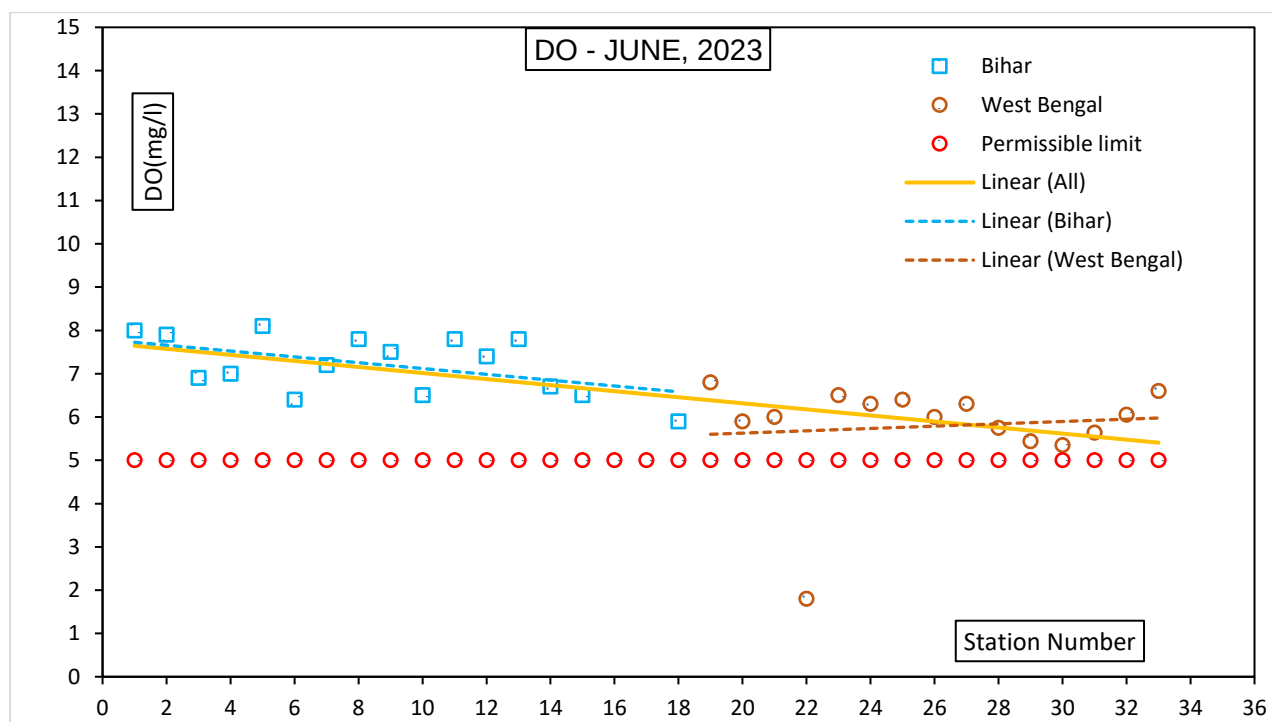


Fig.5.135. Trend Line analysis of DO value for June,2023

The DO values were found in the range of 1.8–8.1 mg/l. The lowest DO value 1.8 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.1 mg/l was for Gulabi Ghat, Patna for the month June, 2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 3: pH

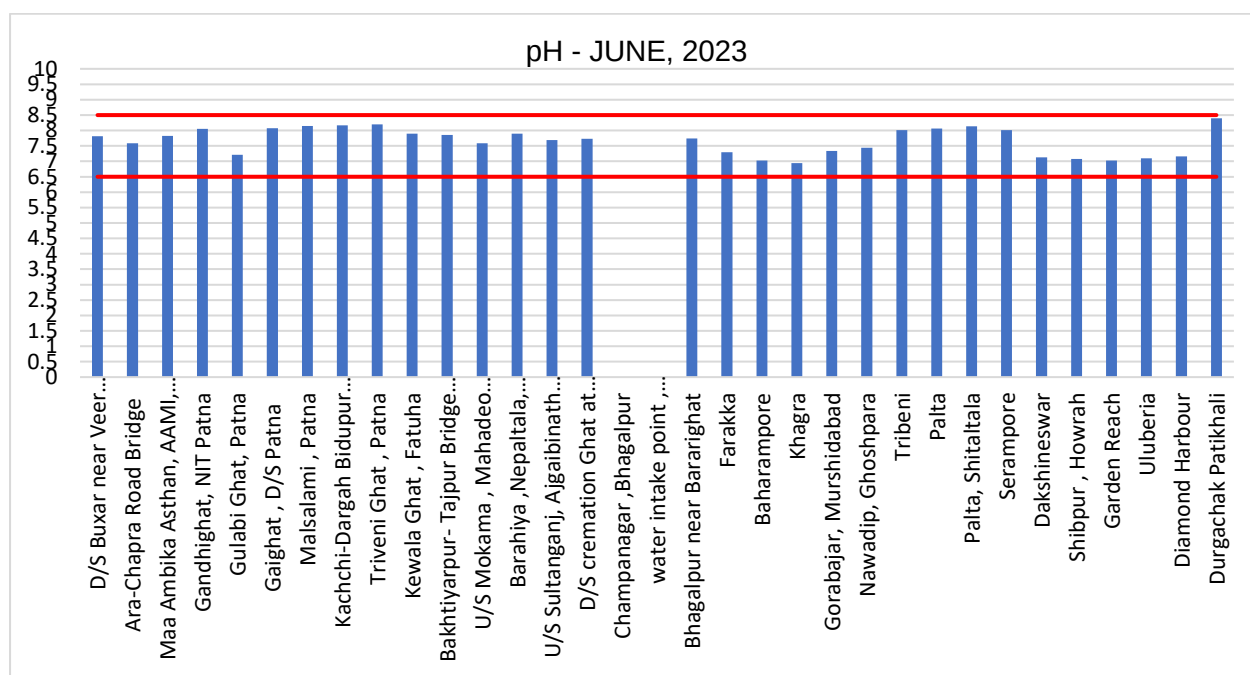


Fig.5.136. pH value for June,2023

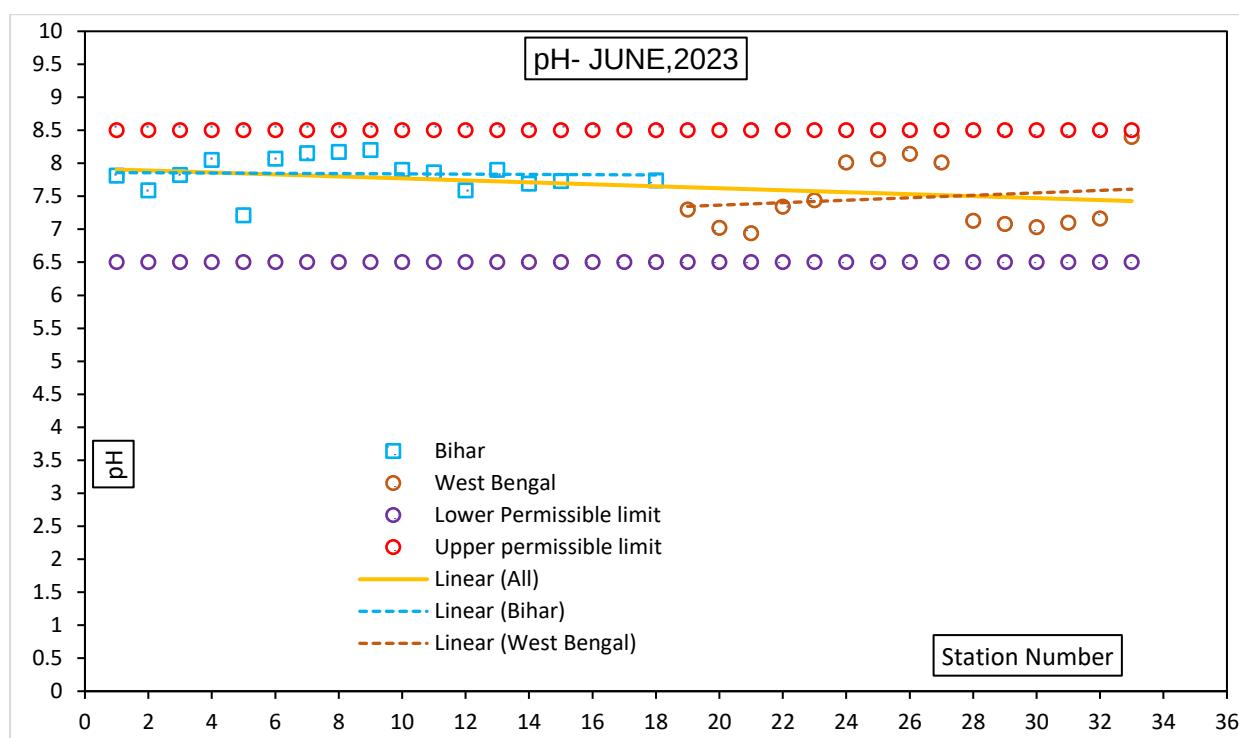


Fig.5.137. Trend Line analysis of pH value for June,2023

The pH values were found in the range of 7.02 – 8.4. for June, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month June, 2023. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is increasing.

Parameter 4: Fecal Coliform

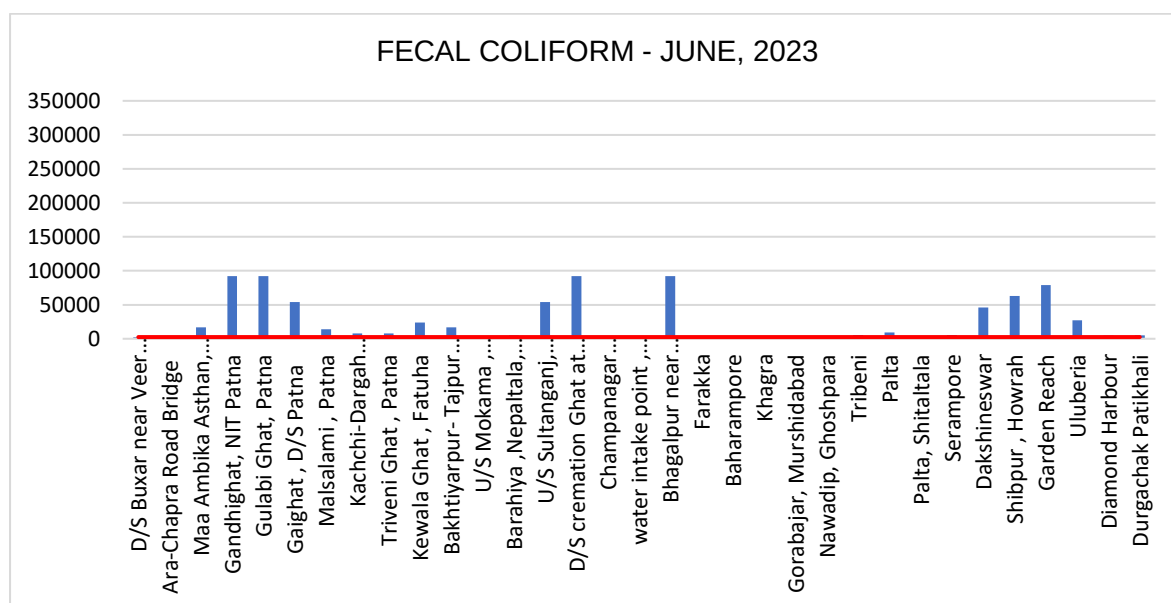


Fig.5.138. Fecal Coliform value for June,2023

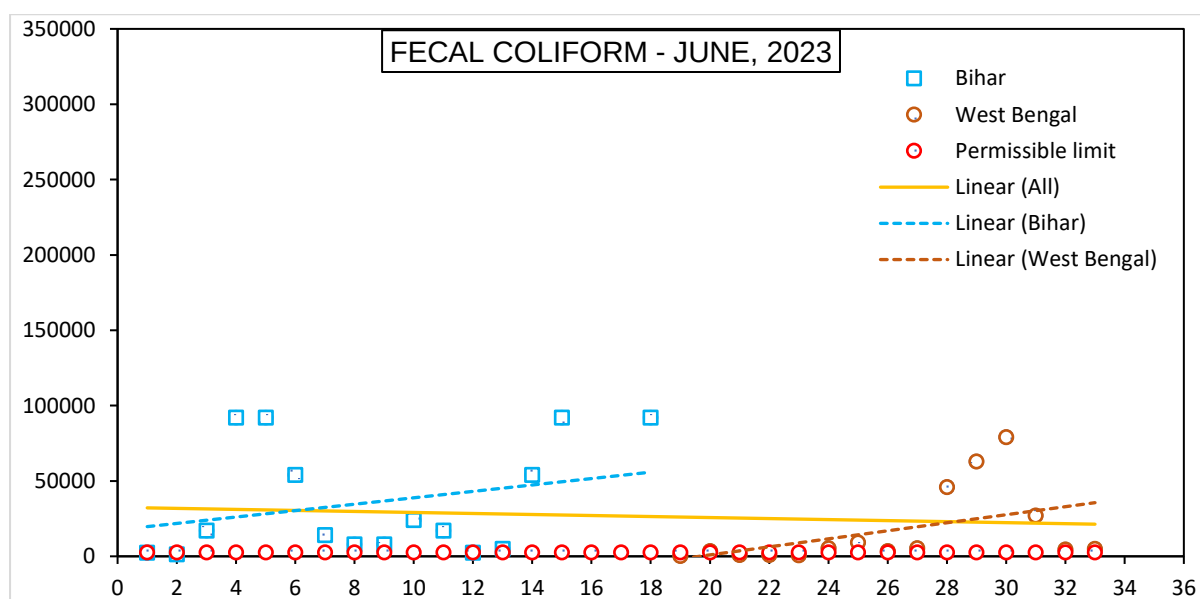


Fig.5.139. Trend Line analysis of Fecal Coliform value for June,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 92000 for June, 2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

July 2021:

Table 20: Data of water quality parameter of river Ganga at different stations for July, 2021						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	05.07.2021	1.8	3.1	7.59	160000
2	Ara-Chapra Road Bridge	06.07.2021	1.2	5.90	7	160000
3	Maa Ambika Asthan, AAMI	missing	-	-	-	-
4	Gandhighat, NIT Patna	12.07.2021	2.1	6.5	7.52	92000
5	Gulabi Ghat, Patna	12.07.2021	2	6.8	7.54	160000
6	Gaighat , D/S Patna	12.07.2021	2.2	8.0	7.55	160000
7	Malsalami , Patna	missing	-	-	-	-
8	Kachchi-Dargah Bidupur	12.07.2021	2	6.3	7.48	160000
9	Triveni Ghat , Patna	12.07.2021	1.9	7.3	7.7	160000
10	Kewala Ghat , Fatuha	12.07.2021	2.8	6.0	7.78	160000
11	Bakhtiyarpur- Tajpur Bridge	07.07.2021	1.1	6.8	7.32	1300
12	U/S Mokama , Mahadeo Asthan	07.07.2021	1.7	6.2	7.19	1300
13	Barahiya ,Nepaltala, Maranchi	07.07.2021	1.2	6.8	7.23	160000
14	U/S Sultanganj, Ajgaibinath Mandir	08.07.2021	1.2	7.2	7.65	160000
15	D/S cremation Ghat at Sultanganj	08.07.2021	1.4	7.1	7.42	160000
16	Champanagar ,Bhagalpur	08.07.2021	1.7	6.5	7.5	35000
17	water intake point , Bhagalpur	08.07.2021	2.1	6.3	7.31	160000
18	Bhagalpur near Bararighat	08.07.2021	2.2	6.2	7.05	160000
19	Farakka	22/07/2021	2.45	5.6	7.6	2300
20	Baharampore	23/07/2021	3.85	5.5	7.7	79000
21	Khagra	23/07/2021	2.2	5.6	7.8	33000
22	Gorabajar, Murshidabad	23/07/2021	1.15	1.15	7.83	23000
23	Nawadip, Ghoshpara	27/07/2021	3.9	5.5	7.49	23000
24	Tribeni	15/07/2021	1.4	5.1	7.98	7900
25	Palta	27/07/2021	2	4.6	7.56	110000
26	Palta, Shitaltala	27/07/2021	2.9	4.4	7.3	130000
27	Serampore	27/07/2021	1.15	4.9	7.66	23000
28	Dakshineswar	15/07/2021	2.5	4.6	7.43	110000
29	Shibpur , Howrah	16/07/2021	2.15	5.4	7.89	17000
30	Garden Reach	14/07/2021	2.65	4.9	7.22	79000
31	Uluberia	19/07/2021	2.45	4.7	7.14	33000
32	Diamond Harbour	20/07/2021	2.1	5.2	7.07	7800
33	Durgachak Patikhali	missing	-	-	-	-

Parameter 1: BOD

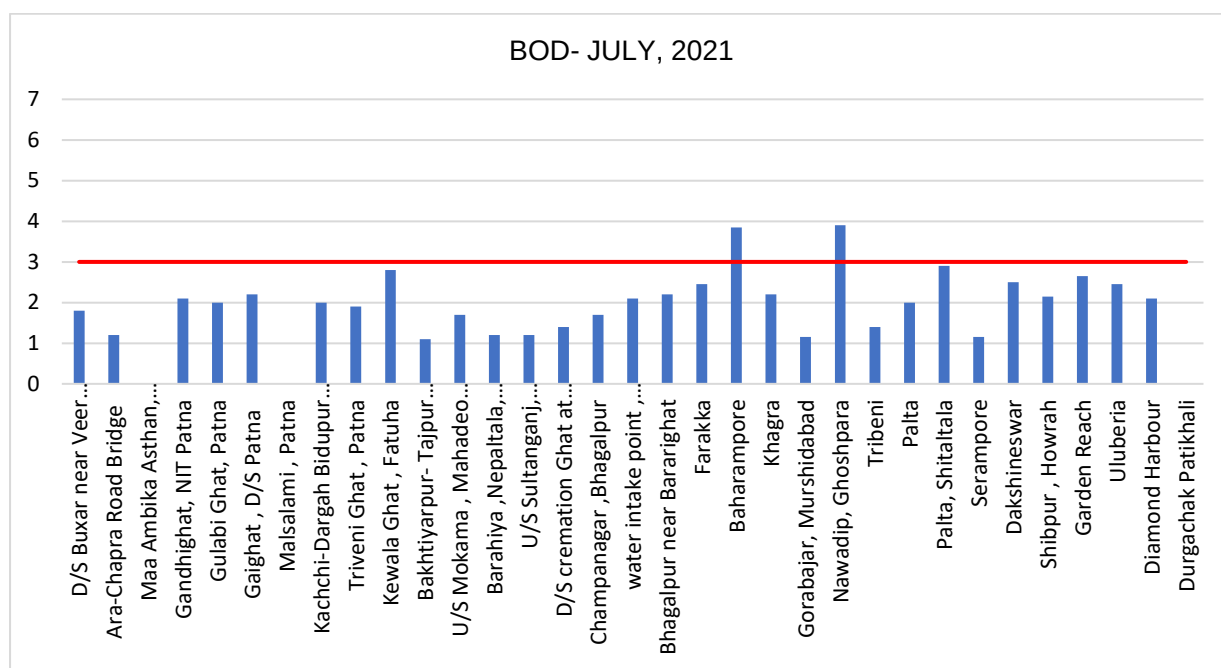


Fig.5.140. BOD value for July,2021

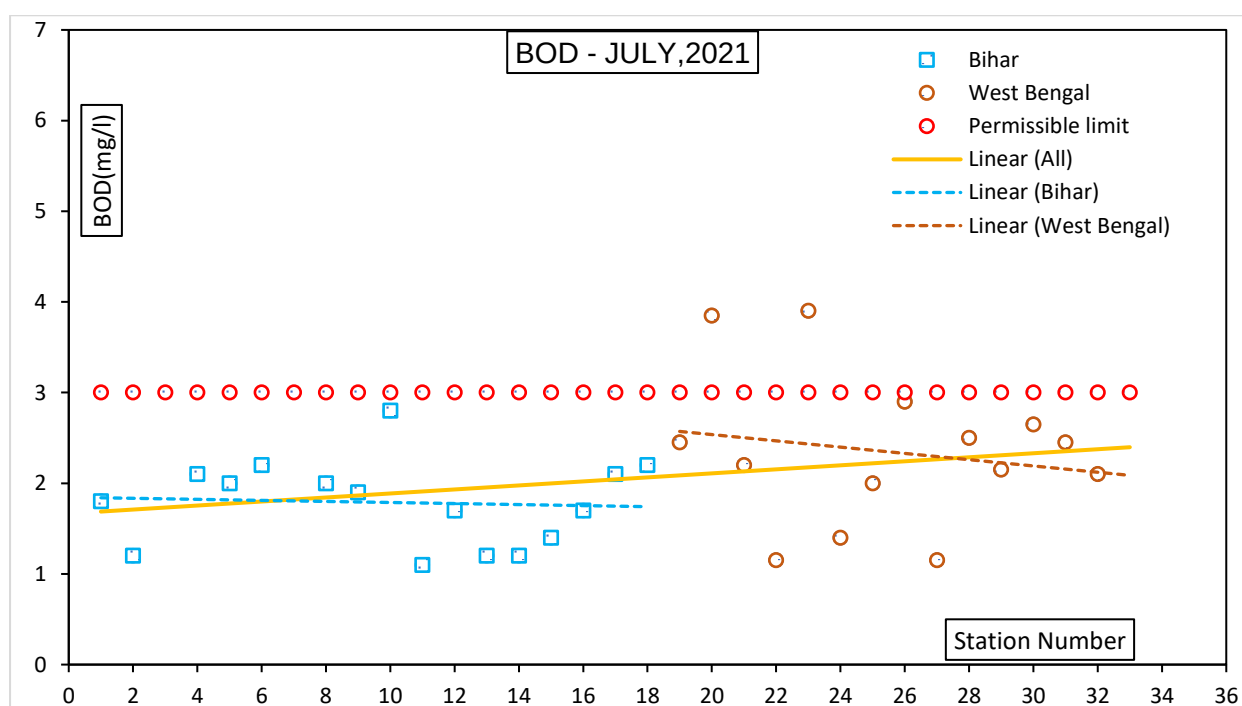


Fig.5.141. Trend Line analysis of BOD value for July,2021

The BOD values were found in the range of 1.1–3.9 mg/l. The highest BOD value of 3.9 mg/l was for Nawadip, Ghoshpara for the month of July, 2021. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O2 (DO)

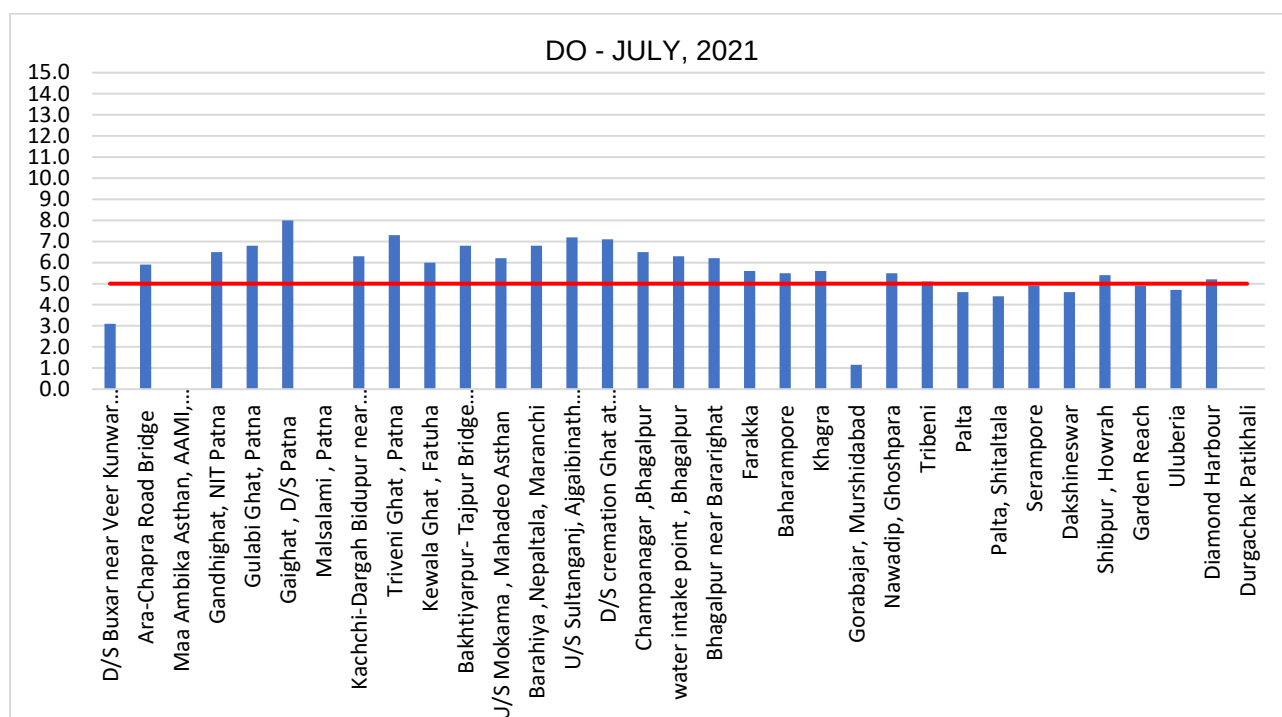


Fig.5.142. DO value for July,2021

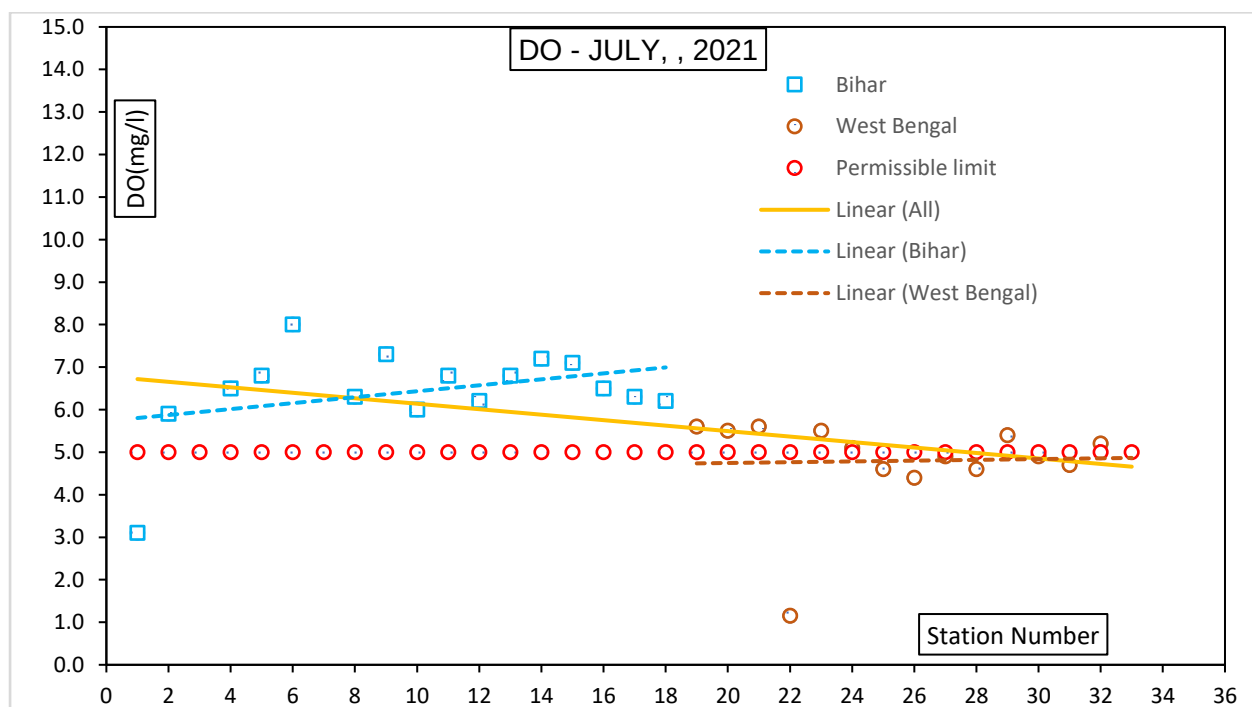


Fig.5.143. Trend Line analysis of DO value for July,2021

The DO values were found in the range of 1.15–8.0 mg/l. The lowest DO value 1.15 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.0 mg/l was for Gaighat, D/S Patna for the month July, 2021. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is increasing.

Parameter 3: pH

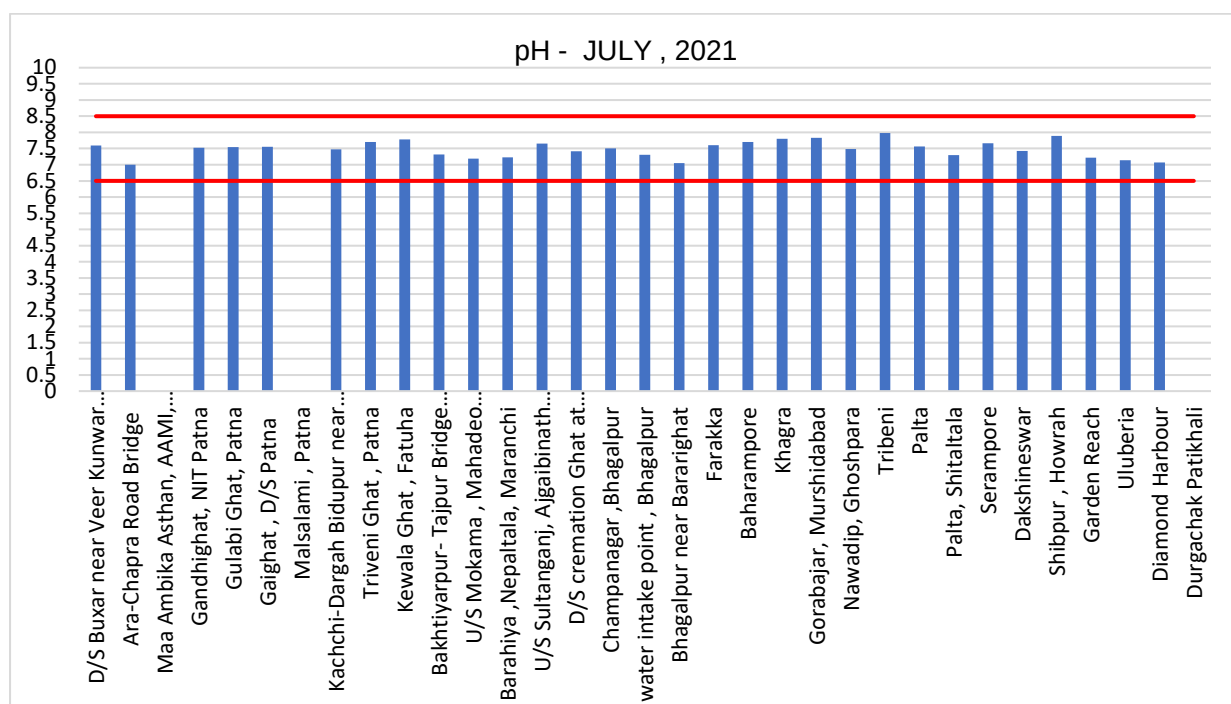


Fig.5.144. pH value for July,2021

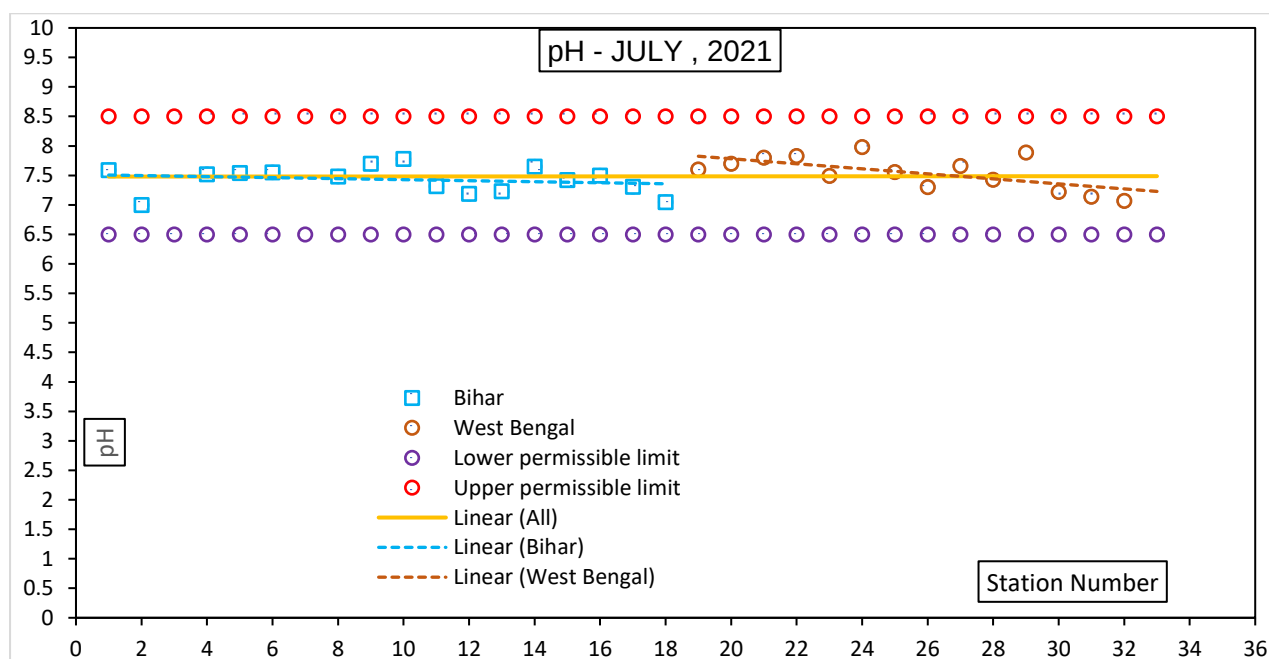


Fig.5.145. Trend Line analysis of pH value for July,2021

The pH values were found in the range of 7.0 – 7.98. for July, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month July, 2021. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

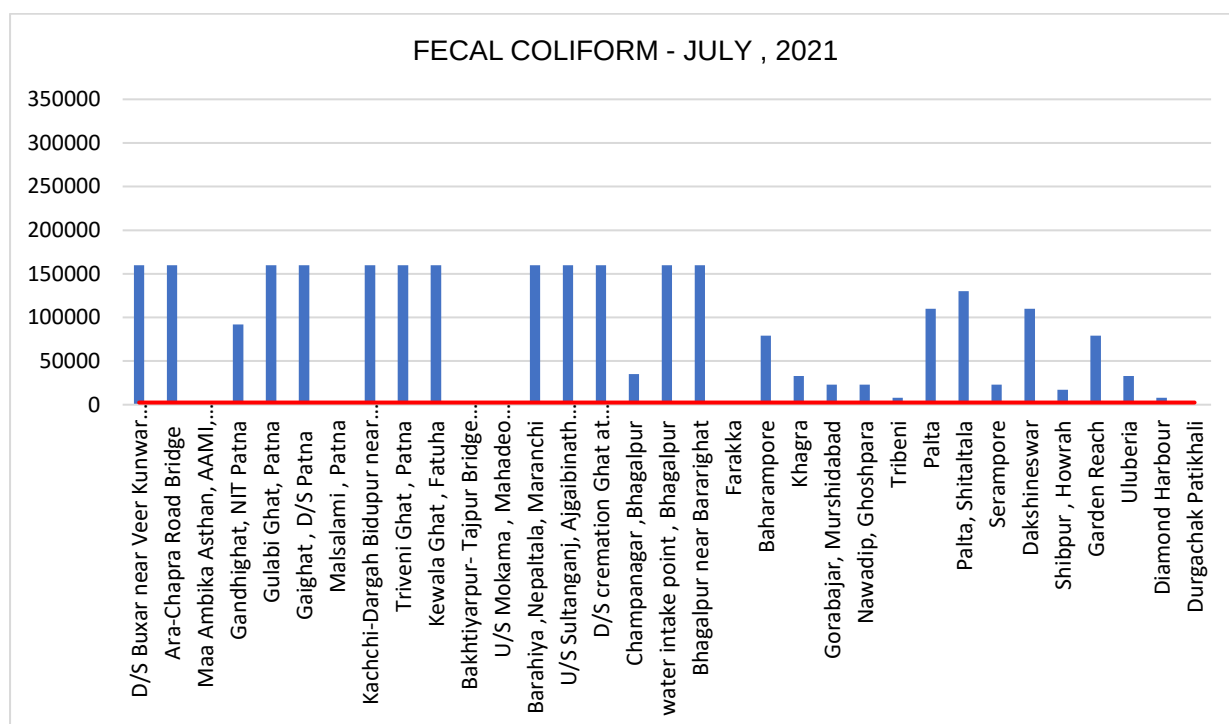


Fig.5.146. Fecal Coliform value for July,2021

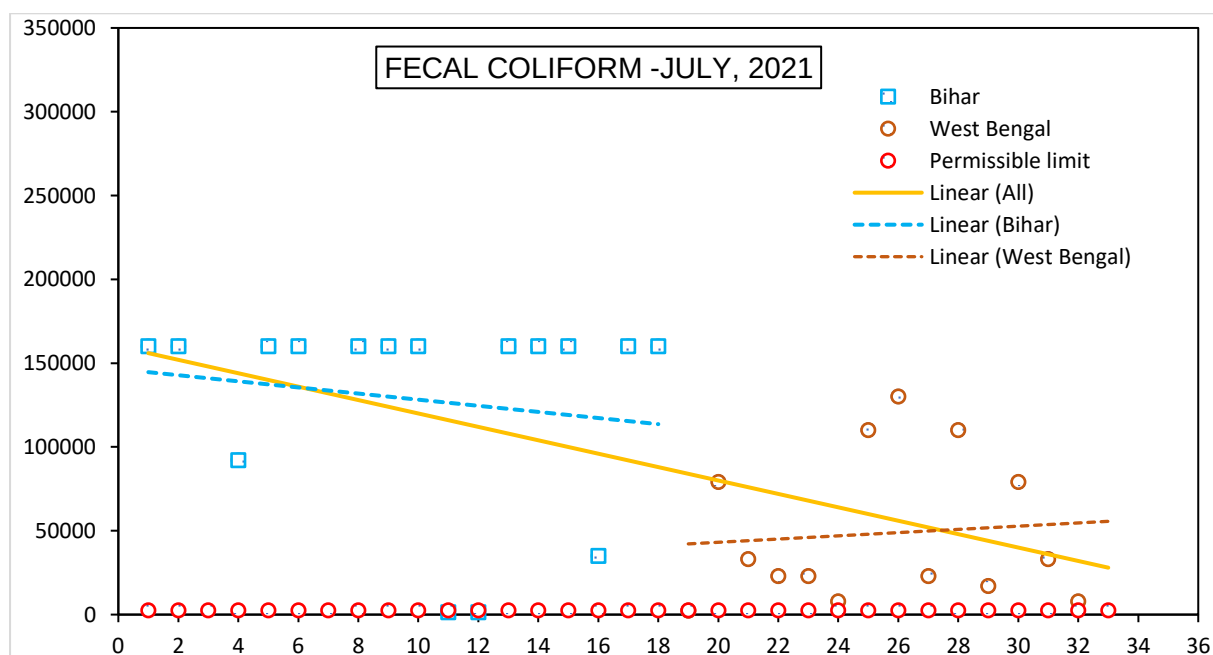


Fig.5.147. Trend Line analysis of Fecal Coliform value for July,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 160000 for July ,2021. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

July 2022:

Table 21: Data of water quality parameter of river Ganga at different stations for July, 2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	21/07/2022	1.7	7.6	8.06	92000
2	Ara-Chapra Road Bridge	07.07.2022	1.7	7.9	7.44	330
3	Maa Ambika Asthan, AAMI	07.07.2022	1.7	7.7	7.22	92000
4	Gandhighat, NIT Patna	15.07.2022	2	7.8	7.56	54000
5	Gulabi Ghat, Patna	15.07.2022	3	6.5	7.28	92000
6	Gaighat , D/S Patna	15.07.2022	2.9	6.4	7.37	35000
7	Malsalami , Patna	01.07.2022	2.1	7.5	7.46	28000
8	Kachchi-Dargah Bidupur	15.07.2022	2.2	6.6	7.34	35000
9	Triveni Ghat , Patna	15.07.2022	1.8	7.1	7.69	13000
10	Kewala Ghat , Fatuha	15.07.2022	1.6	7.3	7.66	35000
11	Bakhtiyarpur- Tajpur Bridge	04.07.2022	2.5	6.2	8.34	490
12	U/S Mokama , Mahadeo Asthan	18.07.2022	1.6	8.6	7.42	22000
13	Barahiya ,Nepaltala, Maranchi	04.07.2022	2.6	6.3	7.25	35000
14	U/S Sultanganj, Ajgaibinath Mandir	19.07.2022	1.7	8.1	7.66	240000
15	D/S cremation Ghat at Sultanganj	04.07.2022	2	6.0	7.76	24000
16	Champanagar ,Bhagalpur	06.07.2022	2.7	6.5	7.83	1100
17	water intake point , Bhagalpur	06.07.2022	2.8	6.3	7.89	35000
18	Bhagalpur near Bararighat	18.07.2022	2	8.6	7.34	92000
19	Farakka	26/07/2022	2.6	6	7.86	3300
20	Baharampore	26/07/2022	3	6.6	7.84	130000
21	Khagra	26/07/2022	1.35	6	7.9	7800
22	Gorabajar, Murshidabad	26/07/2022	1.65	1.65	7.87	49000
23	Nawadip, Ghoshpara	20/07/2022	2.9	5.8	7.81	70000
24	Tribeni	missing	-	-	-	-
25	Palta	18/07/2022	1.65	5.8	7.79	79000
26	Palta, Shitaltala	18/07/2022	3.45	5	7.64	130000
27	Serampore	missing	-	-	-	-
28	Dakshineswar	19/07/2022	3.15	5.2	7.58	130000
29	Shibpur , Howrah	18/07/2022	2.55	5.5	7.74	49000
30	Garden Reach	22/07/2022	3	5.8	7.52	49000
31	Uluberia	22/07/2022	2.8	5.4	7.13	17000
32	Diamond Harbour	25/07/2022	2.8	6.7	7.45	4500
33	Durgachak Patikhali	20/07/2022	2.85	5.9	8.39	17000

Parameter 1: BOD

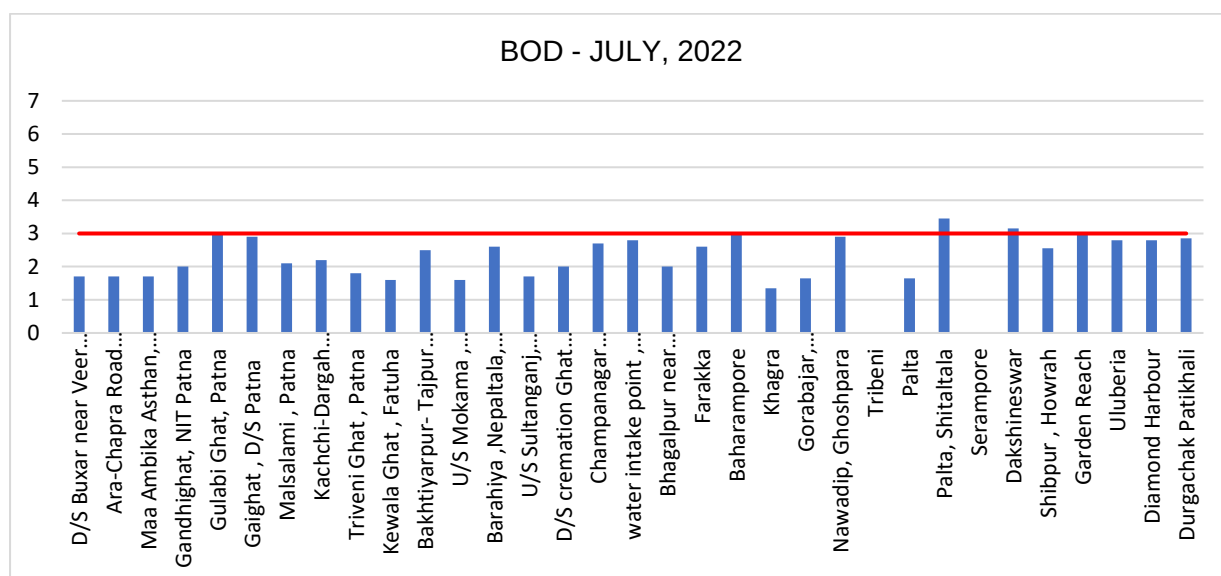


Fig.5.148. BOD value for July,2022

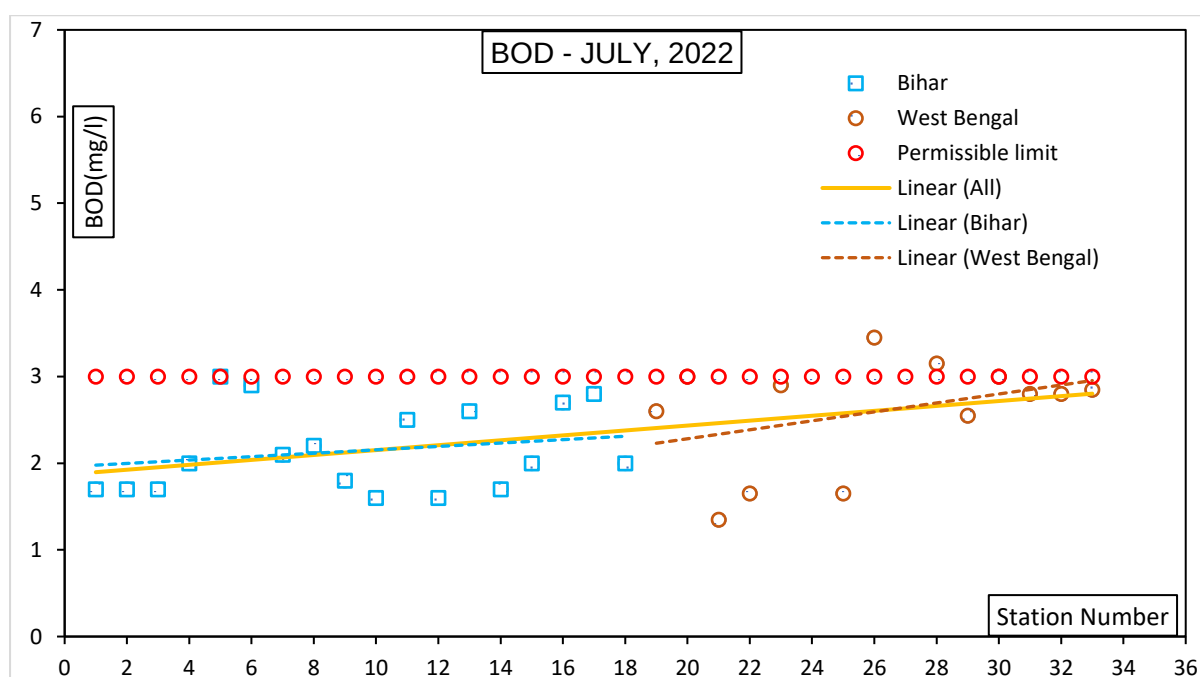


Fig.5.149. Trend Line analysis of BOD value for July,2022

The BOD values were found in the range of 1.35–3.45 mg/l. The highest BOD value of 3.45 mg/l was for Palta, Shitaltala for the month of July, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

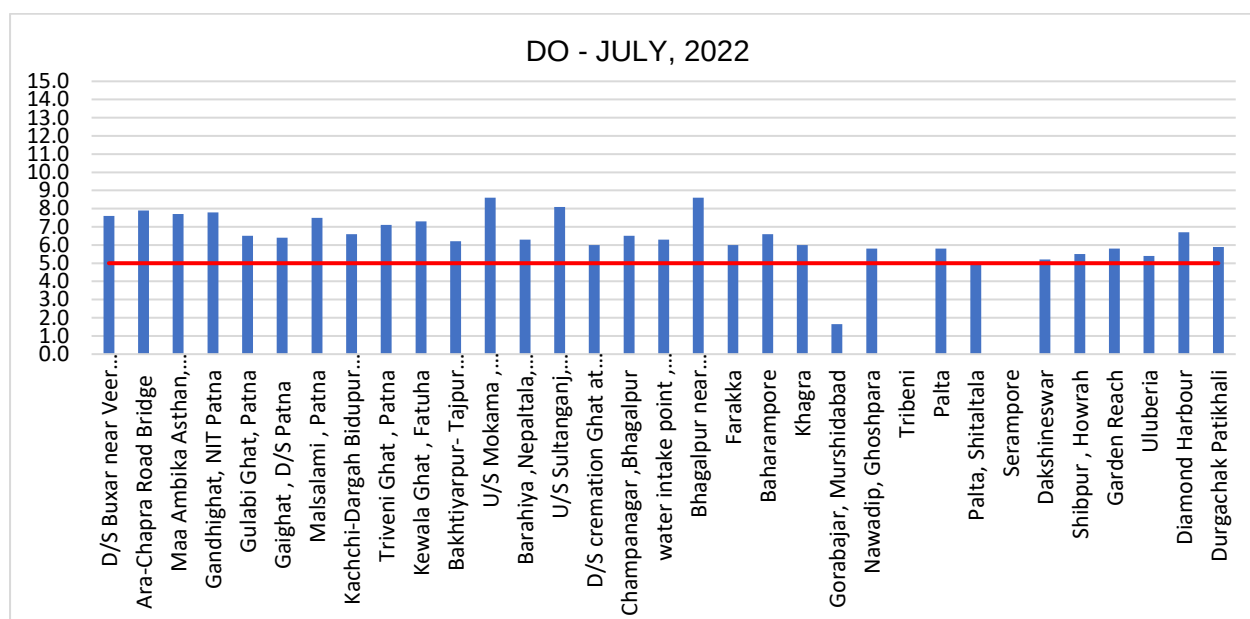


Fig.5.150. DO value for July,2022

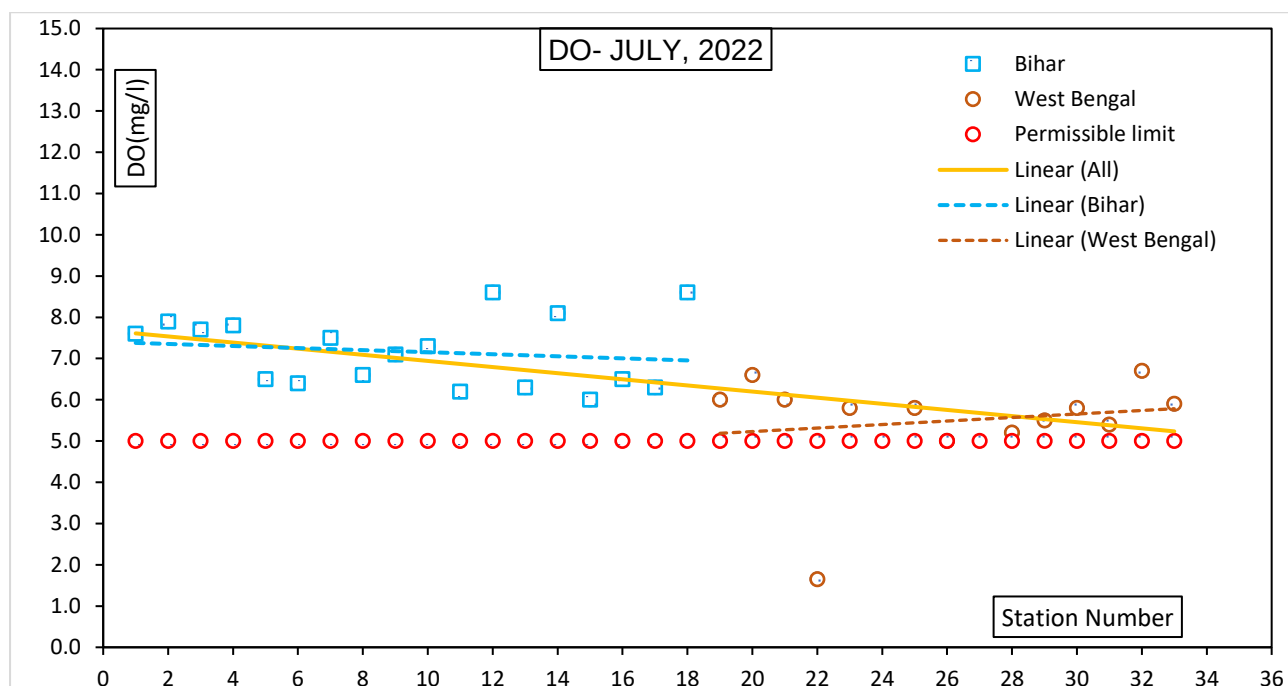


Fig.5.151. Trend Line analysis of DO value for July,2022

The DO values were found in the range of 1.65–8.6 mg/l. The lowest DO value 1.65 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.6 mg/l was for U/S Mokama , Mahadeo Asthan for the month July, 2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 3: pH

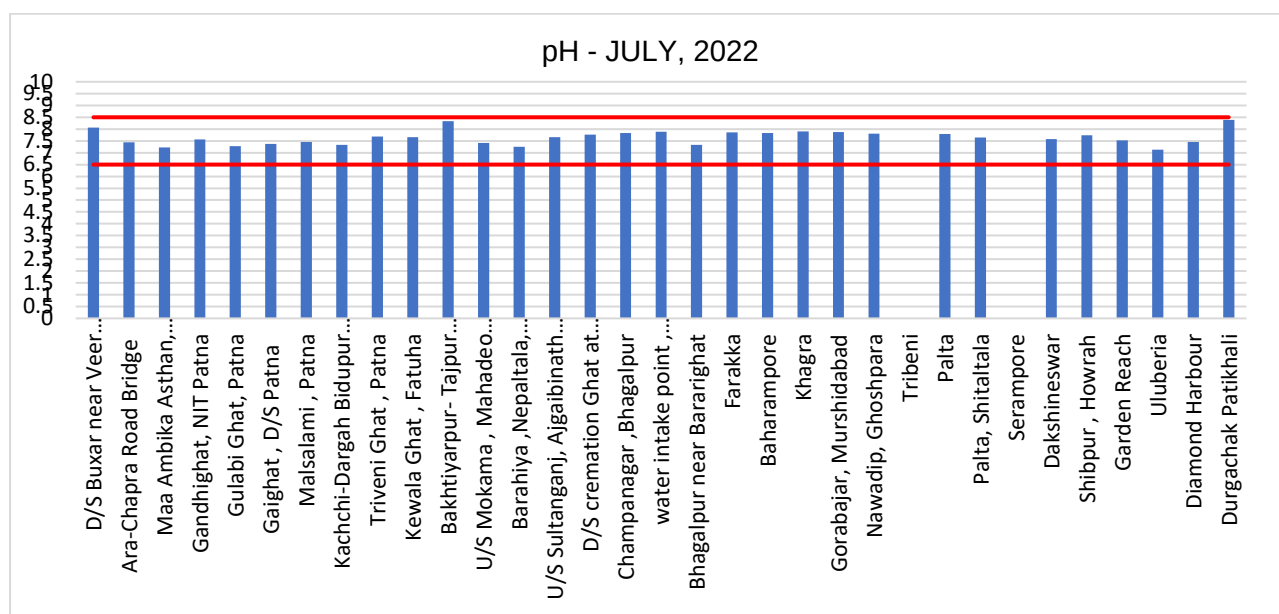


Fig.5.152. pH value for July,2022

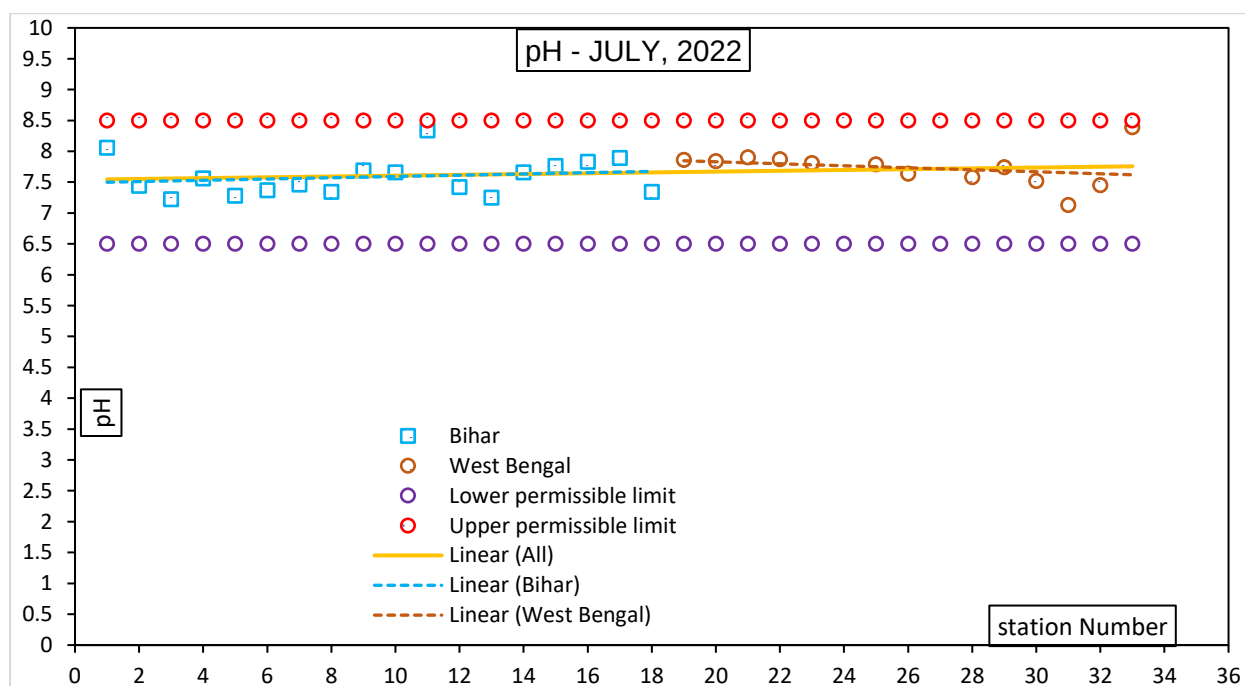


Fig.5.153. Trend Line analysis of pH value for July,2022

The pH values were found in the range of 7.13 – 8.39 for July, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month July, 2022. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

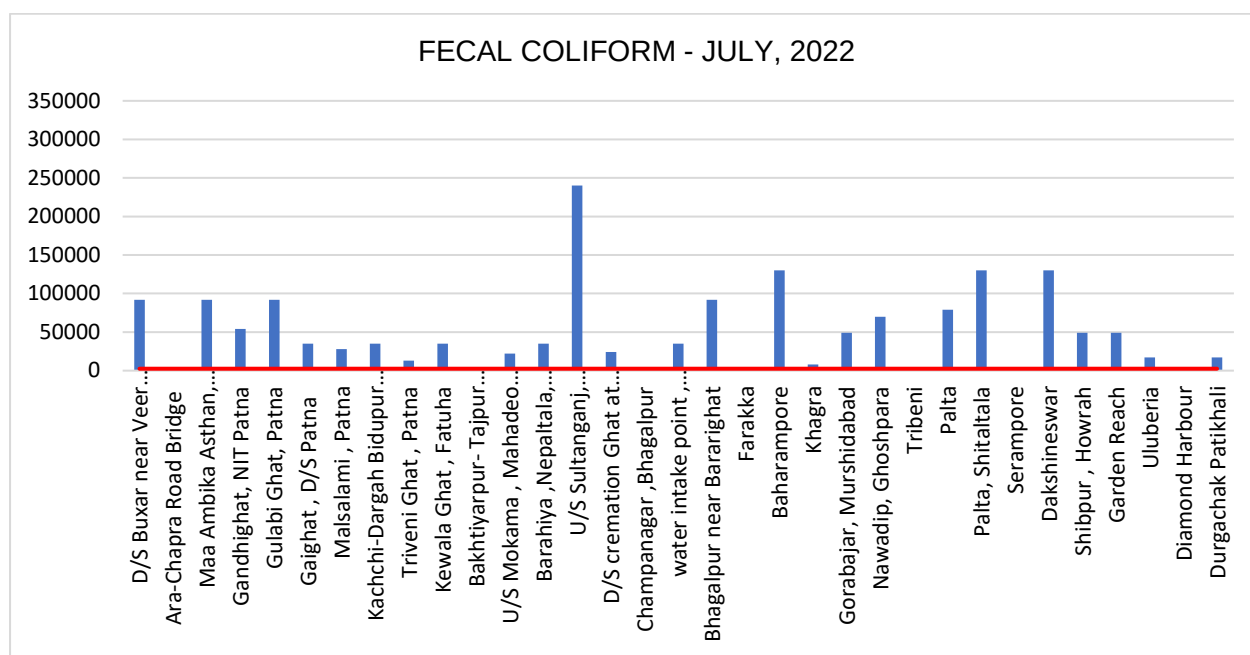


Fig.5.154. Fecal Coliform value for July,2022

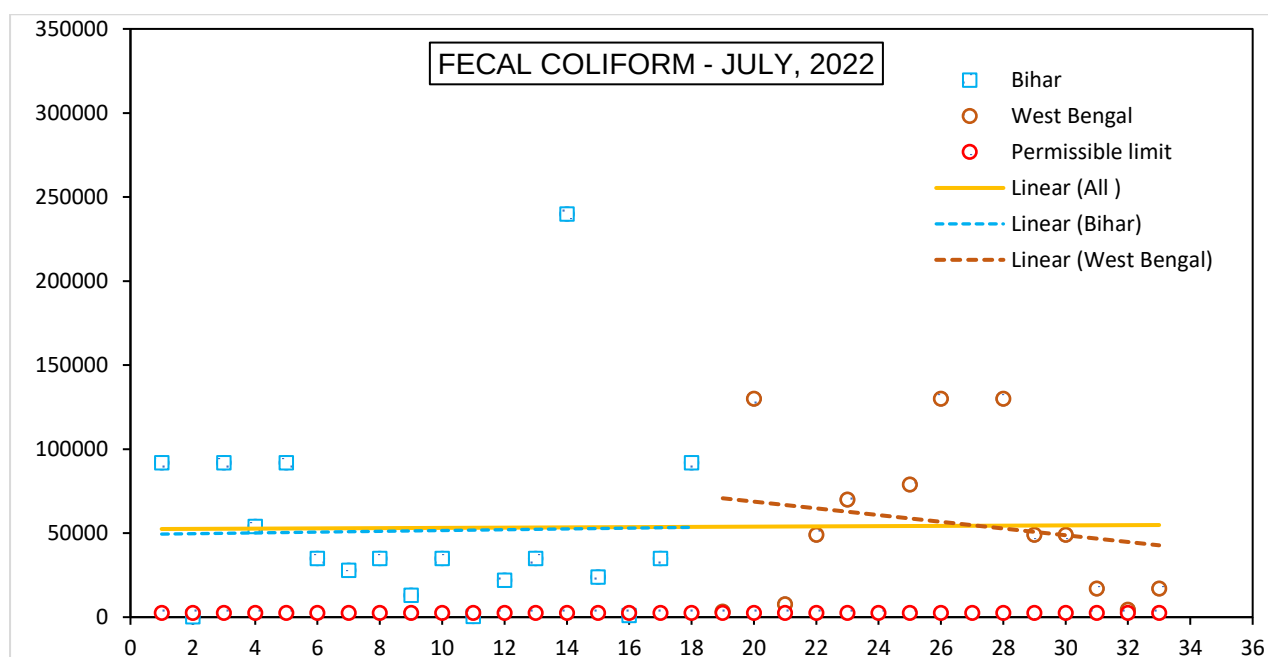


Fig.5.155. Trend Line analysis of Fecal Coliform value for July,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000 for July ,2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

July 2023:

Table 22: Data of water quality parameter of river Ganga at different stations for July, 2023

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	10.07.2023	1.8	7.7	7.56	4900
2	Ara-Chapra Road Bridge	11.07.2023	2.4	7.3	7.59	1300
3	Maa Ambika Asthan, AAMI	11.07.2023	2.3	7.6	7.89	17000
4	Gandhighat, NIT Patna	17.07.2023	1.9	7.1	7.39	35000
5	Gulabi Ghat, Patna	17.07.2023	2.1	6.9	7.44	24000
6	Gaighat, D/S Patna	17.07.2023	1.7	7.5	7.51	24000
7	Malsalami, Patna	17.07.2023	1.3	7.4	7.6	22000
8	Kachchi-Dargah Bidupur	17.07.2023	1.4	7.3	7.48	4900
9	Triveni Ghat, Patna	17.07.2023	1.4	7.1	7.43	2300
10	Kewala Ghat, Fatuha	17.07.2023	1.5	7.2	7.35	2300
11	Bakhtiyarpur- Tajpur Bridge	12.07.2023	2.1	7.4	7.46	17000
12	U/S Mokama, Mahadeo Asthan	26.07.2023	1.3	7.8	7.55	17000
13	Barahiya, Nepaltala, Maranchi	26.07.2023	1.4	7.6	7.43	2400
14	U/S Sultanganj, Ajaibinath Mandir	05.07.2023	2	6.8	8.12	13000
15	D/S cremation Ghat at Sultanganj	05.07.2023	2.2	6.3	8.04	11000
16	Champanagar, Bhagalpur	missing	-	-	-	-
17	water intake point, Bhagalpur	05.07.2023	2.3	6.4	7.76	7000
18	Bhagalpur near Bararighat	05.07.2023	2.4	6.4	7.94	7900
19	Farakka	25.07.2023	2.4	6.5	7.24	310
20	Baharampore	26.07.2023	1.5	6.8	7.41	5400
21	Khagra	26.07.2023	1.6	8	7.29	2400
22	Gorabajar, Murshidabad	24.07.2023	2.6	2.6	7.1	3500
23	Nawadip, Ghoshpara	19.07.2023	2.8	6.7	7.79	1400
24	Tribeni	missing	-	-	-	-
25	Palta	20.07.2023	1.75	6	7.49	5400
26	Palta, Shitaltala	20.07.2023	1.9	6	7.32	3500
27	Serampore	missing	-	-	-	-
28	Dakshineswar	17.07.2023	2.69	5.57	7.03	49000
29	Shibpur, Howrah	18.07.2023	2.54	5.4	7.15	40000
30	Garden Reach	18.07.2023	2.65	5.3	7.05	70000
31	Uluberia	19.07.2023	2.57	5.5	7.18	21000
32	Diamond Harbour	25.07.2023	2.47	5.77	7.38	4600
33	Durgachak Patikhali	17.07.2023	1.6	6.4	8.2	4600

Parameter 1: BOD

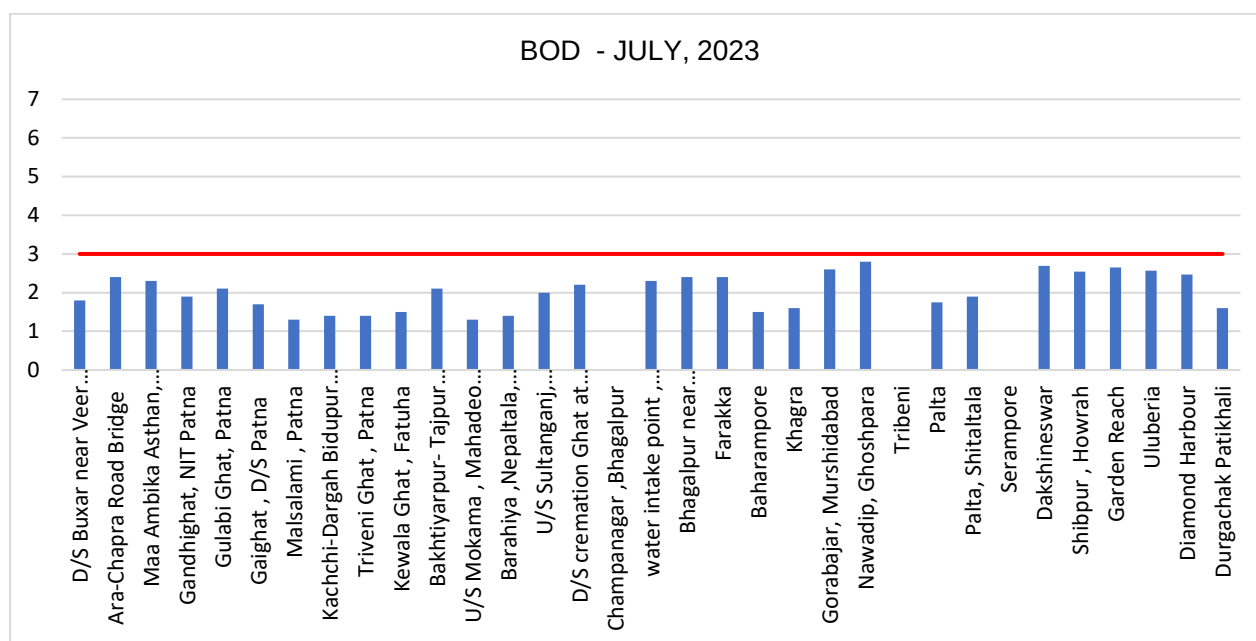


Fig.5.156. BOD value for July,2023

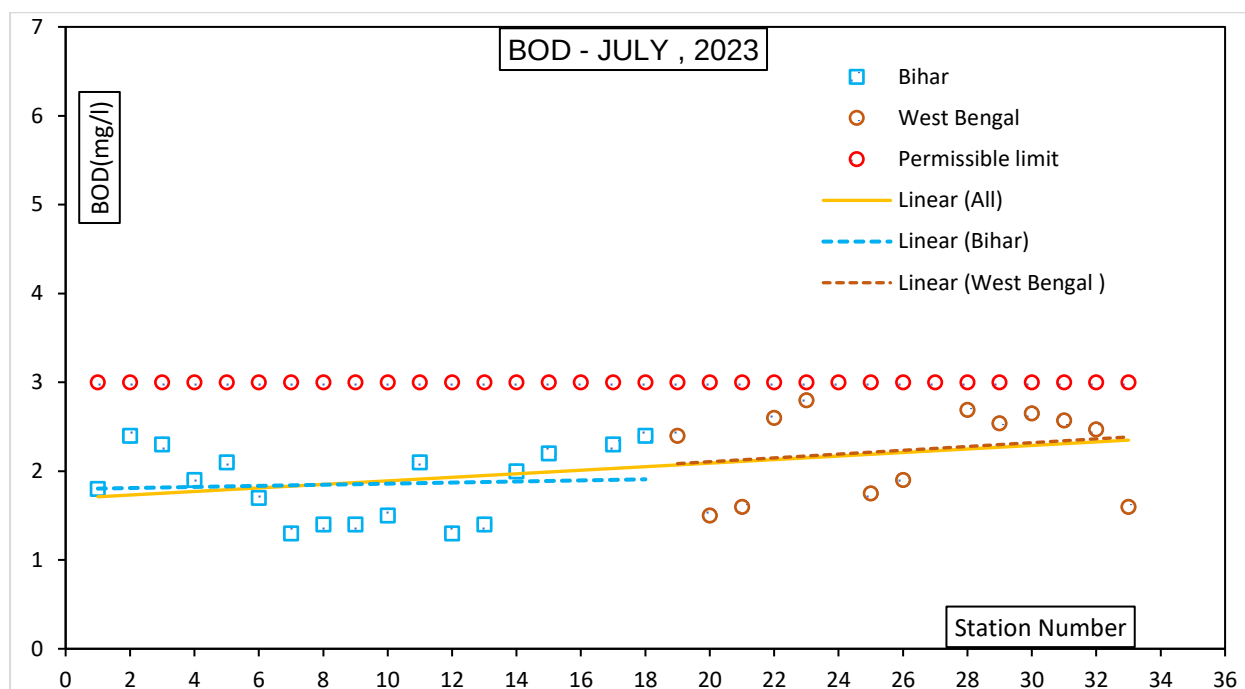


Fig.5.157. Trend Line analysis of BOD value for July,2023

The BOD values were found in the range of 1.3–2.69 mg/l. The highest BOD value of 2.69 mg/l was for Dakshineswar for the month of July, 2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

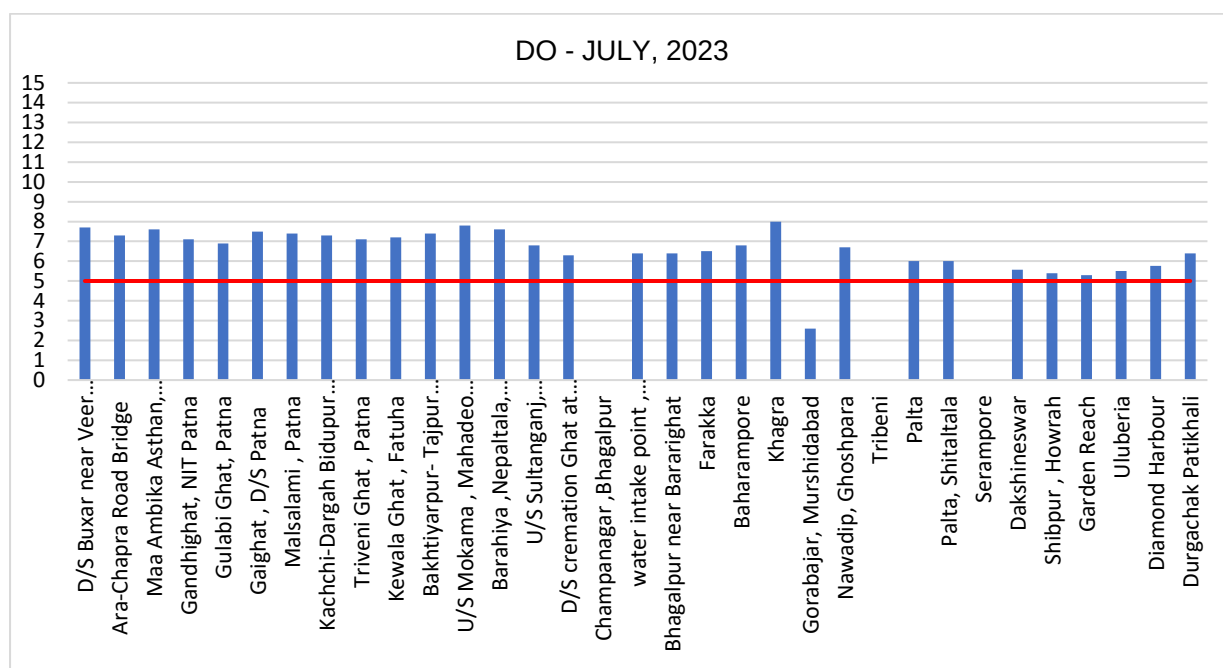


Fig.5.158. DO value for July,2023

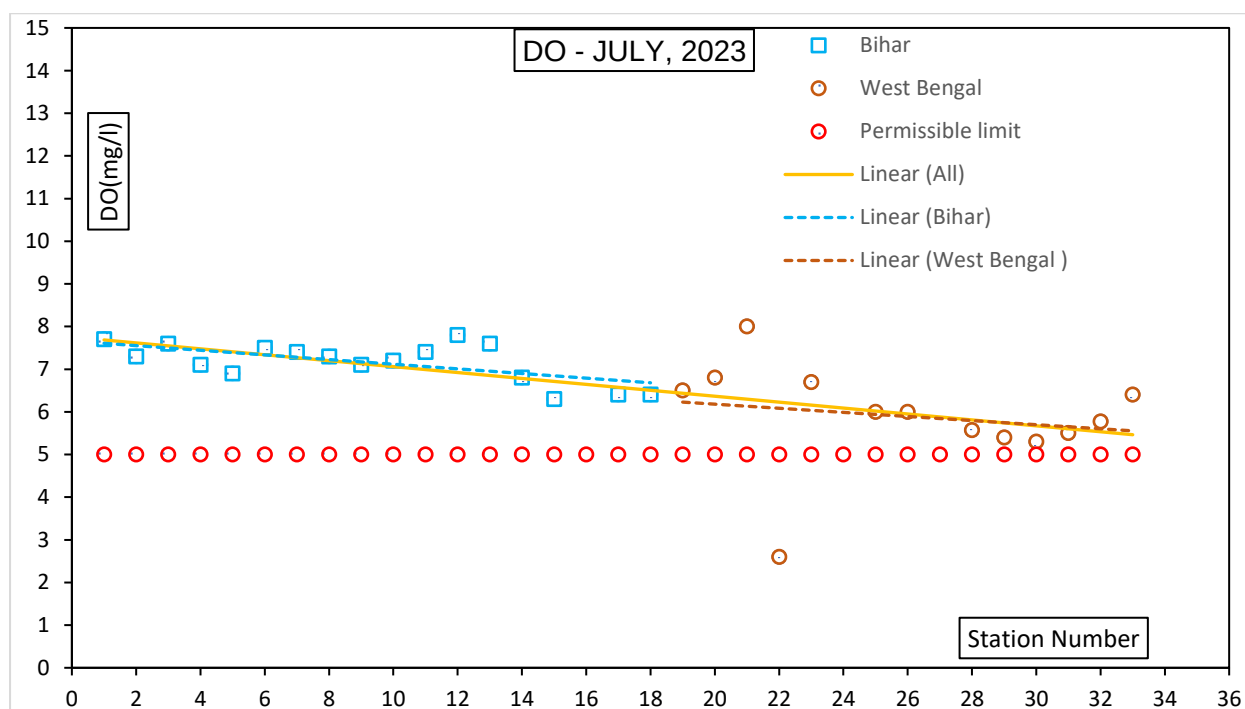


Fig.5.159. Trend Line analysis of DO value for July,2023

The DO values were found in the range of 2.6–7.8 mg/l. The lowest DO value 2.6 mg/l was for Gorabajar, Murshidabad and highest DO value of 7.8 mg/l was for U/S Mokama, Mahadeo Asthan for the month July, 2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

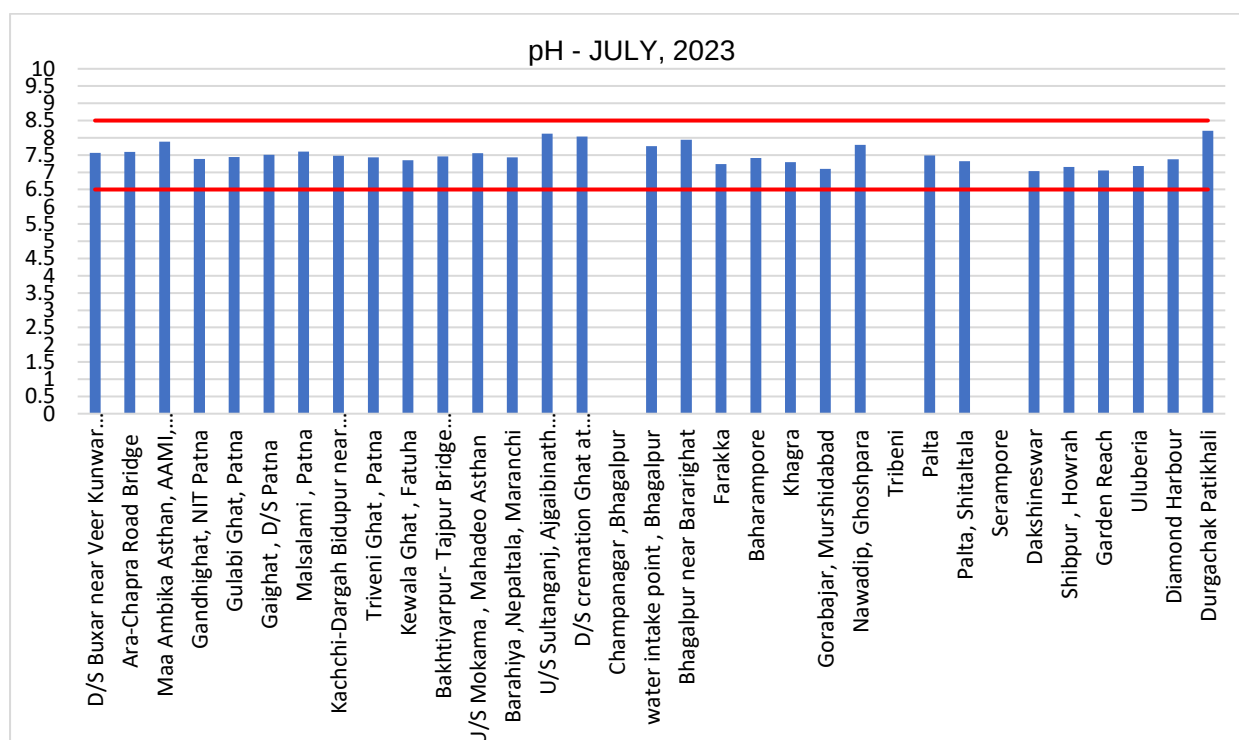


Fig.5.160. pH value for July,2023

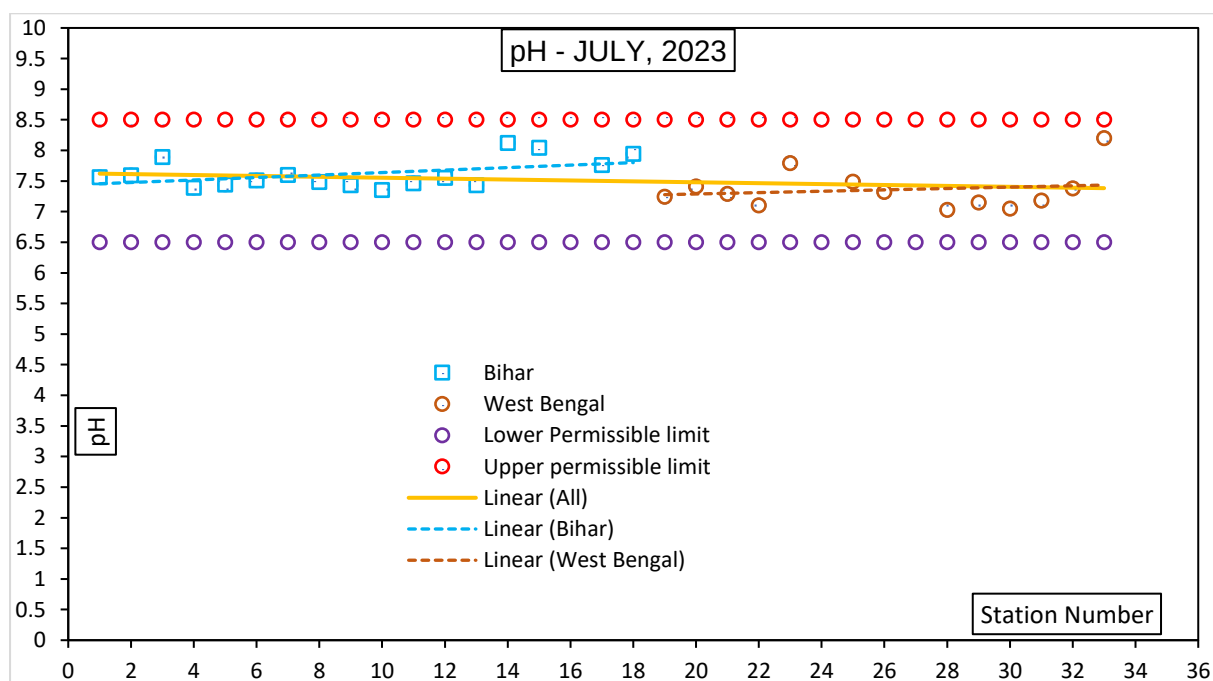


Fig.5.161. Trend Line analysis of pH value for July,2023

The pH values were found in the range of 7.03 – 8.2 for July, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month July, 2023. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is increasing.

Parameter 4: Fecal Coliform

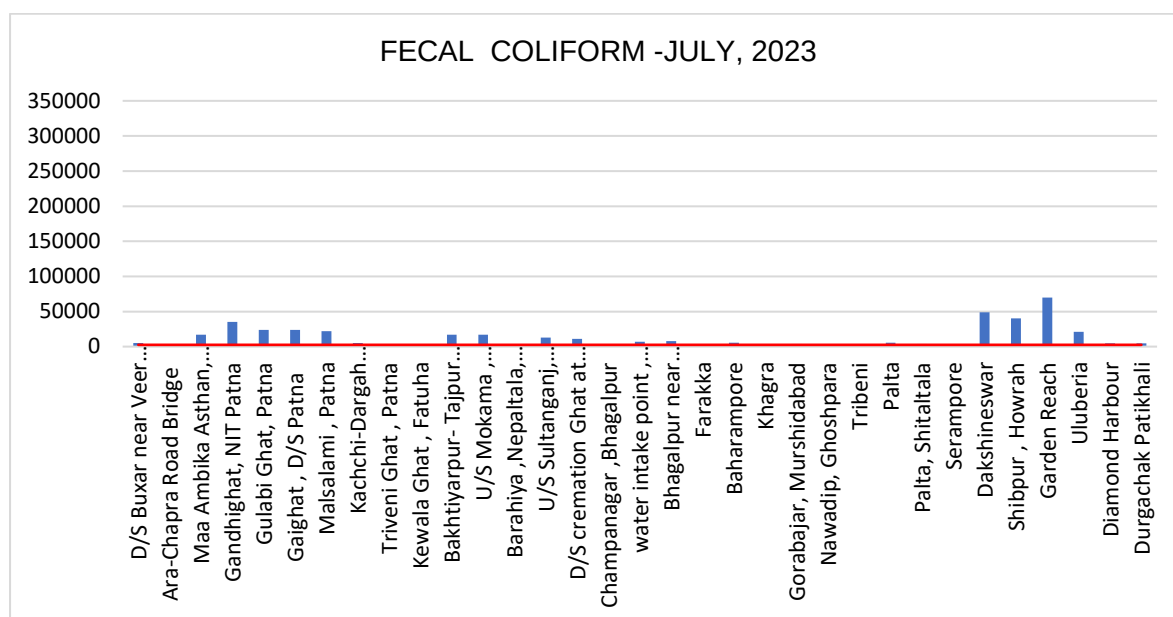


Fig.5.162. Fecal Coliform value for July,2023

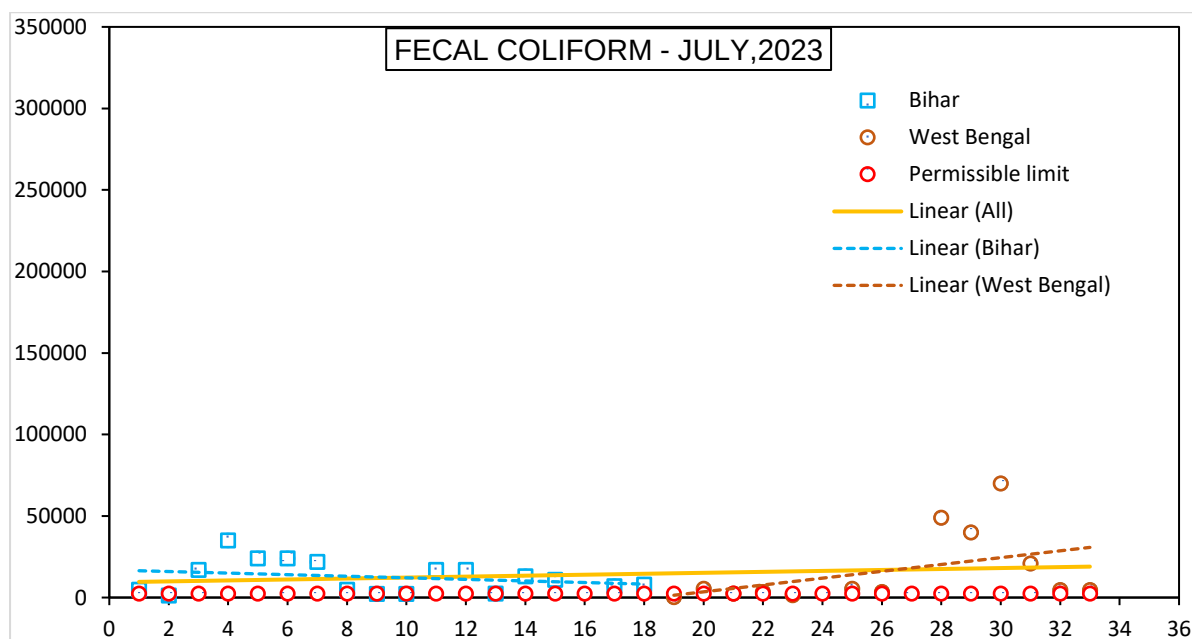


Fig.5.163. Trend Line analysis of Fecal Coliform value for July,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 70000 for July ,2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

August 2021:

Table 23: Data of water quality parameter of river Ganga at different stations for August,2021						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	16.08.2021	2.4	5.9	7.7	35000
2	Ara-Chapra Road Bridge	17.08.2021	2	6.30	7.66	11000
3	Maa Ambika Asthan, AAMI	17.08.2021	2.8	5.6	7.61	11000
4	Gandhighat, NIT Patna	11.08.2021	2.8	4.3	7.83	160000
5	Gulabi Ghat, Patna	06.08.2021	3.2	4.4	7.73	35000
6	Gaighat , D/S Patna	04.08.2021	3	4.3	7.77	160000
7	Malsalami , Patna	missing	-	-	-	-
8	Kachchi-Dargah Bidupur	04.08.2021	3	4.5	7.75	160000
9	Triveni Ghat , Patna	21.08.2021	2.3	5.2	7.9	35000
10	Kewala Ghat , Fatuha	04.08.2021	2.8	5.3	8.11	35000
11	Bakhtiyarpur- Tajpur Bridge	missing	-	-	-	-
12	U/S Mokama , Mahadeo Asthan	25.08.2021	2	7.1	7.59	160000
13	Barahiya ,Nepaltala, Maranchi	11.08.2021	2.3	6.6	7.74	160000
14	U/S Sultanganj, Ajgaibinath Mandir	missing	-	-	-	-
15	D/S cremation Ghat at Sultanganj	10.08.2021	1.2	7.3	7.53	54000
16	Champanagar ,Bhagalpur	11.08.2021	2.2	6.0	7.77	160000
17	water intake point , Bhagalpur	11.08.2021	2.3	5.8	7.58	92000
18	Bhagalpur near Bararighat	26.08.2021	2.5	6.2	7.65	160000
19	Farakka	13/08/2021	4.7	5.7	7.89	2200
20	Baharampore	25/08/2021	1.8	5.3	7.81	33000
21	Khagra	25/08/2021	2	5.2	7.84	23000
22	Gorabajar, Murshidabad	25/08/2021	1.95	1.95	7.78	23000
23	Nawadip, Ghoshpara	27/08/2021	3.19	6.6	7.85	49000
24	Tribeni	27/08/2021	3.56	6.3	7.79	33000
25	Palta	25/08/2021	2.25	4.3	7.7	94000
26	Palta, Shitaltala	25/08/2021	2.87	4.2	7.67	63000
27	Serampore	18/08/2021	2.7	4.2	7.67	170000
28	Dakshineswar	27/08/2021	2.9	4.9	7.05	110000
29	Shibpur , Howrah	16/08/2021	2	4	7.42	33000
30	Garden Reach	17/08/2021	2.2	4.2	7.05	70000
31	Uluberia	18/08/2021	2.35	4.6	7.16	49000
32	Diamond Harbour	31/08/2021	1.7	4.3	7.12	4500
33	Durgachak Patikhali	missing	-	-	-	-

Parameter 1: BOD

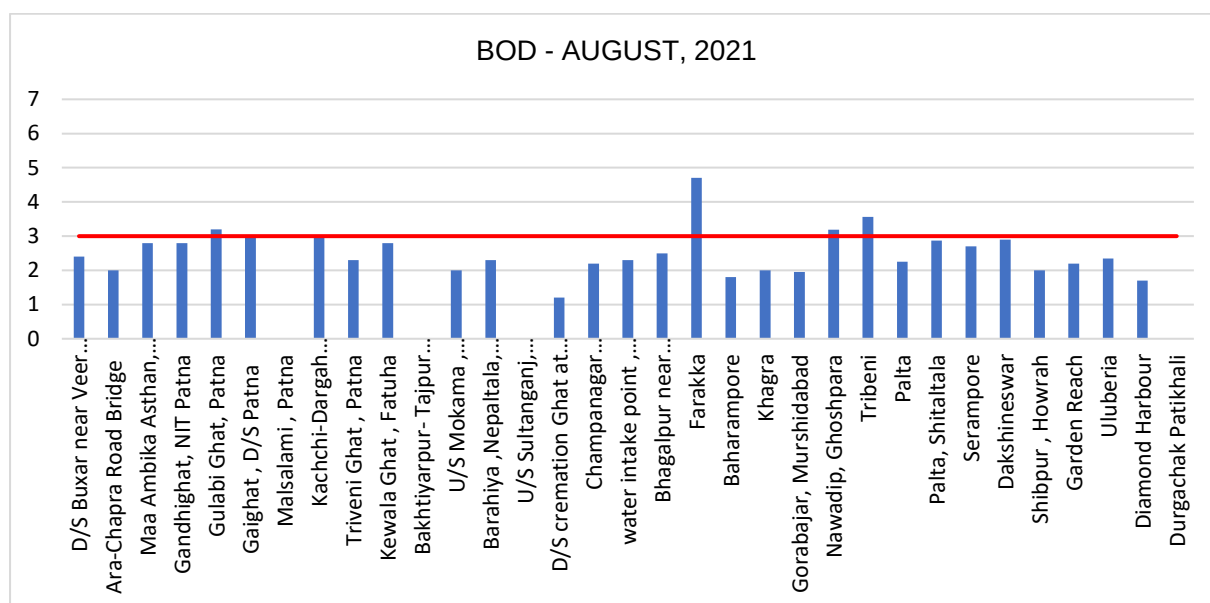


Fig.5.164. BOD value for August,2021

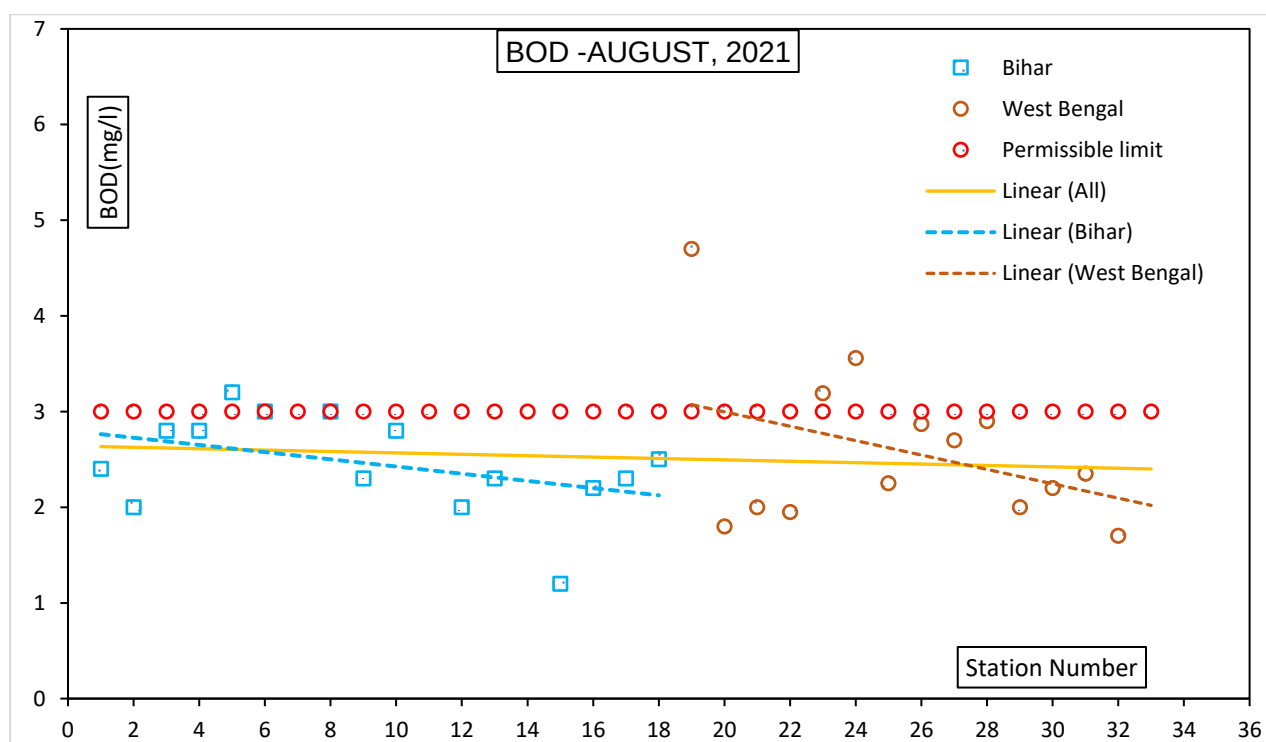


Fig.5.165. Trend Line analysis of BOD value for August,2021

The BOD values were found in the range of 1.2–4.7 mg/l. The highest BOD value of 4.7 mg/l was for Farakka for the month of August, 2021. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O2 (DO)

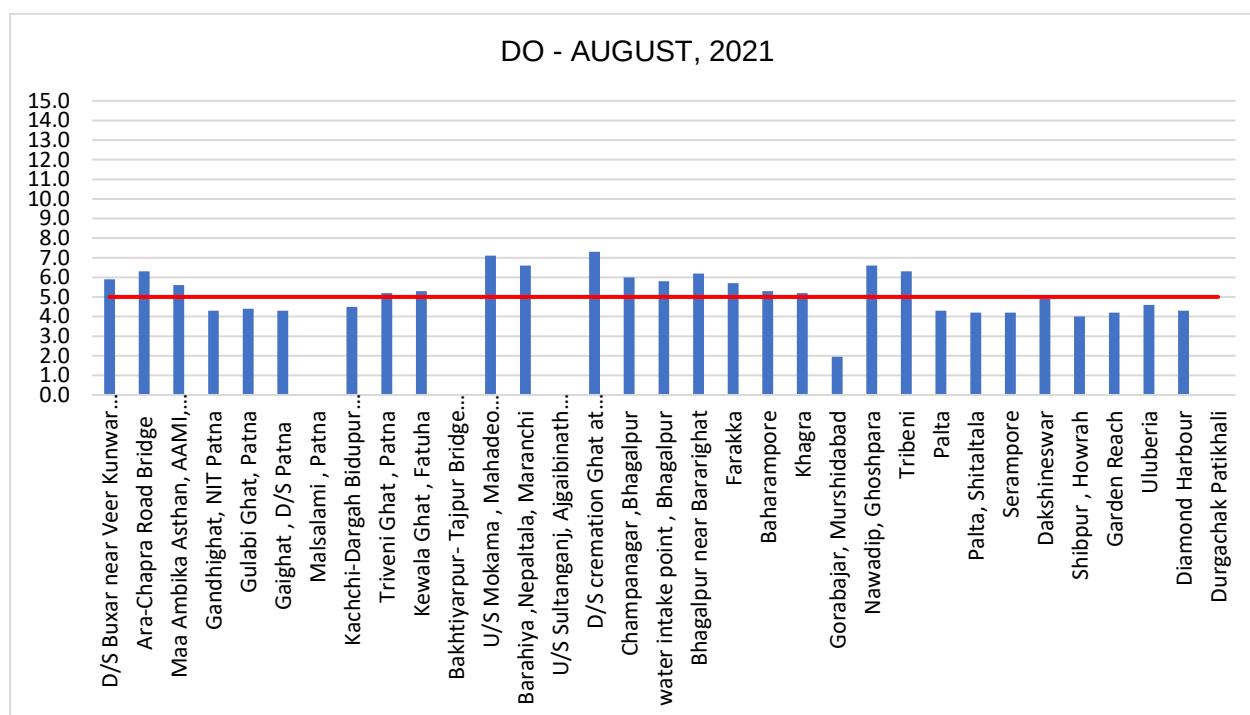


Fig.5.166. DO value for August,2021

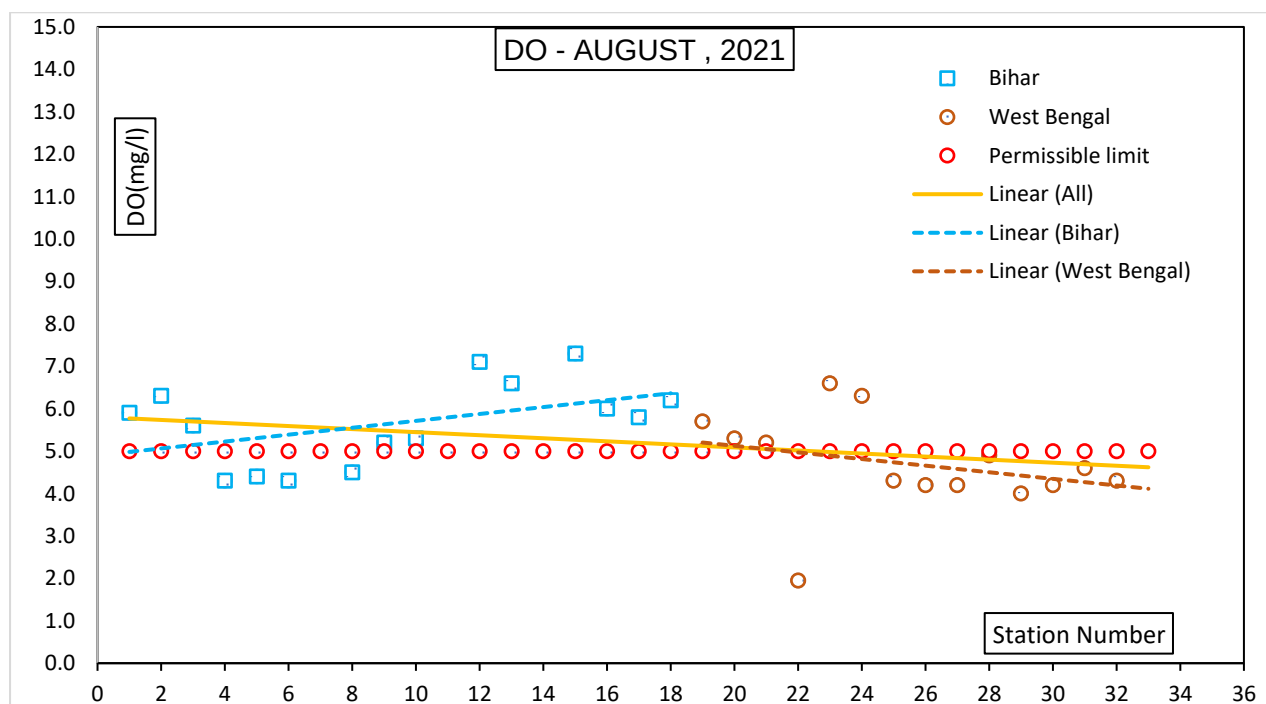


Fig.5.167. Trend Line analysis of DO value for August,2021

The DO values were found in the range of 1.95–7.3 mg/l. The lowest DO value 1.95 mg/l was for Gorabajar, Murshidabad and highest DO value of 7.3 mg/l was for D/S cremation Ghat at Sultanganj for the month August, 2021. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

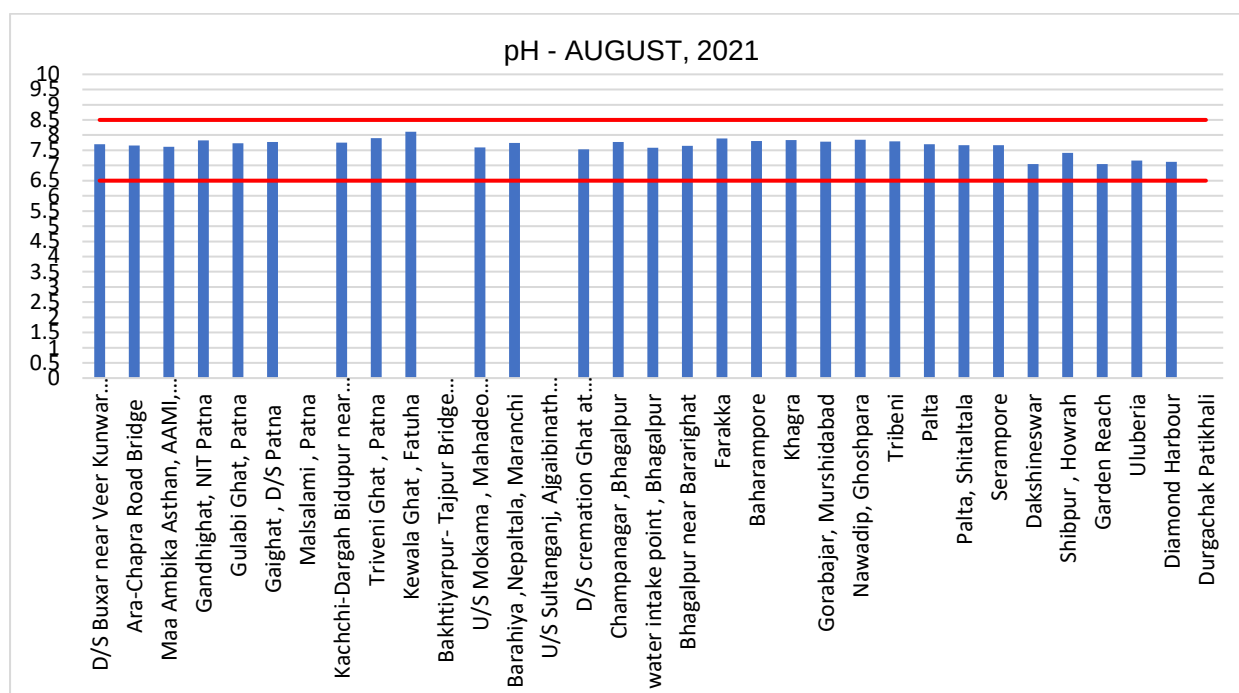


Fig.5.168. pH value for August,2021

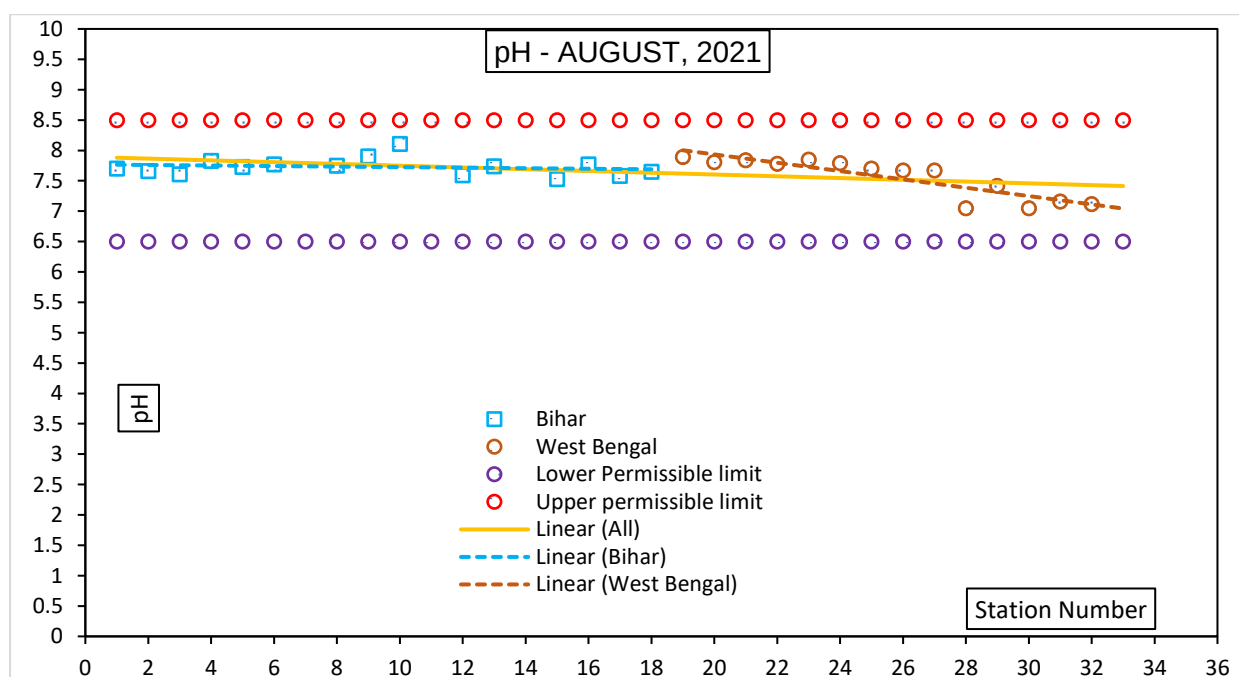


Fig.5.169. Trend Line analysis of pH value for August,2021

The pH values were found in the range of 7.05 – 8.11 for August, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month August, 2021. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

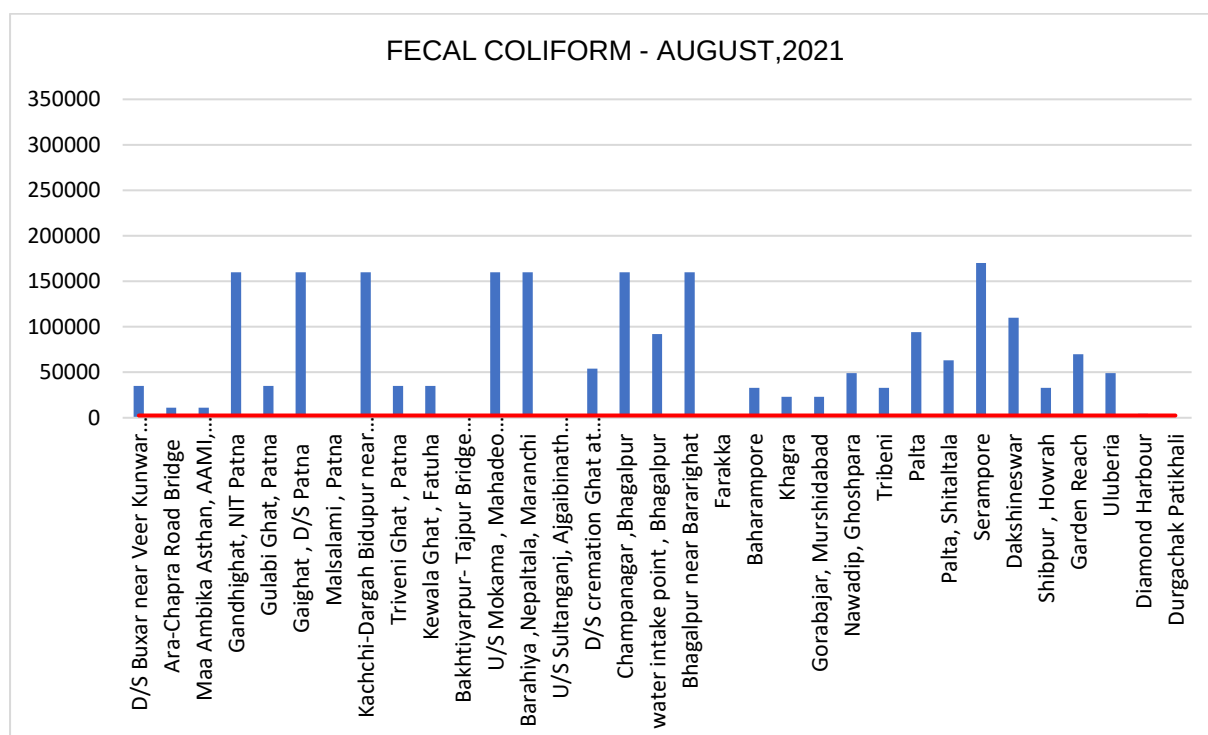


Fig.5.170. Fecal Coliform value for August,2021

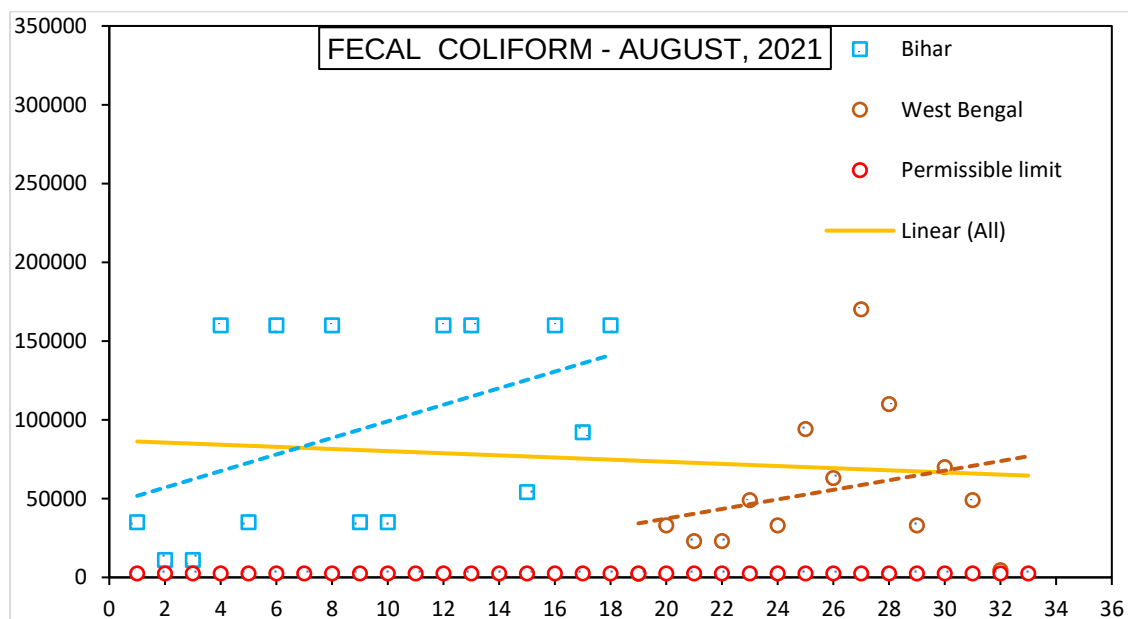


Fig.5.171. Trend Line analysis of Fecal Coliform value for August,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 170000 for August ,2021. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

August 2022:

Table 24: Data of water quality parameter of river Ganga at different stations for August, 2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	10.08.2022	2.1	7.4	7.3	350000
2	Ara-Chapra Road Bridge	23.08.2022	1.4	7.4	7.49	220
3	Maa Ambika Asthan, AAMI	23.08.2022	1.7	7.0	7.61	790
4	Gandhighat, NIT Patna	04.08.2022	2.4	6.5	7.61	350000
5	Gulabi Ghat, Patna	04.08.2022	2.9	6.4	7.74	94000
6	Gaighat , D/S Patna	04.08.2022	2.7	6.2	7.57	35000
7	Malsalami , Patna	22.08.2022	2.6	5.6	7.18	54000
8	Kachchi-Dargah Bidupur	04.08.2022	2.8	6.2	7.7	22000
9	Triveni Ghat , Patna	04.08.2022	3	6.0	8	92000
10	Kewala Ghat , Fatuha	04.08.2022	3	6.0	8.01	7900
11	Bakhtiyarpur- Tajpur Bridge	16.08.2022	2.2	6.8	7.74	33
12	U/S Mokama , Mahadeo Asthan	02.08.2022	2.7	5.8	8.01	540000
13	Barahiya ,Nepaltala, Maranchi	16.08.2022	2.5	5.7	8.03	13000
14	U/S Sultanganj, Ajgaibinath Mandir	17.08.2022	2.1	6.4	7.54	54000
15	D/S cremation Ghat at Sultanganj	17.08.2022	2	6.2	7.62	35000
16	Champanagar ,Bhagalpur	missing	-	-	-	-
17	water intake point , Bhagalpur	16.08.2022	2.5	6.0	7.54	2300
18	Bhagalpur near Bararighat	02.08.2022	2.2	5.3	7.36	35000
19	Farakka	25/08/2022	1.1	6.1	7.91	4900
20	Baharampore	24/08/2022	3	6.6	7.84	130000
21	Khagra	24/08/2022	1.7	7	7.88	24000
22	Gorabajar, Murshidabad	24/08/2022	2.9	2.9	7.85	13000
23	Nawadip, Ghoshpara	23/08/2022	2.7	6.4	7.89	130000
24	Tribeni	missing	-	-	-	-
25	Palta	17/08/2022	2	5.1	7.88	79000
26	Palta, Shitaltala	17/08/2022	3.9	5	7.76	240000
27	Serampore	missing	-	-	-	-
28	Dakshineswar	17/08/2022	3.1	5.6	6.81	49000
29	Shibpur , Howrah	16/08/2022	2.45	5.3	7.02	33000
30	Garden Reach	18/08/2022	3	5.4	7.03	49000
31	Uluberia	22/08/2022	2.55	5.2	7.44	21000
32	Diamond Harbour	23/08/2022	2.5	5.3	7.23	3500
33	Durgachak Patikhali	16/08/2022	0.95	5.6	8.05	17000

Parameter 1: BOD

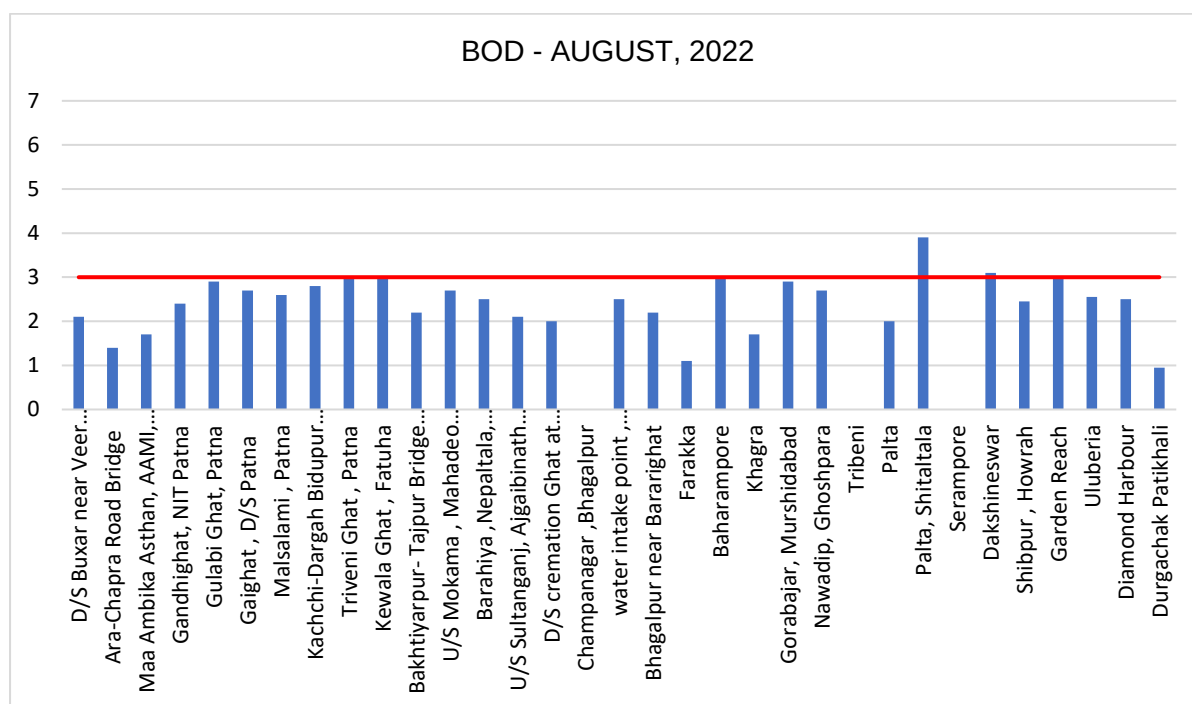


Fig.5.172. BOD value for August,2022

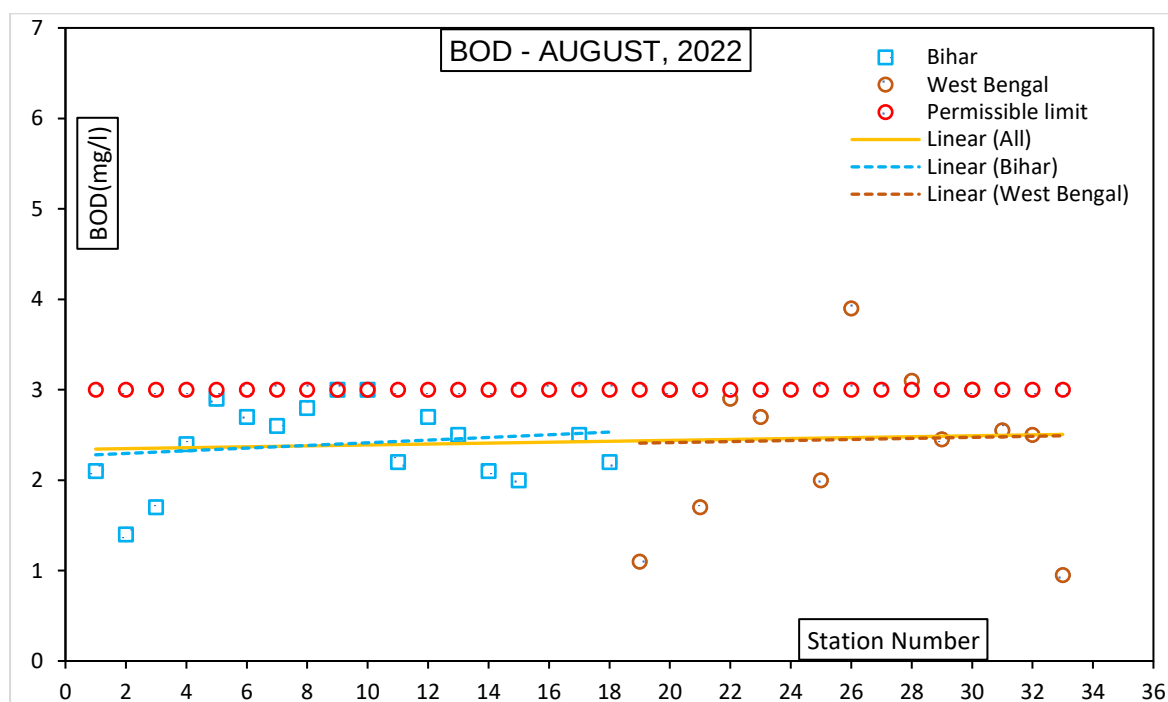


Fig.5.173. Trend Line analysis of BOD value for August,2022

The BOD values were found in the range of 1.1–3.9 mg/l. The highest BOD value of 3.9 mg/l was for Palta, Shitaltala for the month of August, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

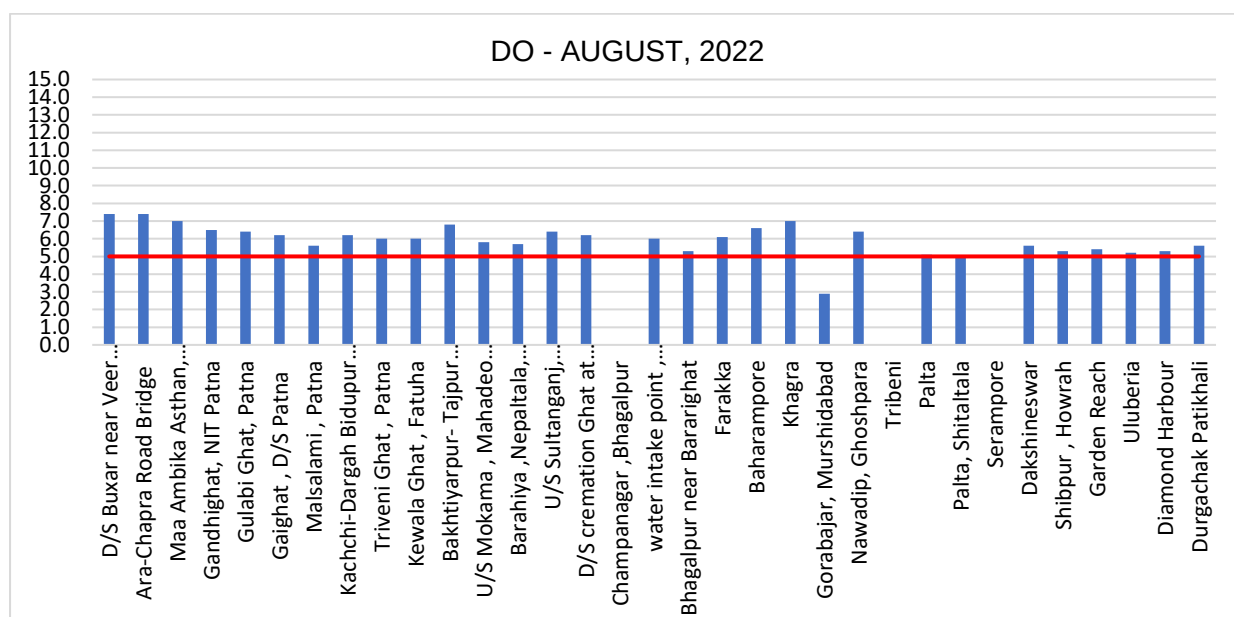


Fig.5.174. DO value for August,2022

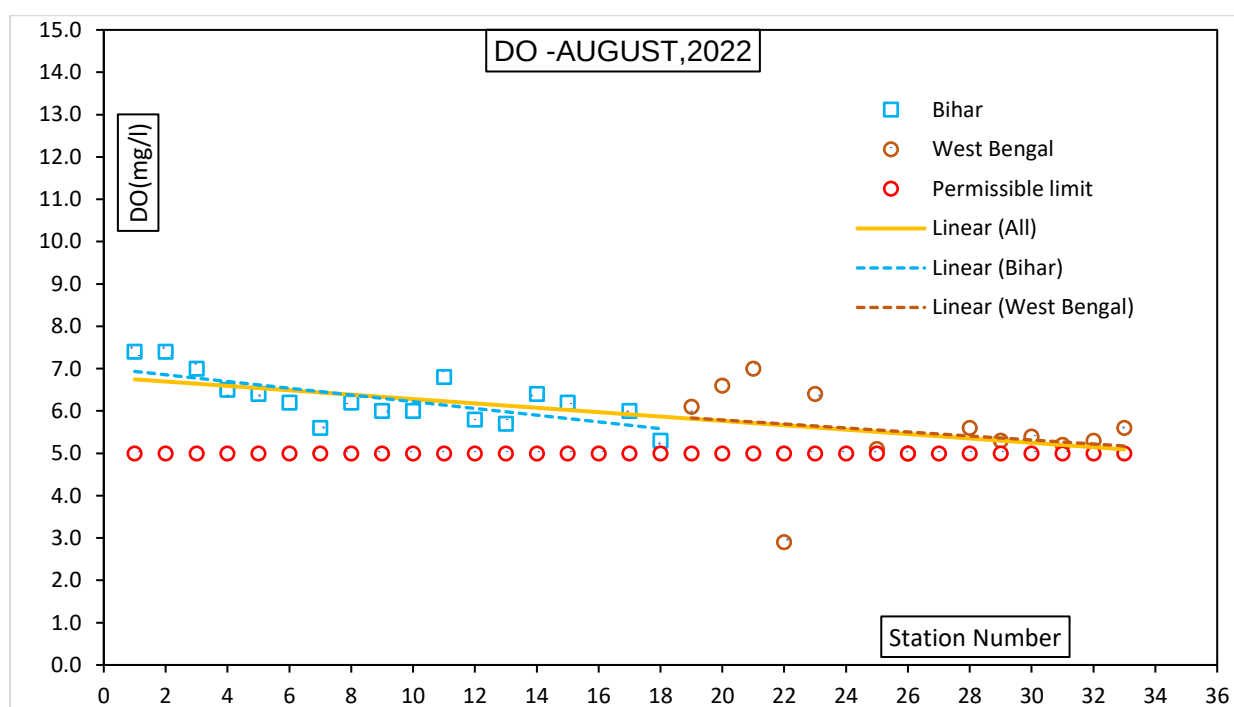


Fig.5.175. Trend Line analysis of DO value for August,2022

The DO values were found in the range of 2.9–7.4 mg/l. The lowest DO value 2.9 mg/l was for Gorabajar, Murshidabad and highest DO value of 7.4 mg/l was for D/S Buxar near Veer Kunwar Singh Road Bridge for the month August, 2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

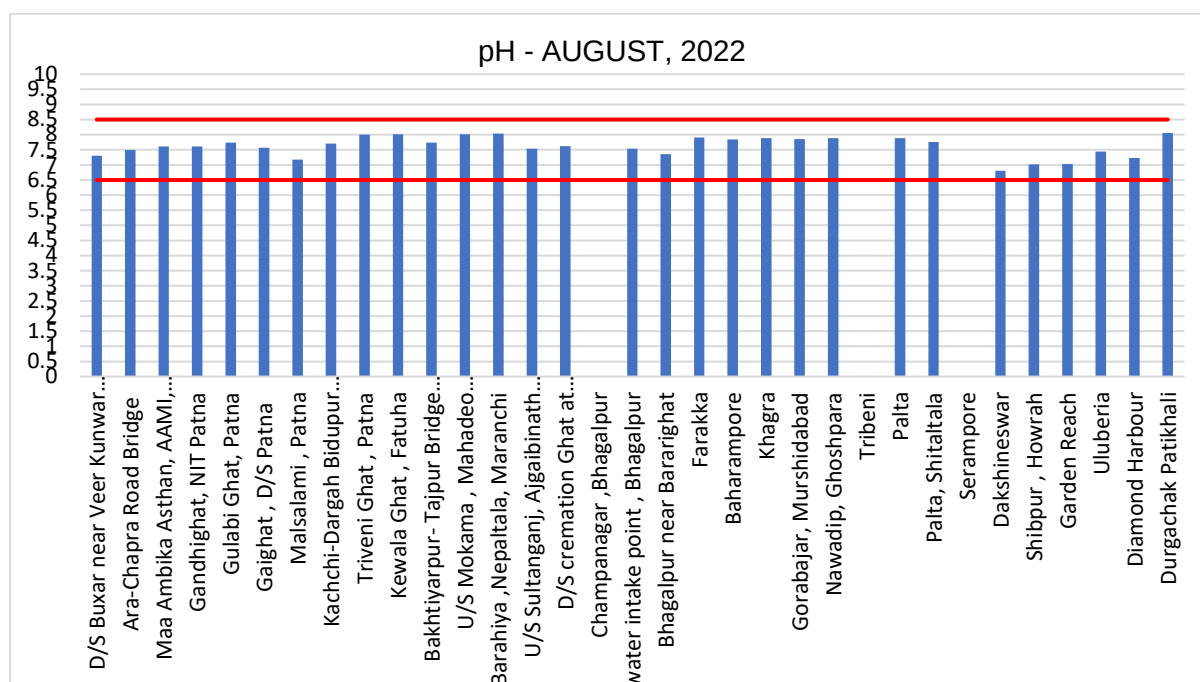


Fig.5.176. pH value for August,2022

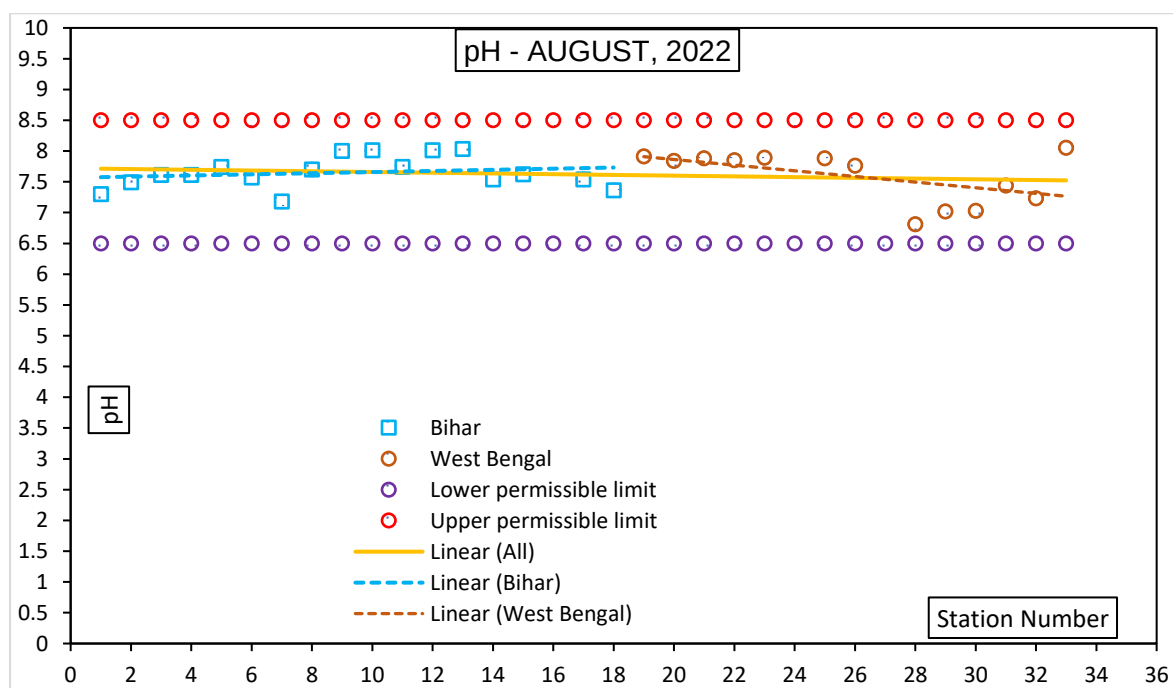


Fig.5.177. Trend Line analysis of pH value for August,2022

The pH values were found in the range of 6.81 – 8.05 for August, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month August, 2022. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

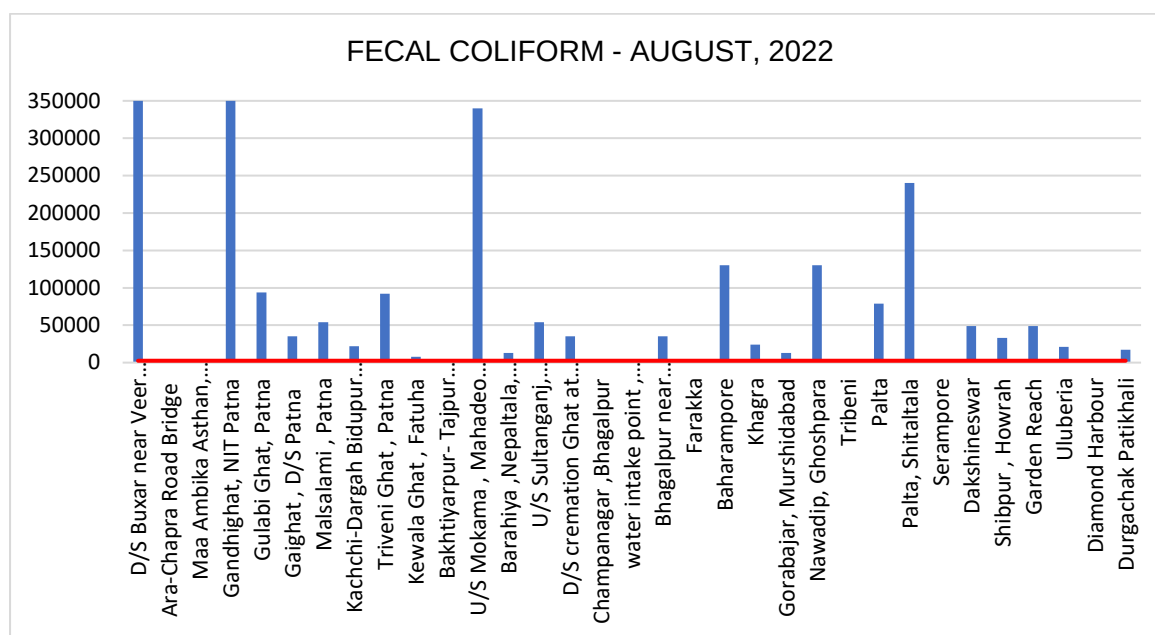


Fig.5.178. Fecal Coliform value for August,2022

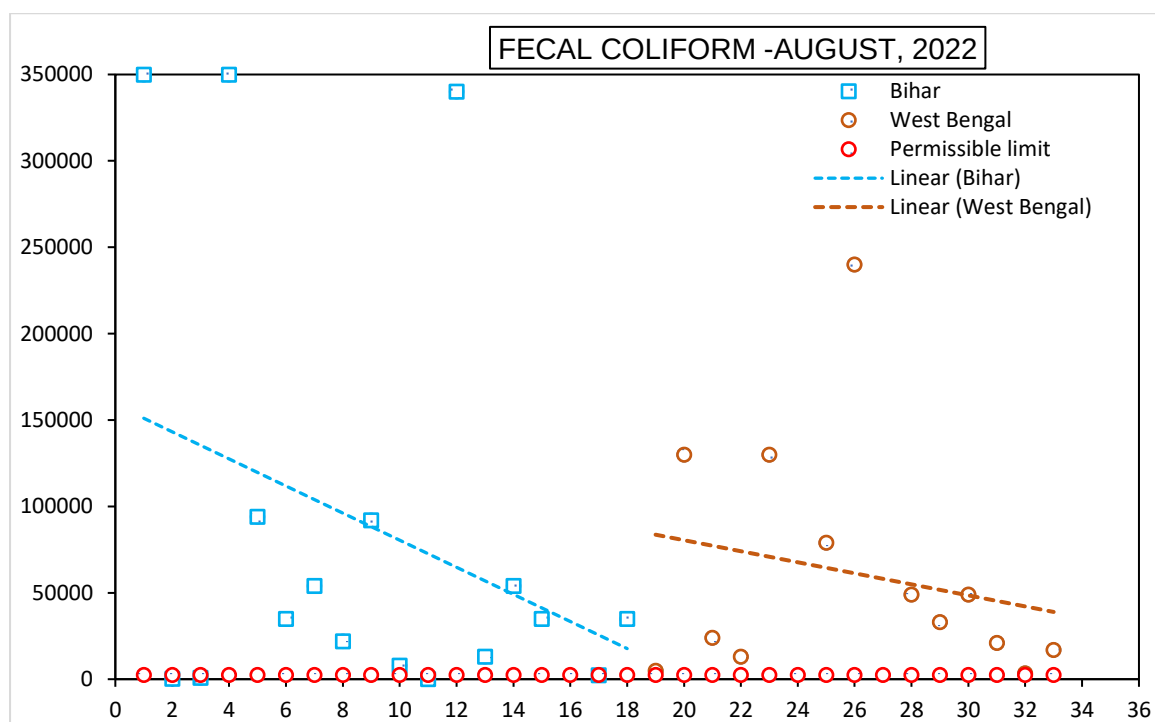


Fig.5.179. Trend Line analysis of Fecal Coliform value for August,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 170000 for August ,2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

August 2023:

Table 25: Data of water quality parameter of river Ganga at different stations for August , 2023						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	16.08.2023	1.8	7.4	7.84	35000
2	Ara-Chapra Road Bridge	17.08.2023	1.8	7.4	7.64	35000
3	Maa Ambika Asthan, AAMI	17.08.2023	2.1	7.3	7.91	35000
4	Gandhighat, NIT Patna	01.08.2023	1.9	7.4	7.68	54000
5	Gulabi Ghat, Patna	01.08.2023	2.1	7.1	7.59	54000
6	Gaighat , D/S Patna	01.08.2023	1.8	7.8	7.64	35000
7	Malsalami , Patna	01.08.2023	1.7	7.3	7.82	35000
8	Kachchi-Dargah Bidupur	01.08.2023	1.4	7.2	7.68	missing
9	Triveni Ghat , Patna	01.08.2023	1.9	7	7.71	7900
10	Kewala Ghat , Fatuha	01.08.2023	1.7	7.4	7.65	54000
11	Bakhtiyarpur- Tajpur Bridge	25.08.2023	1.9	7.8	7.84	35000
12	U/S Mokama , Mahadeo Asthan	11.08.2023	1.6	7.3	7.59	24000
13	Barahiya ,Nepaltala, Maranchi	11.08.2023	1.1	7.4	7.39	1300
14	U/S Sultanganj, Ajgaibinath Mandir	21.08.2023	1.7	7.3	7.93	7900
15	D/S cremation Ghat at Sultanganj	21.08.2023	2.1	6.9	7.99	7900
16	Champanagar ,Bhagalpur	missing	-	-	-	-
17	water intake point , Bhagalpur	22.08.2023	2.2	6.6	7.88	17000
18	Bhagalpur near Bararighat	22.08.2023	2.4	6.4	7.62	35000
19	Farakka	23.08.2023	1.8	5.5	7.24	1300
20	Baharampore	24.08.2023	1.75	7	7.33	9200
21	Khagra	24.08.2023	1.9	7.4	7.46	1700
22	Gorabajar, Murshidabad	24.08.2023	1.8	1.8	7.42	3500
23	Nawadip, Ghoshpara	28.08.2023	2.25	6	7.49	2400
24	Tribeni	missing	-	-	-	-
25	Palta	23.08.2023	2.35	5.8	7.16	7900
26	Palta, Shitaltala	23.08.2023	2.7	5.6	7.41	14000
27	Serampore	missing	-	-	-	-
28	Dakshineswar	16.08.2023	2.78	5.57	7.62	40000
29	Shibpur , Howrah	17.08.2023	2.59	5.49	6.87	49000
30	Garden Reach	18.08.2023	2.66	5.36	6.85	63000
31	Uluberia	24.08.2023	2.72	5.47	7.45	22000
32	Diamond Harbour	24.08.2023	2.47	5.57	7.71	3300
33	Durgachak Patikhali	16.08.2023	1.15	5.8	8.1	7000

Parameter 1: BOD

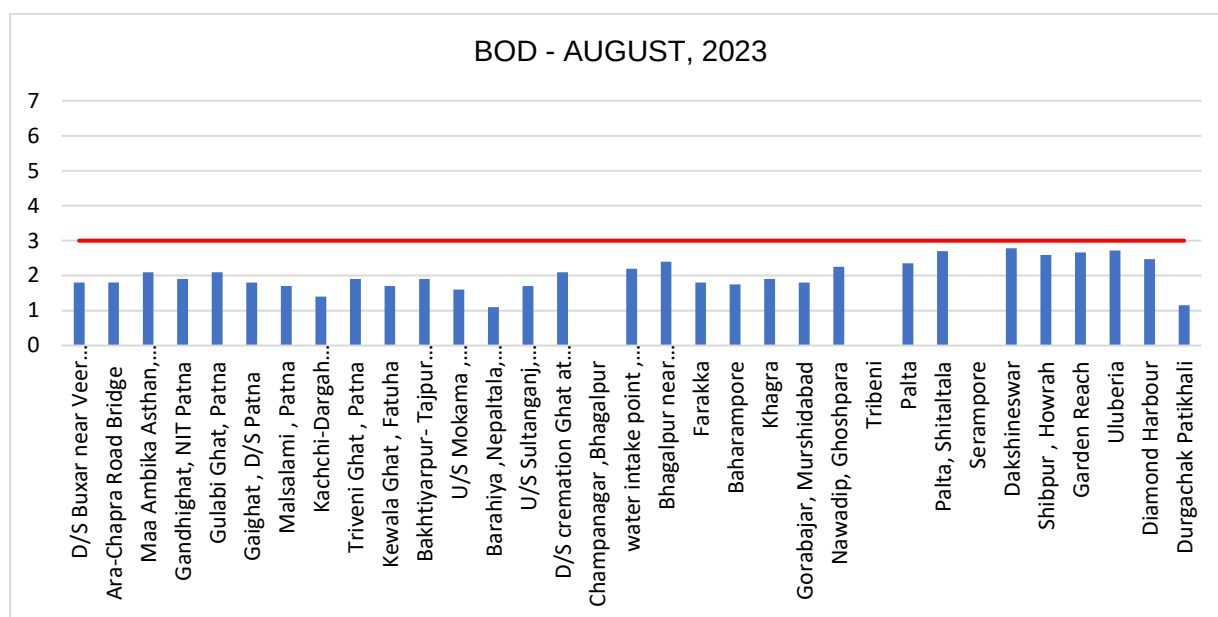


Fig.5.180. BOD value for August,2023

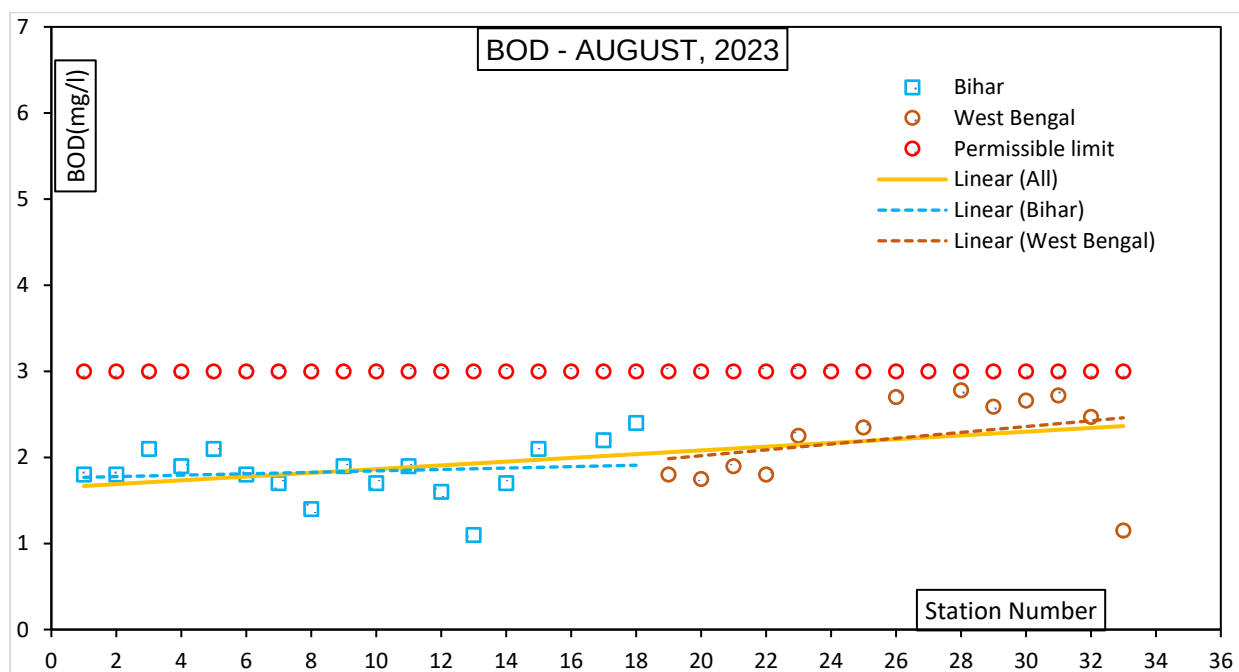


Fig.5.181. Trend Line analysis of BOD value for August,2023

The BOD values were found in the range of 1.1–2.78 mg/l. The highest BOD value of 2.78 mg/l was for Dakshineswar for the month of August, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

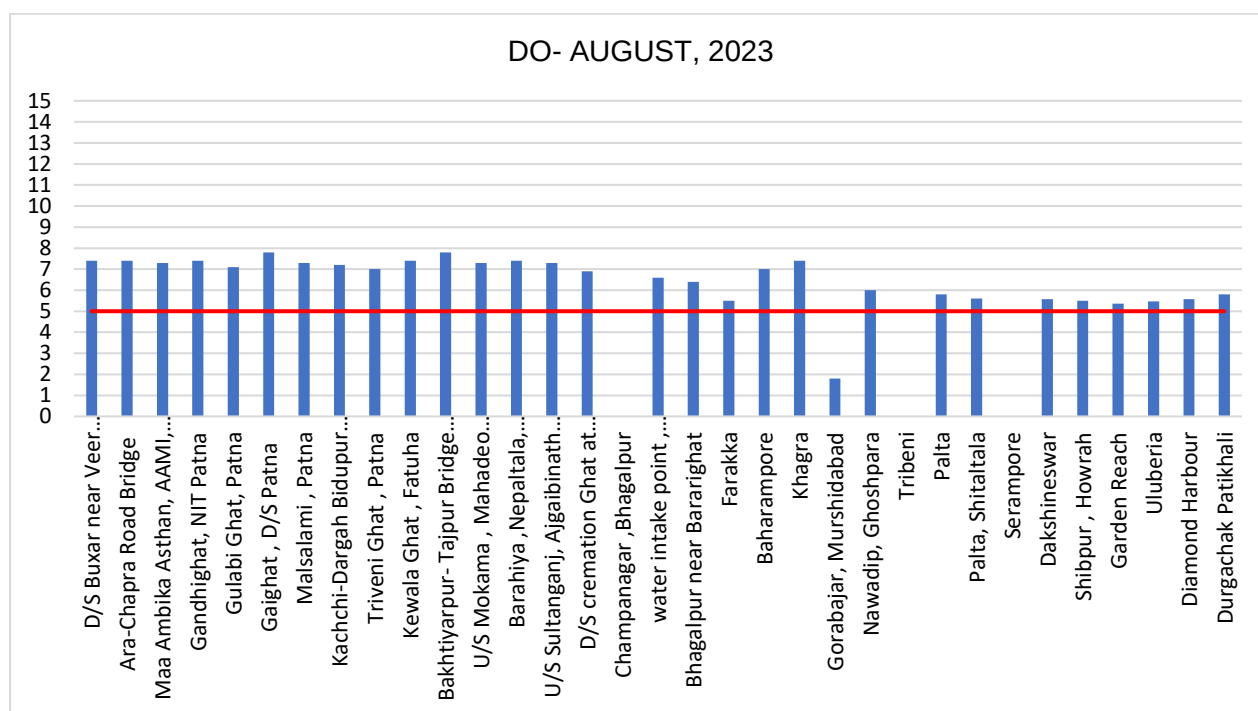


Fig.5.182. DO value for August,2023

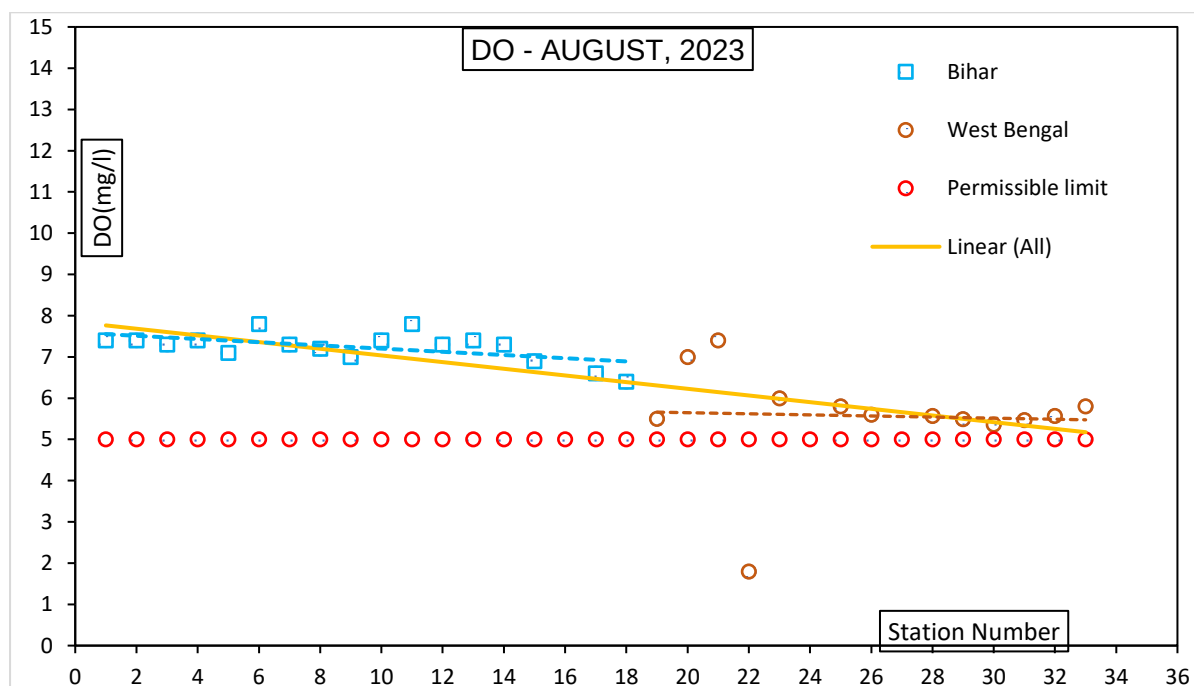


Fig.5.183. Trend Line analysis of DO value for August,2023

The DO values were found in the range of 1.8–7.8 mg/l. The lowest DO value 1.8 mg/l was for Gorabajar, Murshidabad and highest DO value of 7.8 mg/l was for Gaighat, D/S Patna and Bakhtiyarpur- Tajpur Bridge for the month August, 2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is slightly decreasing.

Parameter 3: pH

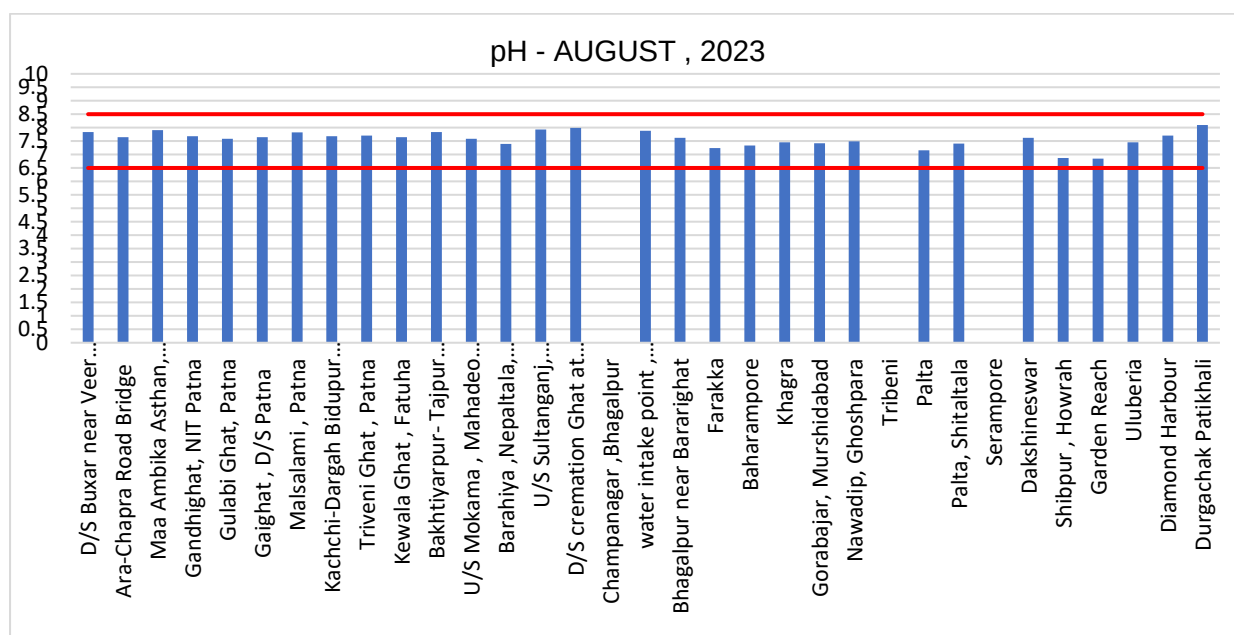


Fig.5.184. pH value for August,2023

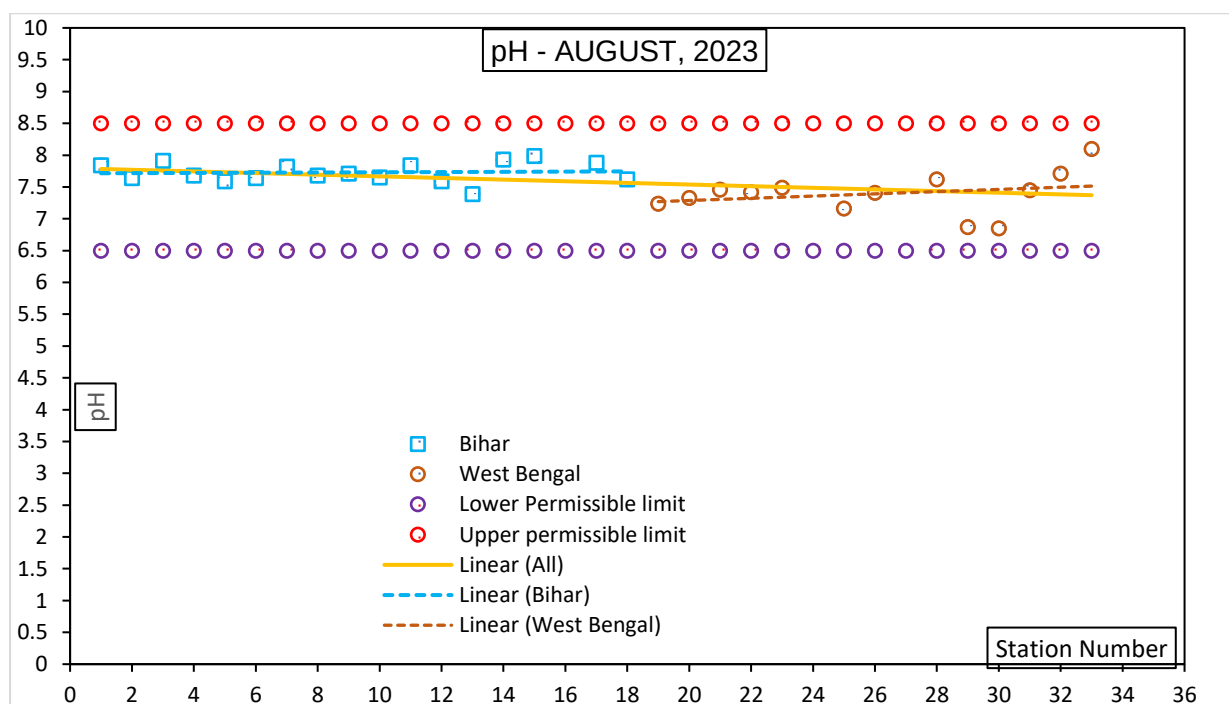


Fig.5.185. Trend Line analysis of pH value for August,2023

The pH values were found in the range of 6.85 – 8.1 for August, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month August, 2023. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 4: Fecal Coliform

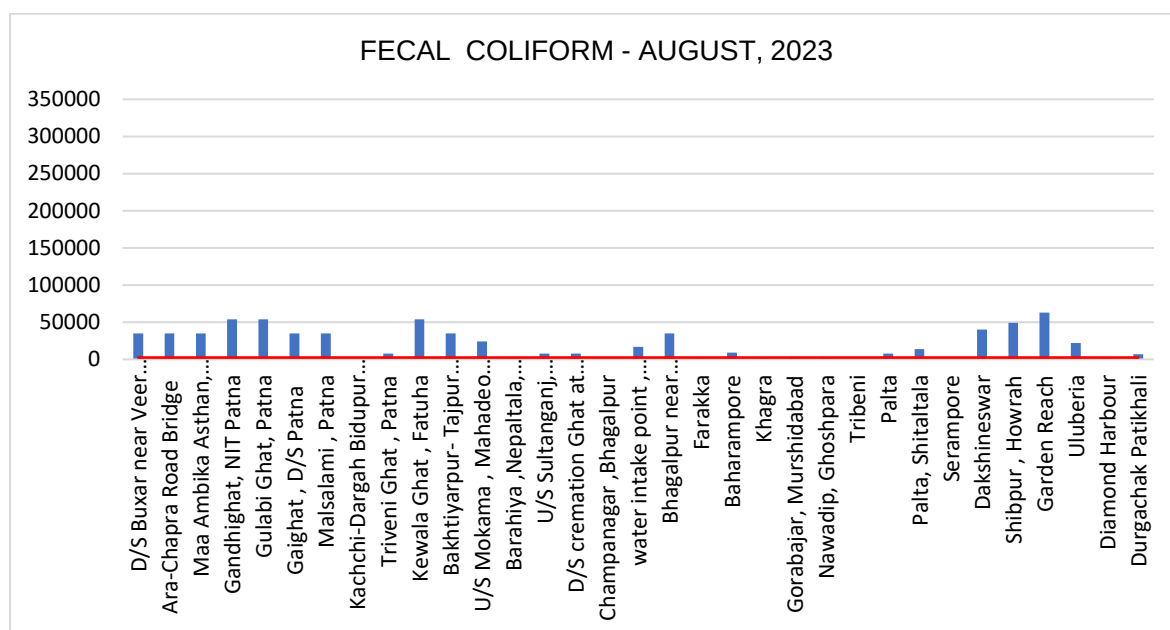


Fig.5.186. Fecal Coliform value for August,2023

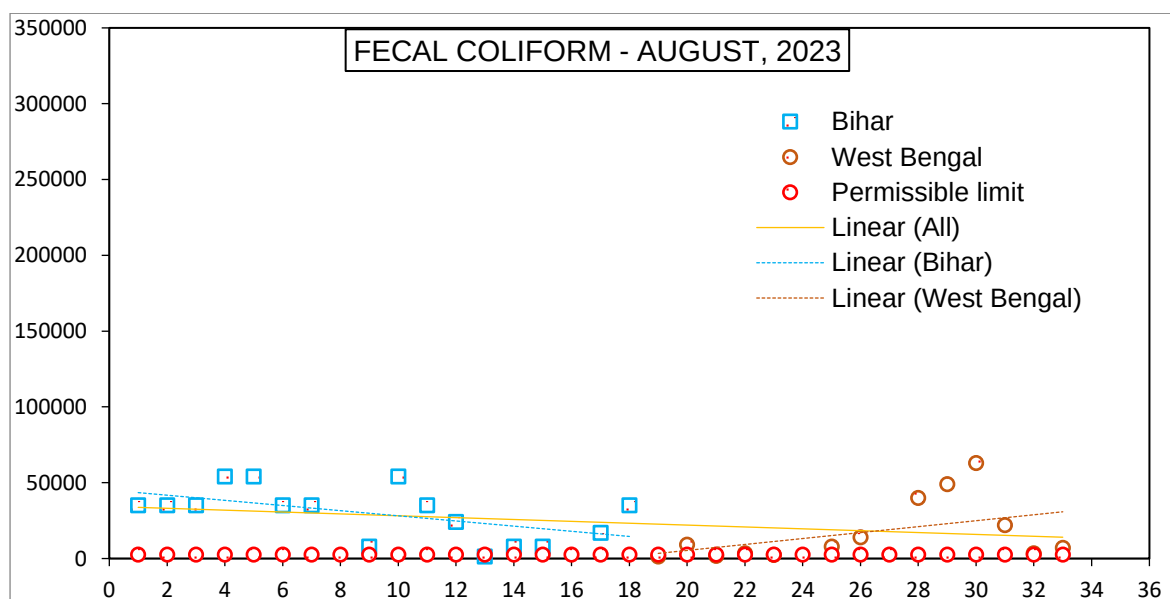


Fig.5.187. Trend Line analysis of Fecal Coliform value for August,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 63000 for August ,2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

September 2021:

Table 26: Data of water quality parameter of river Ganga at different stations for September, 2021

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	15.09.2021	1.1	8.0	7.68	92000
2	Ara-Chapra Road Bridge	16.09.2021	1.2	8.30	7.8	92000
3	Maa Ambika Asthan, AAMI	16.09.2021	1.7	7.7	7.99	92000
4	Gandhighat, NIT Patna	16.09.2021	3	5.4	7.72	160000
5	Gulabi Ghat, Patna	16.09.2021	2.8	5.6	7.63	160000
6	Gaighat , D/S Patna	16.09.2021	3	5.0	7.58	92000
7	Malsalami , Patna	missing	-	-	-	-
8	Kachchi-Dargah Bidupur	missing	-	-	-	-
9	Triveni Ghat , Patna	16.09.2021	2.5	5.7	7.88	35000
10	Kewala Ghat , Fatuha	16.09.2021	2.9	5.4	7.84	35000
11	Bakhtiyarpur- Tajpur Bridge	missing	-	-	-	-
12	U/S Mokama , Mahadeo Asthan	22.09.2021	1.8	6.5	7.79	160000
13	Barahiya ,Nepaltala, Maranchi	22.09.2021	1.3	7.0	7.66	33000
14	U/S Sultanganj, Ajgaibinath Mandir	07.09.2021	1.3	6.9	7.32	54000
15	D/S cremation Ghat at Sultanganj	08.09.2021	2.2	6.1	7.59	160000
16	Champanagar ,Bhagalpur	09.09.2021	1.4	7.1	7.45	160000
17	water intake point , Bhagalpur	09.09.2021	1.6	6.7	7.29	160000
18	Bhagalpur near Bararighat	missing	-	-	-	-
19	Farakka	28/09/2021	2.25	5.1	7.79	1700
20	Baharampore	22/09/2021	2.85	6.5	7.91	170000
21	Khagra	22/09/2021	3.25	6.6	7.92	23000
22	Gorabajar, Murshidabad	22/09/2021	1.7	1.7	7.93	33000
23	Nawadip, Ghoshpara	20/09/2021	2.1	5.6	7.81	49000
24	Tribeni	06/09/2021	2.9	5.3	7.87	79000
25	Palta	27/09/2021	1.7	5	7.69	33000
26	Palta, Shitaltala	27/09/2021	4	4.2	7.3	130000
27	Serampore	29/09/2021	1.1	5.9	7.8	79000
28	Dakshineswar	24/09/2021	2.45	4.7	7.02	79000
29	Shibpur , Howrah	16/09/2021	2.65	4.7	7.21	49000
30	Garden Reach	16/09/2021	3	5.3	7.19	79000
31	Uluberia	17/09/2021	2.4	4.7	7.23	23000
32	Diamond Harbour	17/09/2021	2.8	5.2	7.38	4500
33	Durgachak Patikhali	21/09/2021	2.45	6	6.88	7900

Parameter 1: BOD

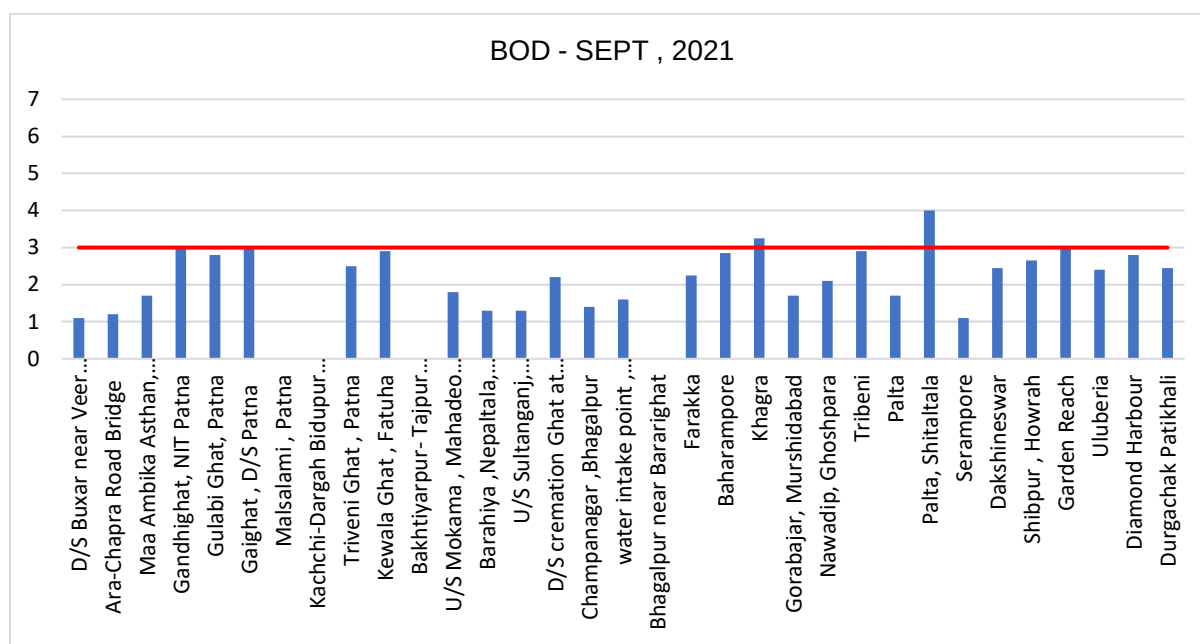


Fig.5.188. BOD value for September,2021

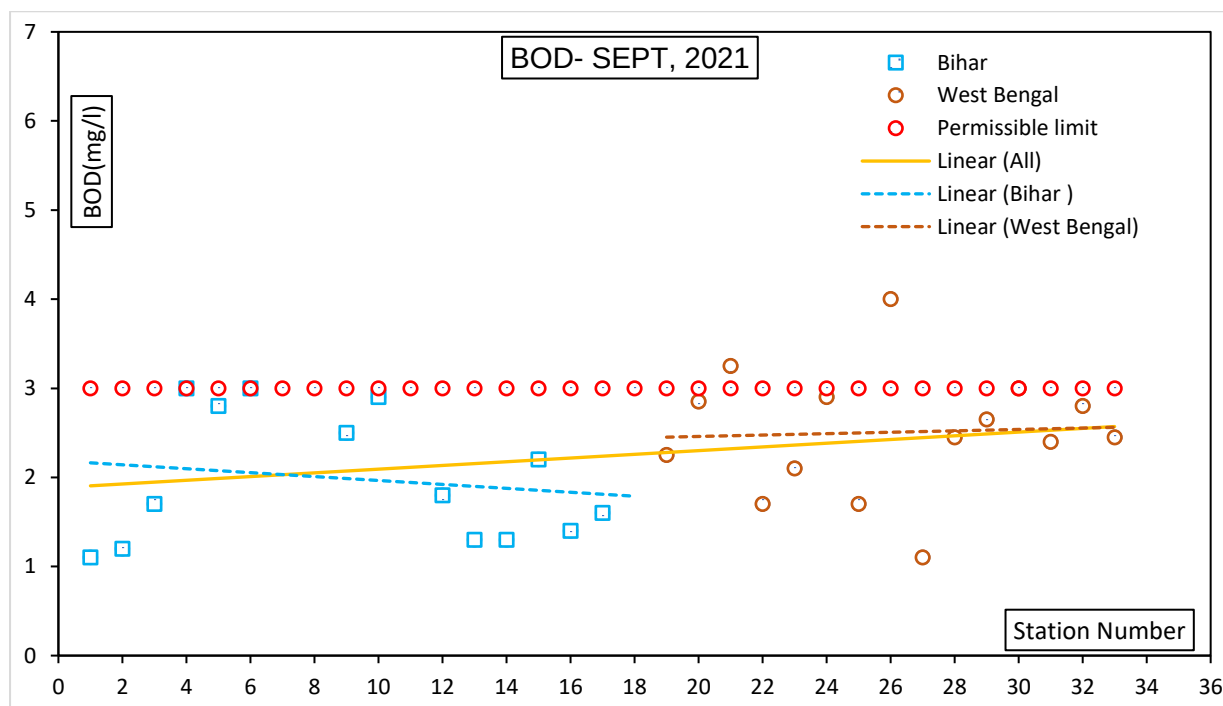


Fig.5.189. Trend Line analysis of BOD value for September,2021

The BOD values were found in the range of 1.1–4.0 mg/l. The highest BOD value of 4.0 mg/l was for Palta, Shitaltala for the month of September, 2021. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

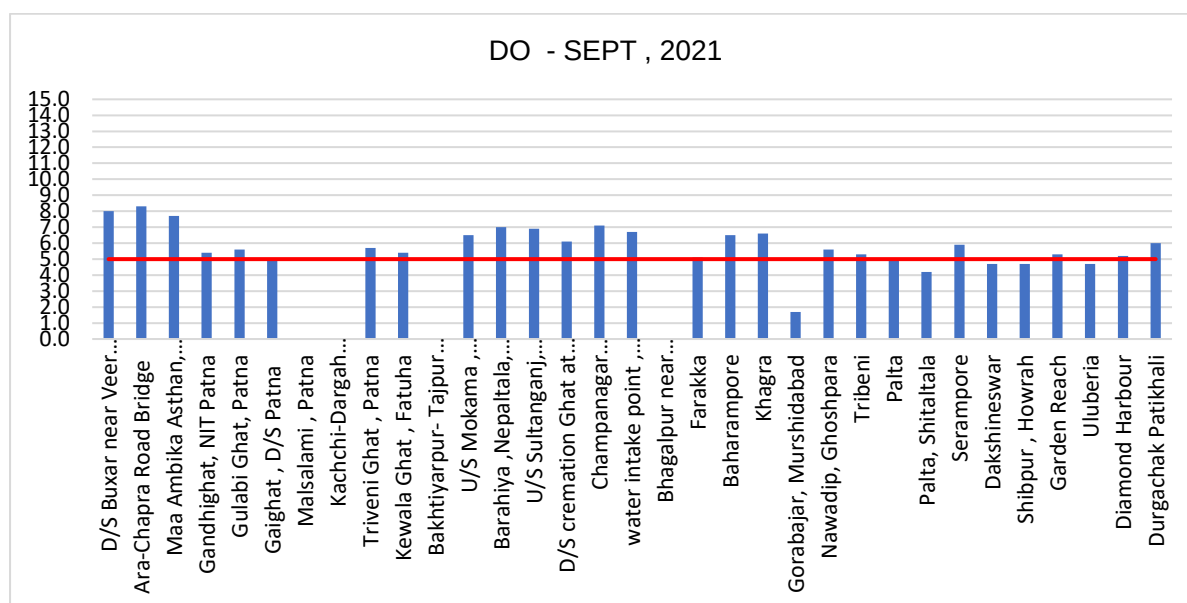


Fig.5.190. DO value for September,2021

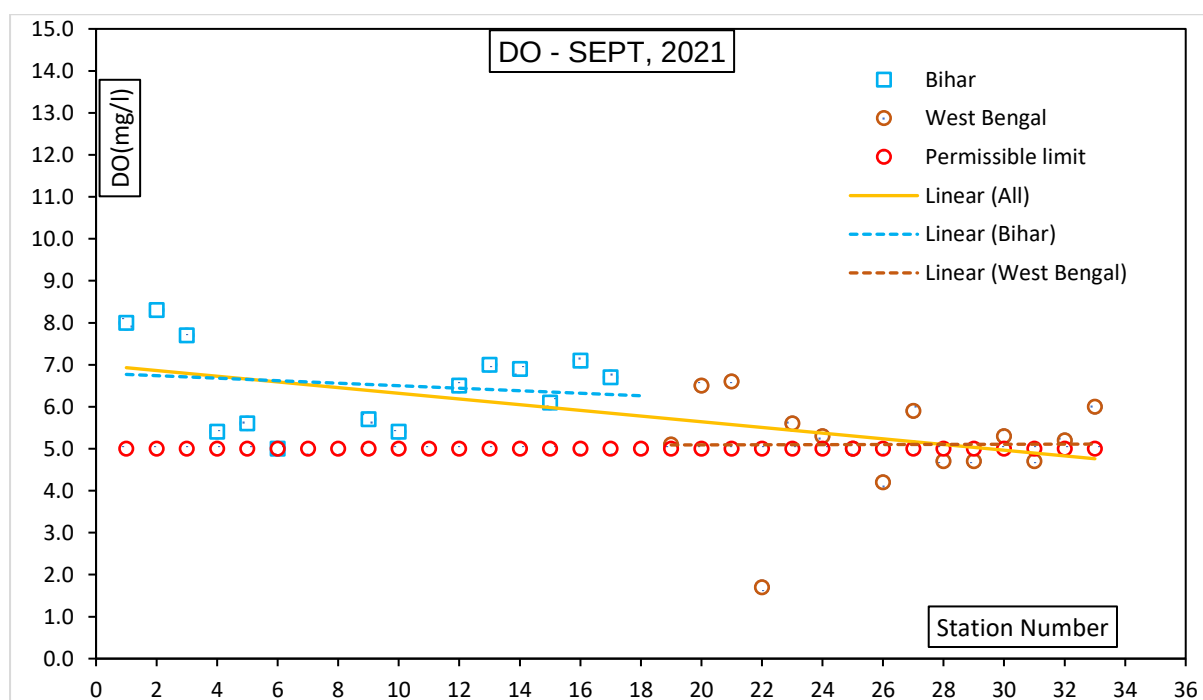


Fig.5.191. Trend Line analysis of DO value for September,2021

The DO values were found in the range of 1.7–8.3 mg/l. The lowest DO value 1.7 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.3 mg/l was for Ara-Chapra Road Bridge for the month September, 2021. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 3: pH

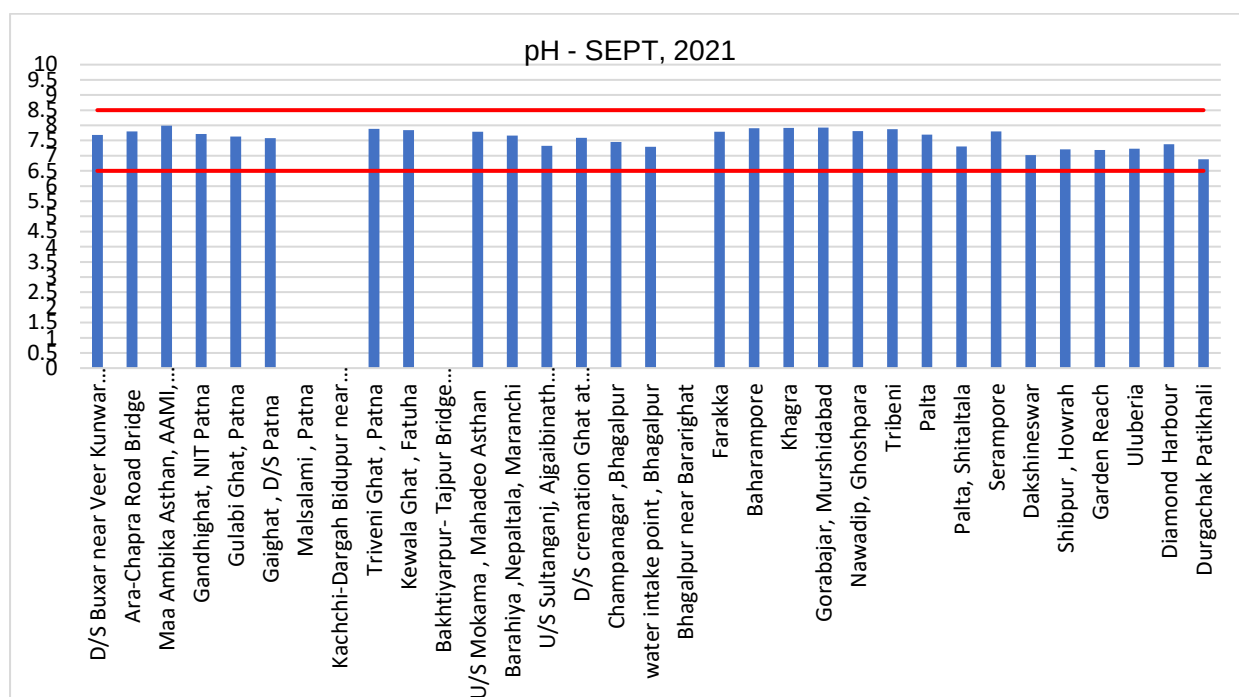


Fig.5.192. pH value for September,2021

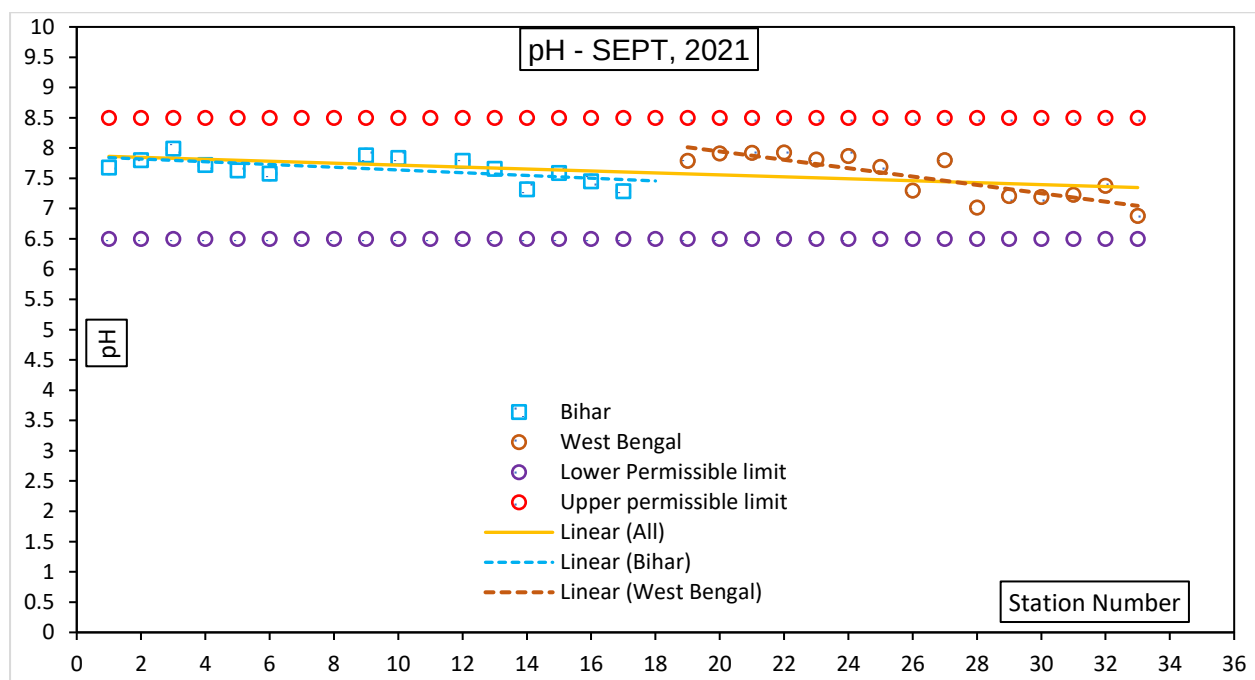


Fig.5.193. Trend Line analysis of pH value for September,2021

The pH values were found in the range of 6.88 – 7.99 for September, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month September, 2021. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

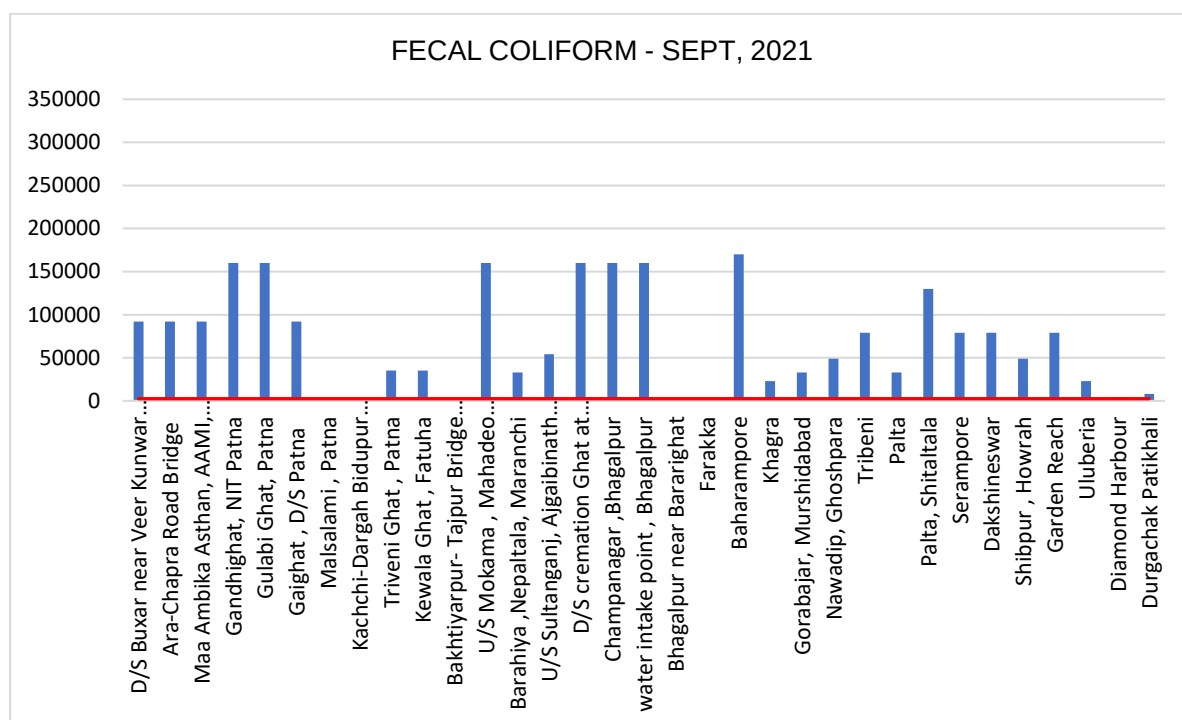


Fig.5.194. Fecal Coliform value for September,2021

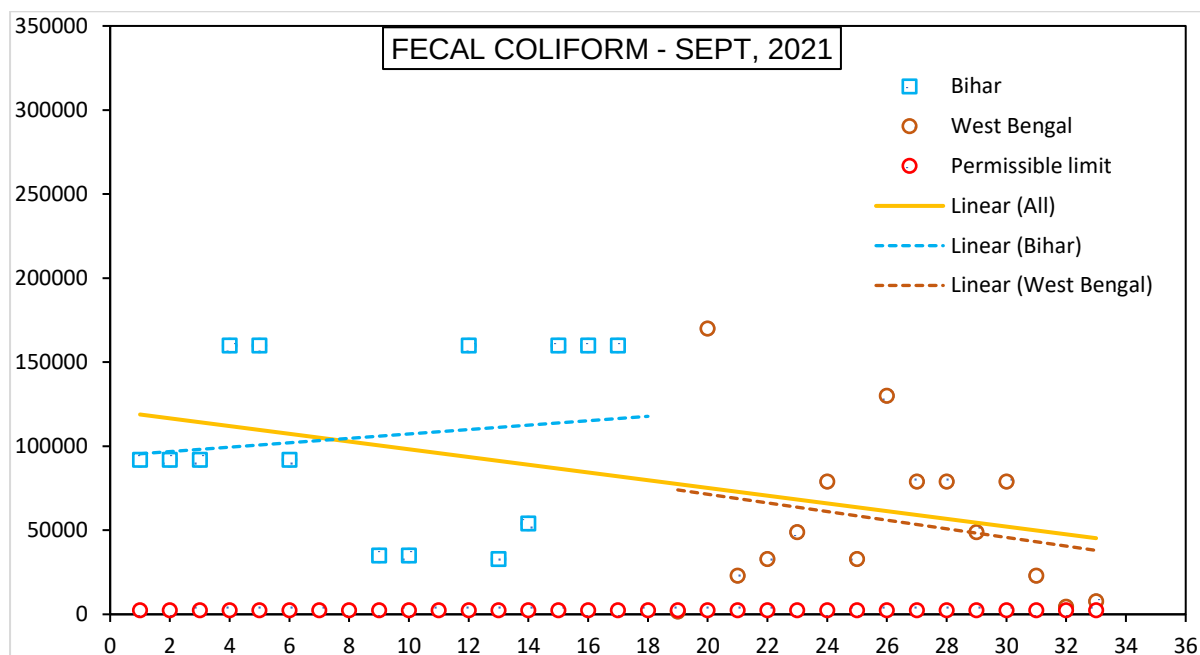


Fig.5.195. Trend Line analysis of Fecal Coliform value for September,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 170000 for September, 2021. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

September 2022:

Table 27: Data of water quality parameter of river Ganga at different stations for September,2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	15.09.2022	1.7	7.3	7.76	54000
2	Ara-Chapra Road Bridge	09.09.2022	2	6.7	6.96	3500
3	Maa Ambika Asthan, AAMI	14.09.2022	1.3	7.2	6.99	3300
4	Gandhighat, NIT Patna	15.09.2022	2.6	6.5	7.6	170000
5	Gulabi Ghat, Patna	14.09.2022	2.7	6.2	7.28	130000
6	Gaighat , D/S Patna	14.09.2022	1.9	6.9	7.35	8400
7	Malsalami , Patna	15.09.2022	2.3	5.9	7.6	7900
8	Kachchi-Dargah Bidupur	05.09.2022	1.7	6.3	7.33	92000
9	Triveni Ghat , Patna	05.09.2022	1.9	6.6	7.23	54000
10	Kewala Ghat , Fatuha	14.09.2022	2.5	5.8	7.34	3300
11	Bakhtiyarpur- Tajpur Bridge	05.09.2022	2.9	5.4	7.92	35000
12	U/S Mokama , Mahadeo Asthan	05.09.2022	2.6	5.4	7.29	11000
13	Barahiya ,Nepaltala, Maranchi	05.09.2022	2.9	5.1	7.42	54000
14	U/S Sultanganj, Ajgaibinath Mandir	05.09.2022	2.1	6.0	7.2	240000
15	D/S cremation Ghat at Sultanganj	05.09.2022	2.5	6.0	7.3	240000
16	Champanagar ,Bhagalpur	22.09.2022	2	6.3	7.28	92000
17	water intake point , Bhagalpur	14.09.2022	1.2	7.5	7.19	17000
18	Bhagalpur near Bararighat	14.09.2022	1.6	6.8	7.26	1300
19	Farakka	22/09/2022	1.5	6.2	7.94	1300
20	Baharampore	22/09/2022	2.4	6.2	7.88	170000
21	Khagra	22/09/2022	1.9	6.4	7.82	1300
22	Gorabajar, Murshidabad	22/09/2022	2.8	2.8	7.69	23000
23	Nawadip, Ghoshpara	20/09/2022	2.05	5.5	7.84	2400
24	Tribeni	missing	-	-	-	-
25	Palta	26/09/2022	2.8	5.8	7.9	33000
26	Palta, Shitaltala	26/09/2022	1.2	5.7	8.05	49000
27	Serampore	missing	-	-	-	-
28	Dakshineswar	19/09/2022	3.3	5.8	7.11	79000
29	Shibpur , Howrah	16/09/2022	3.15	5.6	7.2	33000
30	Garden Reach	16/09/2022	3.1	5.2	7.3	49000
31	Uluberia	20/09/2022	3	5.4	7.35	13000
32	Diamond Harbour	21/09/2022	3.05	5.4	6.93	4500
33	Durgachak Patikhali	21/09/2022	2.55	6.6	8.4	14000

Parameter 1: BOD

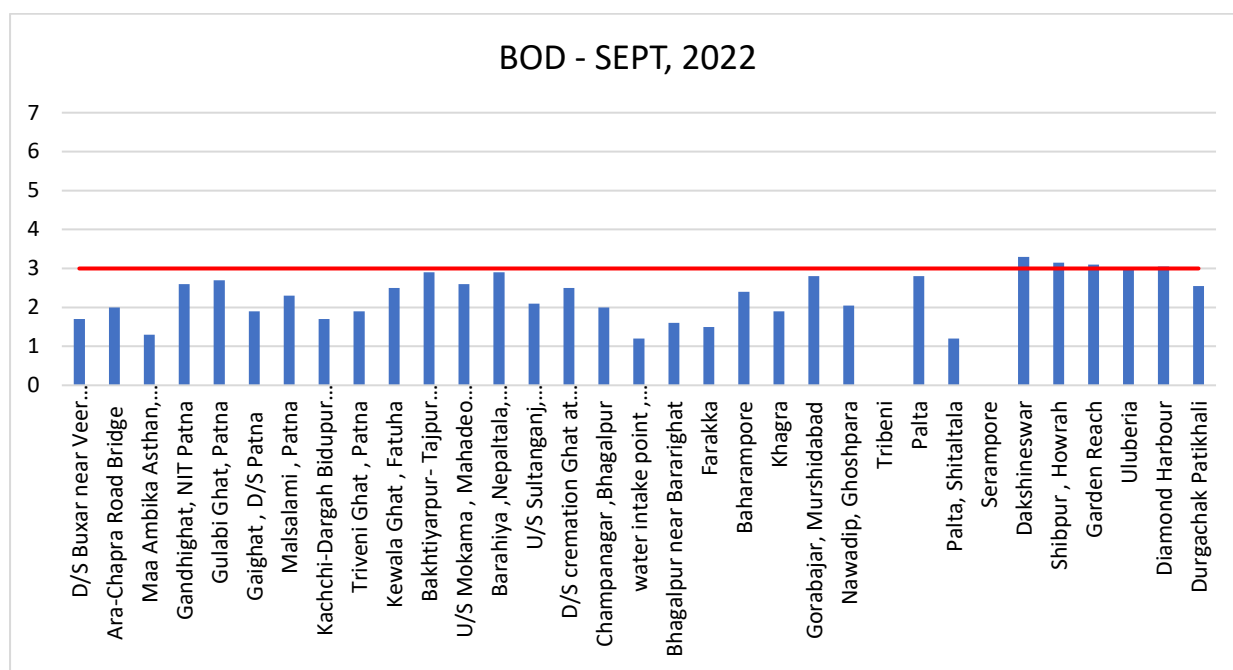


Fig.5.196. BOD value for September,2022

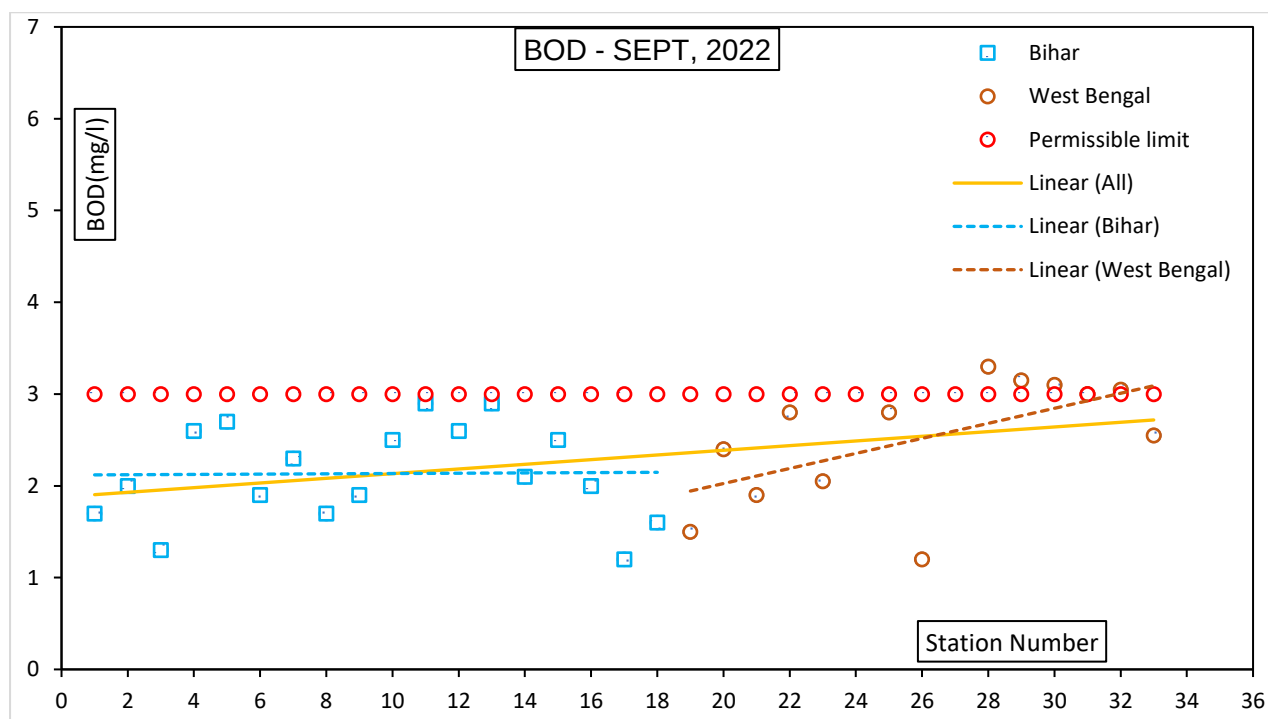


Fig.5.197. Trend Line analysis of BOD value for September,2022

The BOD values were found in the range of 1.2–3.3 mg/l. The highest BOD value of 3.3 mg/l was Dakshineswar for the month of September, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

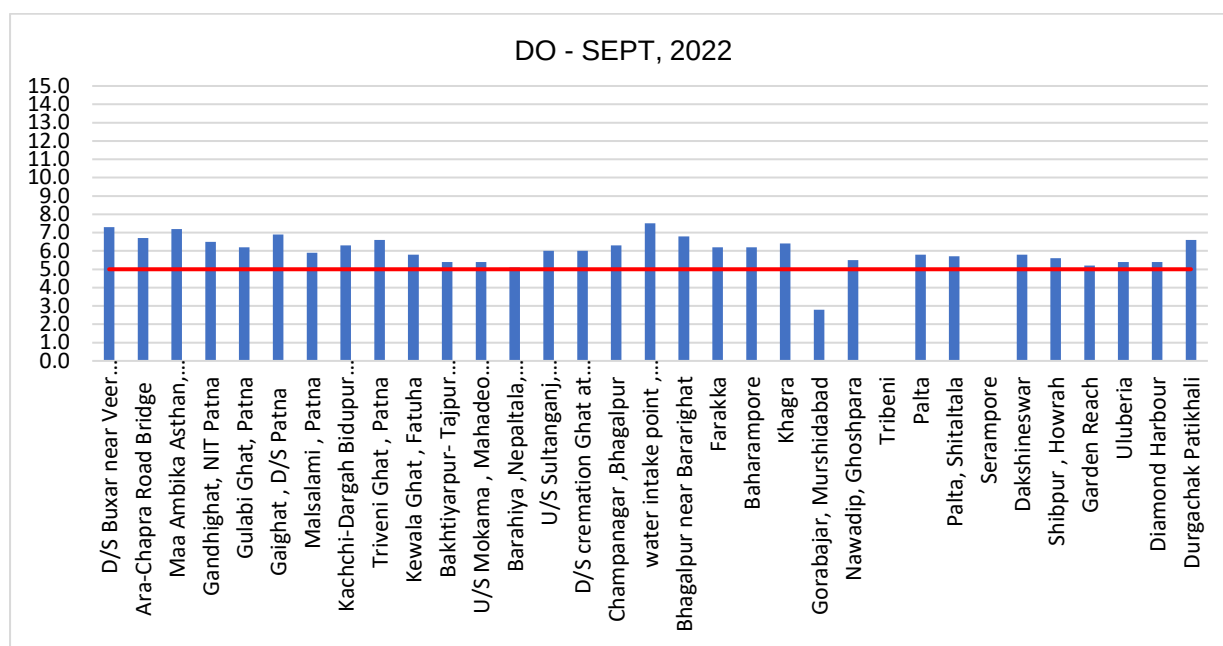


Fig.5.198. DO value for September,2022

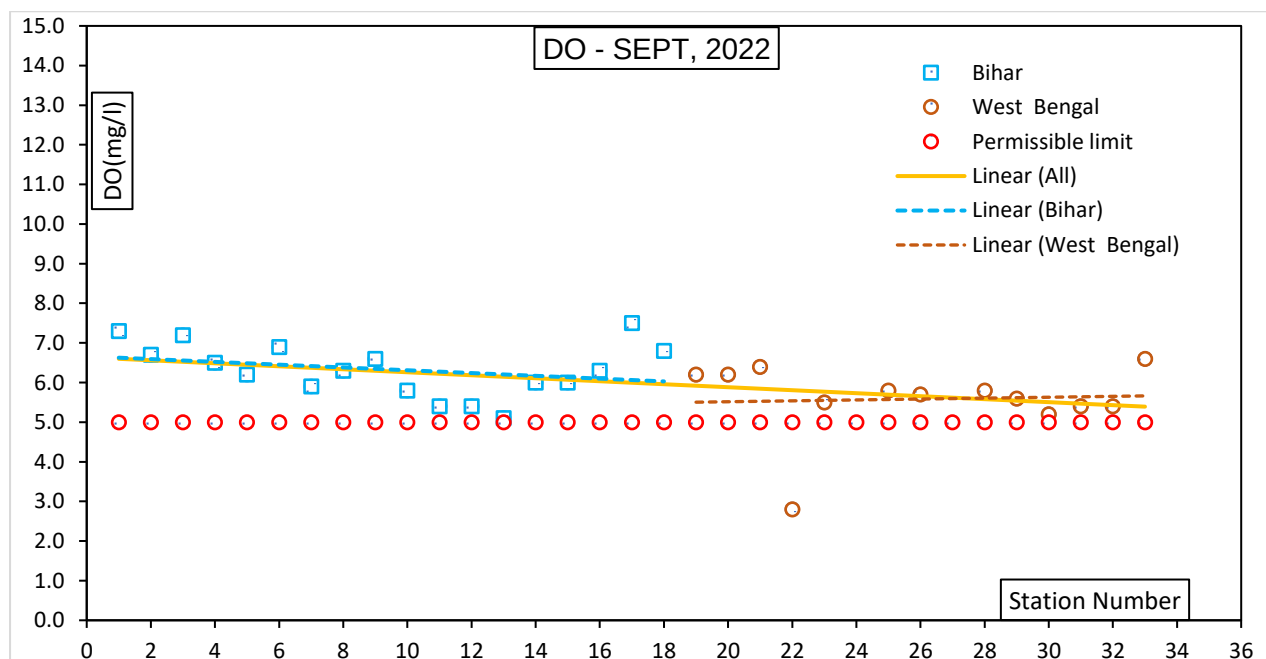


Fig.5.199. Trend Line analysis of DO value for September,2022

The DO values were found in the range of 2.8–7.5 mg/l. The lowest DO value 2.8 mg/l was for Gorabajar, Murshidabad and highest DO value of 7.5 mg/l was for water intake point, Bhagalpur September, 2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

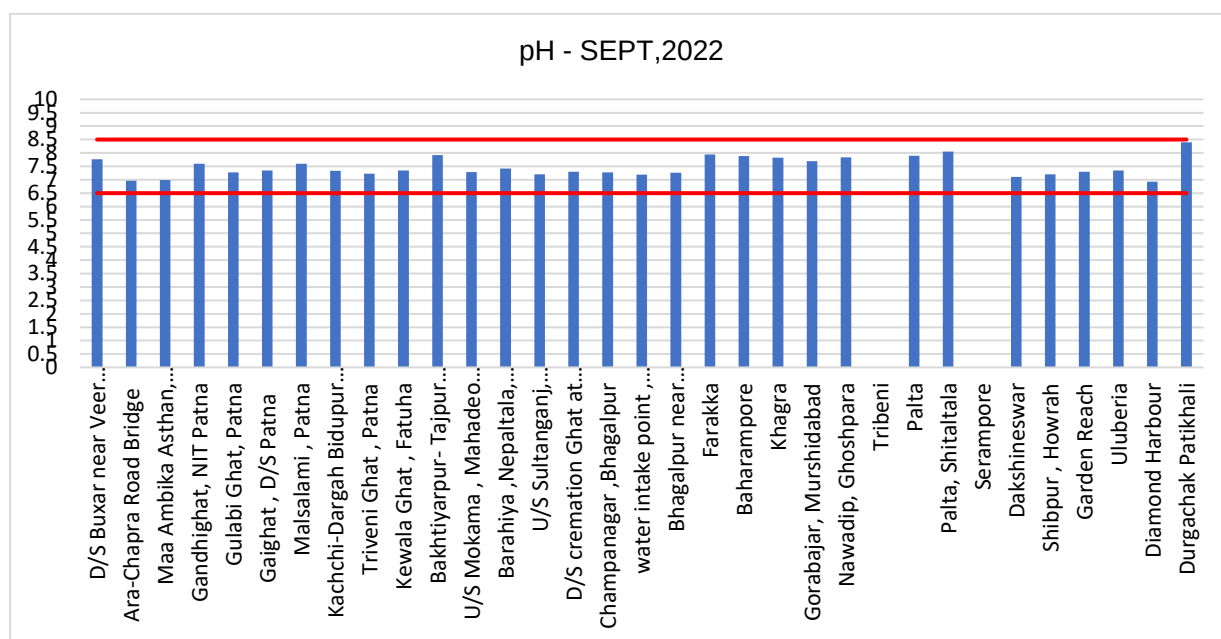


Fig.5.200. pH value for September,2022

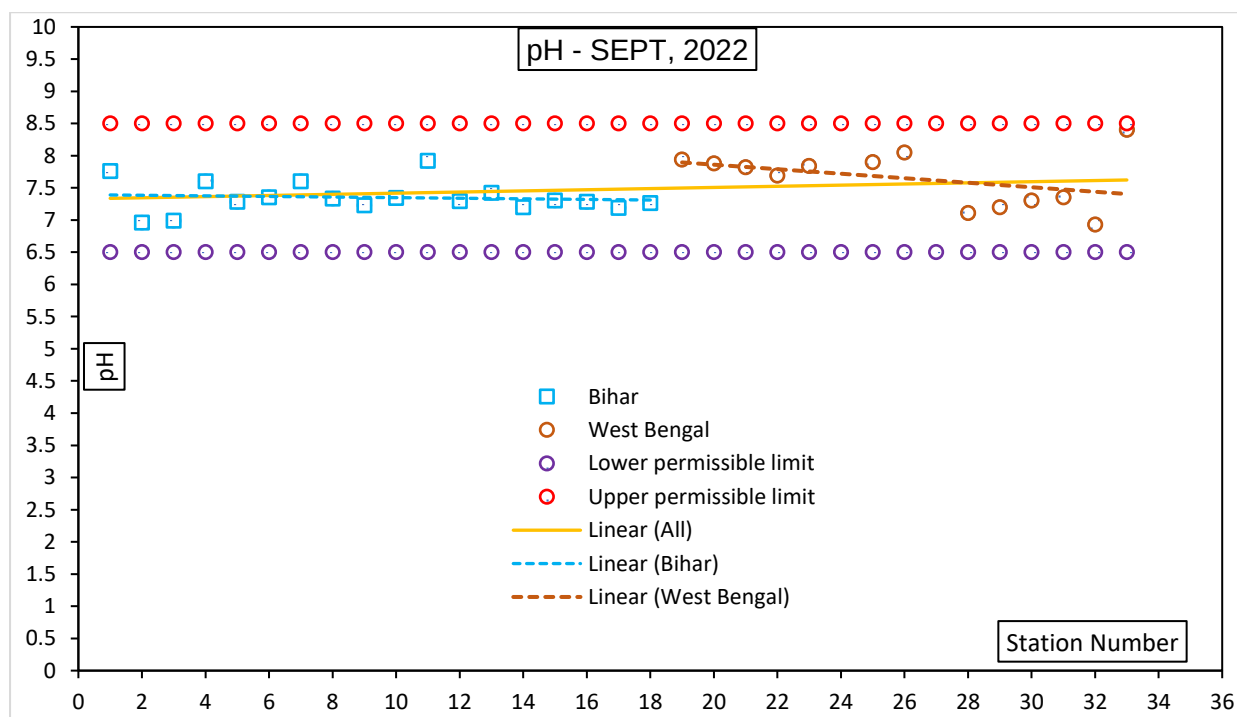


Fig.5.201. Trend Line analysis of DO value for September,2022

The pH values were found in the range of 6.93 – 8.4 for September, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month September, 2022. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

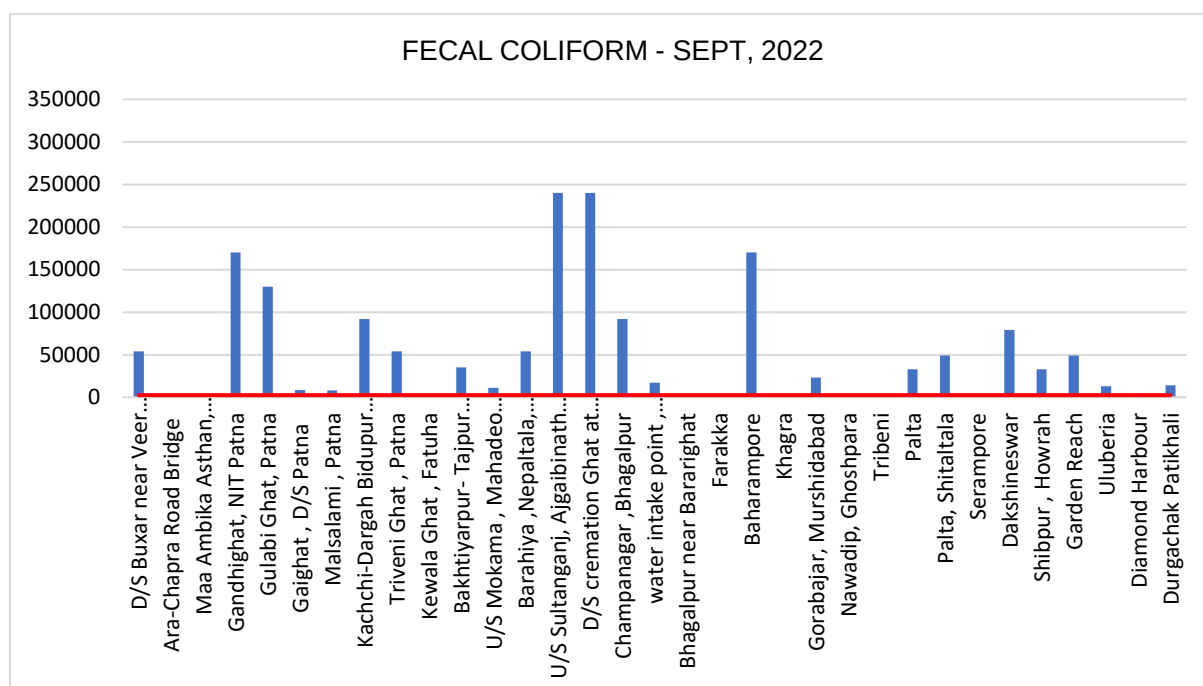


Fig.5.202. Fecal Coliform value for September,2022

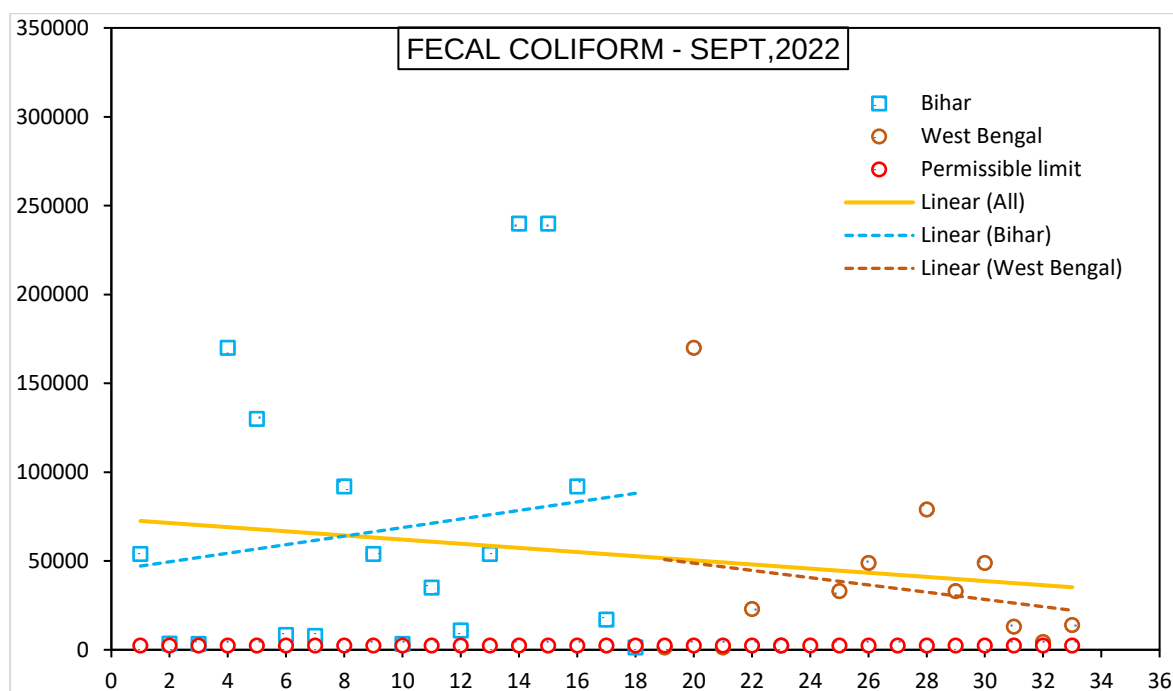


Fig.5.203. Trend Line analysis of Fecal Coliform value for September,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000 for September, 2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

September 2023:

Table 28: Data of water quality parameter of river Ganga at different stations for September, 2023

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	23.09.2023	1.4	7.2	7.52	2300
2	Ara-Chapra Road Bridge	24.09.2023	1.3	7.7	7.72	780
3	Maa Ambika Asthan, AAMI	24.09.2023	1.5	7.2	7.71	780
4	Gandhighat, NIT Patna	05.09.2023	2.5	6.1	7.56	35000
5	Gulabi Ghat, Patna	20.09.2023	1.6	7.7	7.63	13000
6	Gaighat , D/S Patna	20.09.2023	1.7	7.8	7.76	4900
7	Malsalami , Patna	20.09.2023	1.4	8.0	7.67	2300
8	Kachchi-Dargah Bidupur	20.09.2023	1.5	8.3	7.71	3300
9	Triveni Ghat , Patna	20.09.2023	1.6	8.1	7.82	2300
10	Kewala Ghat , Fatuha	20.09.2023	1.8	7.8	7.69	4900
11	Bakhtiyarpur- Tajpur Bridge	18.09.2023	1	8.5	7.65	7900
12	U/S Mokama , Mahadeo Asthan	18.09.2023	1.8	7.9	7.84	2300
13	Barahiya ,Nepaltala, Maranchi	18.09.2023	1.9	7.7	7.93	7900
14	U/S Sultanganj, Ajgaibinath Mandir	14.09.2023	1.5	7.5	7.71	13000
15	D/S cremation Ghat at Sultanganj	14.09.2023	1.6	7.3	7.83	35000
16	Champanagar ,Bhagalpur	28.09.2023	1.3	7.8	7.71	2300
17	water intake point , Bhagalpur	15.09.2023	1.9	7.1	7.62	17000
18	Bhagalpur near Bararighat	15.09.2023	2.3	6.7	7.89	17000
19	Farakka	20.09.2023	1.8	6.7	7.27	1300
20	Baharampore	21.09.2023	1.6	6.9	7.52	9200
21	Khagra	21.09.2023	1.9	6.9	7.49	1100
22	Gorabajar, Murshidabad	21.09.2023	1.5	1.5	7.43	5400
23	Nawadip, Ghoshpara	26.09.2023	1.7	5.4	6.95	3500
24	Tribeni	missing	-	-	-	-
25	Palta	19.09.2023	2.9	6.4	7.09	22000
26	Palta, Shitaltala	19.09.2023	2.8	6.1	7.27	14000
27	Serampore	missing	-	-	-	-
28	Dakshineswar	18.09.2023	2.53	5.36	7.24	70000
29	Shibpur , Howrah	21.09.2023	2.71	5.36	6.84	43000
30	Garden Reach	21.09.2023	2.57	5.46	6.93	79000
31	Uluberia	18.09.2023	2.63	5.26	7.17	22000
32	Diamond Harbour	20.09.2023	2.52	5.41	7.45	7800
33	Durgachak Patikhali	20.09.2023	1.25	5.5	8.3	4600

Parameter 1: BOD

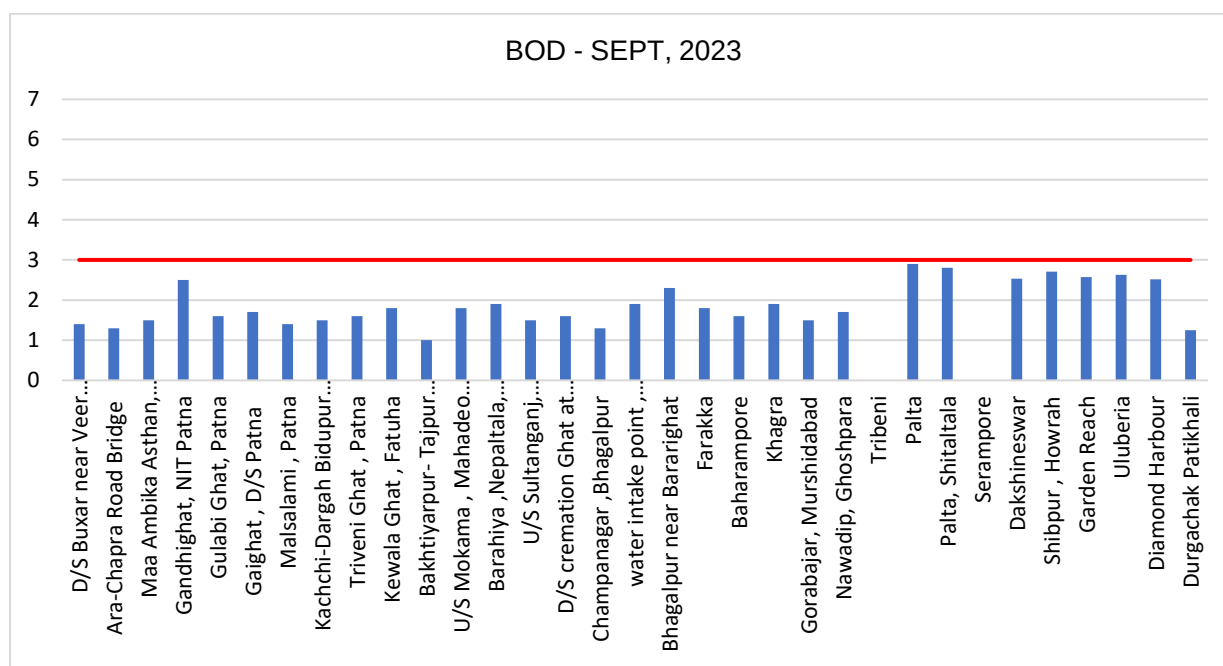


Fig.5.204. BOD value for September,2023

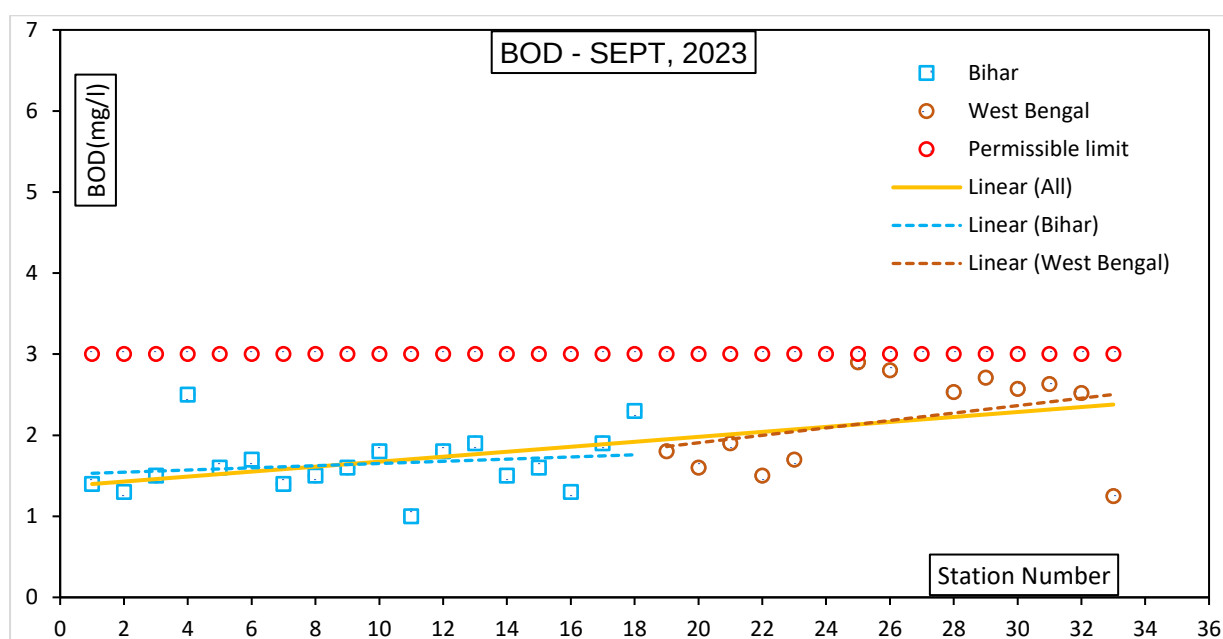


Fig.5.205. Trend Line analysis of BOD value for September,2023

The BOD values were found in the range of 1.0–2.9 mg/l. The highest BOD value of 2.9 mg/l was Palta for the month of September, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

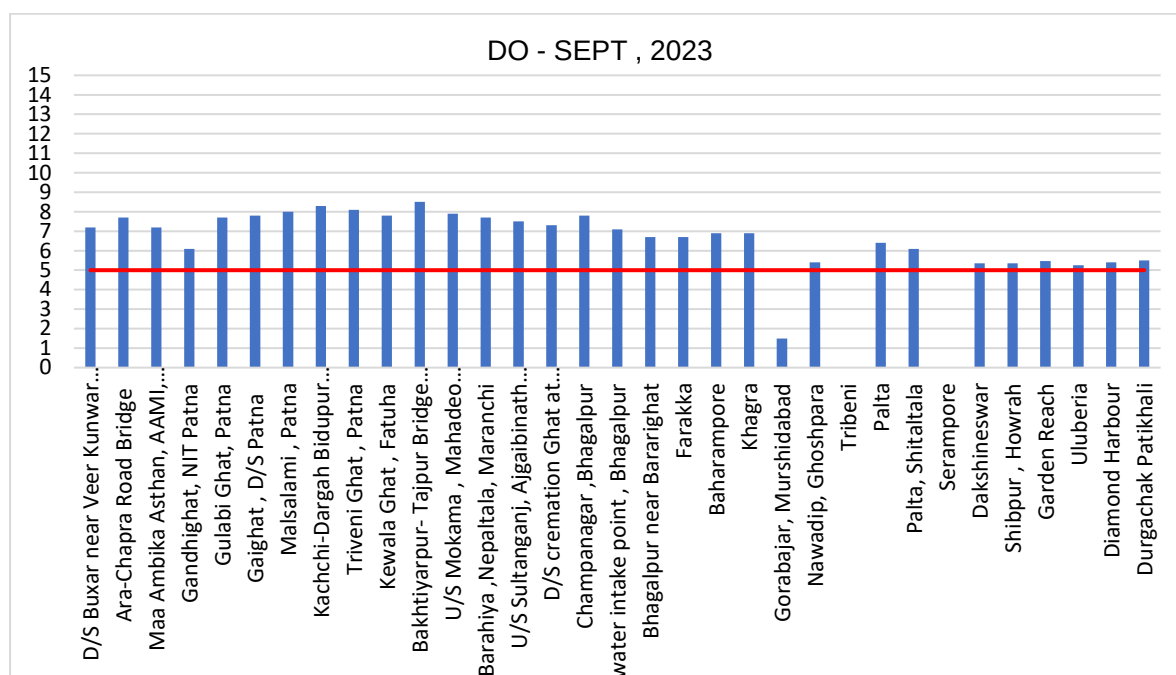


Fig.5.206. DO value for September,2023

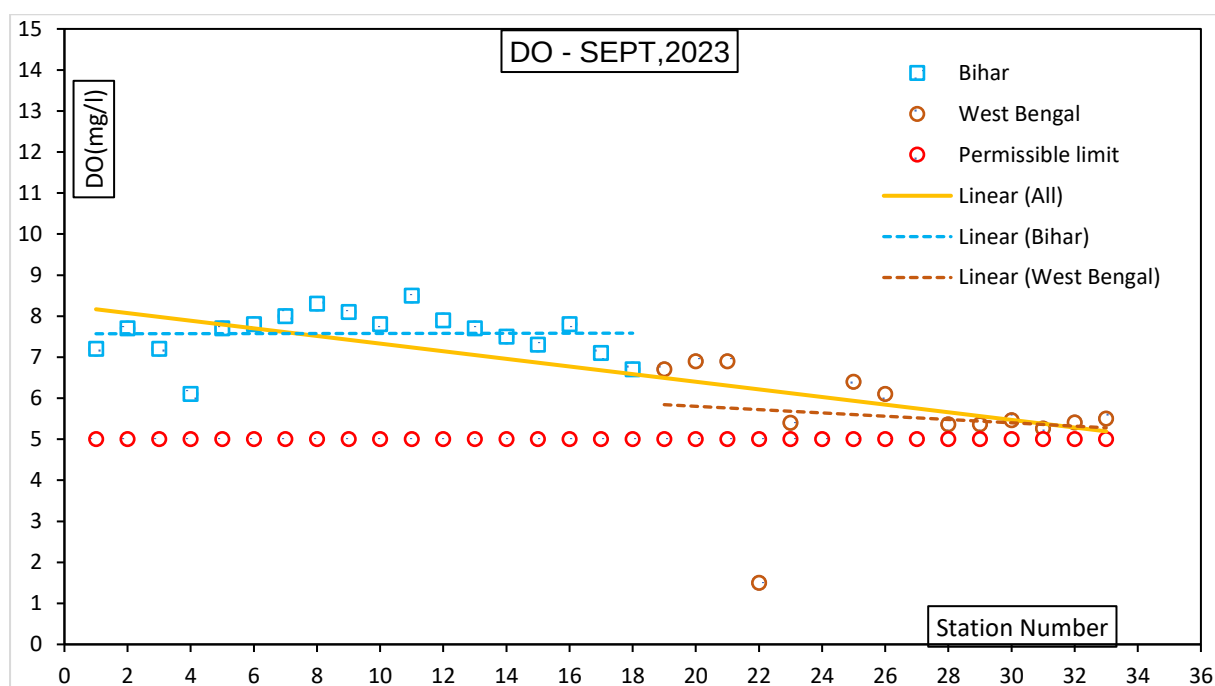


Fig.5.207. Trend Line analysis of DO value for September,2023

The DO values were found in the range of 1.5–8.5 mg/l. The lowest DO value 1.5 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.5 mg/l was for Bakhtiyarpur- Tajpur Bridge September ,2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

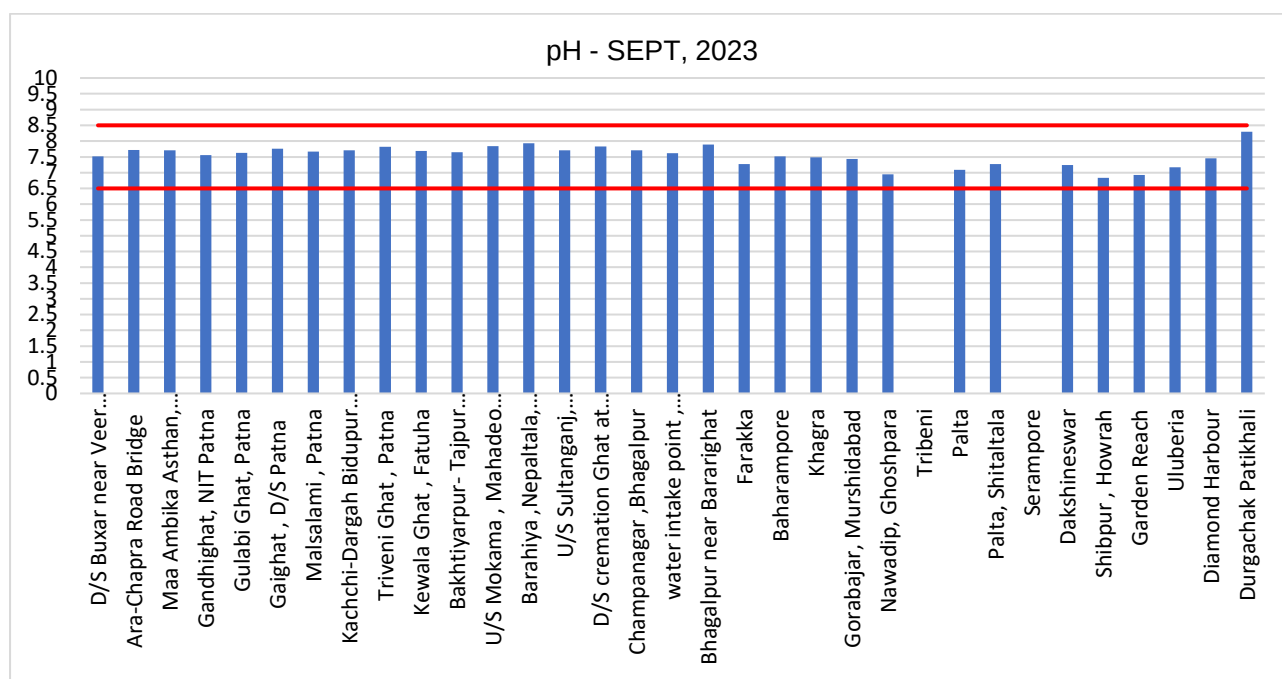


Fig.5.208. pH value for September,2023

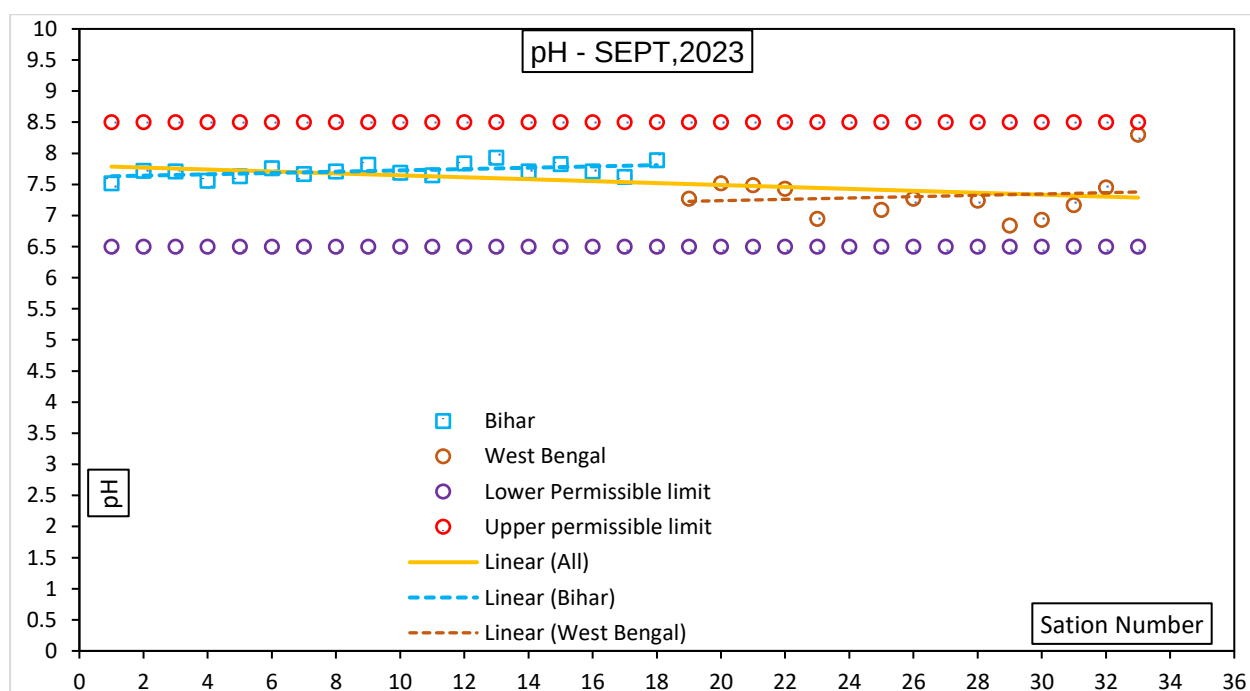


Fig.5.209. Trend Line analysis of pH value for September,2023

The pH values were found in the range of 6.93 – 8.3 for September, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month September, 2023. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is increasing.

Parameter 4: Fecal Coliform

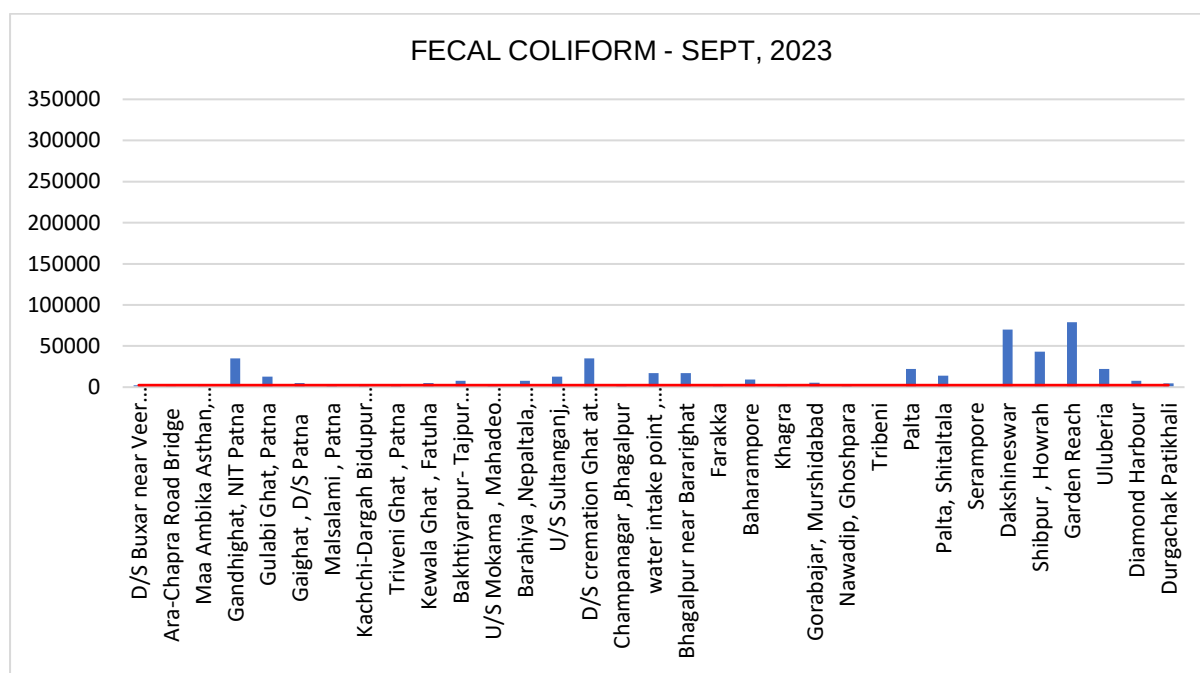


Fig.5.210. Fecal Coliform value for September,2023

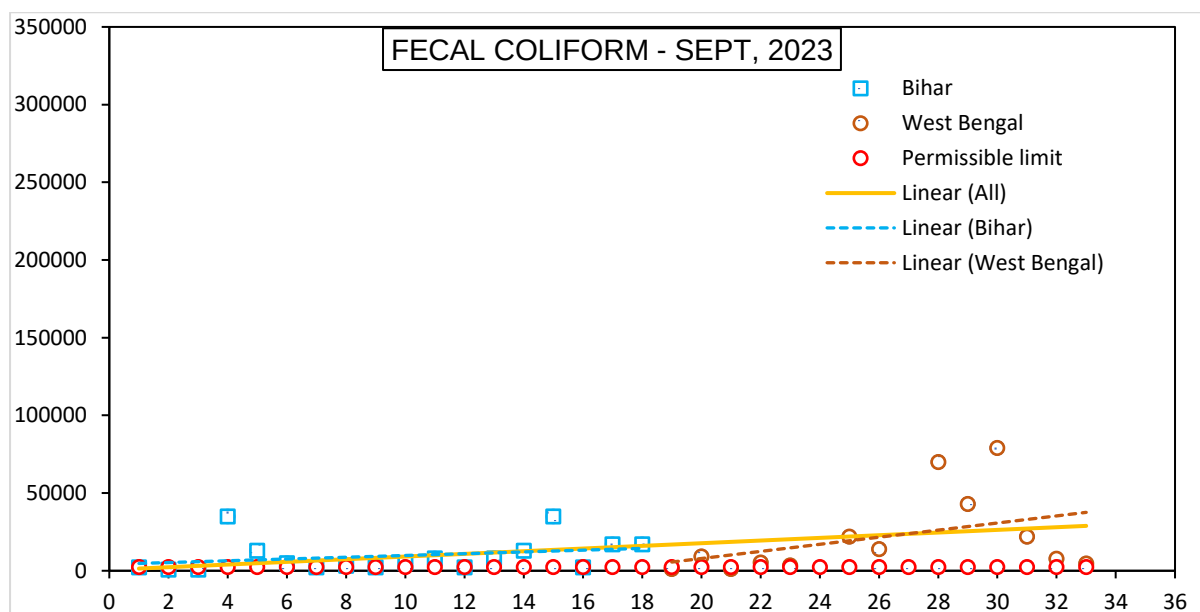


Fig.5.211. Trend Line analysis of Fecal Coliform value for September,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 79000 for September, 2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

October 2021:

Table 29: Data of water quality parameter of river Ganga at different stations for October , 2021

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	22.10.2021	1	7.2	7.6	92000
2	Ara-Chapra Road Bridge	05.10.2021	1.8	6.00	7.8	24000
3	Maa Ambika Asthan, AAMI	05.10.2021	2.3	7.7	6.6	160000
4	Gandhighat, NIT Patna	07.10.2021	2.5	6.5	7.8	160000
5	Gulabi Ghat, Patna	07.10.2021	2.8	5.2	7.9	160000
6	Gaighat , D/S Patna	07.10.2021	2.3	5.9	7.9	160000
7	Malsalami , Patna	07.10.2021	2	6.2	7.9	24000
8	Kachchi-Dargah Bidupur	07.10.2021	2.9	6.2	7.8	17000
9	Triveni Ghat , Patna	07.10.2021	3	4.5	7.8	54000
10	Kewala Ghat , Fatuha	08.10.2021	2.5	6.0	8	160000
11	Bakhtiyarpur- Tajpur Bridge	08.10.2021	1.4	7.5	8	2400
12	U/S Mokama , Mahadeo Asthan	08.10.2021	1.7	7.2	7.8	160000
13	Barahiya ,Nepaltala, Maranchi	06.10.2021	2.5	6.8	7.7	49000
14	U/S Sultanganj, Ajgaibinath Mandir	07.10.2021	2	6.5	7.7	92000
15	D/S cremation Ghat at Sultanganj	07.10.2021	1.9	7.4	7.7	54000
16	Champanagar ,Bhagalpur	07.10.2021	1.7	7.2	7.8	92000
17	water intake point , Bhagalpur	07.10.2021	2.1	6.7	7.6	92000
18	Bhagalpur near Bararighat	07.10.2021	2.5	6.1	7.2	110000
19	Farakka	28/10/2021	2.65	6.2	7.67	4900
20	Baharampore	28/10/2021	2.9	7	7.77	170000
21	Khagra	28/10/2021	2.4	6.6	7.72	70000
22	Gorabajar, Murshidabad	28/10/2021	2.15	2.15	7.54	23000
23	Nawadip, Ghoshpara	21/10/2021	2.95	7.1	7.53	49000
24	Tribeni	25/10/2021	1.8	5.9	7.65	33000
25	Palta	26/10/2021	2.5	5.6	7.52	49000
26	Palta, Shitaltala	26/10/2021	3.6	6.8	7.58	170000
27	Serampore	29/10/2021	2.45	5.8	7.52	23000
28	Dakshineswar	26/10/2021	2.1	5.2	7.62	79000
29	Shibpur , Howrah	27/10/2021	1.7	5.3	7.47	49000
30	Garden Reach	28/10/2021	1.75	5.2	7.05	79000
31	Uluberia	28/10/2021	1.75	5	7.1	46000
32	Diamond Harbour	25/10/2021	2	5.3	7.47	6800
33	Durgachak Patikhali	22/10/2021	2.3	5.7	6.42	17000

Parameter 1: BOD

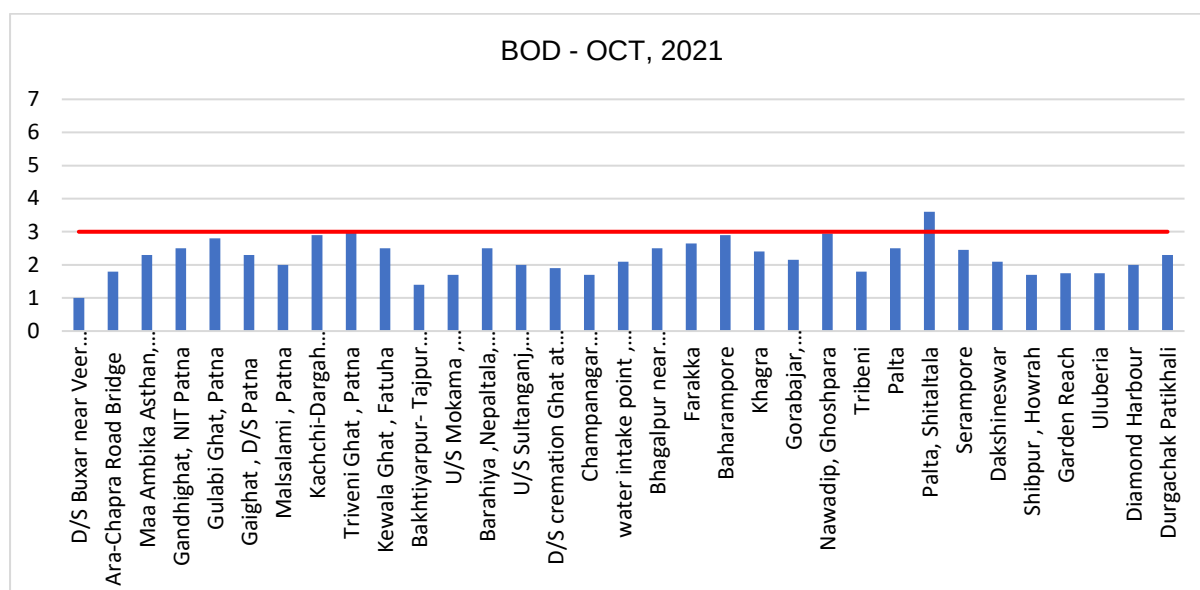


Fig.5.212. BOD value for October,2021

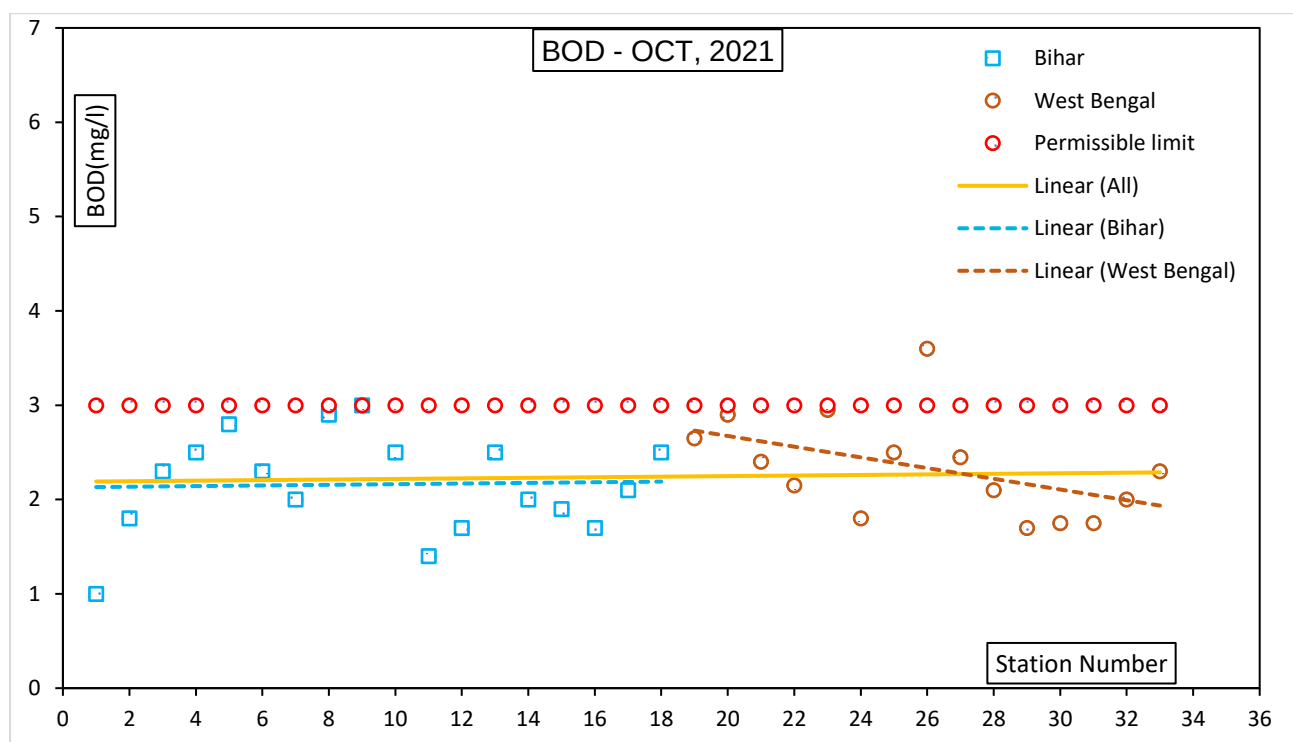


Fig.5.213. Trend Line analysis of BOD value for October,2021

The BOD values were found in the range of 1.0–3.6 mg/l. The highest BOD value of 3.6 mg/l was Palta, Shitaltala for the month of October, 2021. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O2 (DO)

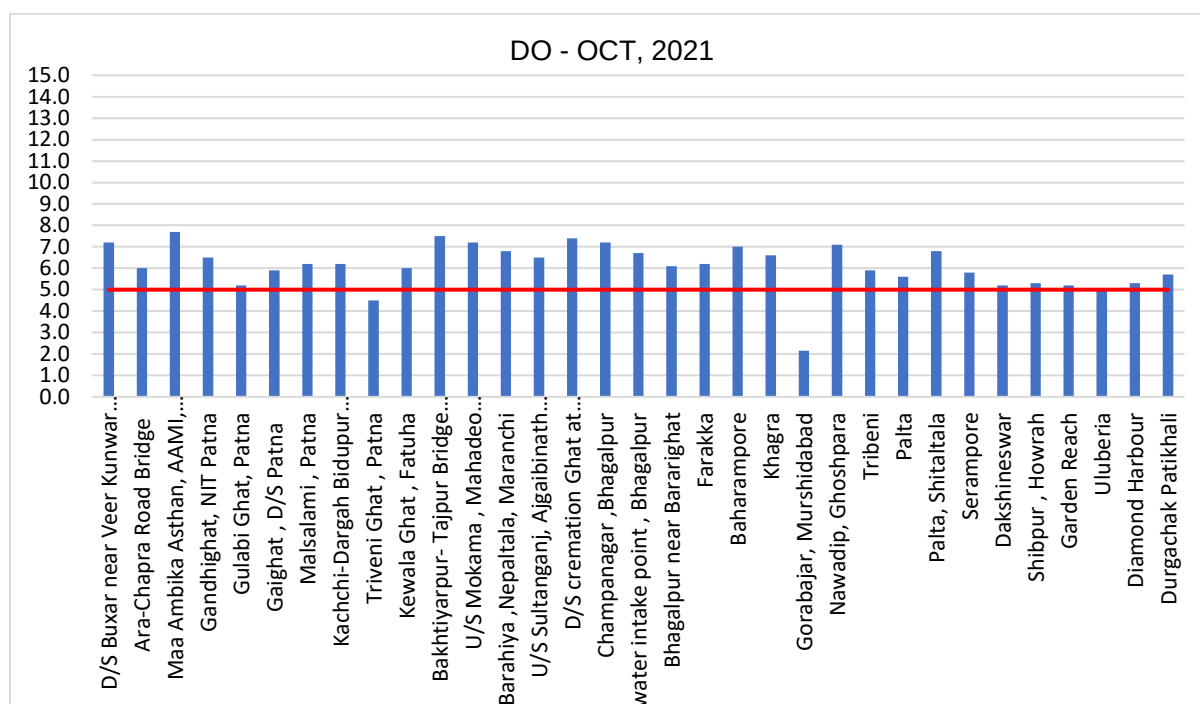


Fig.5.214. DO value for October,2021

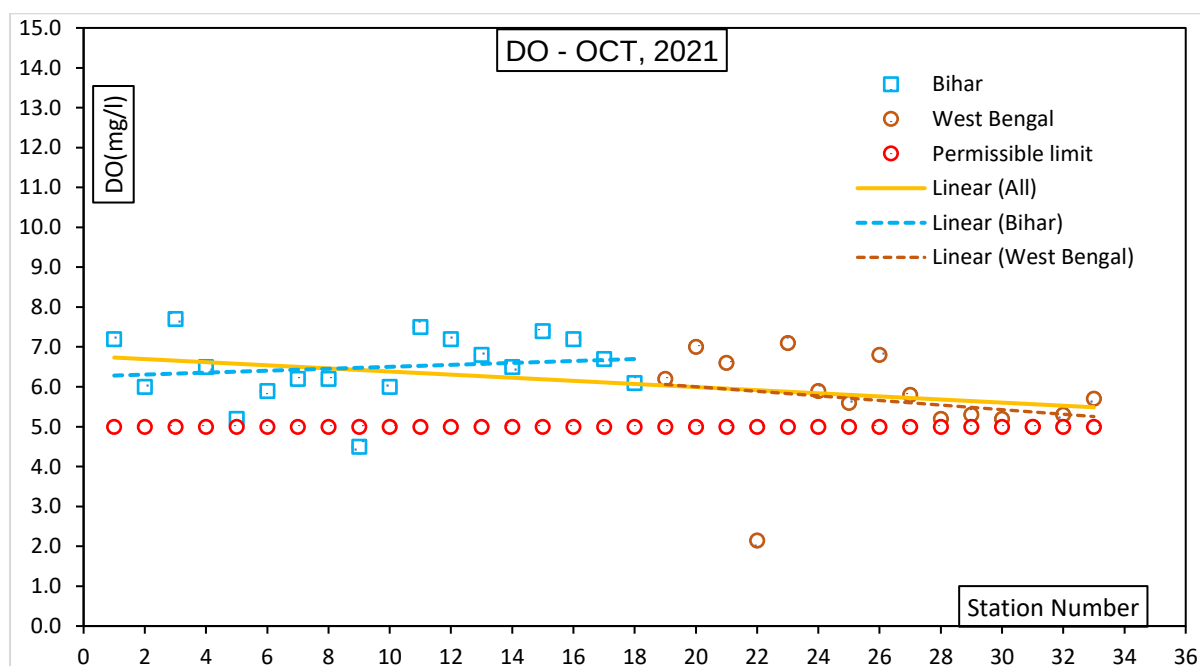


Fig.5.215. Trend Line analysis of DO value for October,2021

The DO values were found in the range of 2.15–7.7 mg/l. The lowest DO value 2.15 mg/l was for Gorabajar, Murshidabad and highest DO value of 7.7 mg/l was for Maa Ambika Asthan, AAMI October ,2021. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

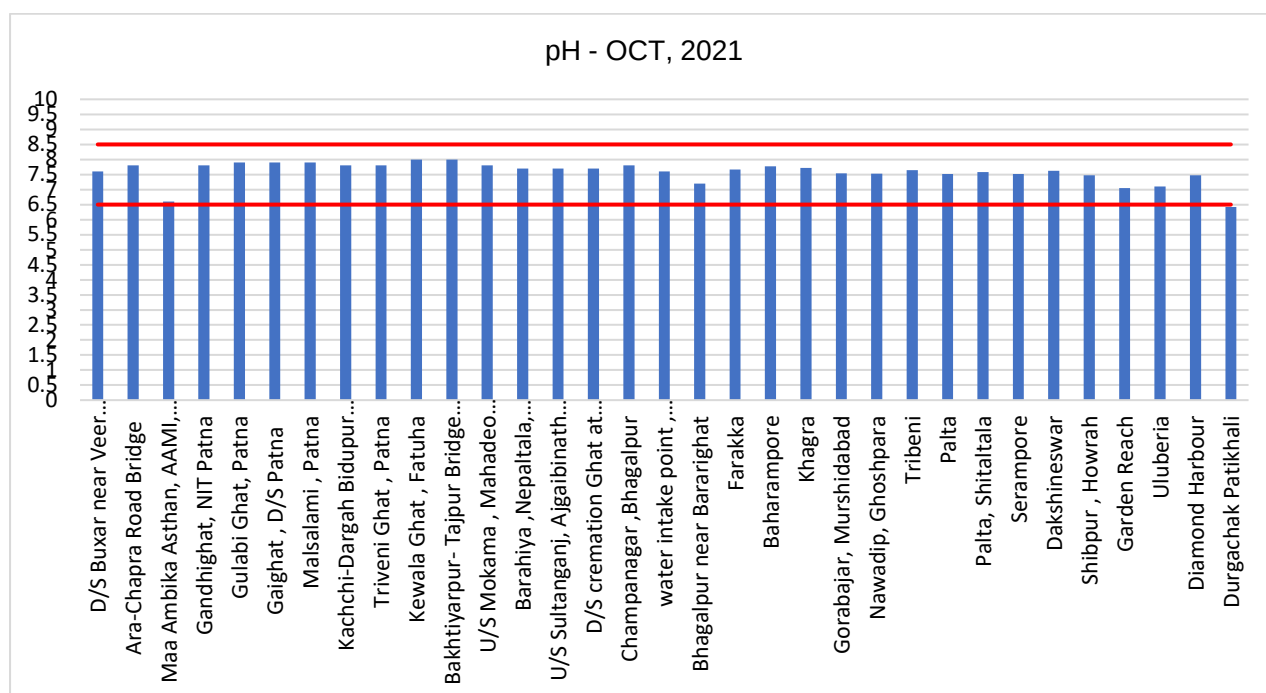


Fig.5.216. pH value for October,2021

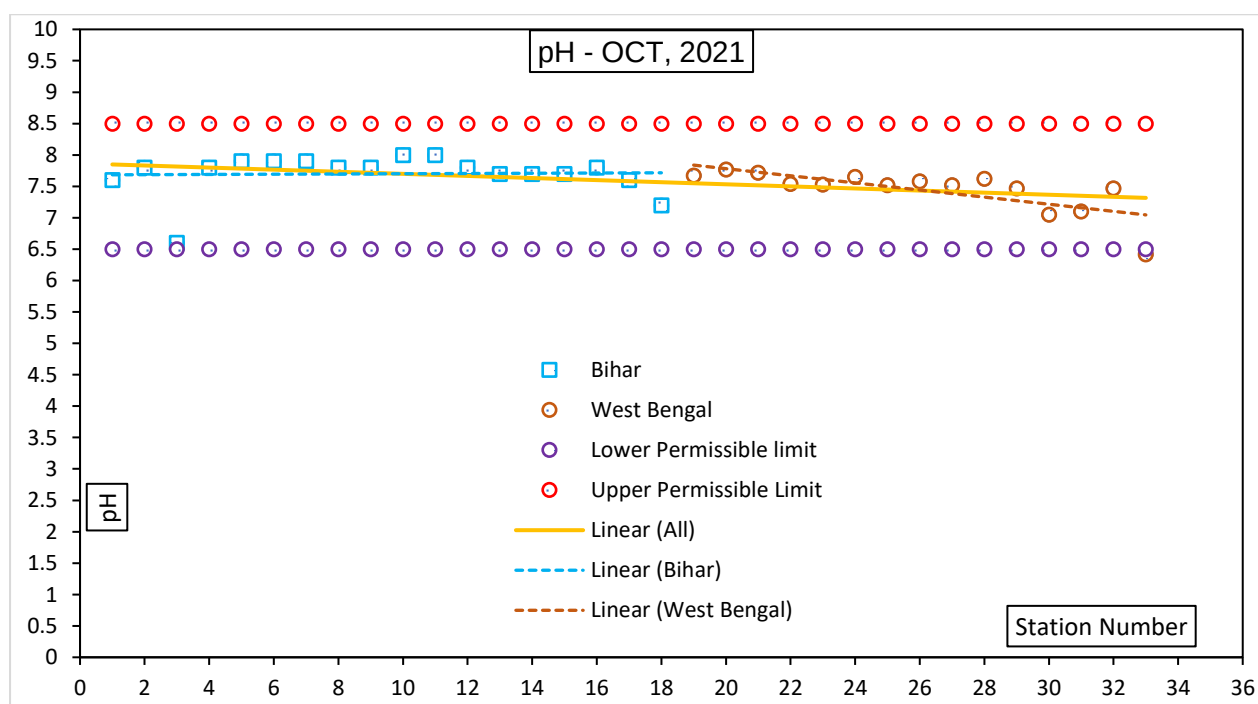


Fig.5.217. Trend Line analysis of pH value for October,2021

The pH values were found in the range of 6.42 – 8.0 for October, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month October, 2021. From Trend Line analysis curve the pH value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

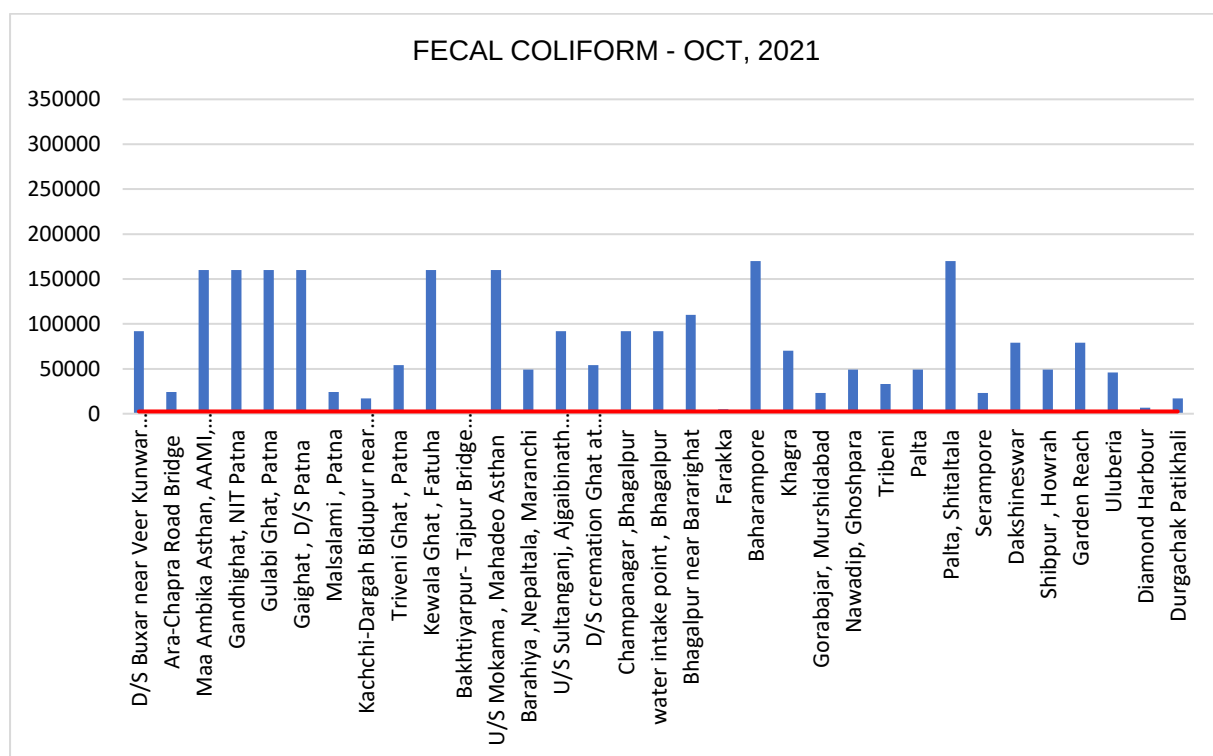


Fig.5.218. Fecal Coliform value for October,2021

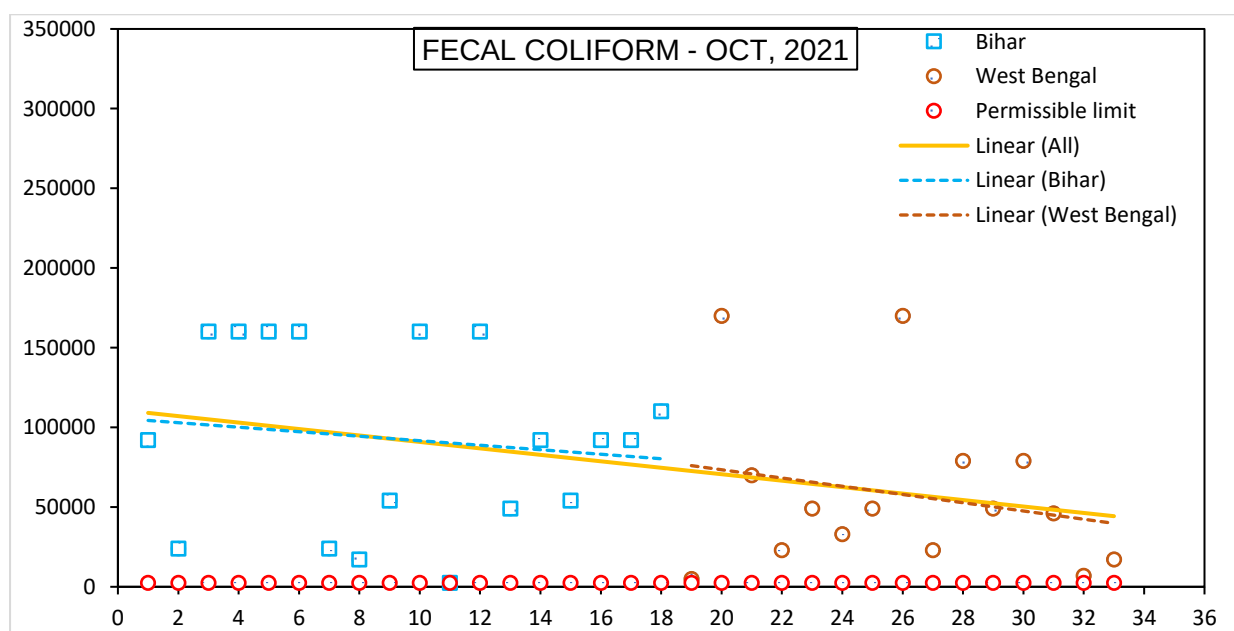


Fig.5.219. Trend Line analysis of Fecal Coliform value for October,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 170000 for October, 2021. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

October 2022:

Table 30: Data of water quality parameter of river Ganga at different stations for October, 2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	10.10.2022	1.9	6.7	7.51	240000
2	Ara-Chapra Road Bridge	25.10.2022	1.3	8.1	7.2	92000
3	Maa Ambika Asthan, AAMI	25.10.2022	2.3	6.8	7.65	22000
4	Gandhighat, NIT Patna	13.10.2022	1.8	6.9	7.68	240000
5	Gulabi Ghat, Patna	13.10.2022	1.7	6.0	7.47	130000
6	Gaighat , D/S Patna	13.10.2022	2.1	6.0	7.23	92000
7	Malsalami , Patna	13.10.2022	1.7	6.4	7.82	92000
8	Kachchi-Dargah Bidupur	14.10.2022	1.9	6.7	7.7	22000
9	Triveni Ghat , Patna	14.10.2022	2.2	6.4	7.5	35000
10	Kewala Ghat , Fatuha	14.10.2022	2	7.2	7.47	54000
11	Bakhtiyarpur- Tajpur Bridge	11.10.2022	1	8.5	7.72	460
12	U/S Mokama , Mahadeo Asthan	11.10.2022	1.6	7.5	7.63	24000
13	Barahiya ,Nepaltala, Maranchi	11.10.2022	1.5	7.6	7.35	92000
14	U/S Sultanganj, Ajgaibinath Mandir	22.10.2022	2.7	5.6	7.58	35000
15	D/S cremation Ghat at Sultanganj	22.10.2022	2.7	5.5	7.58	92000
16	Champanagar ,Bhagalpur	22.10.2022	2.5	6.1	7.45	54000
17	water intake point , Bhagalpur	22.10.2022	2.5	6.0	7.58	35000
18	Bhagalpur near Bararighat	22.10.2022	2.9	5.5	7.14	35000
19	Farakka	18/10/2022	1.1	5.8	8.03	3300
20	Baharampore	17/10/2022	1.5	6.7	7.82	79000
21	Khagra	17/10/2022	1	6.6	7.78	490
22	Gorabajar, Murshidabad	17/10/2022	1.1	1.1	7.85	3300
23	Nawadip, Ghoshpara	19/10/2022	2.25	6.4	7.88	790
24	Tribeni	missing	-	-	-	-
25	Palta	20/10/2022	1.7	6.1	7.85	13000
26	Palta, Shitaltala	missing	-	-	-	-
27	Serampore	missing	-	-	-	-
28	Dakshineswar	17/10/2022	2.95	5.2	7.4	49000
29	Shibpur , Howrah	17/10/2022	3	5.4	7.44	23000
30	Garden Reach	17/10/2022	2.85	5.2	7.49	23000
31	Uluberia	18/10/2022	2.8	5.2	6.95	13000
32	Diamond Harbour	18/10/2022	2.1	6.2	7.09	2300
33	Durgachak Patikhali	18/10/2022	2.65	5.3	7.84	13000

Parameter 1: BOD

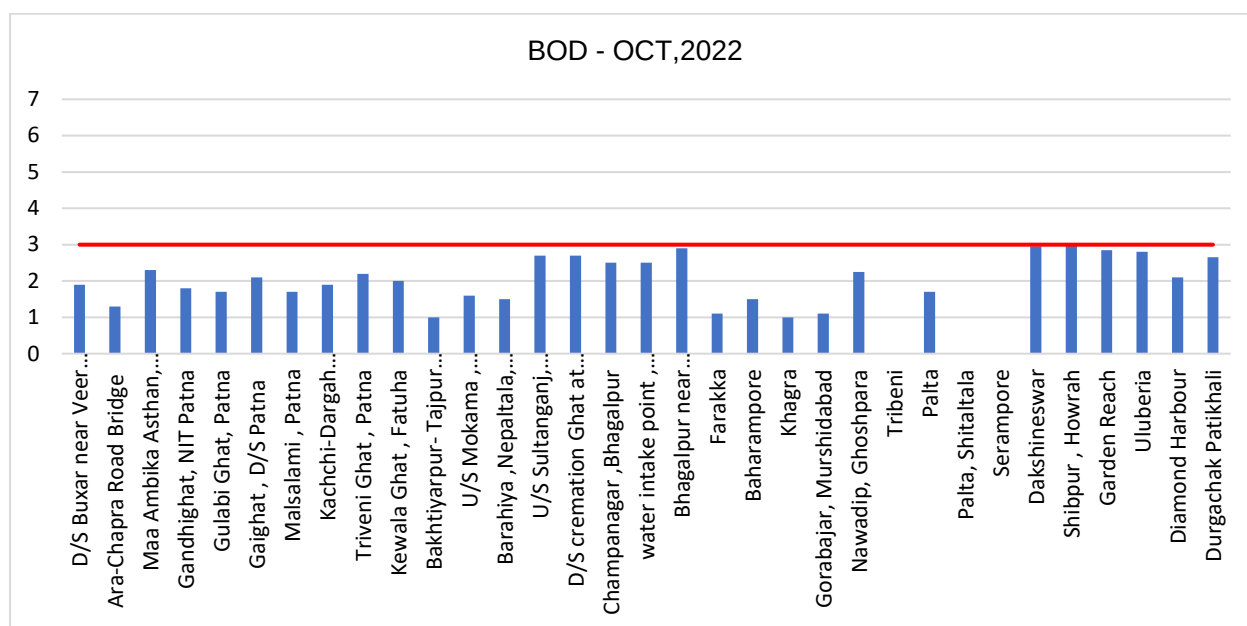


Fig.5.220. BOD value for October,2022

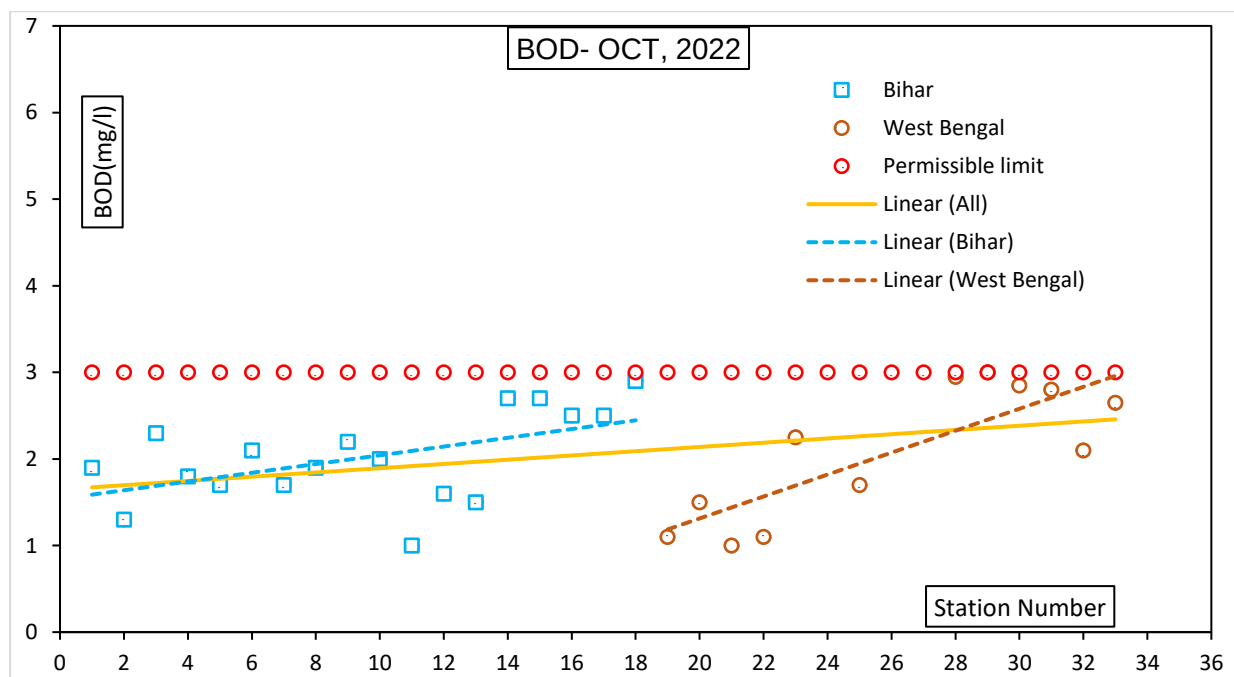


Fig.5.221. Trend Line analysis of BOD value for October,2022

The BOD values were found in the range of 1.0–3.0 mg/l. The highest BOD value of 3.0 mg/l was Shibpur, Howrah for the month of October, 2022. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O2 (DO)

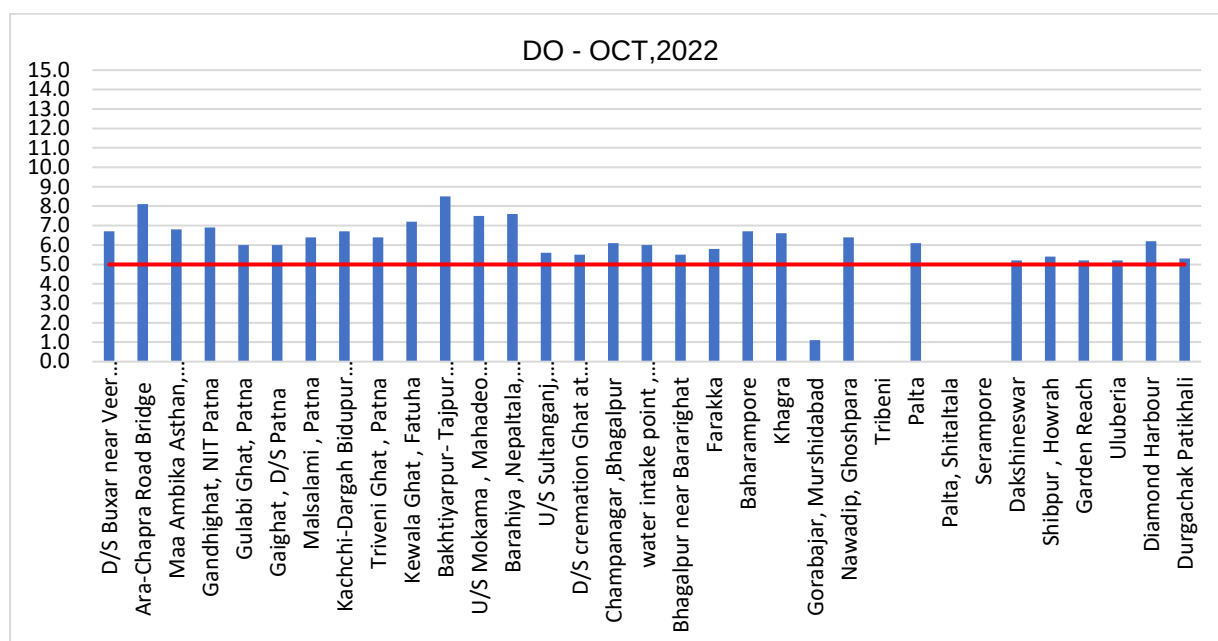


Fig.5.222. DO value for October,2022

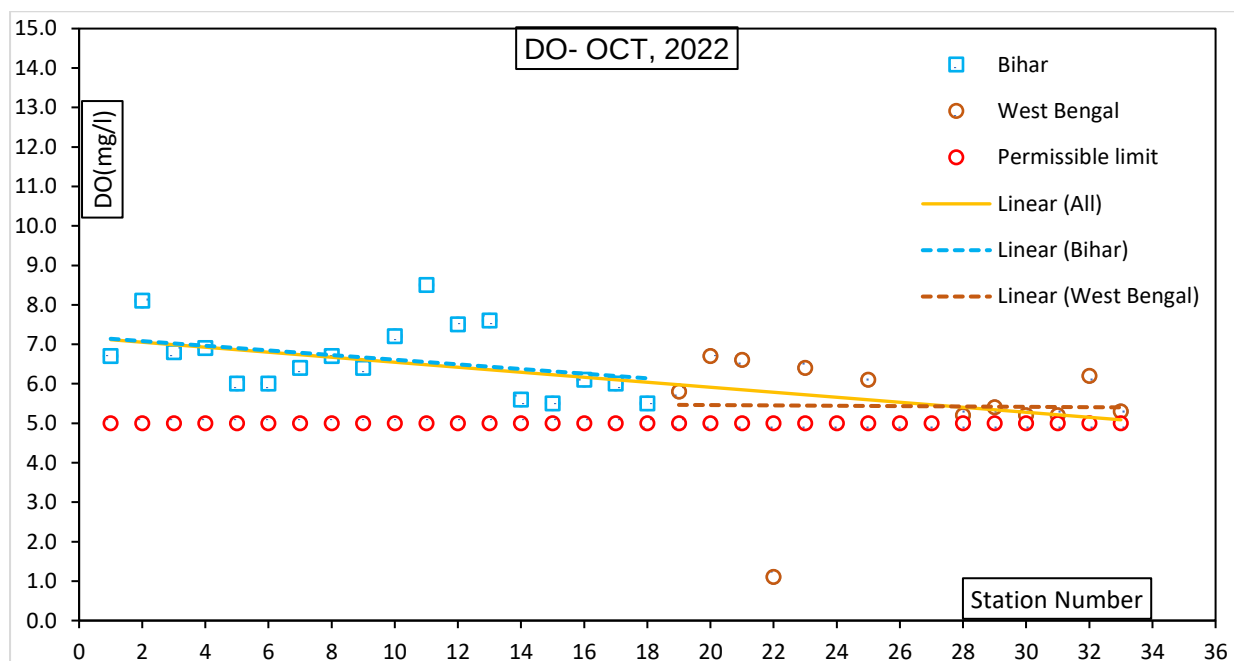


Fig.5.223. Trend Line analysis of DO value for October,2022

The DO values were found in the range of 1.1–8.5 mg/l. The lowest DO value 1.1 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.5 mg/l was for Bakhtiyarpur- Tajpur Bridge October ,2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

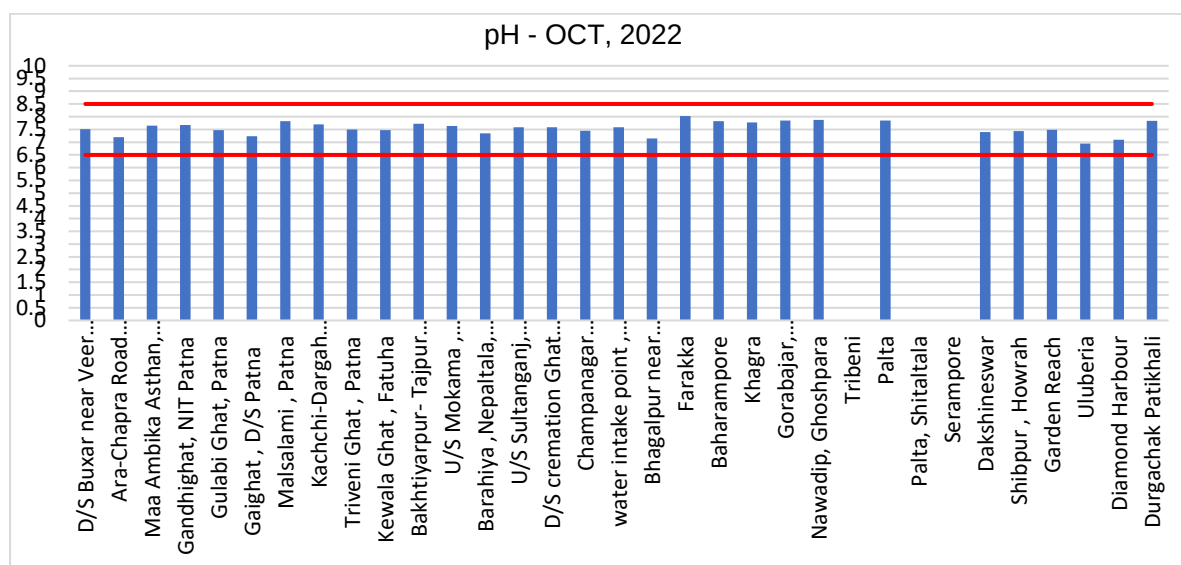


Fig.5.224. pH value for October,2022

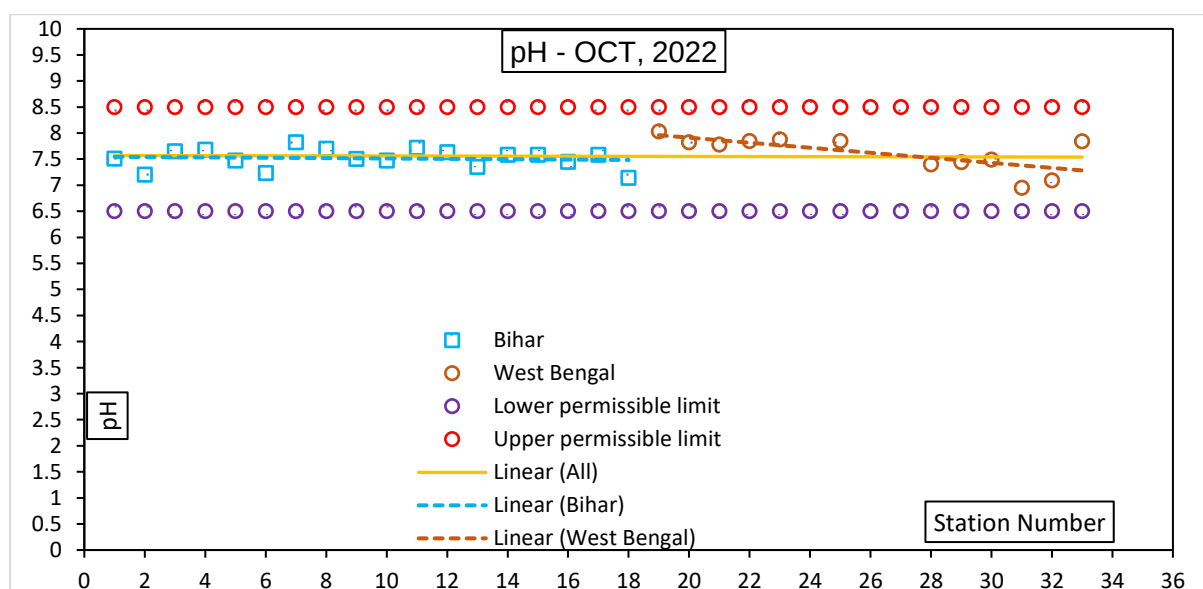


Fig.5.225. Trend Line analysis of pH value for October,2022

The pH values were found in the range of 6.95 – 8.03 for October, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month October, 2022. From Trend Line analysis curve the pH value for Bihar is almost same in the trend line and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

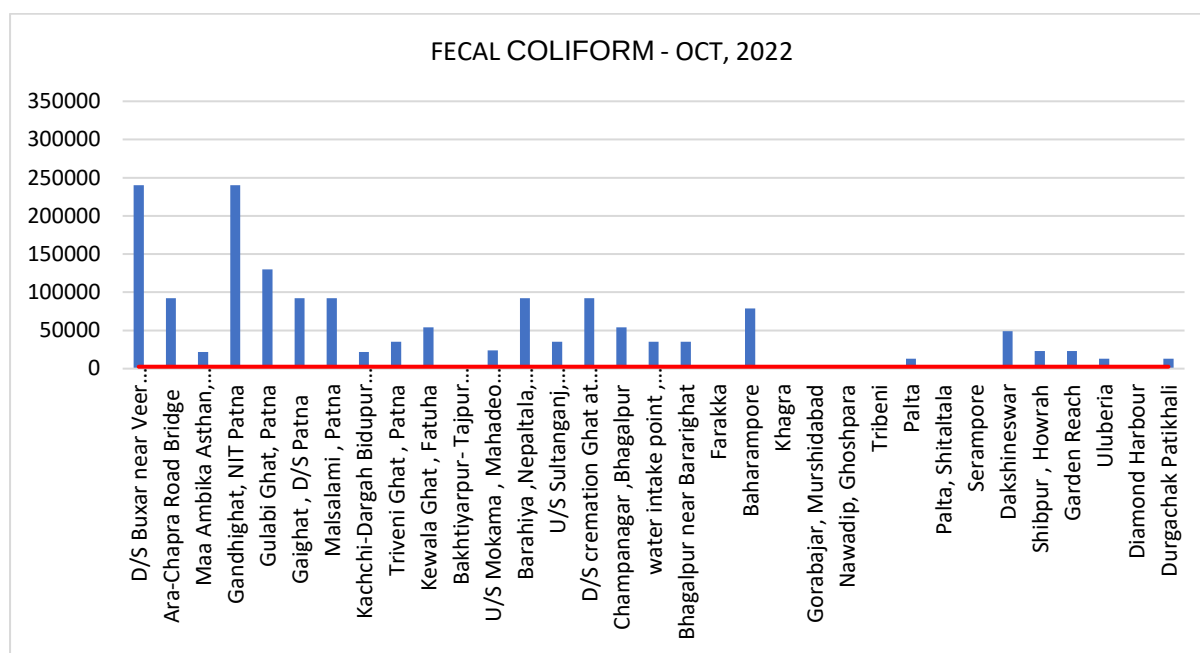


Fig.5.226. Fecal Coliform value for October,2022

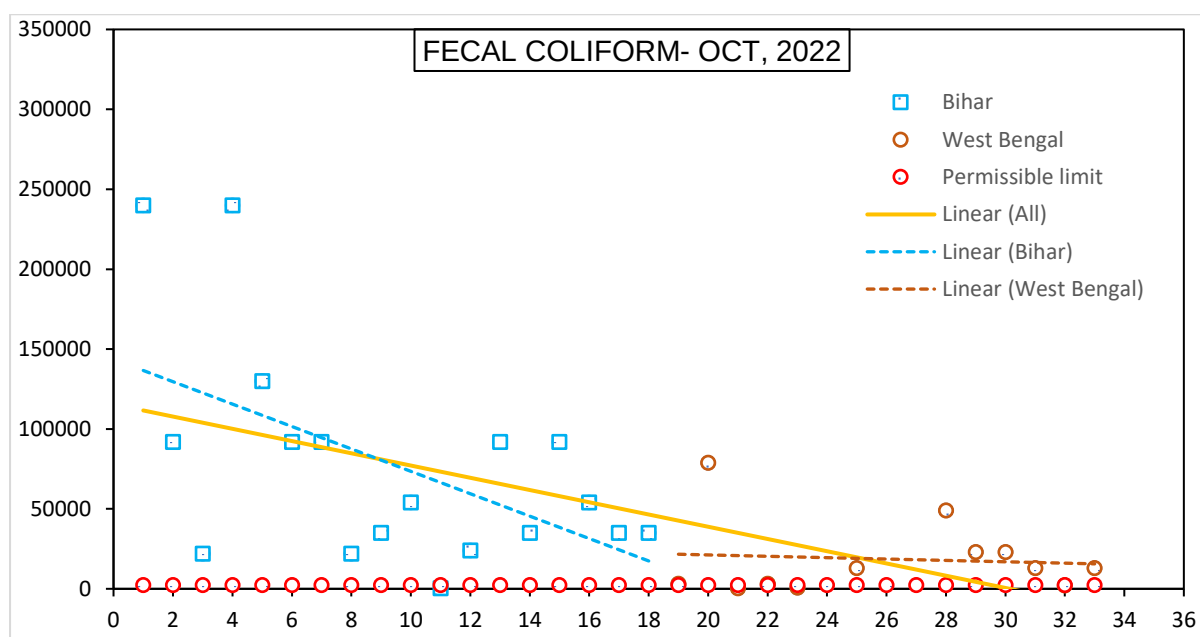


Fig.5.227. Trend Line analysis of Fecal Coliform value for October,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000 for October, 2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

October 2023:

Table 31: Data of water quality parameter of river Ganga at different stations for October , 2023

Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	04.10.2023	1.4	7.8	7.6	4900
2	Ara-Chapra Road Bridge	05.10.2023	1.4	8.3	7.8	1300
3	Maa Ambika Asthan, AAMI	05.10.2023	1.3	7.4	7.8	17000
4	Gandhighat, NIT Patna	03.10.2023	1.6	7.4	7.3	24000
5	Gulabi Ghat, Patna	03.10.2023	1.8	7.2	7.4	54000
6	Gaighat , D/S Patna	03.10.2023	2	6.9	7.5	3300
7	Malsalami , Patna	03.10.2023	2	7.1	7.3	1300
8	Kachchi-Dargah Bidupur	03.10.2023	1	7.5	7.3	2300
9	Triveni Ghat , Patna	03.10.2023	1.2	7.3	7.4	2300
10	Kewala Ghat , Fatuha	03.10.2023	1.4	7	7.6	7000
11	Bakhtiyarpur- Tajpur Bridge	26.10.2023	1.8	7.6	7.4	11000
12	U/S Mokama , Mahadeo Asthan	26.10.2023	1.9	7.2	7.3	11000
13	Barahiya ,Nepaltala, Maranchi	26.10.2023	1.8	7.5	7.6	7900
14	U/S Sultanganj, Ajgaibinath Mandir	05.10.2023	1.3	7.5	7.8	7900
15	D/S cremation Ghat at Sultanganj	18.10.2023	1.8	7.6	7.3	13000
16	Champanagar ,Bhagalpur	19.10.2023	1.9	7.4	7.2	7000
17	water intake point , Bhagalpur	19.10.2023	1.7	7.3	7.4	4900
18	Bhagalpur near Bararighat	19.10.2023	2.2	6.9	7.2	24000
19	Farakka	30.10.2023	2.8	6.9	7.96	940
20	Baharampore	30.10.2023	1.9	6.9	7.85	5400
21	Khagra	30.10.2023	2.1	6.9	7.92	1100
22	Gorabajar, Murshidabad	30.10.2023	2.5	2.5	7.82	3500
23	Nawadip, Ghoshpara	30.10.2023	2.1	6.6	7.97	3500
24	Tribeni	missing	-	-	-	-
25	Palta	31.10.2023	2.85	6.5	7.43	11000
26	Palta, Shitaltala	31.10.2023	2.8	5.7	7.09	7900
27	Serampore	missing	-	-	-	-
28	Dakshineswar	30.10.2023	2.5	5.59	6.91	63000
29	Shibpur , Howrah	30.10.2023	2.79	5.29	7.1	33000
30	Garden Reach	30.10.2023	2.74	5.39	7.1	70000
31	Uluberia	31.10.2023	2.59	5.49	7.46	23000
32	Diamond Harbour	31.10.2023	2.43	5.78	7.3	4500
33	Durgachak Patikhali	25.10.2023	1.8	5.9	8.1	6300

Parameter 1: BOD

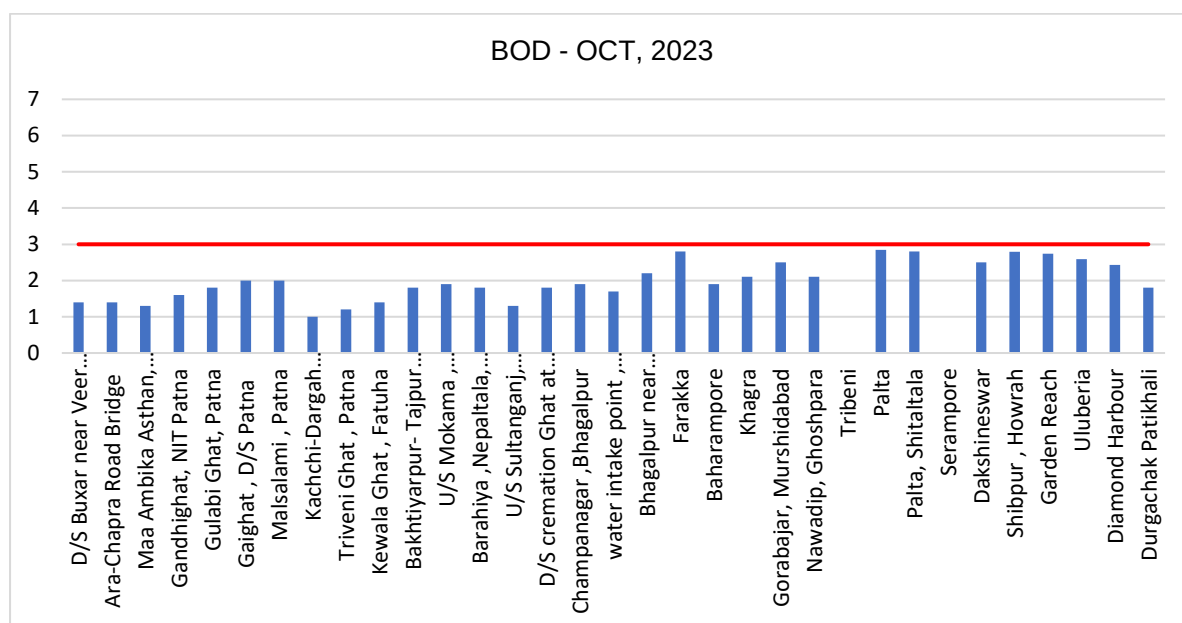


Fig.5.228. BOD value for October,2023

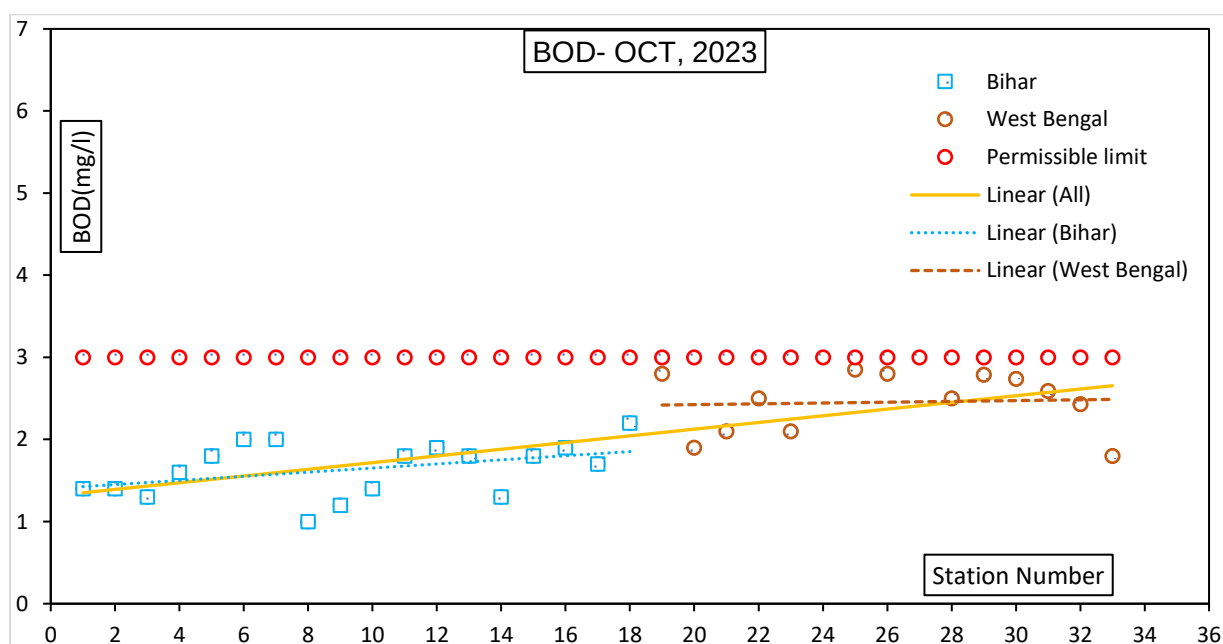


Fig.5.229. Trend Line analysis of BOD value for October,2023

The BOD values were found in the range of 1.0–2.85 mg/l. The highest BOD value of 2.85 mg/l was Palta for the month of October, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O2 (DO)

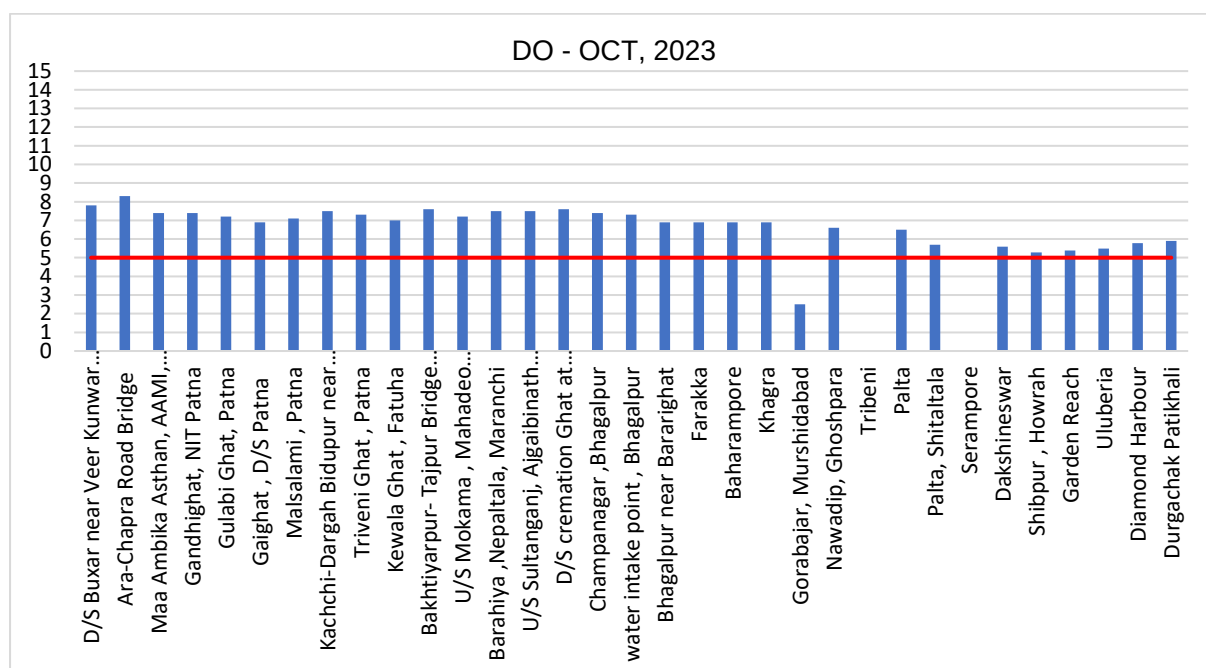


Fig.5.230. DO value for October,2023

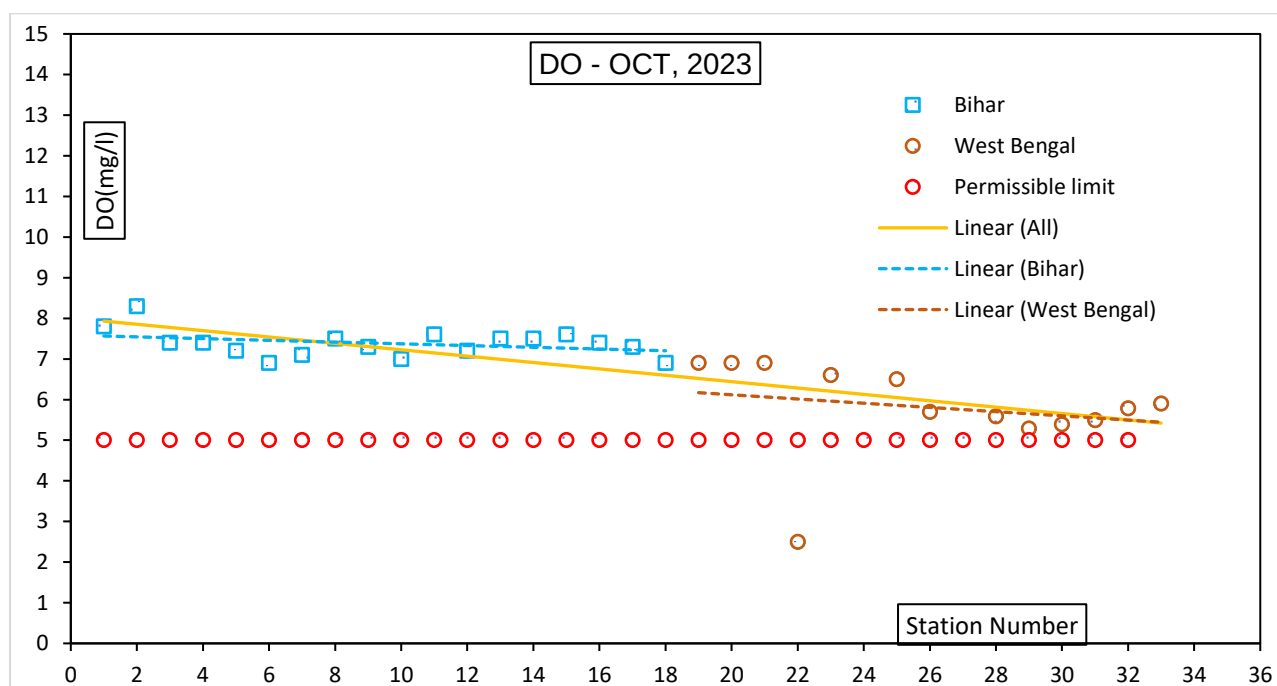


Fig.5.231. Trend Line analysis of DO value for October,2023

The DO values were found in the range of 2.5–8.3 mg/l. The lowest DO value 2.5 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.3 mg/l was for Ara-Chapra Road Bridge October, 2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

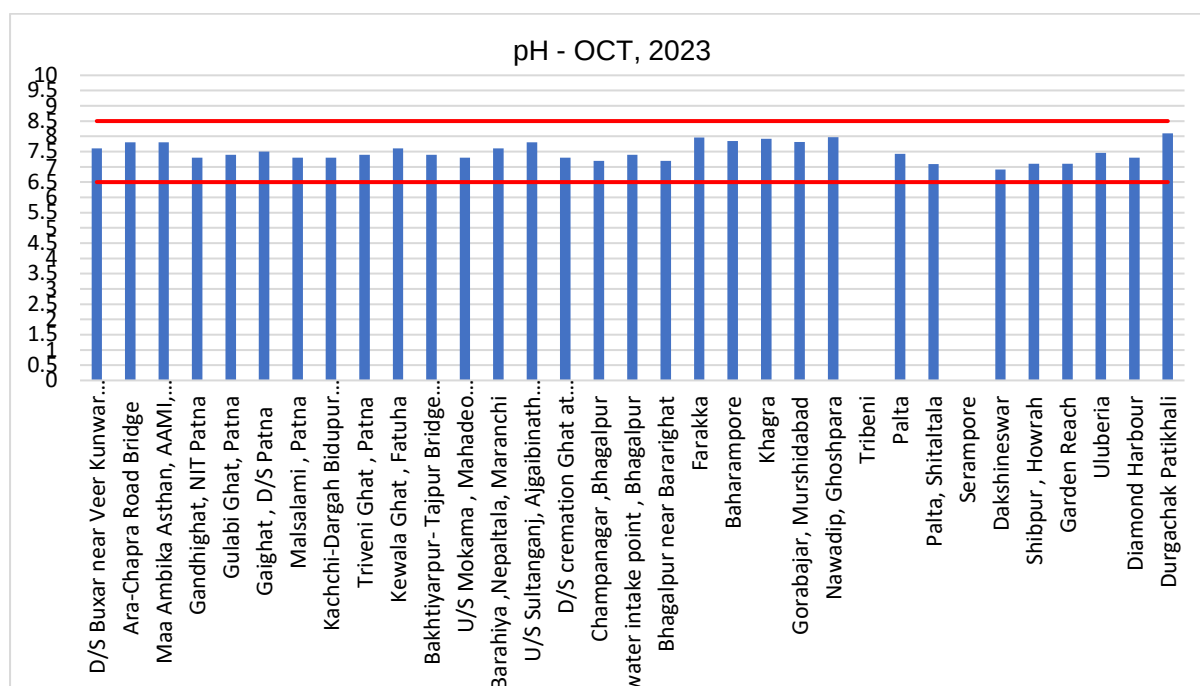


Fig.5.232. pH value for October,2023

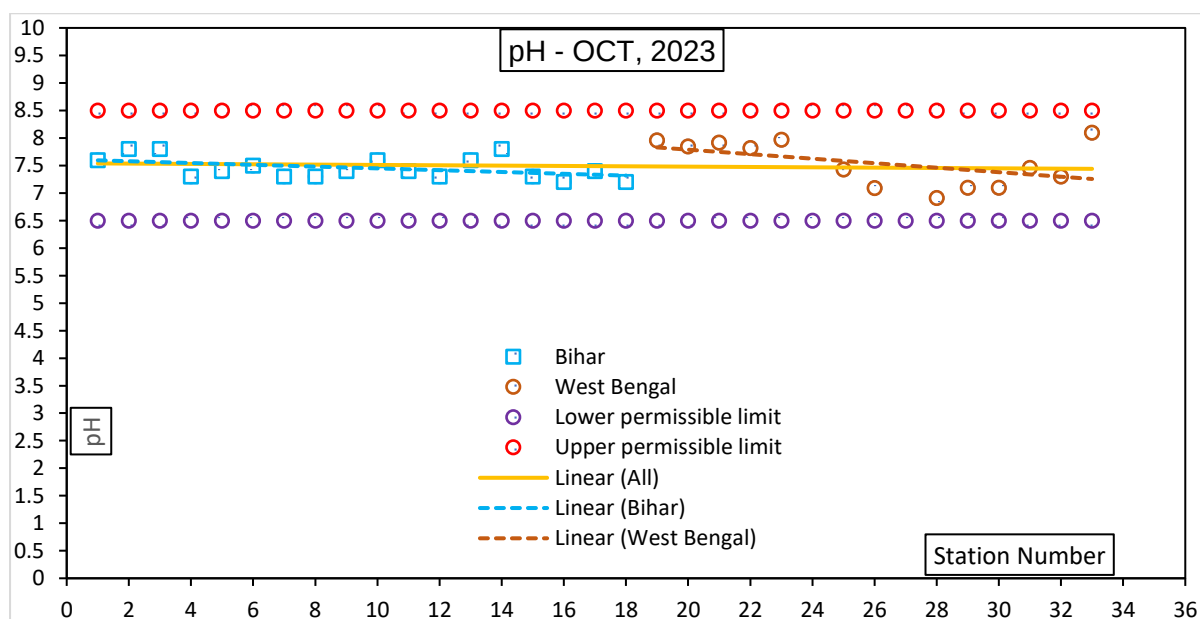


Fig.5.233. Trend Line analysis of pH value for October,2023

The pH values were found in the range of 6.91 – 8.1 for October, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month October, 2023. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

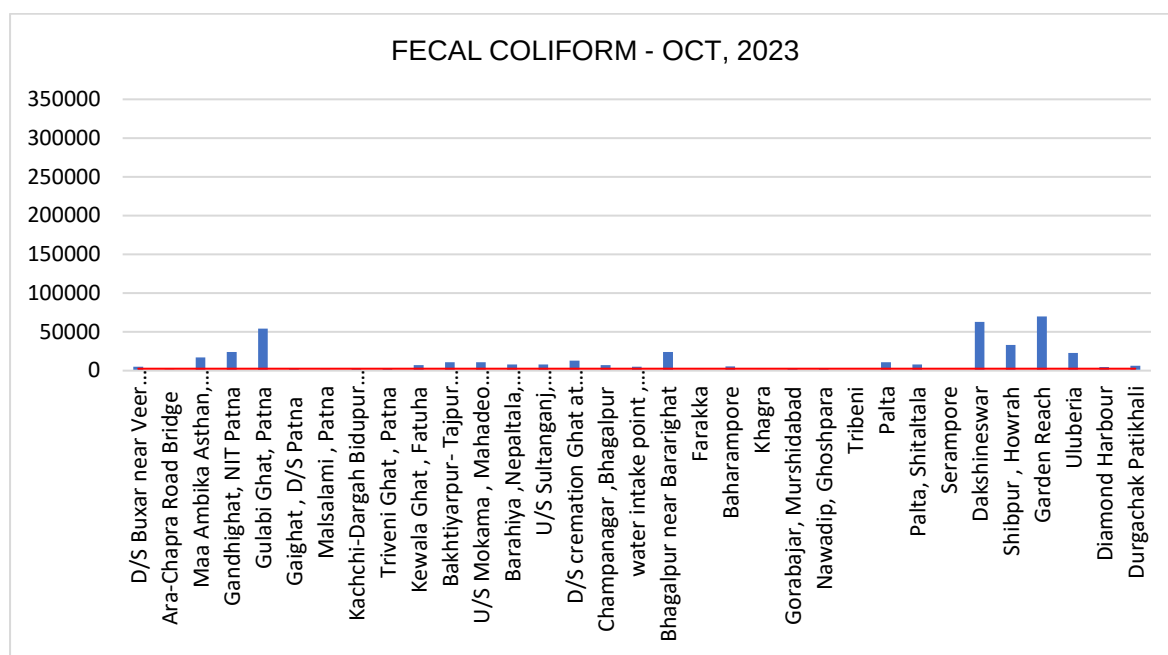


Fig.5.234. Fecal Coliform value for October,2023

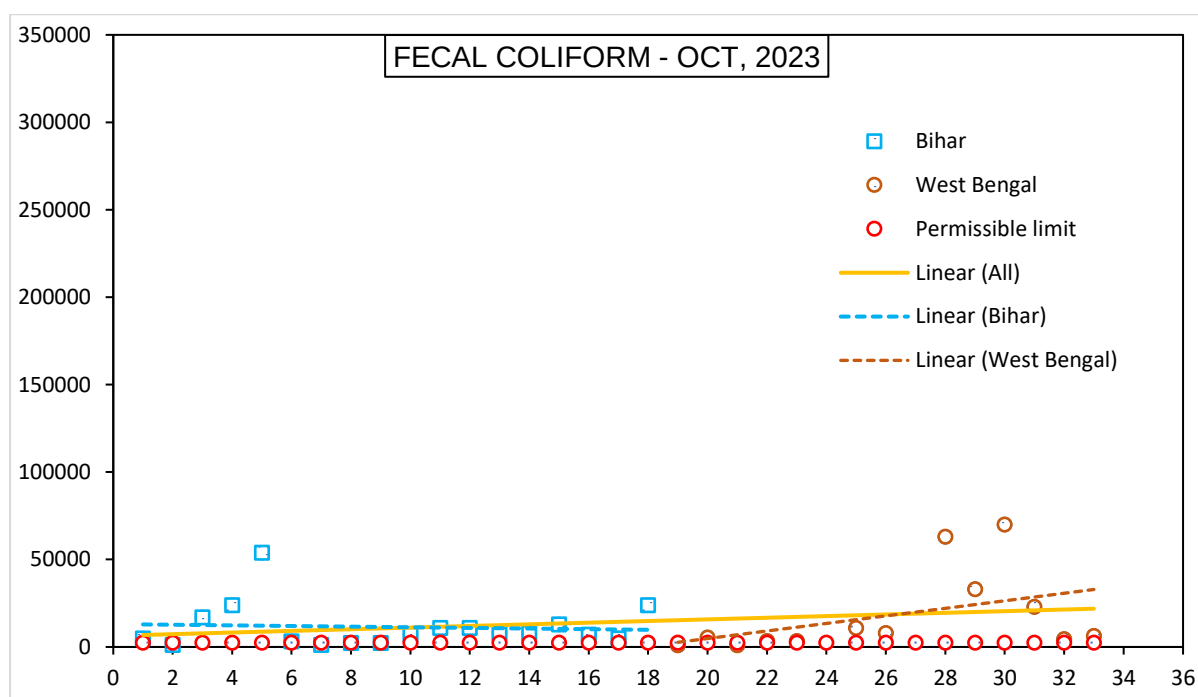


Fig.5.235. Trend Line analysis of Fecal Coliform value for October,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 70000 for October, 2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

November 2021:

Table 32: Data of water quality parameter of river Ganga at different stations for November, 2021						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	02.11.2021	3	5.7	7.9	160000
2	Ara-Chapra Road Bridge	01.11.2021	2.8	6.1	7.9	35000
3	Maa Ambika Asthan, AAMI	01.11.2021	2.8	6.2	8.1	160000
4	Gandhighat, NIT Patna	03.11.2021	3	5.6	8	160000
5	Gulabi Ghat, Patna	17.11.2021	1.4	7.3	8.1	54000
6	Gaighat , D/S Patna	03.11.2021	3	6.5	7.9	54000
7	Malsalami , Patna	03.11.2021	2.5	6.5	8.2	160000
8	Kachchi-Dargah Bidupur	17.11.2021	2.4	6.4	7.9	160000
9	Triveni Ghat , Patna	17.11.2021	2	7.2	8.1	92000
10	Kewala Ghat , Fatuha	17.11.2021	2	7.4	8.1	24000
11	Bakhtiyarpur- Tajpur Bridge	17.11.2021	1	8.1	8	35000
12	U/S Mokama , Mahadeo Asthan	17.11.2021	1.9	7.8	7.9	92000
13	Barahiya ,Nepaltala, Maranchi	02.11.2021	1.7	7.4	8	92000
14	U/S Sultanganj, Ajgaibinath Mandir	01.11.2021	1.7	7.4	8	160000
15	D/S cremation Ghat at Sultanganj	16.11.2021	1.9	7.8	7.6	160000
16	Champanagar ,Bhagalpur	02.11.2021	2.9	6.9	7.9	7900
17	water intake point , Bhagalpur	02.11.2021	2.4	6.7	7.9	160000
18	Bhagalpur near Bararighat	02.11.2021	3	5.9	8	160000
19	Farakka	24/11/2021	1.8	8.7	8.19	130
20	Baharampore	24/11/2021	1.65	7.1	8.02	110000
21	Khagra	24/11/2021	1.8	7.8	7.95	23000
22	Gorabajar, Murshidabad	24/11/2021	2.8	2.8	8.01	79000
23	Nawadip, Ghoshpara	24/11/2021	3	7.7	7.86	23000
24	Tribeni	24/11/2021	3.2	7.5	7.82	7800
25	Palta	22/11/2021	3.5	6	7.46	240000
26	Palta, Shitaltala	22/11/2021	3.8	5.5	7.69	330000
27	Serampore	29/11/2021	2.6	6.6	8.04	79000
28	Dakshineswar	23/11/2021	3.6	5.9	7.82	79000
29	Shibpur , Howrah	24/11/2021	2.45	6.1	7.7	23000
30	Garden Reach	26/11/2021	2.6	6.1	7.99	46000
31	Uluberia	29/11/2021	1.9	5.4	7.06	21000
32	Diamond Harbour	16/11/2021	2.35	6	7.23	3500
33	Durgachak Patikhali	17/11/2021	1.55	5.7	7.58	11000

Parameter 1: BOD

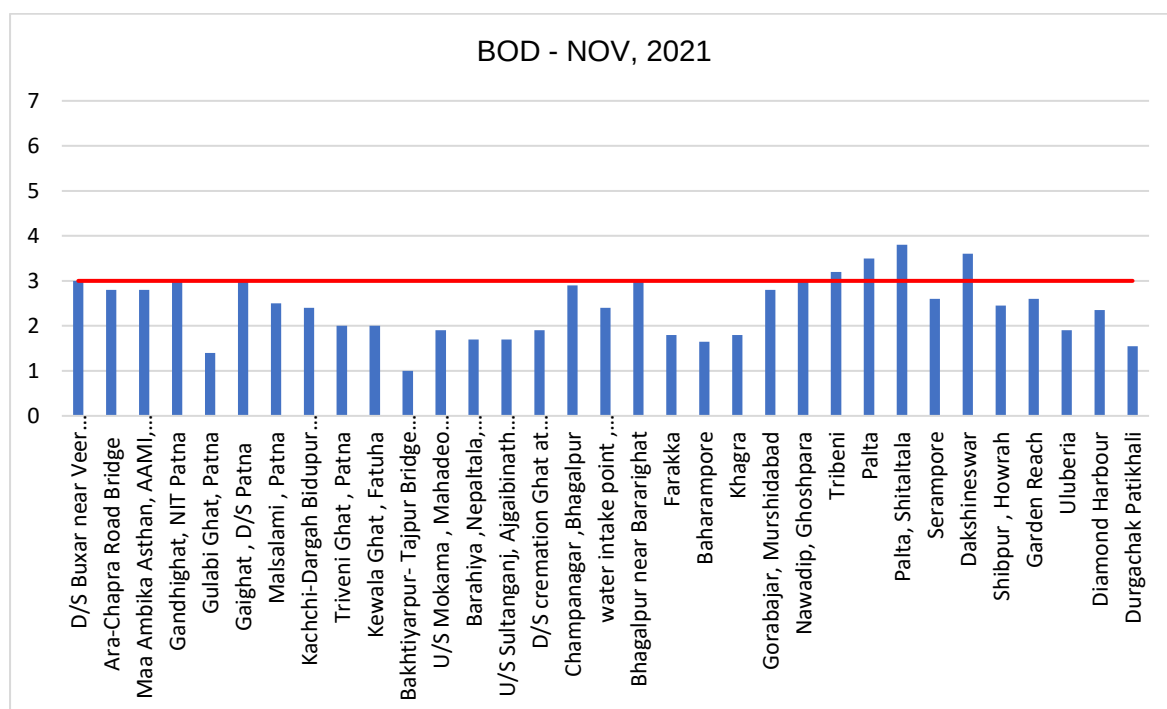


Fig.5.236. BOD value for November,2021

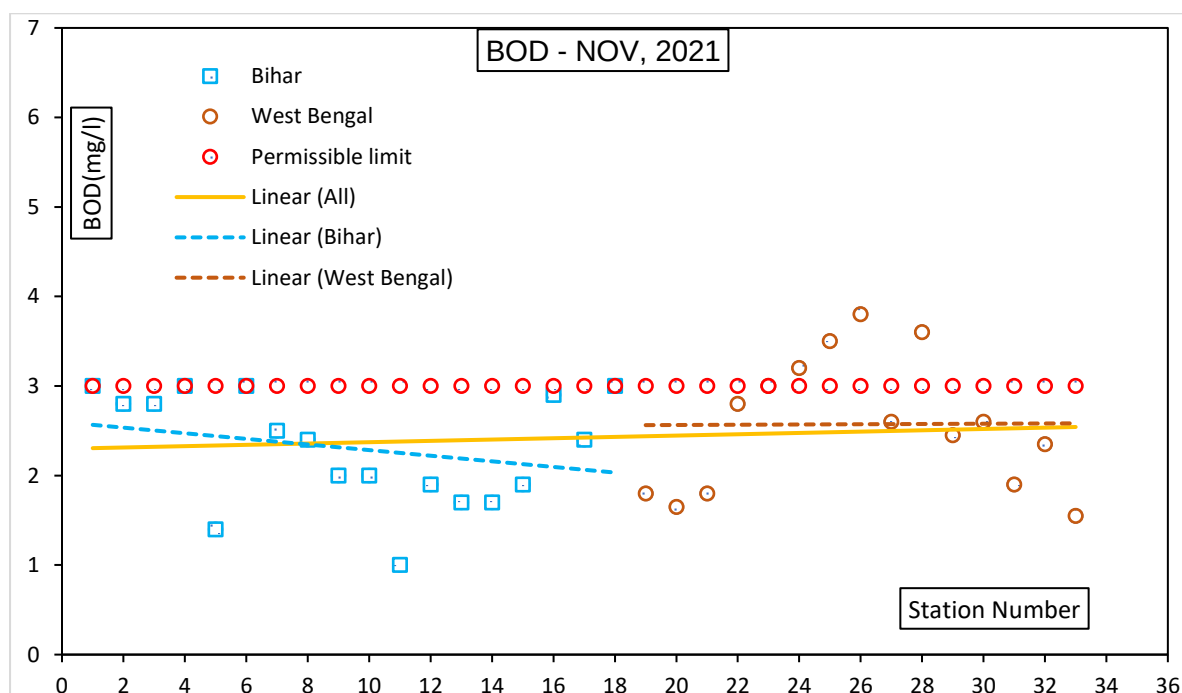


Fig.5.237. Trend Line analysis of BOD value for November,2021

The BOD values were found in the range of 1.0–3.8 mg/l. The highest BOD value of 3.8 mg/l was Palta, Shitaltala for the month of November, 2021. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O₂ (DO)

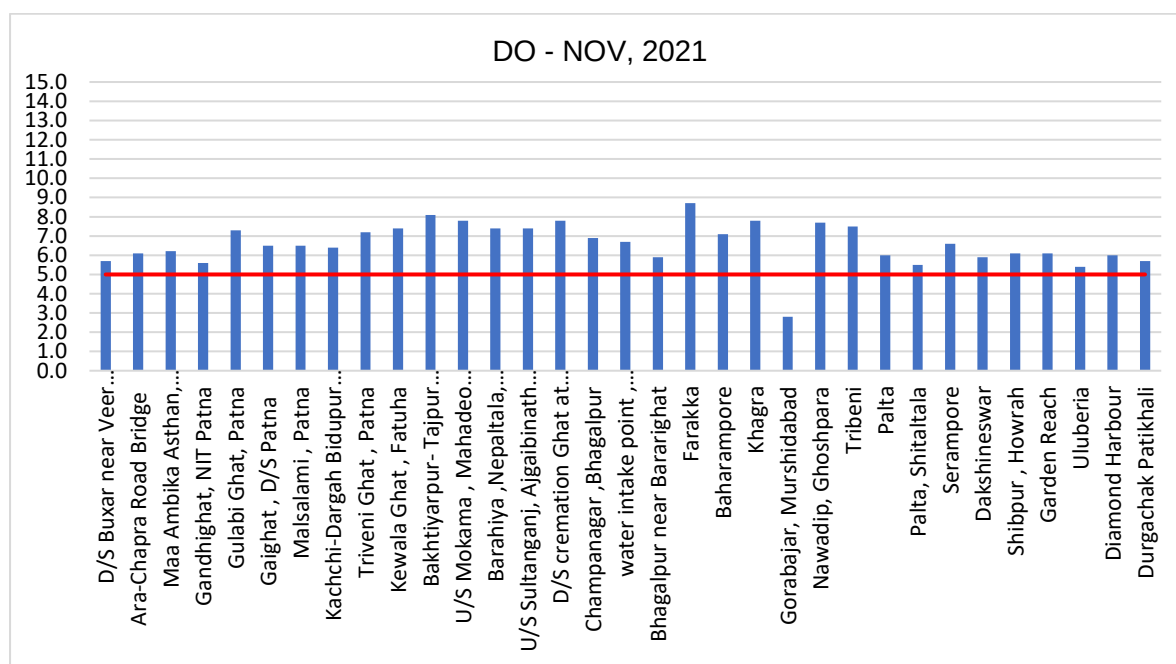


Fig.5.238. DO value for November,2021

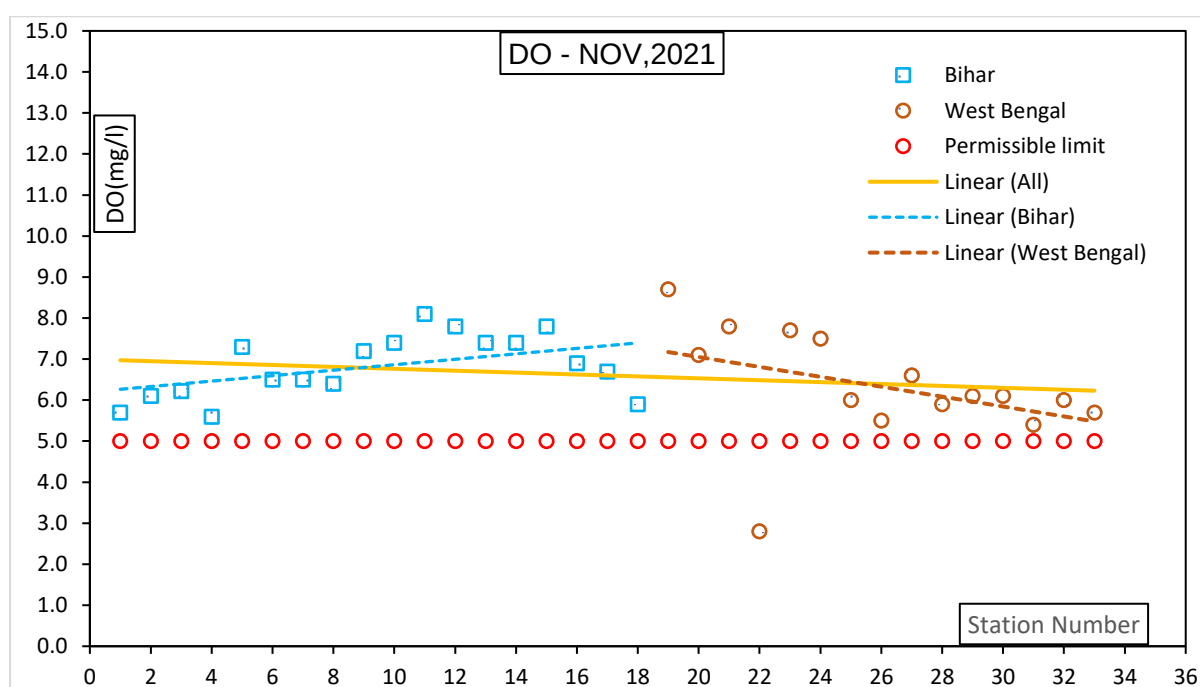


Fig.5.239. Trend Line analysis of DO value for November,2021

The DO values were found in the range of 2.8–8.7 mg/l. The lowest DO value 2.8 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.7 mg/l was for Farakka for November, 2021. From Trend Line analysis curve the DO value for Bihar is increasing and for West Bengal it is decreasing.

Parameter 3: pH

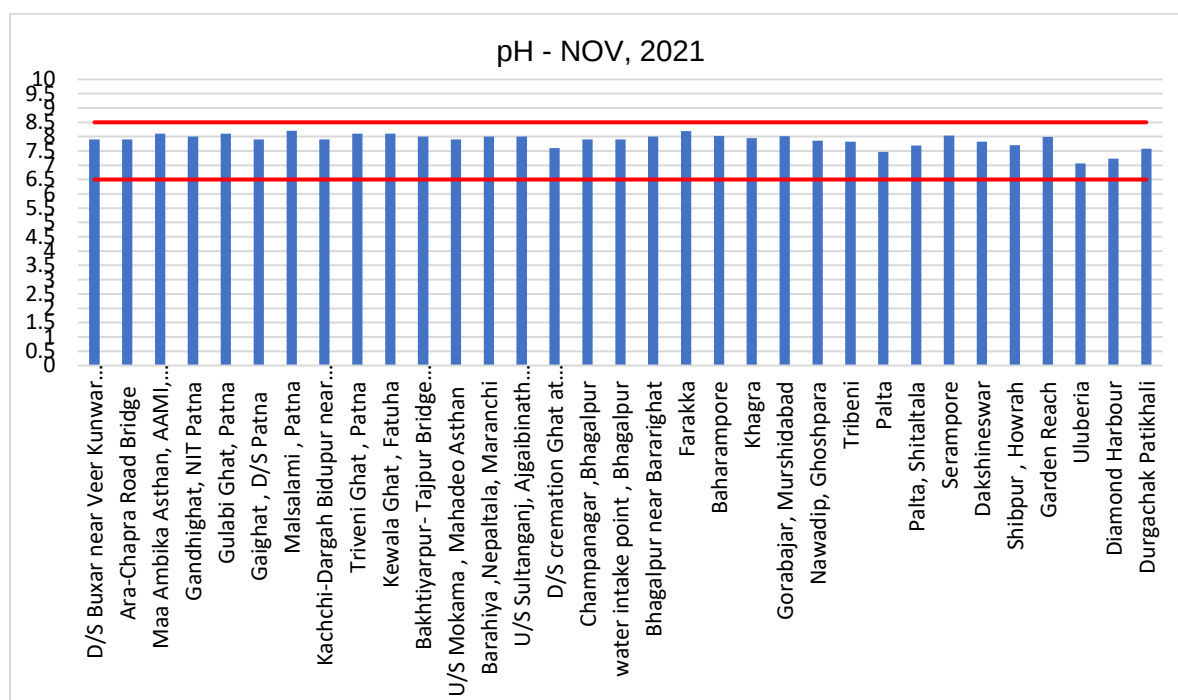


Fig.5.240. pH value for November,2021

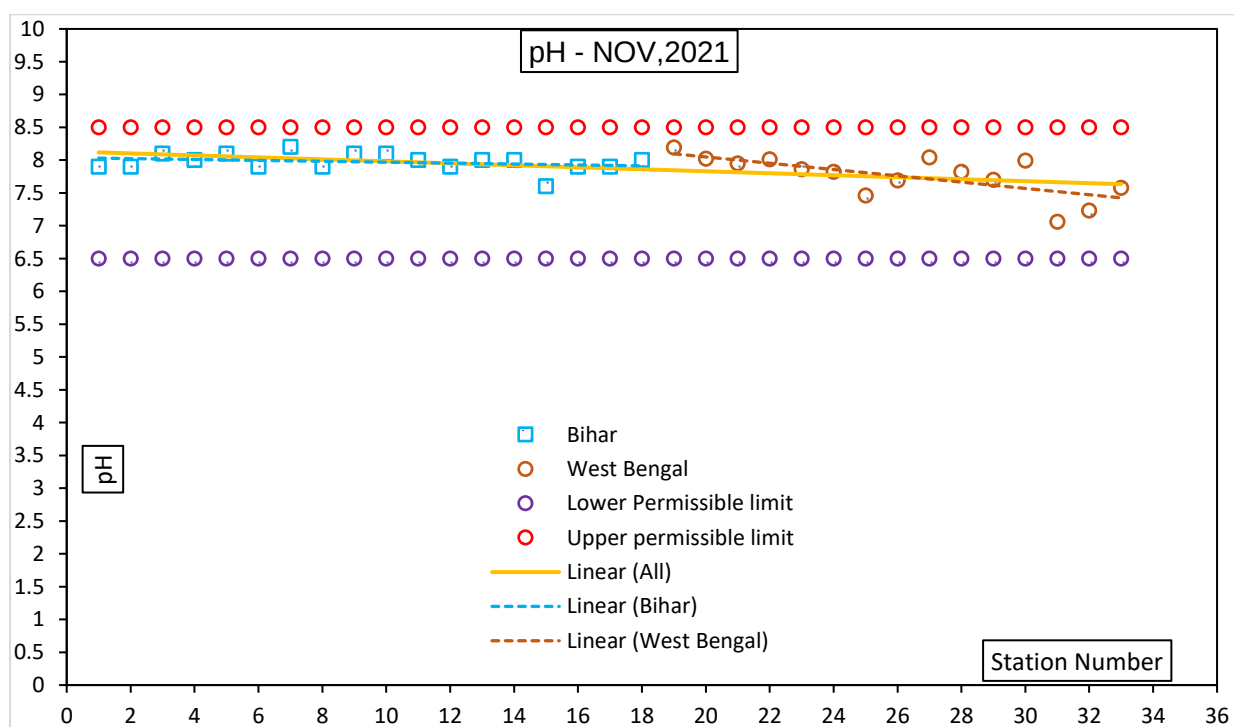


Fig.5.241. Trend Line analysis of pH value for November,2021

The pH values were found in the range of 7.06 – 8.2 for November, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month November, 2021. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

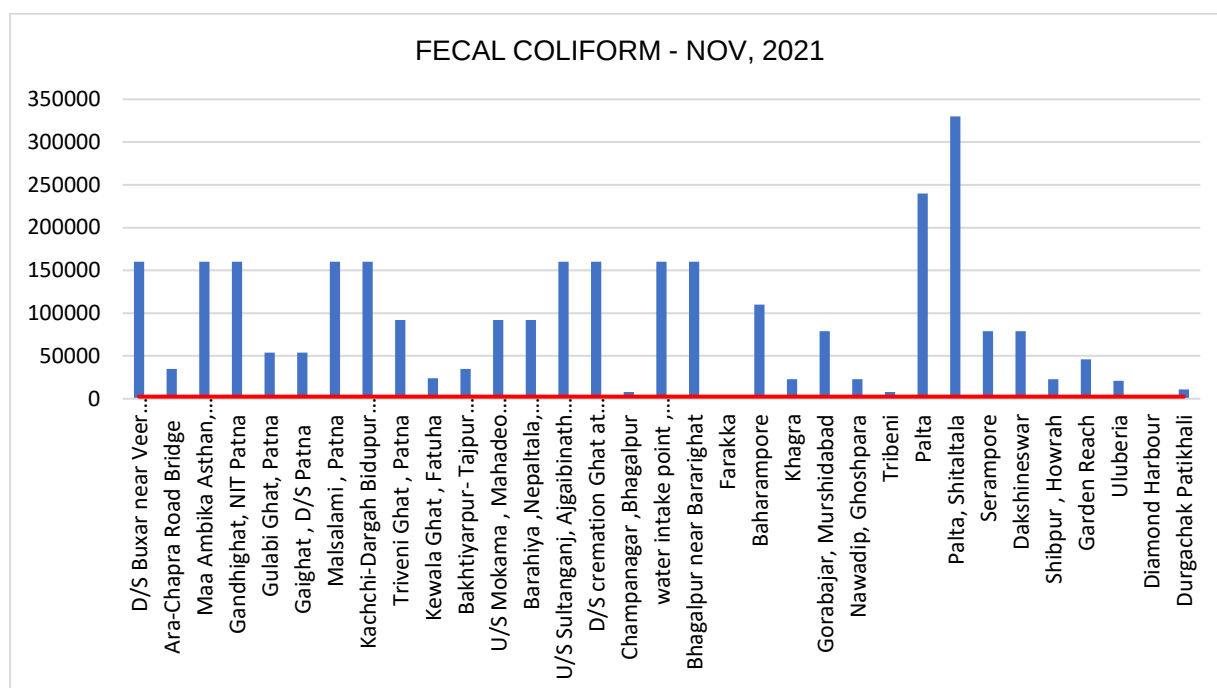


Fig.5.242. Fecal Coliform value for November,2021

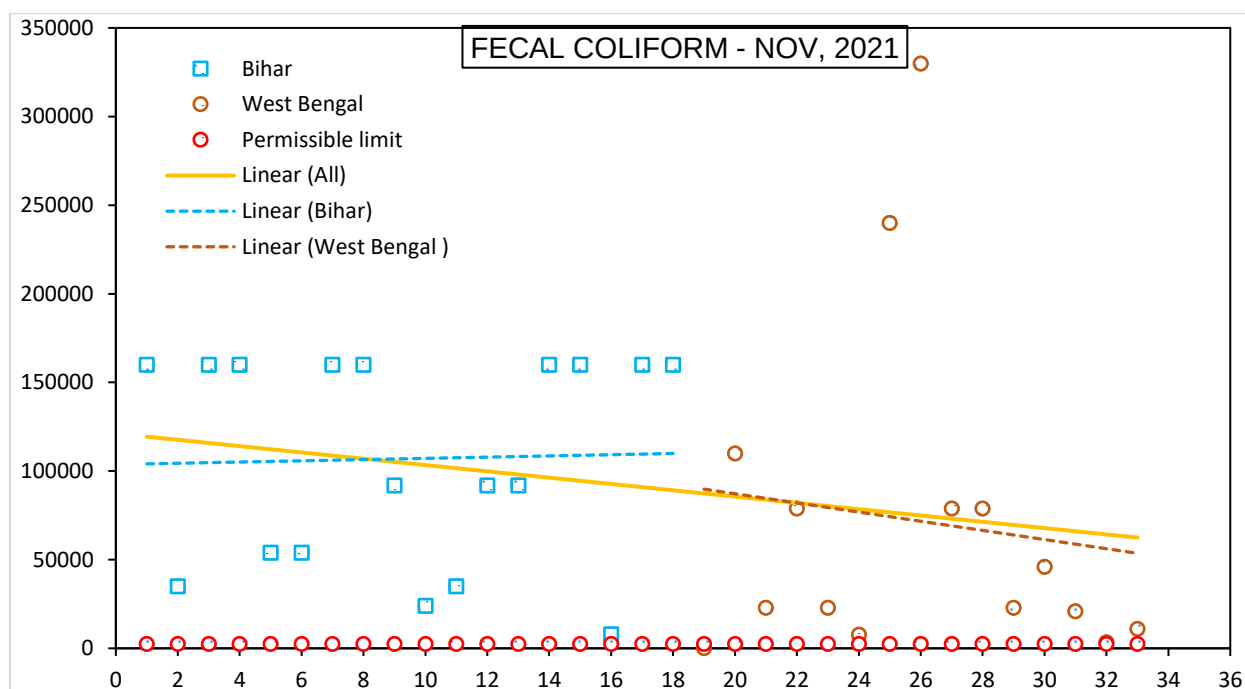


Fig.5.243. Trend Line analysis of Fecal Coliform value for November,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 330000 for November, 2021. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

November 2022:

Table 33: Data of water quality parameter of river Ganga at different stations for November , 2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	03.11.2022	2.1	7.8	7.78	92000
2	Ara-Chapra Road Bridge	15.11.2022	1.6	7.7	7.39	130
3	Maa Ambika Asthan, AAMI	03.11.2022	1.7	7.7	7.81	92000
4	Gandhighat, NIT Patna	25.11.2022	1.8	7.8	7.88	130000
5	Gulabi Ghat, Patna	25.11.2022	2.2	7.1	7.21	92000
6	Gaighat , D/S Patna	25.11.2022	2.7	6.2	7.57	35000
7	Malsalami , Patna	01.11.2022	1.8	6.6	7.62	240000
8	Kachchi-Dargah Bidupur	25.11.2022	1.7	8.2	7.82	28000
9	Triveni Ghat , Patna	01.11.2022	1.4	9.1	7.32	22000
10	Kewala Ghat , Fatuha	01.11.2022	2	6.7	7.52	240000
11	Bakhtiyarpur- Tajpur Bridge	07.11.2022	2.1	7.9	7.42	35000
12	U/S Mokama , Mahadeo Asthan	21.11.2022	1.5	7.6	7.66	24000
13	Barahiya ,Nepaltala, Maranchi	07.11.2022	2.5	6.8	7.68	11000
14	U/S Sultanganj, Ajgaibinath Mandir	missing	=	=	=	=
15	D/S cremation Ghat at Sultanganj	05.11.2022	2.1	6.1	7.49	35000
16	Champanagar ,Bhagalpur	19.11.2022	1.3	8.2	7.56	54000
17	water intake point , Bhagalpur	18.11.2022	1.5	8.4	7.67	92000
18	Bhagalpur near Bararighat	04.11.2022	2.6	5.8	7.47	24000
19	Farakka	28/11/2022	1.7	8	8.12	700
20	Baharampore	30/11/2022	2	8	8.12	22000
21	Khagra	30/11/2022	1.1	8	8.1	790
22	Gorabajar, Murshidabad	30/11/2022	1.6	1.6	8.05	3300
23	Nawadip, Ghoshpara	29/11/2022	2.2	7.7	8.28	1100
24	Tribeni	missing	=	=	=	-
25	Palta	24/11/2022	2.9	7.3	8.06	14000
26	Palta, Shitaltala	24/11/2022	1.6	7.6	8.07	7900
27	Serampore	missing	=	=	=	=
28	Dakshineswar	21/11/2022	2.1	6.2	7.25	49000
29	Shibpur , Howrah	23/11/2022	2.45	5.8	7.38	79000
30	Garden Reach	23/11/2022	3.1	5.6	7.43	79000
31	Uluberia	25/11/2022	2.65	5.6	7.13	23000
32	Diamond Harbour	28/11/2022	3.7	6.5	7.33	6800
33	Durgachak Patikhali	22/11/2022	1.15	6.7	8.51	12000

Parameter 1: BOD

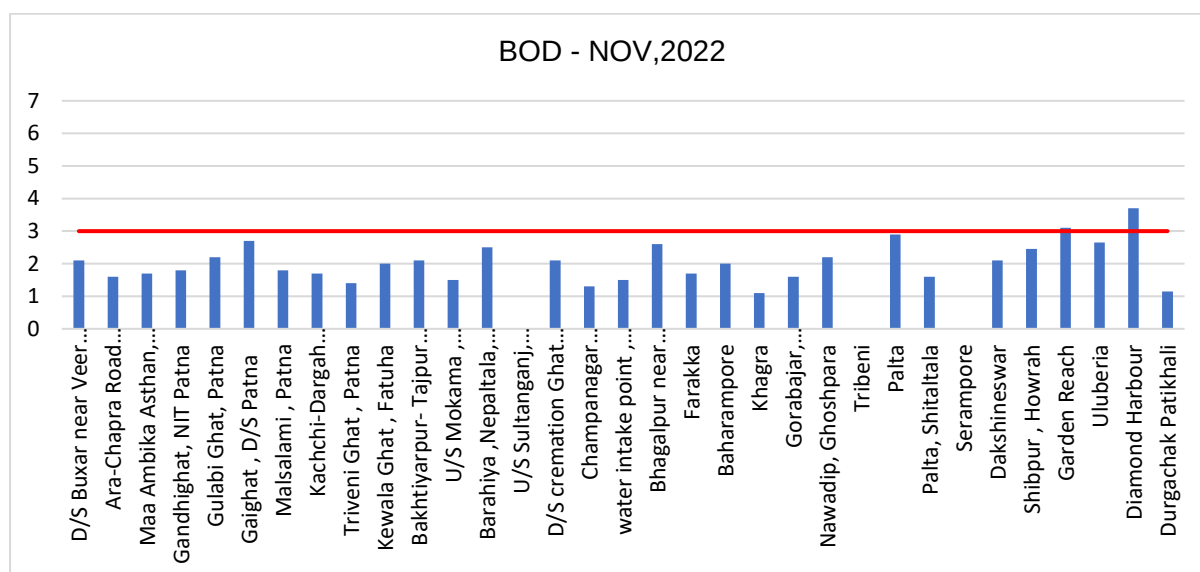


Fig.5.244. BOD value for November,2022

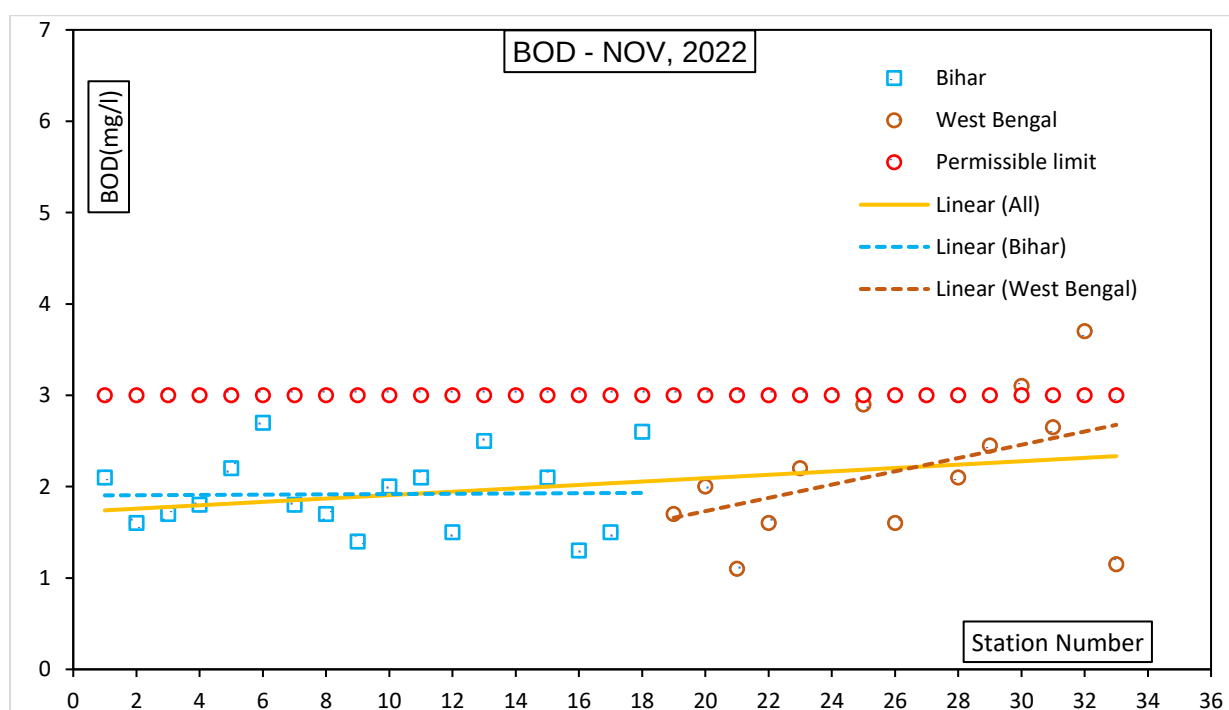


Fig.5.245. Trend Line analysis of BOD value for November,2022

The BOD values were found in the range of 1.1–3.7 mg/l. The highest BOD value of 3.7 mg/l was Diamond Harbour for the month of November, 2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 2: Dissolved O₂ (DO)

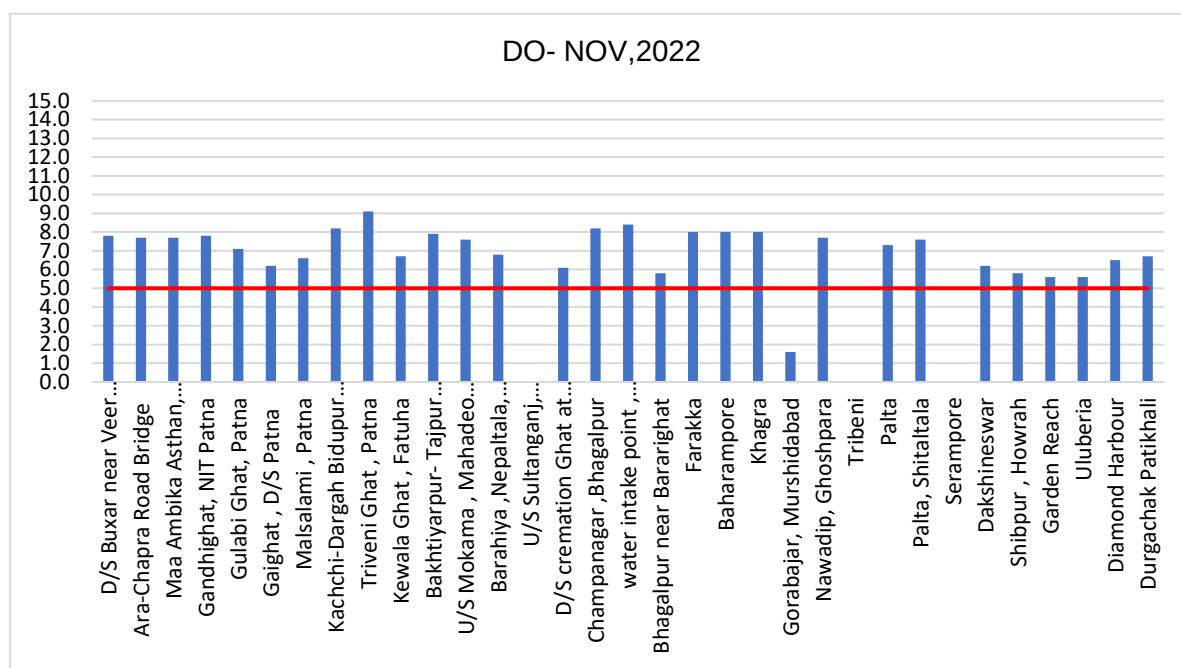


Fig.5.246. DO value for November,2022

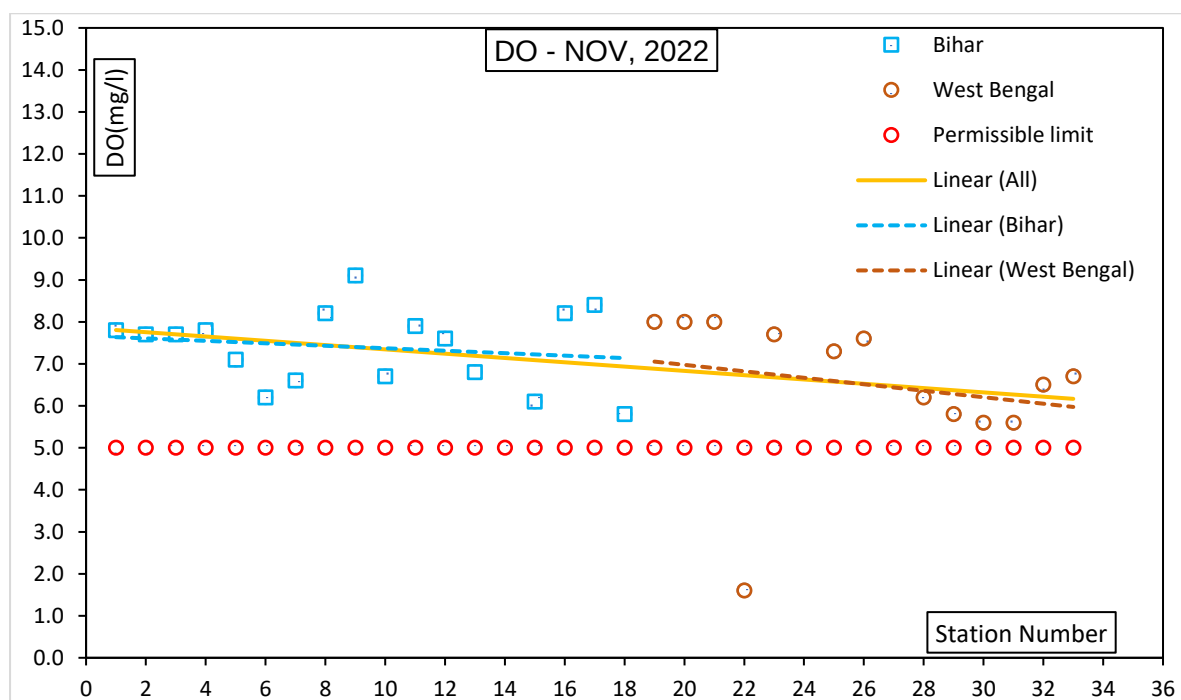


Fig.5.247. Trend Line analysis of DO value for November,2022

The DO values were found in the range of 1.6–9.1 mg/l. The lowest DO value 1.6 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.1 mg/l was for Triveni Ghat, Patna for November, 2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

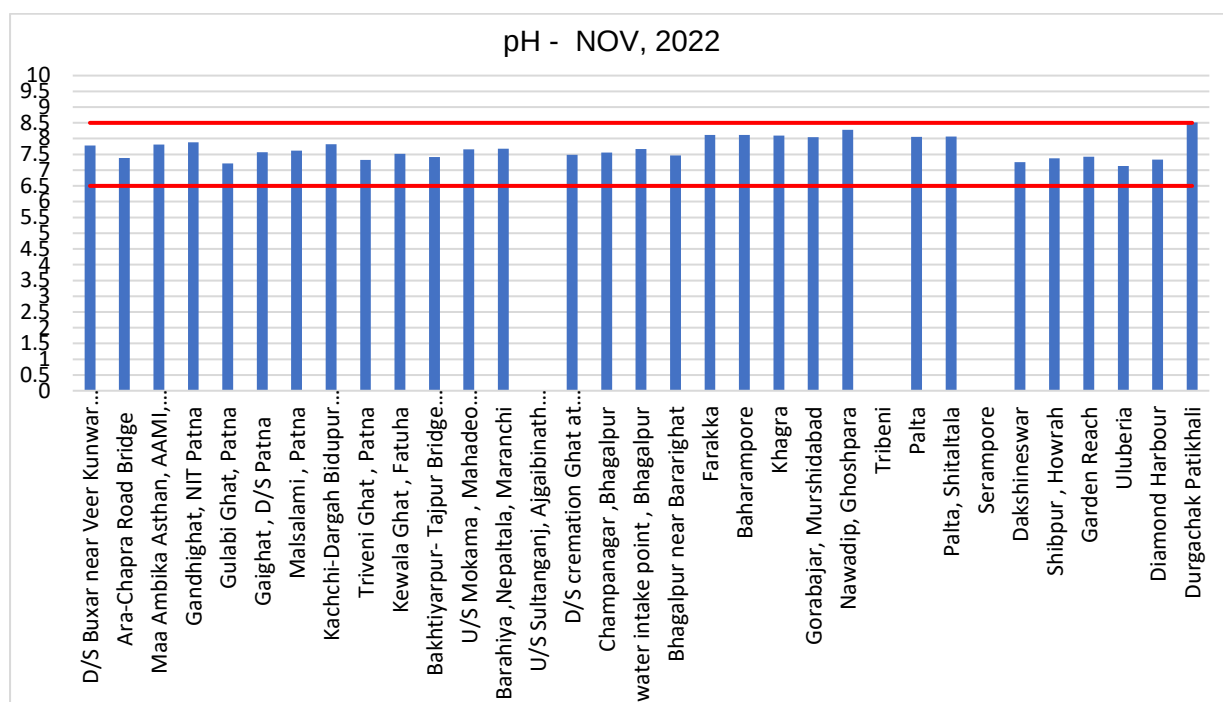


Fig.5.248. pH value for November,2022

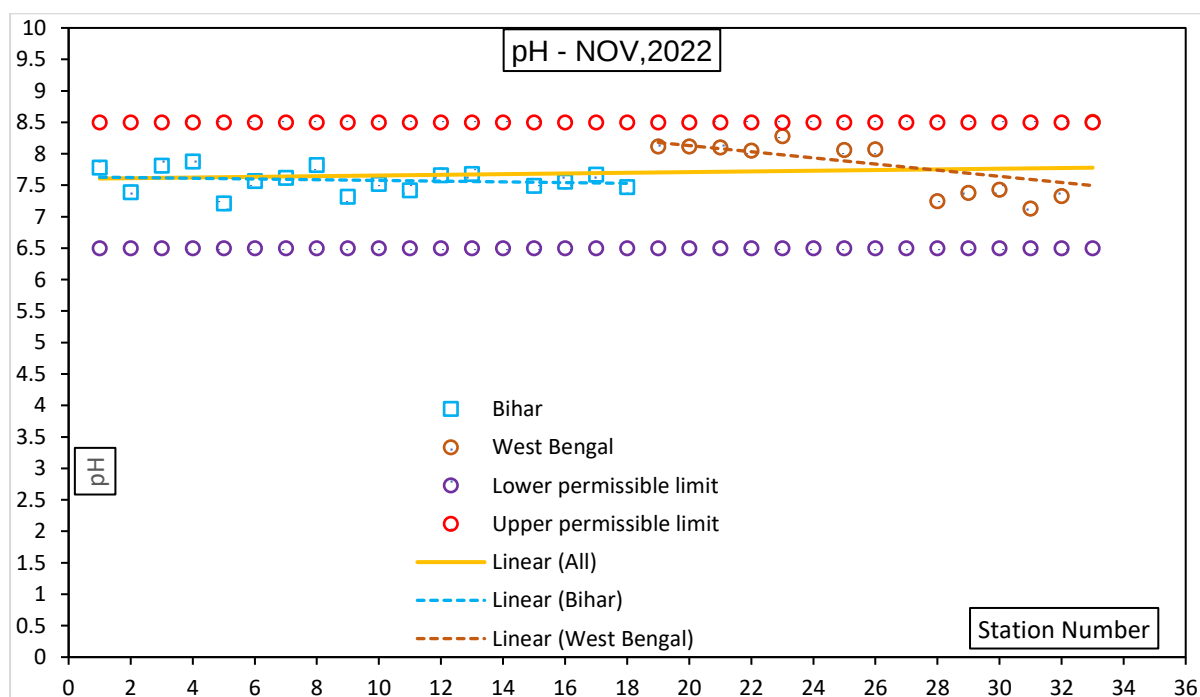


Fig.5.249. Trend Line analysis of pH value for November,2022

The pH values were found in the range of 7.13 – 8.51 for November, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) exceeded the permissible limit once for the month November, 2022. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

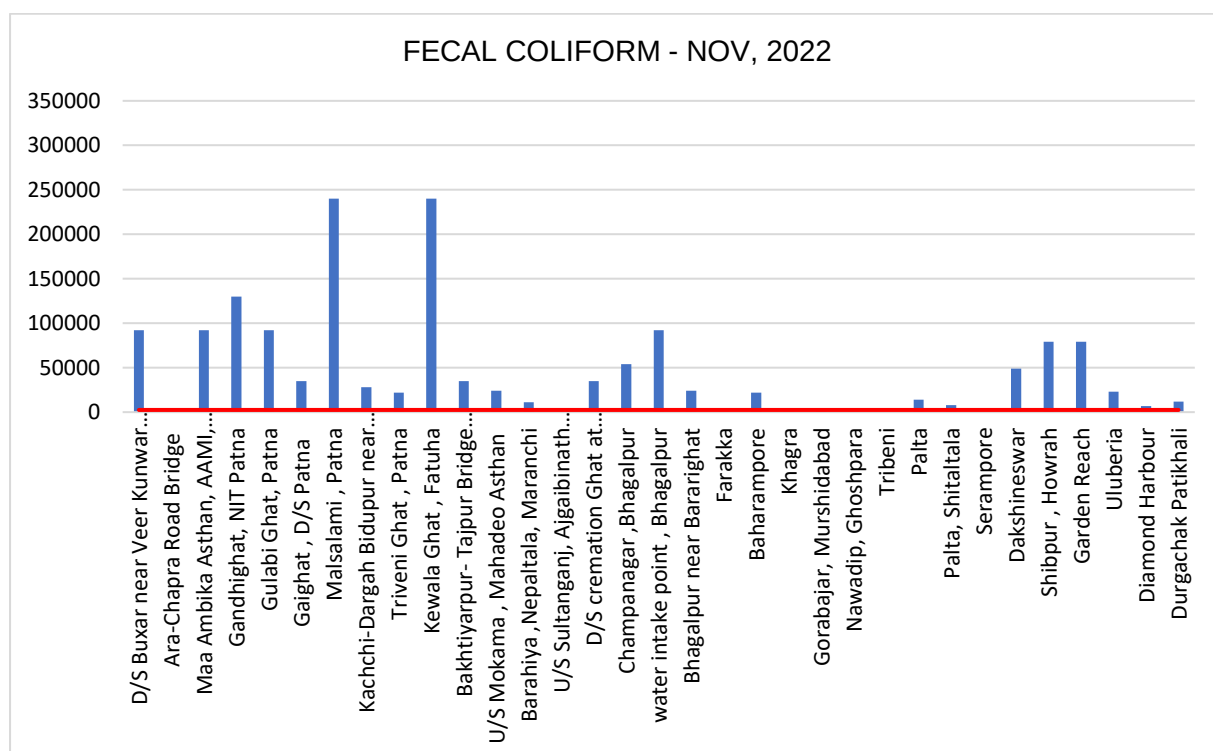


Fig.5.250. Fecal Coliform value for November,2022

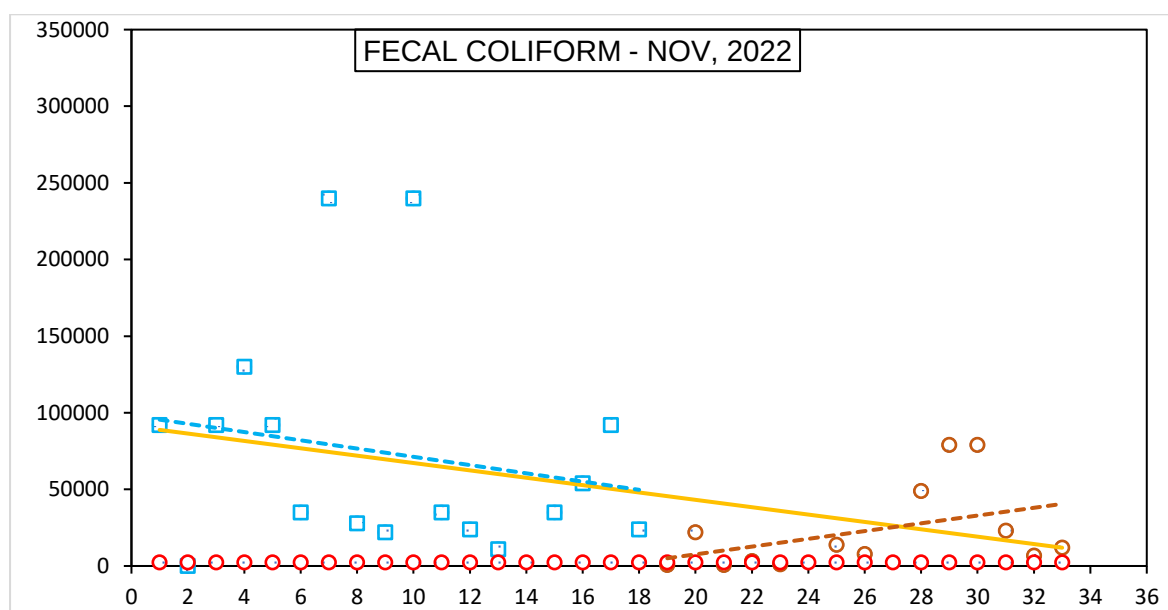


Fig.5.251. Trend Line analysis of Fecal Coliform value for November,2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000 for November, 2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is increasing.

November 2023:

Table 34: Data of water quality parameter of river Ganga at different stations for November,2023						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	23.11.2023	1.4	7.8	7.42	7900
2	Ara-Chapra Road Bridge	22.11.2023	1	8.1	7.74	1300
3	Maa Ambika Asthan, AAMI	22.11.2023	1.8	7.9	7.82	14000
4	Gandhighat, NIT Patna	23.11.2023	1.6	7.6	7.64	17000
5	Gulabi Ghat, Patna	02.11.2023	1.8	7.8	7.78	35000
6	Gaighat , D/S Patna	02.11.2023	1.9	7.5	7.54	17000
7	Malsalami , Patna	02.11.2023	1.2	8.7	7.78	13000
8	Kachchi-Dargah Bidupur	02.11.2023	1.4	8.5	7.81	13000
9	Triveni Ghat , Patna	02.11.2023	1.9	7.9	7.9	11000
10	Kewala Ghat , Fatuha	02.11.2023	1.3	7.8	7.8	17000
11	Bakhtiyarpur- Tajpur Bridge	06.11.2023	2	7.2	7.41	4900
12	U/S Mokama , Mahadeo Asthan	17.11.2023	1.9	7.7	7.81	22000
13	Barahiya ,Nepaltala, Maranchi	17.11.2023	2.1	7.2	7.32	7900
14	U/S Sultanganj, Ajgaibinath Mandir	22.11.2023	1.3	7.8	7.76	17000
15	D/S cremation Ghat at Sultanganj	22.11.2023	2	7.6	7.68	13000
16	Champanagar ,Bhagalpur	22.11.2023	1.7	8.0	7.7	7900
17	water intake point , Bhagalpur	22.11.2023	2.2	7.6	7.85	13000
18	Bhagalpur near Bararighat	22.11.2023	2.1	7.2	7.78	22000
19	Farakka	28.11.2023	2.25	8	7.43	1700
20	Baharampore	29.11.2023	2	8.1	7.49	3500
21	Khagra	29.11.2023	1.75	8.1	7.89	1300
22	Gorabajar, Murshidabad	29.11.2023	2.2	2.2	-	2400
23	Nawadip, Ghoshpara	23.11.2023	2.1	7.3	7.43	1400
24	Tribeni	02.11.2023	2.5	6.5	7.5	1700
25	Palta	23.11.2023	2.3	7.2	7.69	7000
26	Palta, Shitaltala	23.11.2023	2.8	6.9	7.61	11000
27	Serampore	23.11.2023	2.6	7	7.76	17000
28	Dakshineswar	28.11.2023	2.83	5.5	7.02	79000
29	Shibpur , Howrah	29.11.2023	2.79	5.87	7.26	79000
30	Garden Reach	28.11.2023	2.71	5.39	7.17	84000
31	Uluberia	30.11.2023	2.64	5.77	7.04	22000
32	Diamond Harbour	30.11.2023	2.5	6.27	7.53	6800
33	Durgachak Patikhali	22.11.2023	1.2	6.4	7.8	7900

Parameter 1: BOD

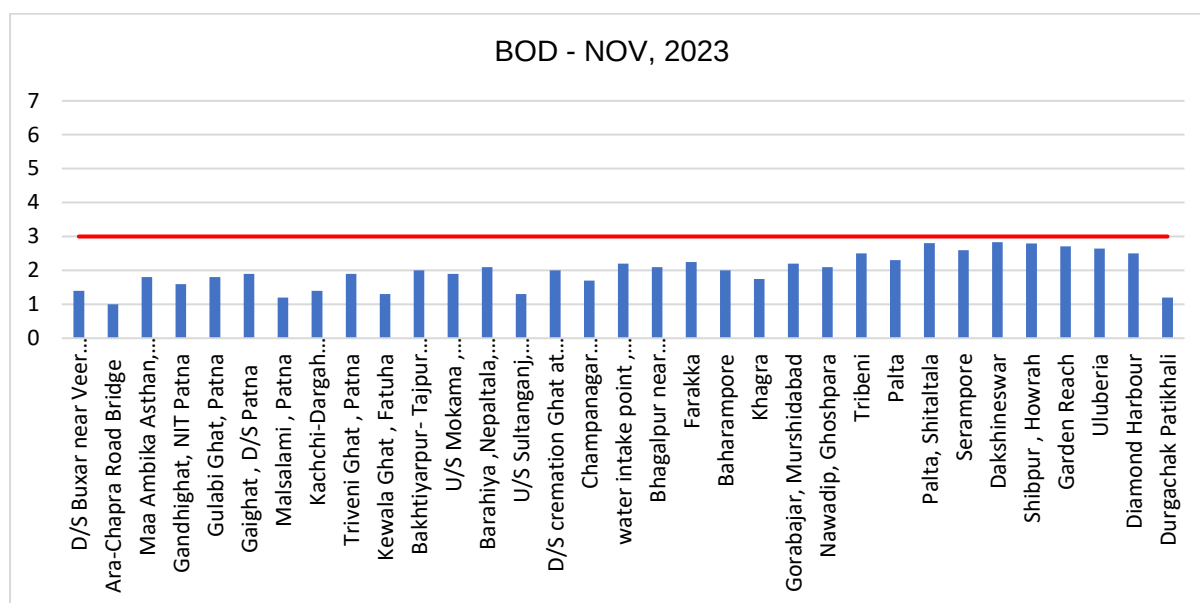


Fig.5.252. BOD value for November,2023

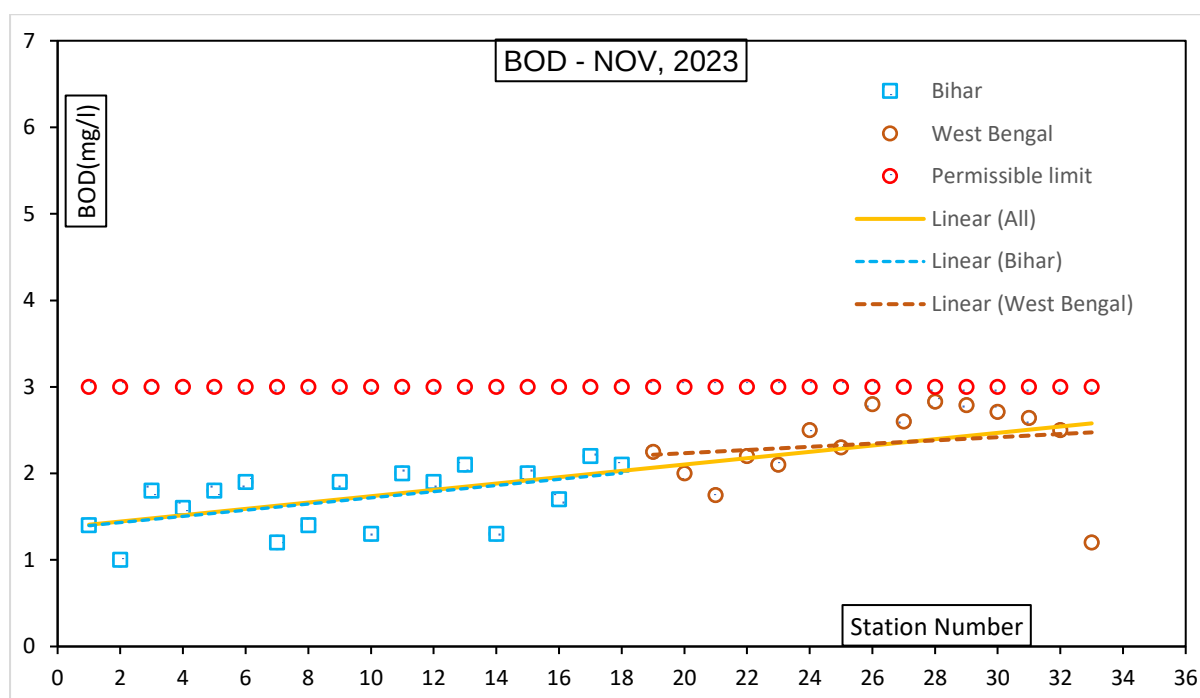


Fig.5.253. Trend Line analysis of BOD value for November,2023

The BOD values were found in the range of 1.0–2.83 mg/l. The highest BOD value of 2.83 mg/l was Diamond Harbour for the month of November, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

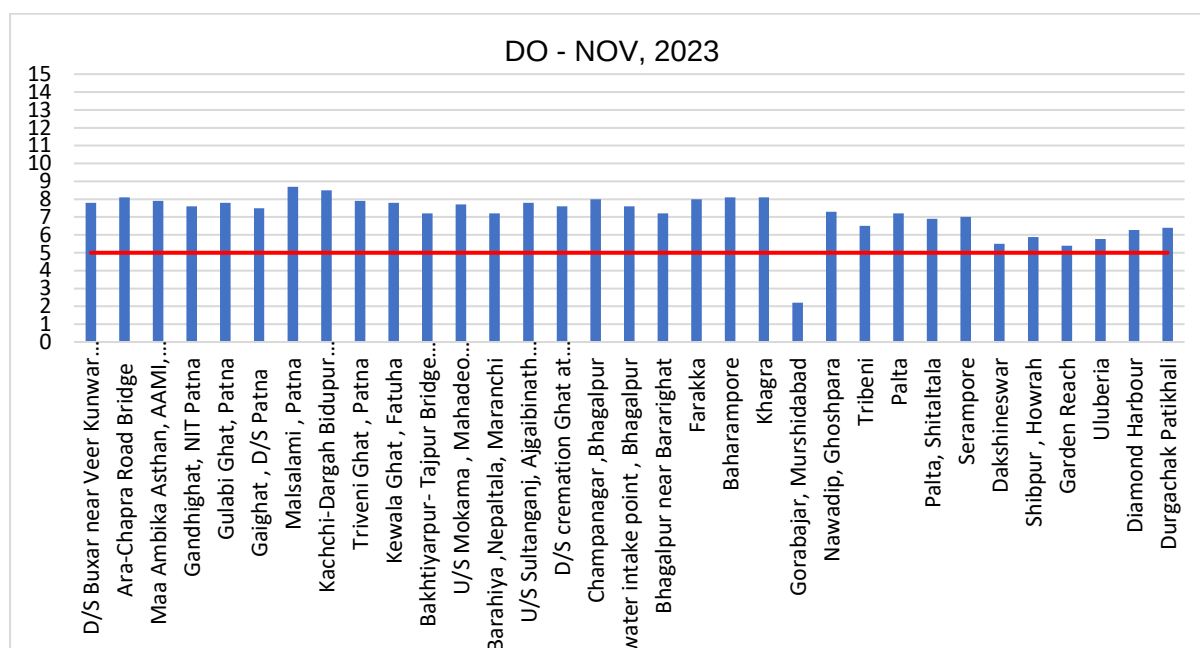


Fig.5.254. DO value for November,2023

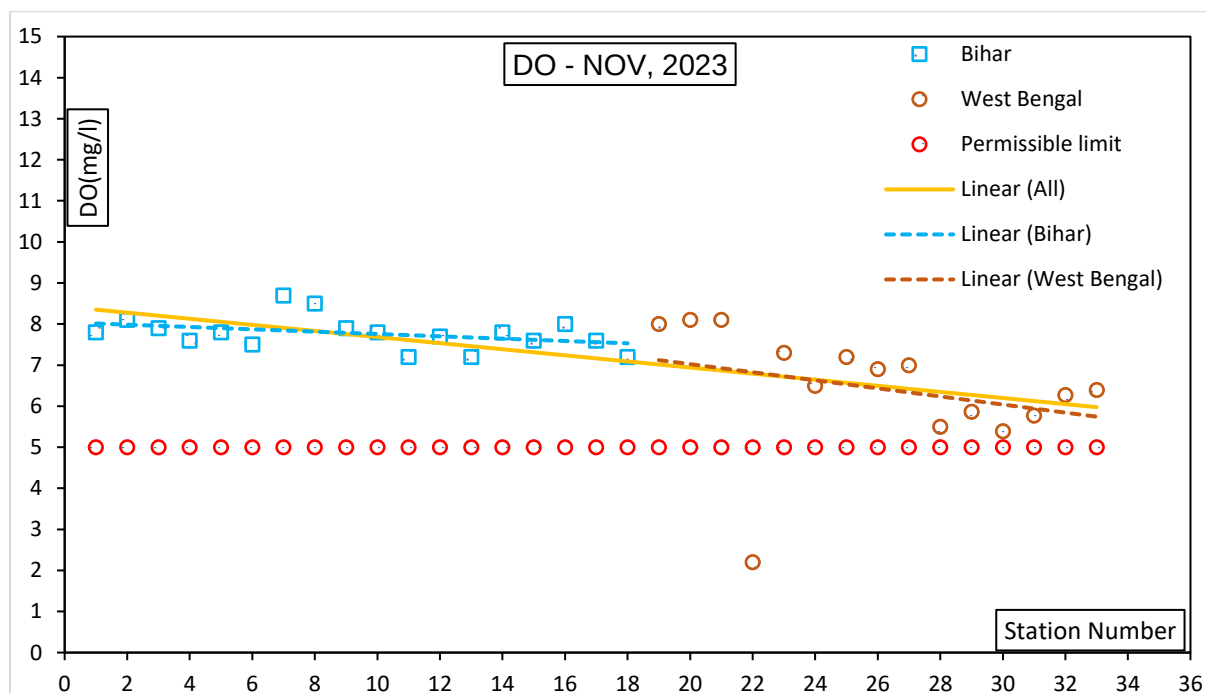


Fig.5.255. Trend Line analysis of DO value for November,2023

The DO values were found in the range of 2.2–8.7 mg/l. The lowest DO value 2.2 mg/l was for Gorabajar, Murshidabad and highest DO value of 8.7 mg/l was for Malsalami, Patna for November, 2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

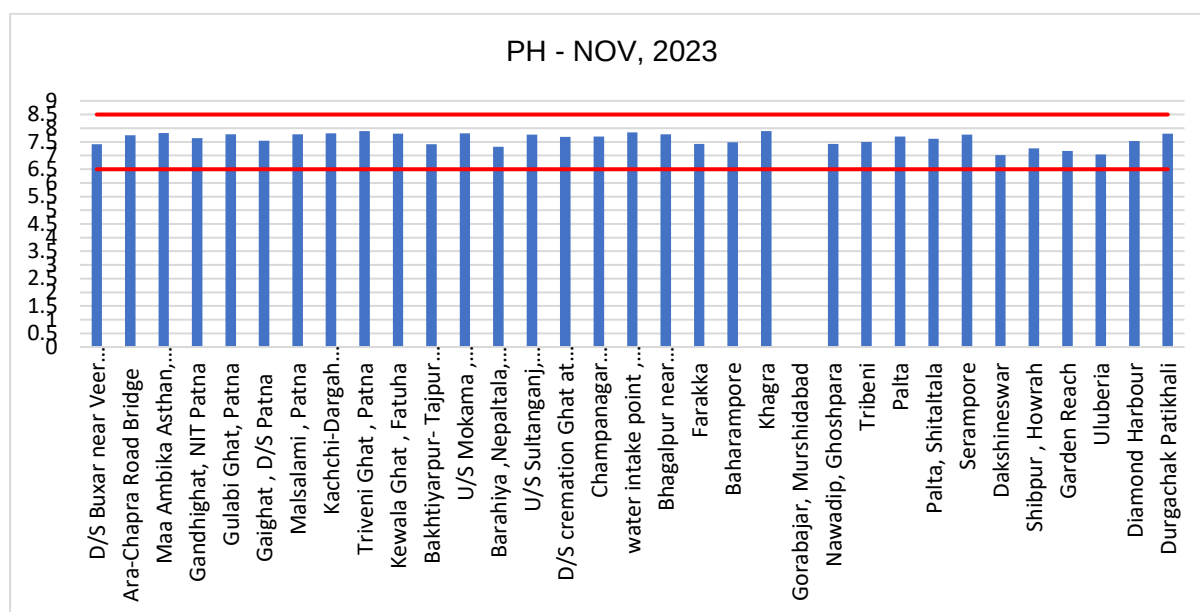


Fig.5.256. pH value for November,2023

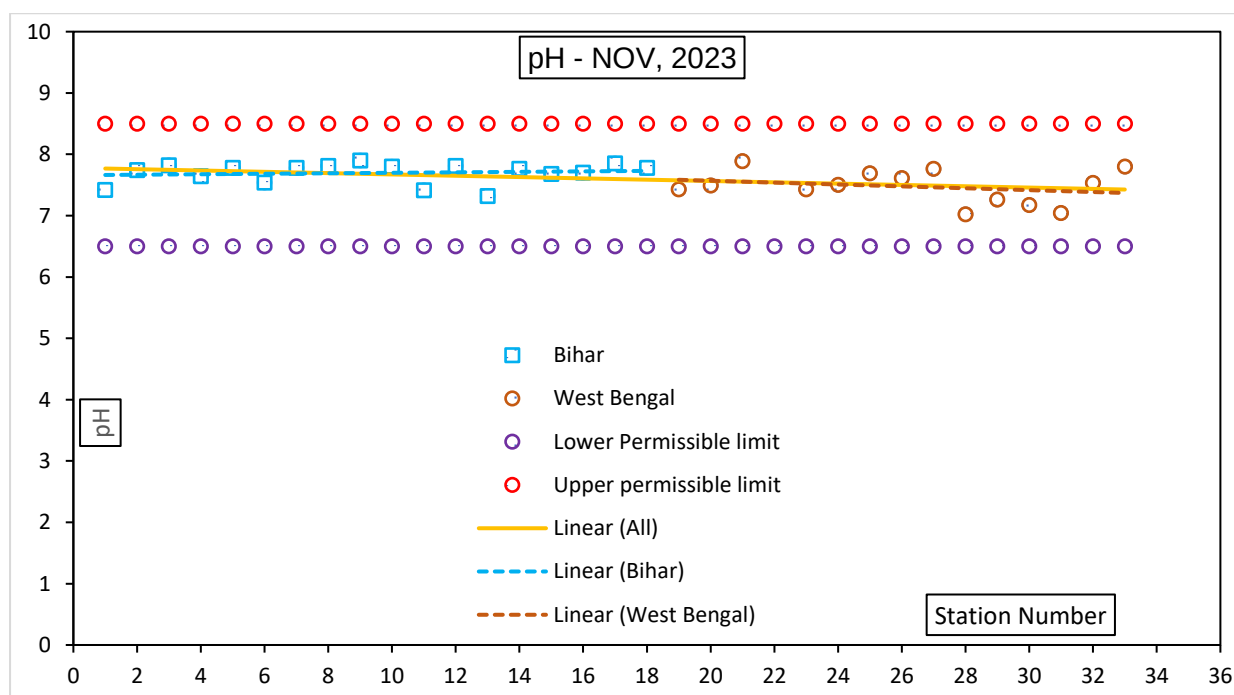


Fig.5.257. Trend Line analysis of pH value for November,2023

The pH values were found in the range of 7.02 – 7.9 for November, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month November, 2023. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

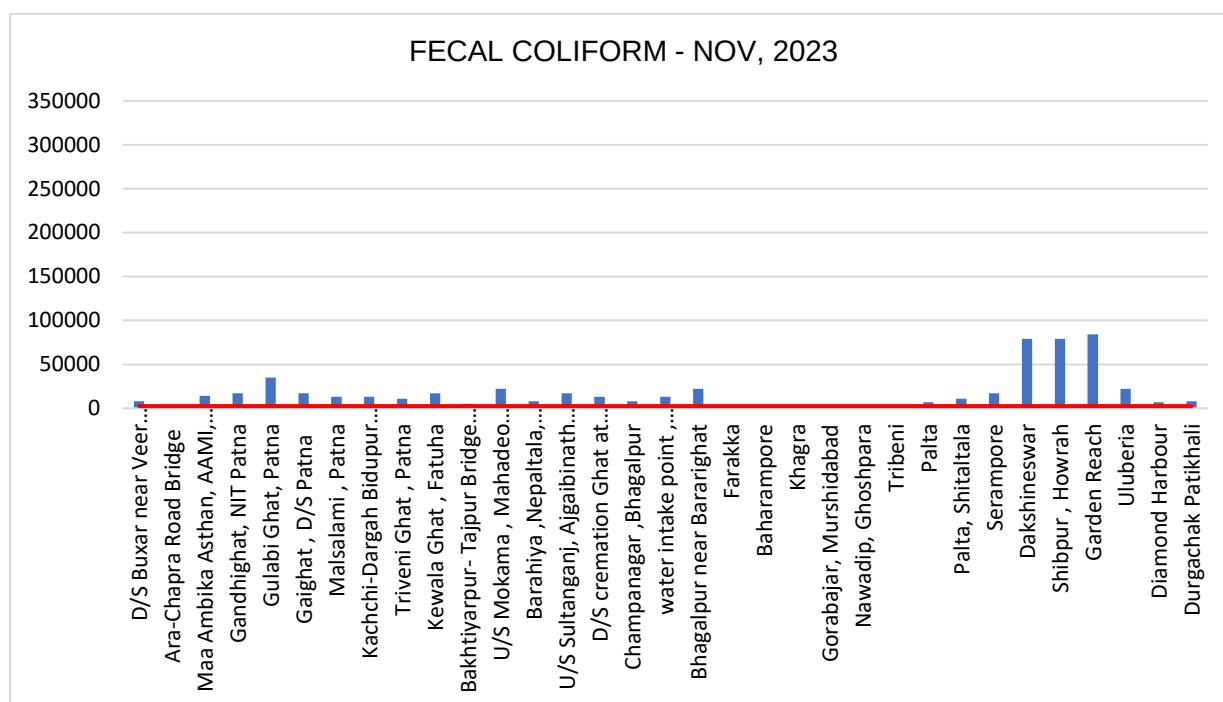


Fig.5.258. Fecal Coliform value for November,2023

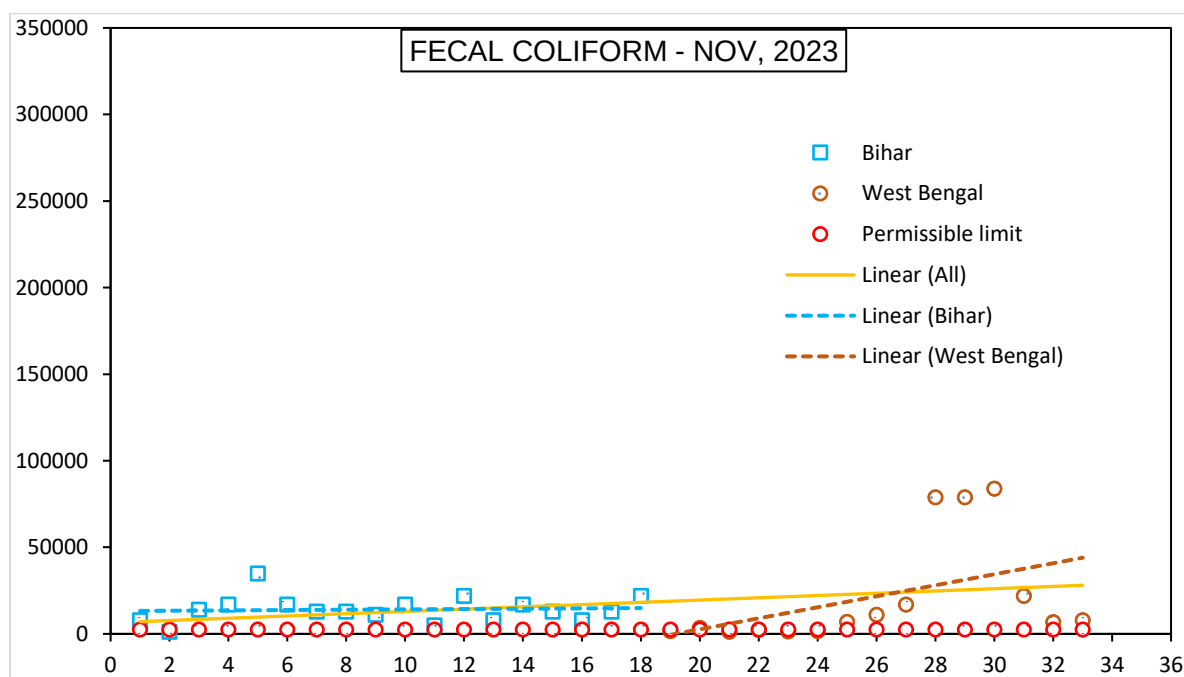


Fig.5.259. Trend Line analysis of Fecal Coliform value for November,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 84000 for November, 2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is decreasing and for West Bengal it is decreasing.

December 2021:

Table 35: Data of water quality parameter of river Ganga at different stations for December, 2021						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	17.12.2021	1.1	10.0	8.43	17000
2	Ara-Chapra Road Bridge	01.12.2021	1.4	8.0	8.01	540
3	Maa Ambika Asthan, AAMI	16.12.2021	1	9.9	7.77	4000
4	Gandhighat, NIT Patna	17.12.2021	1.8	7.6	8.08	92000
5	Gulabi Ghat, Patna	17.12.2021	2	7.2	8.21	54000
6	Gaighat , D/S Patna	17.12.2021	1.7	7.4	8.35	17000
7	Malsalami , Patna	17.12.2021	2.1	7.0	8.16	3300
8	Kachchi-Dargah Bidupur	17.12.2021	2.5	6.8	8.18	24000
9	Triveni Ghat , Patna	17.12.2021	2.1	7.3	8.3	3300
10	Kewala Ghat , Fatuha	17.12.2021	2	7.2	7.93	3300
11	Bakhtiyarpur- Tajpur Bridge	21.12.2021	1.3	8.2	7.81	4000
12	U/S Mokama , Mahadeo Asthan	21.12.2021	1.9	9.4	7.98	160000
13	Barahiya ,Nepaltala, Maranchi	21.12.2021	1.3	9.1	8.15	54000
14	U/S Sultanganj, Ajgaibinath Mandir	22.12.2021	1.7	9.1	7.98	160000
15	D/S cremation Ghat at Sultanganj	07.12.2021	1.7	7.4	8.37	160000
16	Champanagar ,Bhagalpur	22.12.2021	2.1	8.5	8.27	2200
17	water intake point , Bhagalpur	23.12.2021	2.8	8.2	7.32	160000
18	Bhagalpur near Bararighat	08.12.2021	1.9	8.2	8.15	160000
19	Farakka	08/12/2021	2.15	8.1	8.1	1300
20	Baharampore	21/12/2021	1.3	8.9	8.09	130000
21	Khagra	21/12/2021	1.4	8.6	8.02	3300
22	Gorabajar, Murshidabad	21/12/2021	2.65	2.65	8.03	33000
23	Nawadip, Ghoshpara	20/12/2021	2	6.3	8.21	7900
24	Tribeni	20/12/2021	2.6	8.2	8.1	14000
25	Palta	23/12/2021	2.8	7.8	8.08	23000
26	Palta, Shitaltala	23/12/2021	3.4	7.8	8.03	49000
27	Serampore	27/12/2021	3	8	8.01	13000
28	Dakshineswar	23/12/2021	3.35	7.7	7.48	49000
29	Shibpur , Howrah	24/12/2021	3.95	7.7	7.1	49000
30	Garden Reach	24/12/2021	3.2	7.4	7.36	70000
31	Uluberia	27/12/2021	2.4	6.4	7.51	23000
32	Diamond Harbour	17/12/2021	2.55	6.2	7.37	3300
33	Durgachak Patikhali	23/12/2021	2.1	7.6	7.28	9400

Parameter 1: BOD

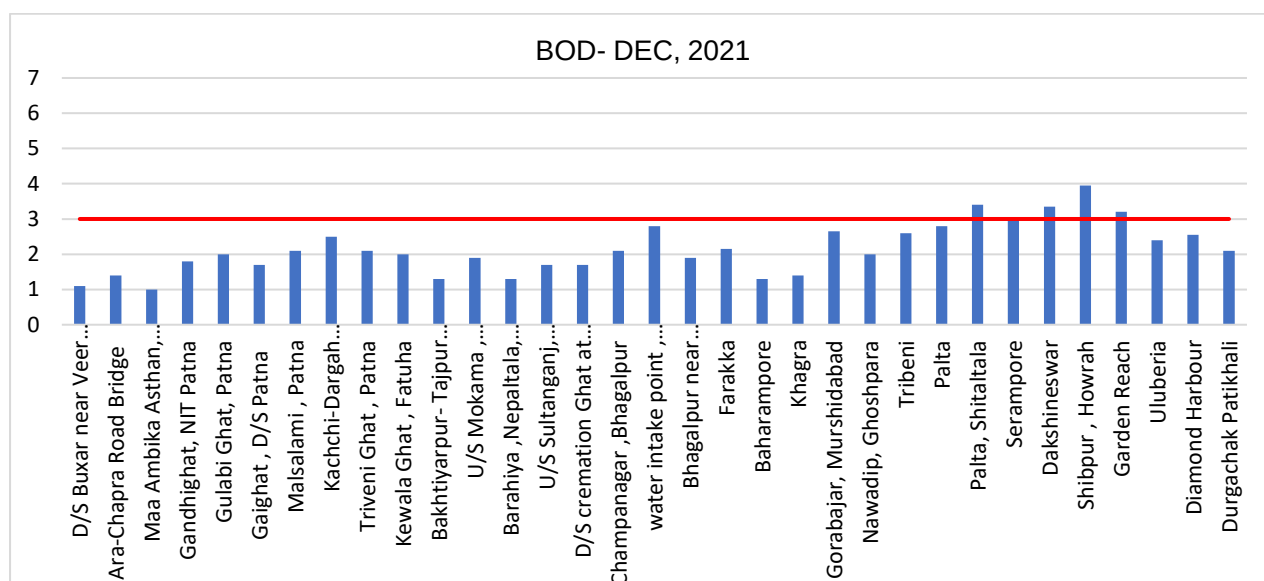


Fig.5.260. BOD value for December,2021

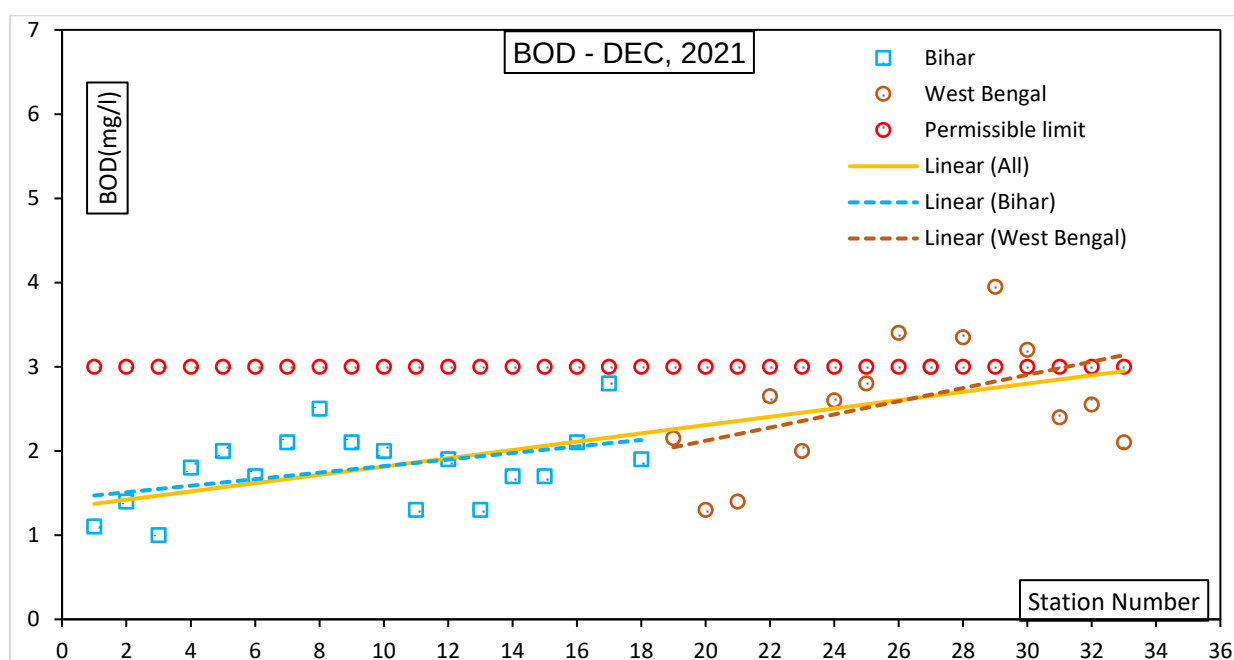


Fig.5.261. Trend Line analysis of BOD value for December,2021

The BOD values were found in the range of 1.0–3.95 mg/l. The highest BOD value of 3.95 mg/l was Shibpur, Howrah for the month of December, 2021. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

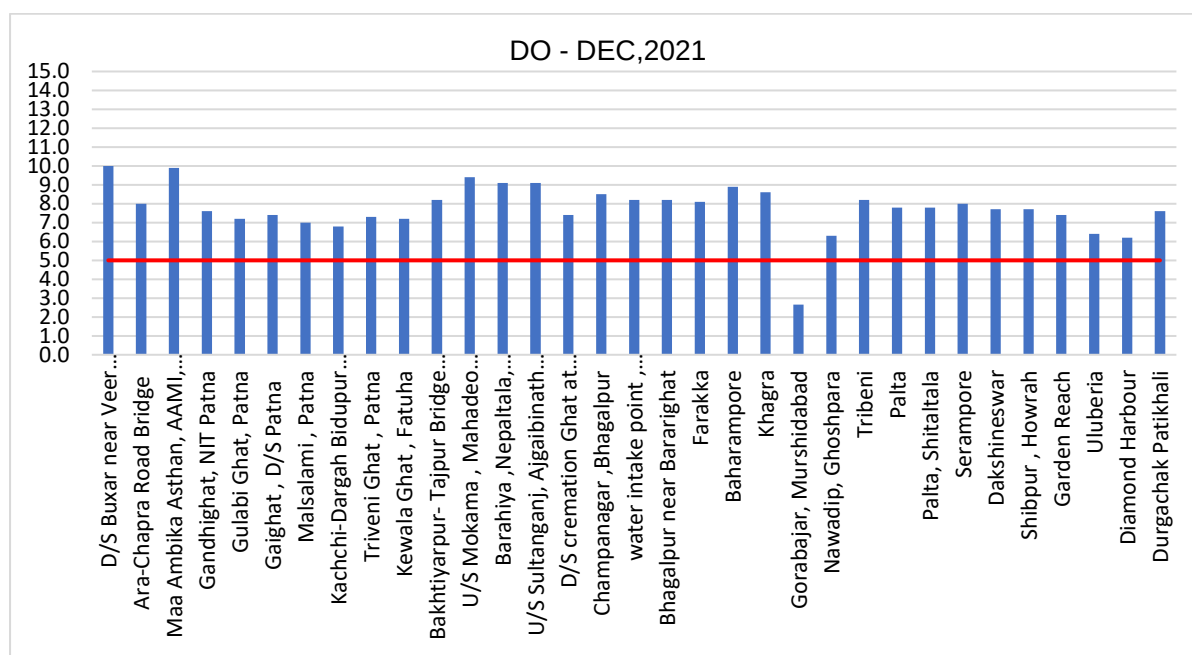


Fig.5.262. DO value for December,2021

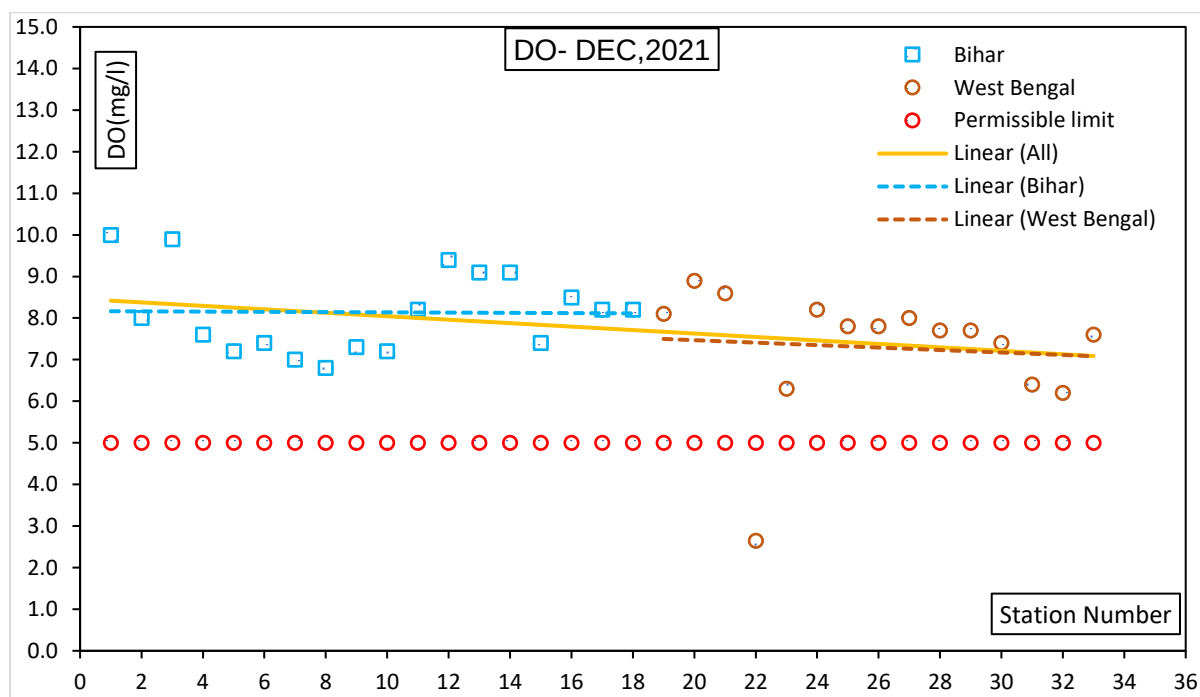


Fig.5.263. Trend Line analysis of DO value for December,2021

The DO values were found in the range of 2.65–9.9 mg/l. The lowest DO value 2.65 mg/l was for Gorabajar, Murshidabad and highest DO value of 10.0 mg/l was for D/S Buxar near Veer Kunwar Singh Road Bridge for December, 2021. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

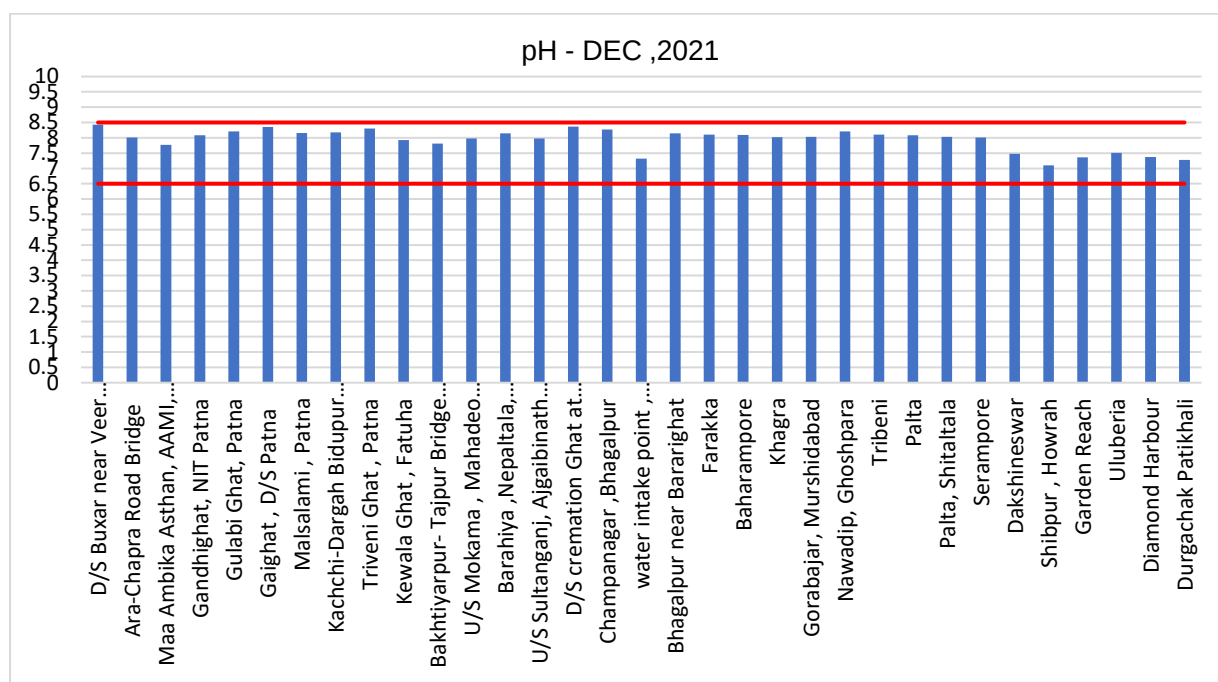


Fig.5.264. pH value for December,2021

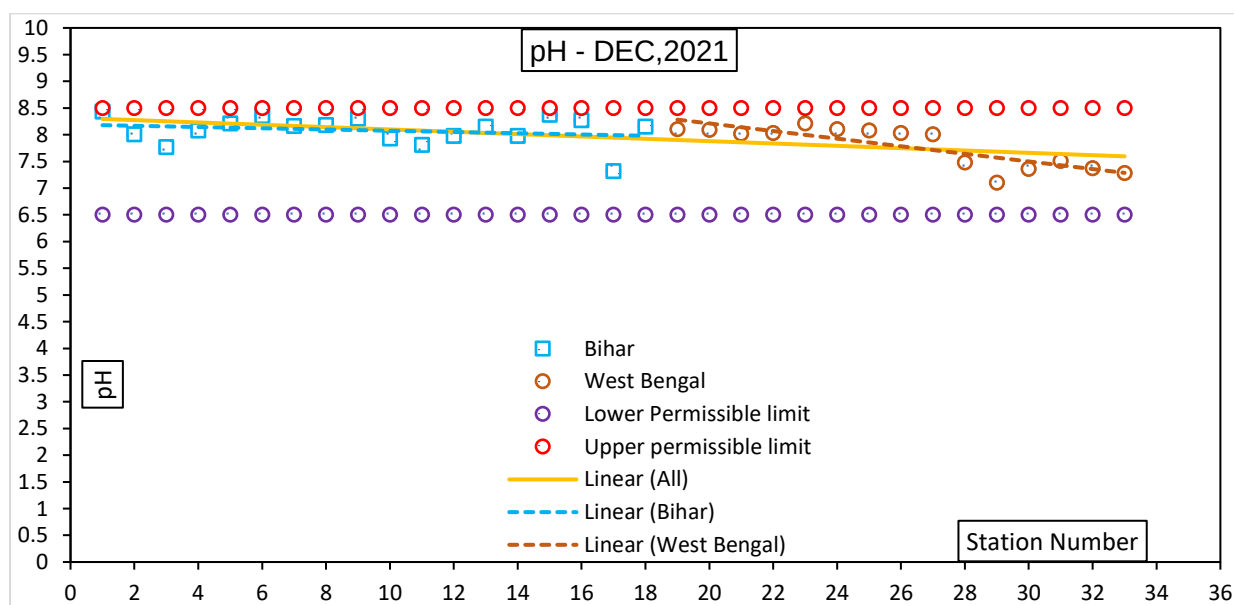


Fig.5.265. Trend Line analysis of pH value for December,2021

The pH values were found in the range of 7.1 – 8.43 for December, 2021. It is seen that the permissible pH value for Class B (6.5 to 8.5) is within the permissible limit for the month December, 2021. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

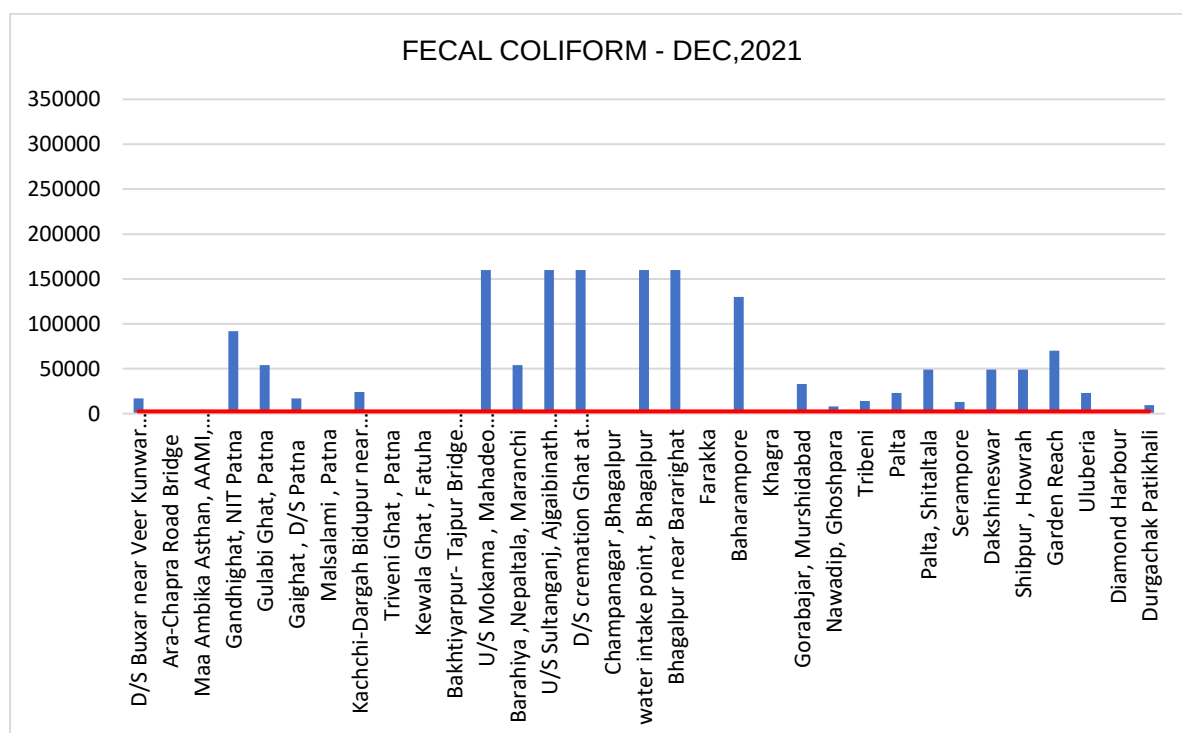


Fig.5.266. Fecal Coliform value for December,2021

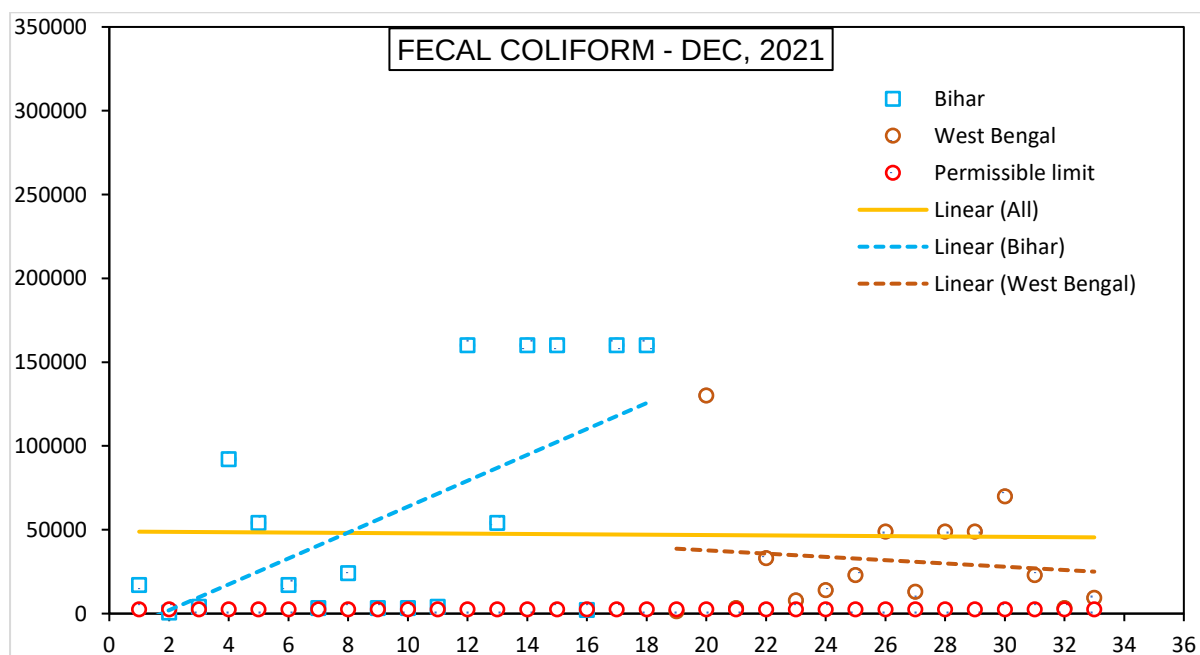


Fig.5.267. Trend Line analysis of Fecal Coliform value for December,2021

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 160000 for December, 2021. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is decreasing.

December 2022:

Table 36: Data of water quality parameter of river Ganga at different stations for December,2022						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	05.12.2022	2	9.2	7.5	17000
2	Ara-Chapra Road Bridge	06.12.2022	1.3	9.5	7.3	680
3	Maa Ambika Asthan, AAMI	06.12.2022	1.2	9.1	7.5	7000
4	Gandhighat, NIT Patna	01.12.2022	1.5	8.1	7.78	240000
5	Gulabi Ghat, Patna	01.12.2022	1.7	7.9	7.73	92000
6	Gaighat , D/S Patna	01.12.2022	1.9	6.9	7.35	8400
7	Malsalami , Patna	01.12.2022	1.2	7.7	7.64	35000
8	Kachchi-Dargah Bidupur	01.12.2022	1.2	8.0	7.64	54000
9	Triveni Ghat , Patna	01.12.2022	1.5	7.8	7.77	17000
10	Kewala Ghat , Fatuha	01.12.2022	1.5	7.5	7.88	54000
11	Bakhtiyarpur- Tajpur Bridge	02.12.2022	1.4	8.3	7.46	54000
12	U/S Mokama , Mahadeo Asthan	02.12.2022	1.3	8.7	7.51	2300
13	Barahiya ,Nepaltala, Maranchi	02.12.2022	1.7	8.0	7.69	2700
14	U/S Sultanganj, Ajgaibinath Mandir	24.12.2022	1	8.8	7.51	35000
15	D/S cremation Ghat at Sultanganj	24.12.2022	1.1	8.7	7.47	92000
16	Champanagar ,Bhagalpur	24.12.2022	1.3	8.4	7.46	92000
17	water intake point , Bhagalpur	24.12.2022	1.1	8.1	7.38	54000
18	Bhagalpur near Bararighat	23.12.2022	1.6	7.8	7.63	92000
19	Farakka	20/12/2022	1.65	8.4	8.3	110
20	Baharampore	30/12/2022	1.8	8.6	8.24	22000
21	Khagra	30/12/2022	1.55	8.4	8.2	1400
22	Gorabajar, Murshidabad	30/12/2022	1.6	1.6	8.2	23000
23	Nawadip, Ghoshpara	22/12/2022	2.9	8.6	8.14	1100
24	Tribeni	missing	--	-	-	-
25	Palta	22/12/2022	1.25	8.4	8.4	6800
26	Palta, Shitaltala	22/12/2022	2.3	8.5	8.33	13000
27	Serampore	missing	-	-	-	-
28	Dakshineswar	21/12/2022	2.6	7.2	7.53	46000
29	Shibpur , Howrah	23/12/2022	2.9	7	7.49	49000
30	Garden Reach	23/12/2022	2.8	7	7.59	79000
31	Uluberia	28/12/2022	2.1	5.9	7.23	22000
32	Diamond Harbour	27/12/2022	3.4	6.8	7.08	6800
33	Durgachak Patikhali	19/12/2022	2.85	7.6	8.67	7900

Parameter 1: BOD

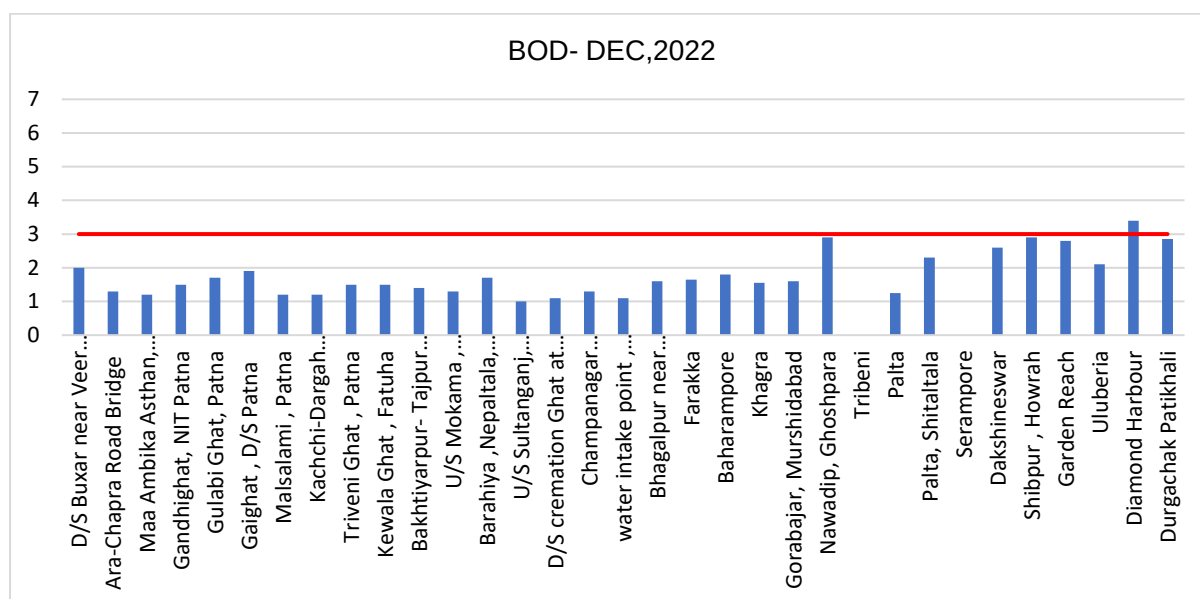


Fig.5.268. BOD value for December,2022

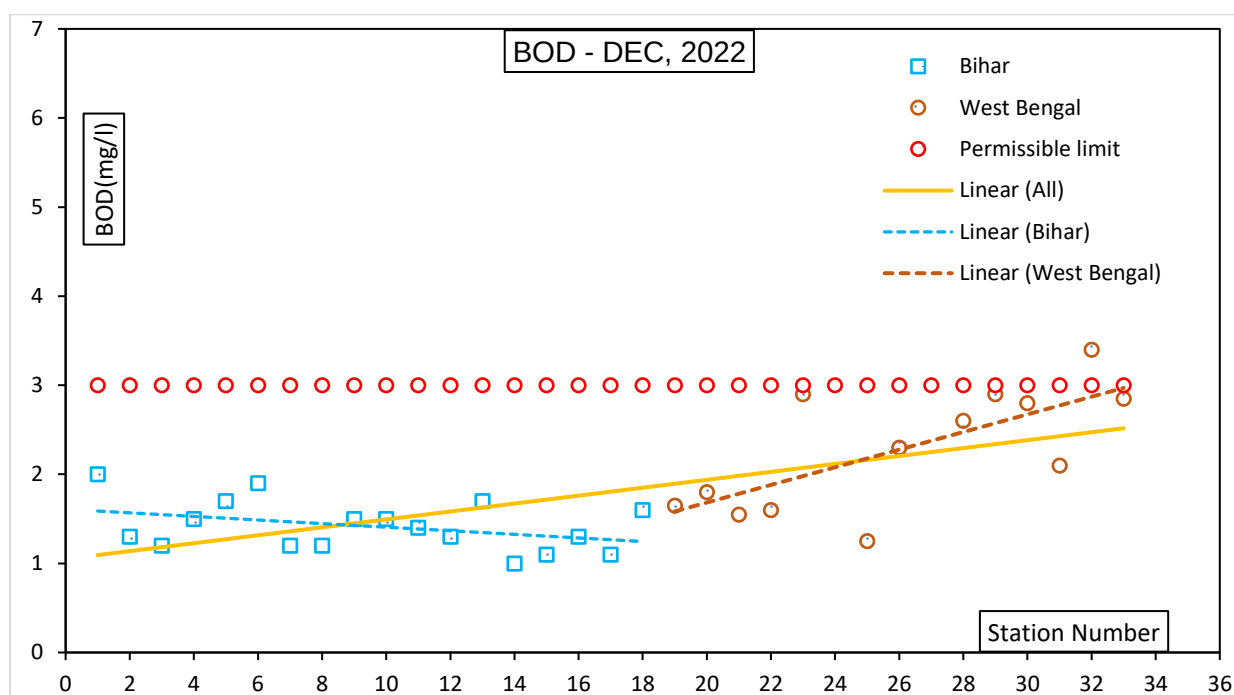


Fig.5.269. Trend Line analysis of BOD value for December,2022

The BOD values were found in the range of 1.0–3.4 mg/l. The highest BOD value of 3.4mg/l was Diamond Harbour for the month of December, 2022. From Trend Line analysis curve the BOD value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

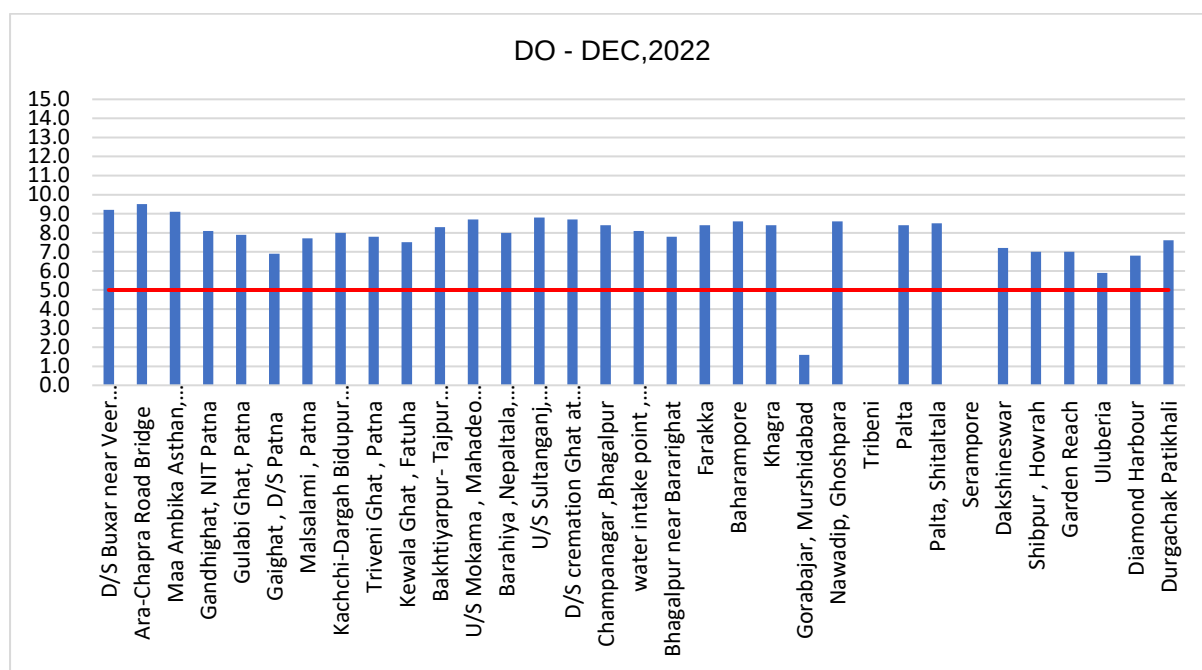


Fig.5.270. DO value for December,2022

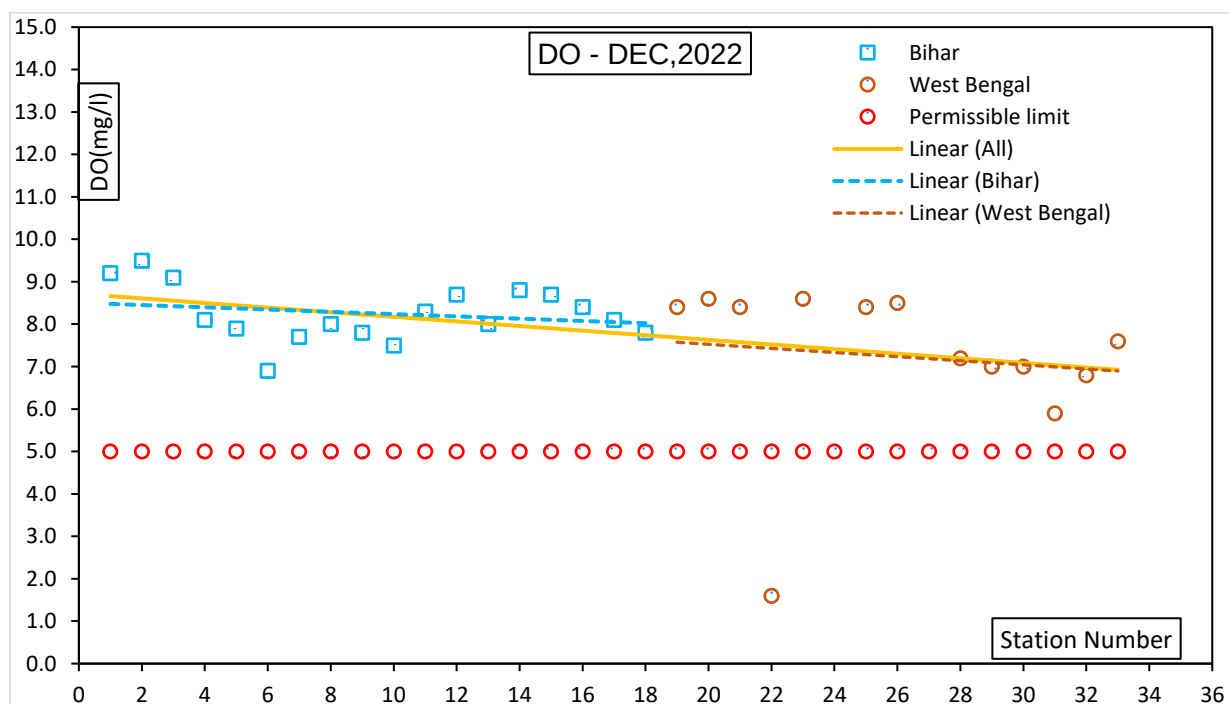


Fig.5.271. Trend Line analysis of DO value for December, 2022

The DO values were found in the range of 1.6–9.5 mg/l. The lowest DO value 1.6 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.5 mg/l was for Ara-Chapra Road Bridge for December, 2022. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

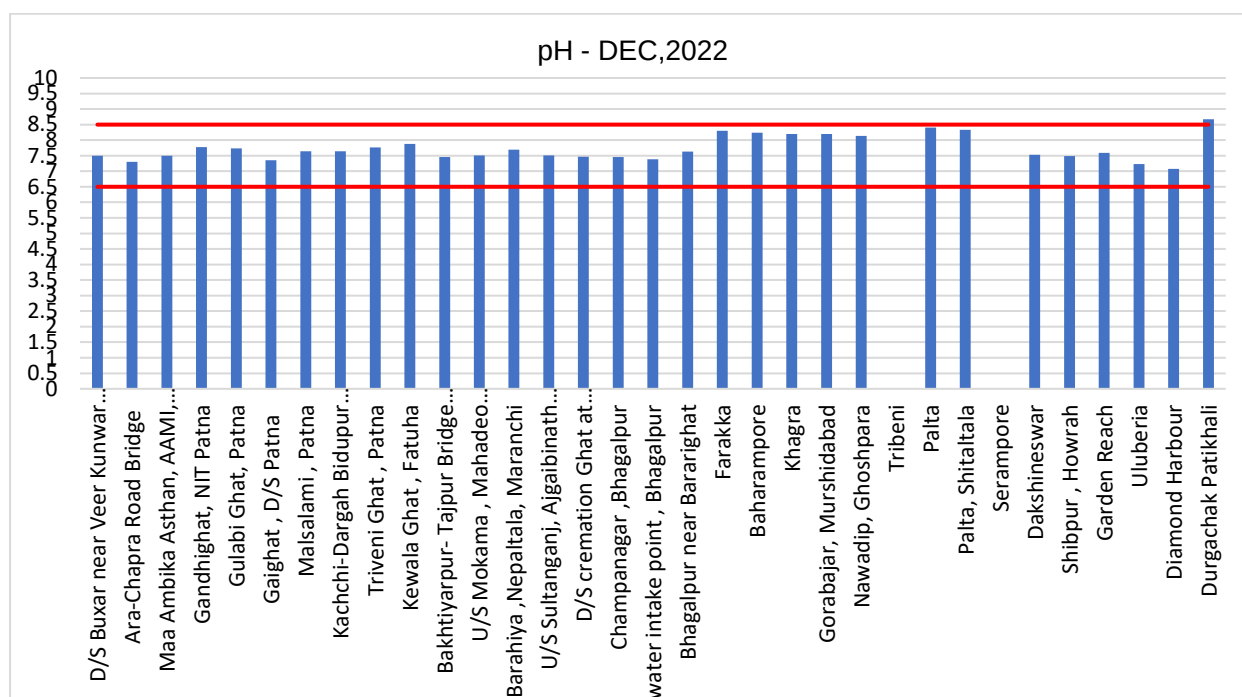


Fig.5.272. pH value for December, 2022

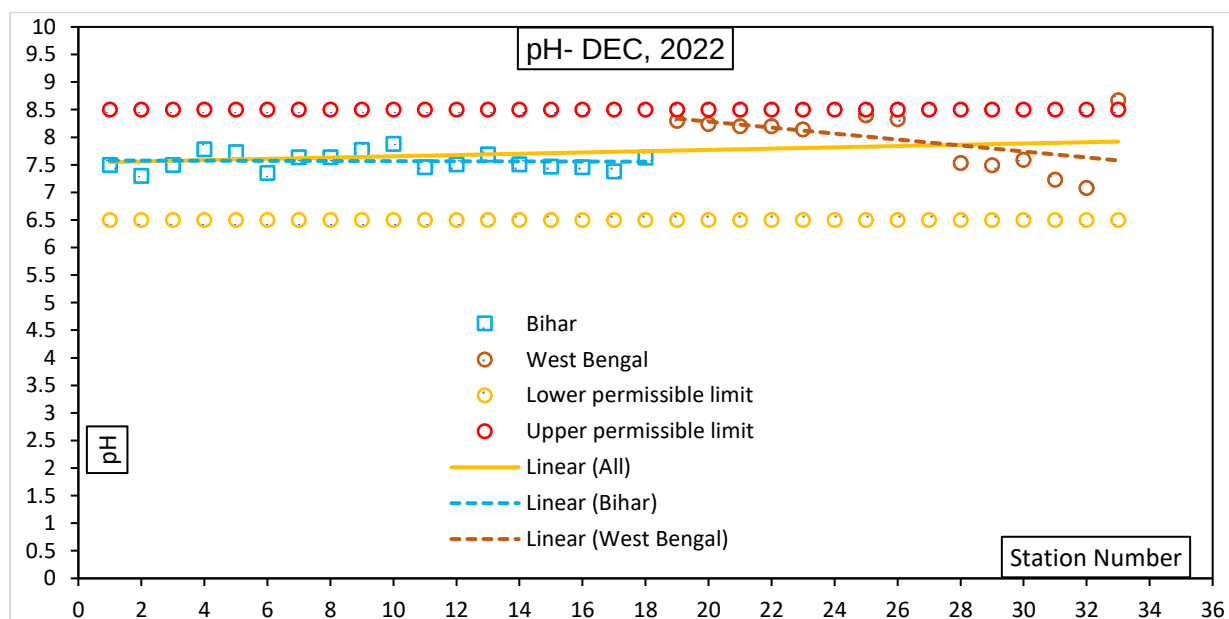


Fig.5.273. Trend Line analysis of pH value for December,2022

The pH values were found in the range of 7.08 – 8.67 for December, 2022. It is seen that the permissible pH value for Class B (6.5 to 8.5) exceeded the permissible limit once for the month December, 2022. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 4: Fecal Coliform

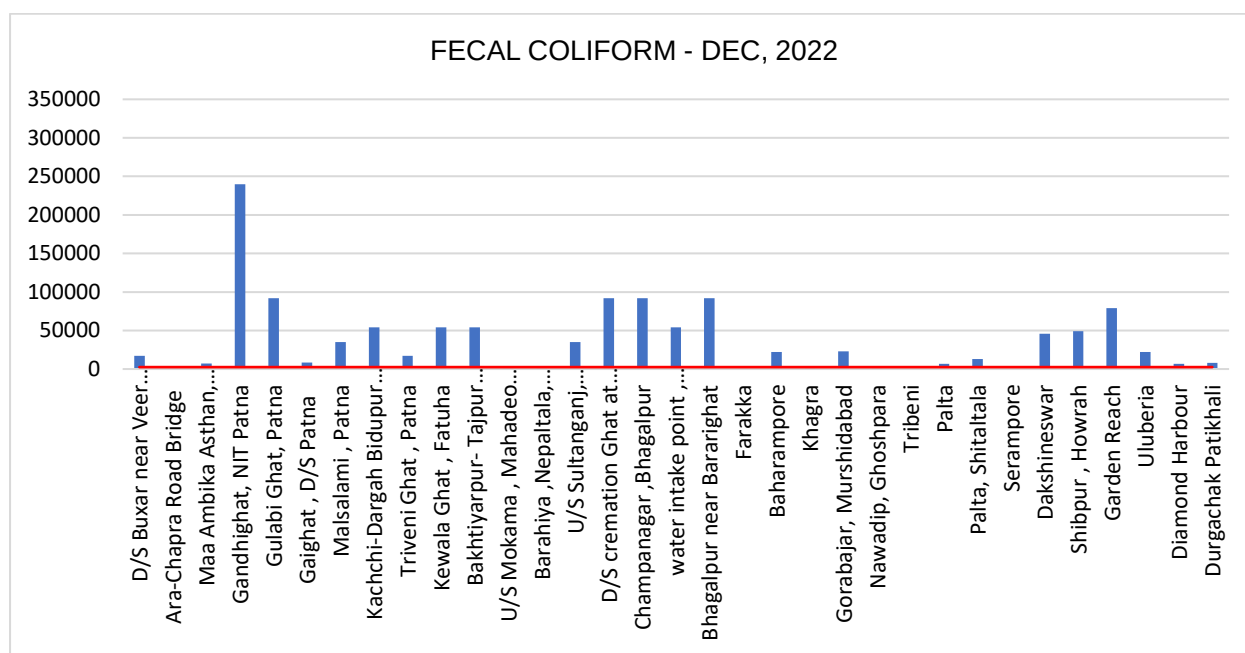


Fig.5.274. Fecal coliform value for December, 2022

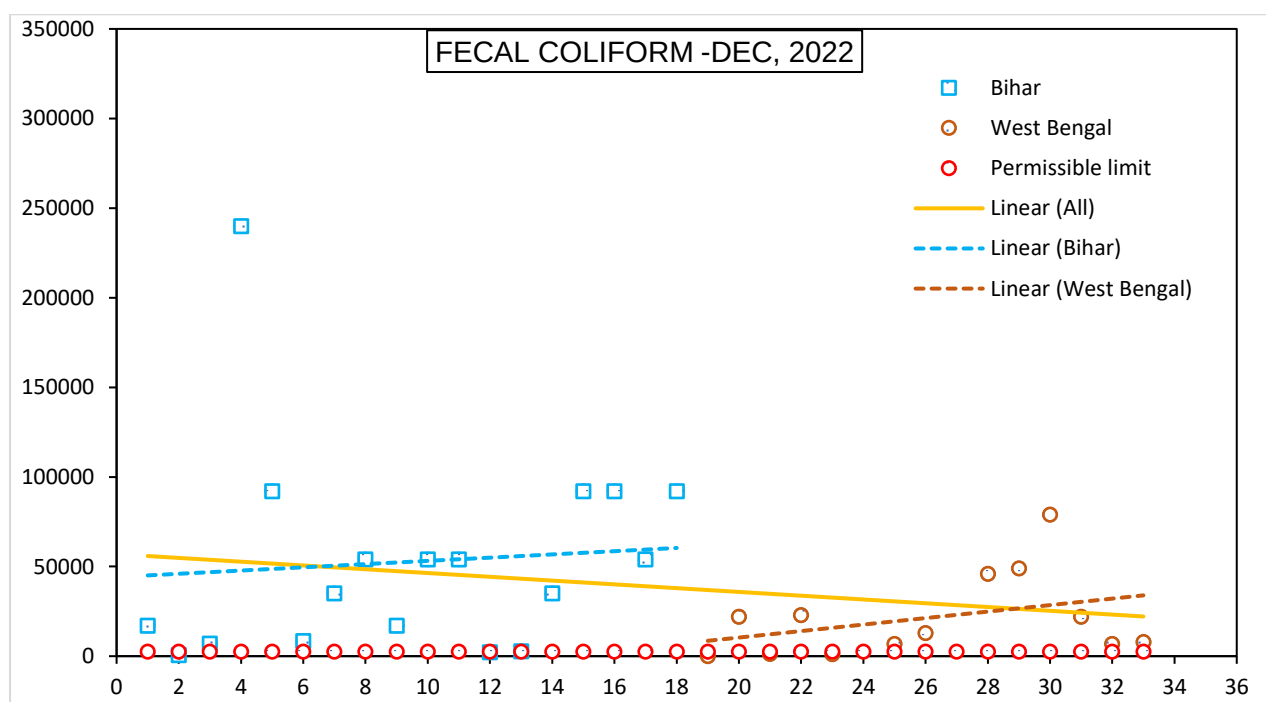


Fig.5.275. Trend Line analysis of fecal Coliform value for December, 2022

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 240000 for December, 2022. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

December 2023:

Table 37: Data of water quality parameter of river Ganga at different stations for December, 2023						
Sl. No.	Station Name	Date	Parameters			
			BOD	Dissolved O ₂ (DO)	pH	Fecal Coliform
			mg/l	mg/l		MPN/100ML
1	D/S Buxar near Veer Kunwar Singh Road Bridge	05.12.2023	1.1	8	7.9	11000
2	Ara-Chapra Road Bridge	19.12.2023	1.7	8.4	7.3	130
3	Maa Ambika Asthan, AAMI	07.12.2023	1.5	8.8	7.5	13000
4	Gandhighat, NIT Patna	01.12.2023	1.4	7.5	7.2	54000
5	Gulabi Ghat, Patna	01.12.2023	1.5	7.2	7.5	54000
6	Gaighat , D/S Patna	01.12.2023	2.1	7	7.2	17000
7	Malsalami , Patna	01.12.2023	1.9	7.2	7.2	11000
8	Kachchi-Dargah Bidupur	01.12.2023	1.4	7.5	7.4	35000
9	Triveni Ghat , Patna	01.12.2023	1.7	7.4	7.5	13000
10	Kewala Ghat , Fatuha	01.12.2023	1.4	7	7.6	35000
11	Bakhtiyarpur- Tajpur Bridge	22.12.2023	1.9	7.7	7.7	17000
12	U/S Mokama , Mahadeo Asthan	22.12.2023	1.9	7.4	7.6	17000
13	Barahiya ,Nepaltala, Maranchi	08.12.2023	1.2	7.2	7.2	13000
14	U/S Sultanganj, Ajsaibinath Mandir	20.12.2023	1.4	7.2	7.5	11000
15	D/S cremation Ghat at Sultanganj	20.12.2023	1.7	7.6	7.4	17000
16	Champanagar ,Bhagalpur	21.12.2023	1.8	7.6	7.4	3300
17	water intake point , Bhagalpur	21.12.2023	2	7.3	7.2	35000
18	Bhagalpur near Bararighat	22.12.2023	2.2	7.5	7.5	54000
19	Farakka	19.12.2023	2.3	9	7.29	1300
20	Baharampore	20.12.2023	1.7	8.5	7.61	3500
21	Khagra	20.12.2023	1.7	8.6	7.44	790
22	Gorabajar, Murshidabad	20.12.2023	1.9	1.9	7.07	1700
23	Nawadip, Ghoshpara	19.12.2023	1	8.5	7.49	790
24	Tribeni	missing	-	-	-	-
25	Palta	18.12.2023	2.5	8	7.31	5400
26	Palta, Shitaltala	18.12.2023	2.5	8	7.15	5400
27	Serampore	missing	-	-	-	-
28	Dakshineswar	26.12.2023	2.5	6.94	7.26	58000
29	Shibpur , Howrah	27.12.2023	2.47	7.11	7.43	47000
30	Garden Reach	27.12.2023	2.52	7.01	7.35	63000
31	Uluberia	28.12.2023	2.69	6.72	7.56	22000
32	Diamond Harbour	18.12.2023	2.3	6.96	7.19	4500
33	Durgachak Patikhali	19.12.2023	1.1	7.5	8.4	7000

Parameter 1: BOD

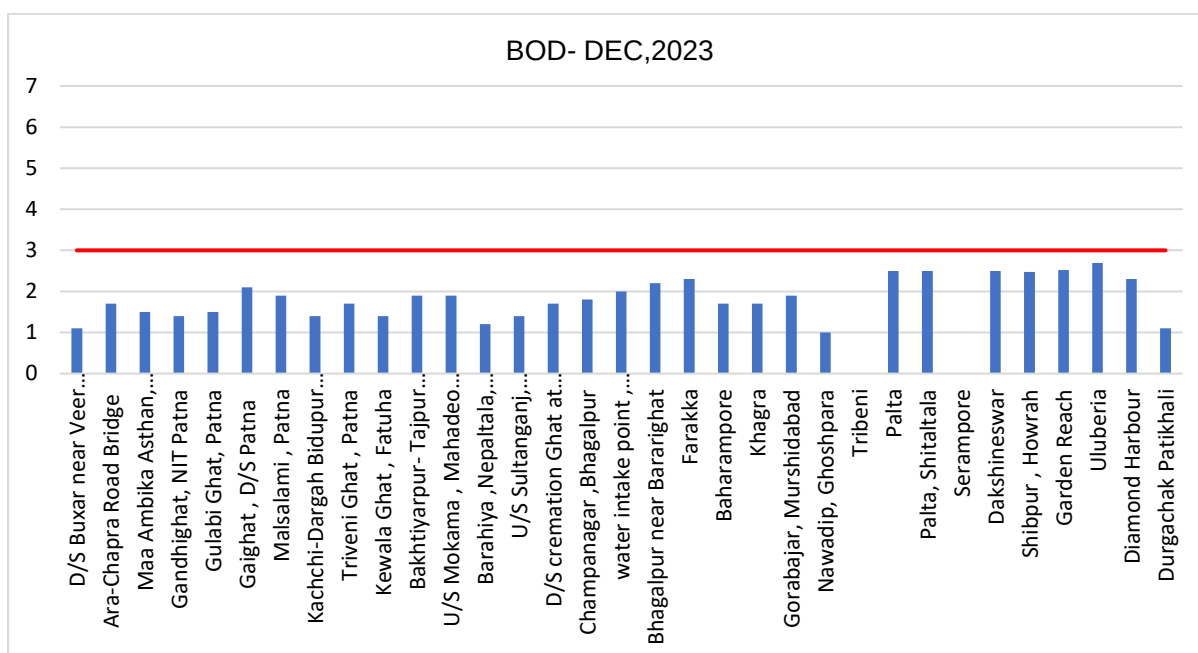


Fig.5.276. BOD value for December, 2023

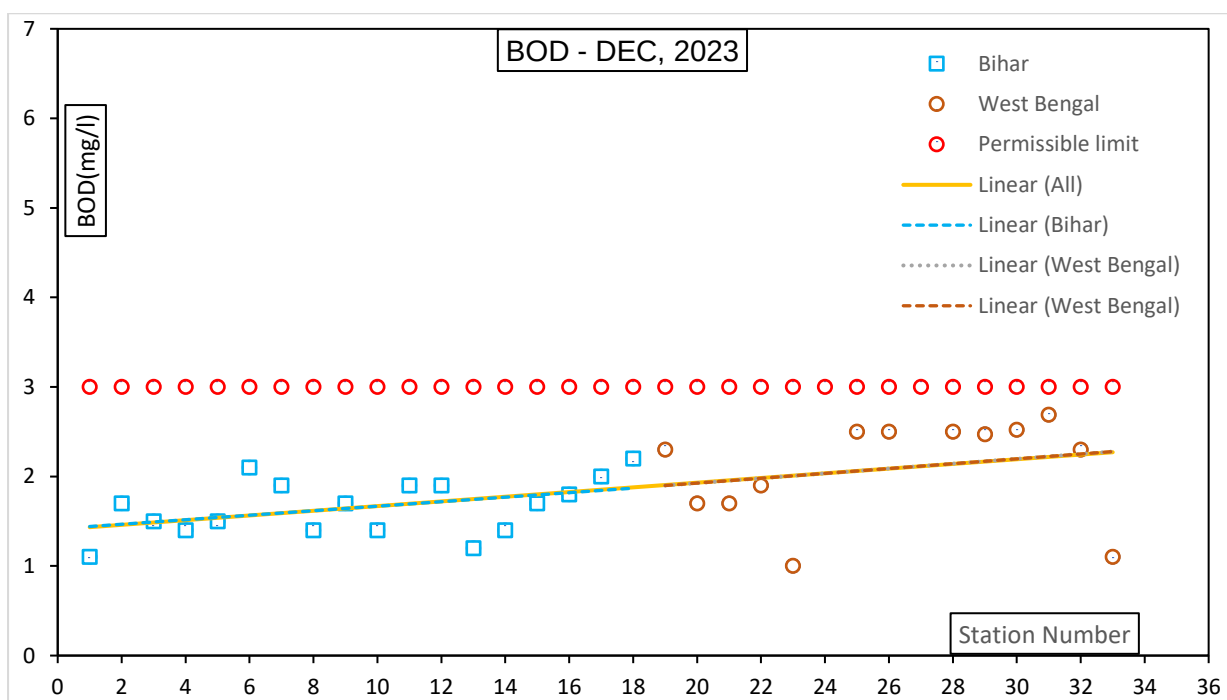


Fig.5.277. Trend Line analysis of BOD value for December, 2023

The BOD values were found in the range of 1.0–3.4 mg/l. The highest BOD value of 3.4mg/l was Diamond Harbour for the month of December, 2023. From Trend Line analysis curve the BOD value for Bihar is increasing and for West Bengal it is increasing.

Parameter 2: Dissolved O₂ (DO)

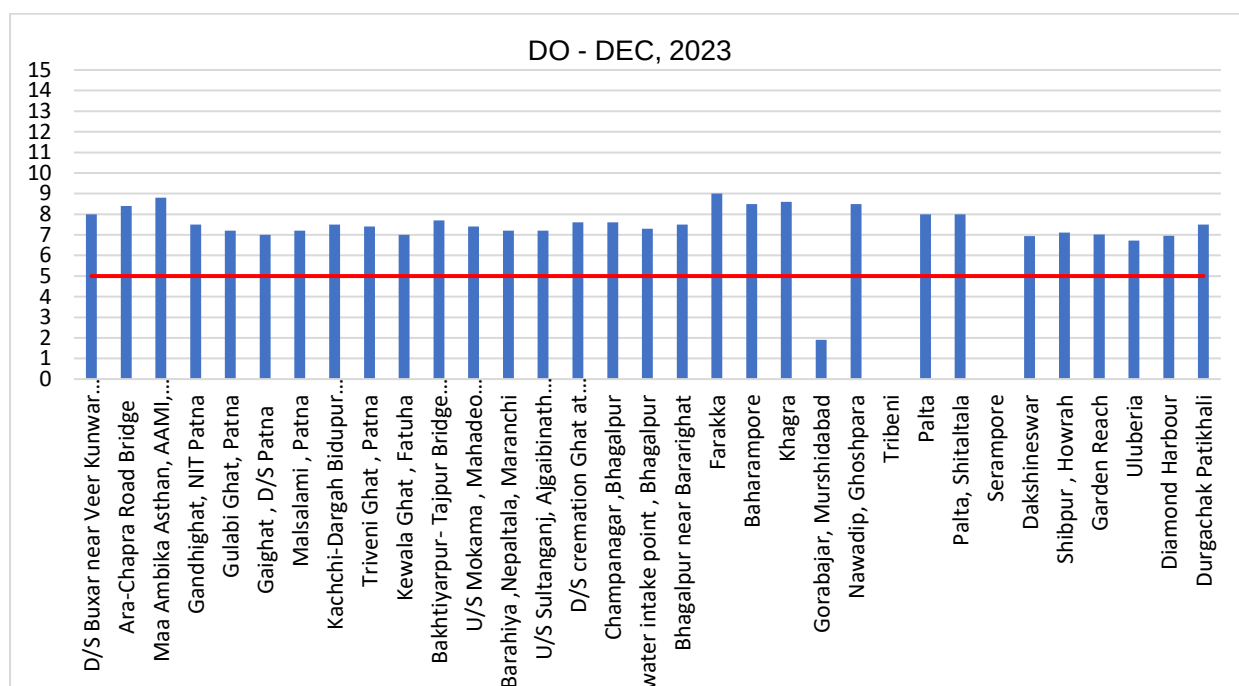


Fig.5.278. DO value for December,2023

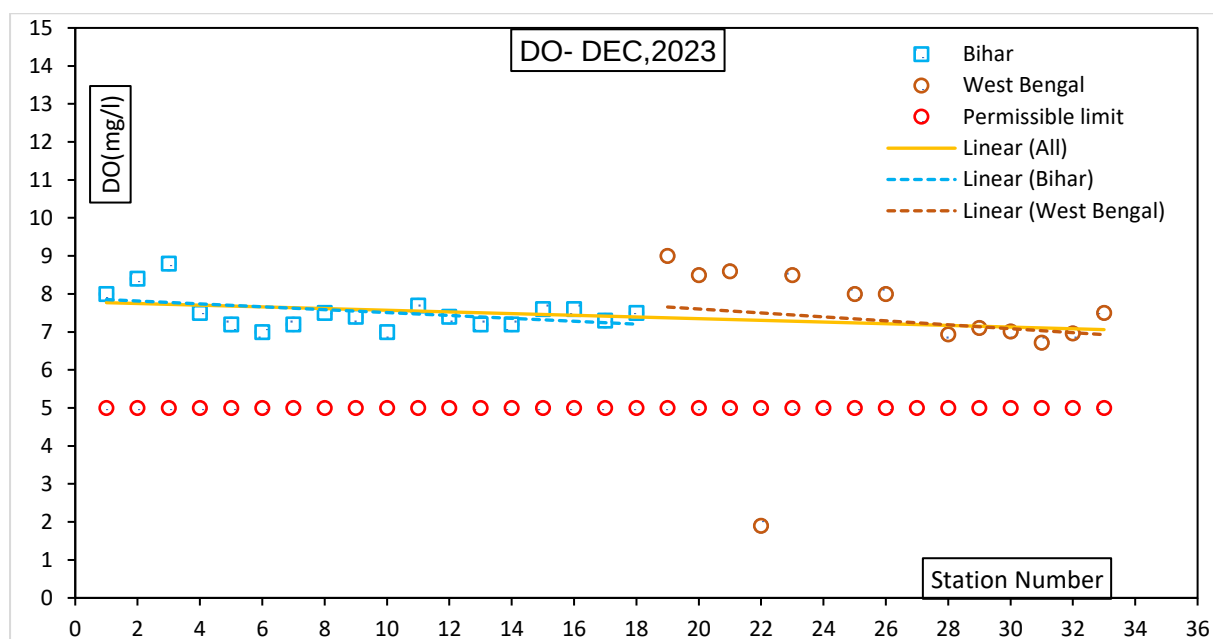


Fig.5.279. Trend Line analysis of DO value for December,2023

The DO values were found in the range of 1.9–9.0 mg/l. The lowest DO value 1.9 mg/l was for Gorabajar, Murshidabad and highest DO value of 9.0 mg/l was for Farakka for December, 2023. From Trend Line analysis curve the DO value for Bihar is decreasing and for West Bengal it is decreasing.

Parameter 3: pH

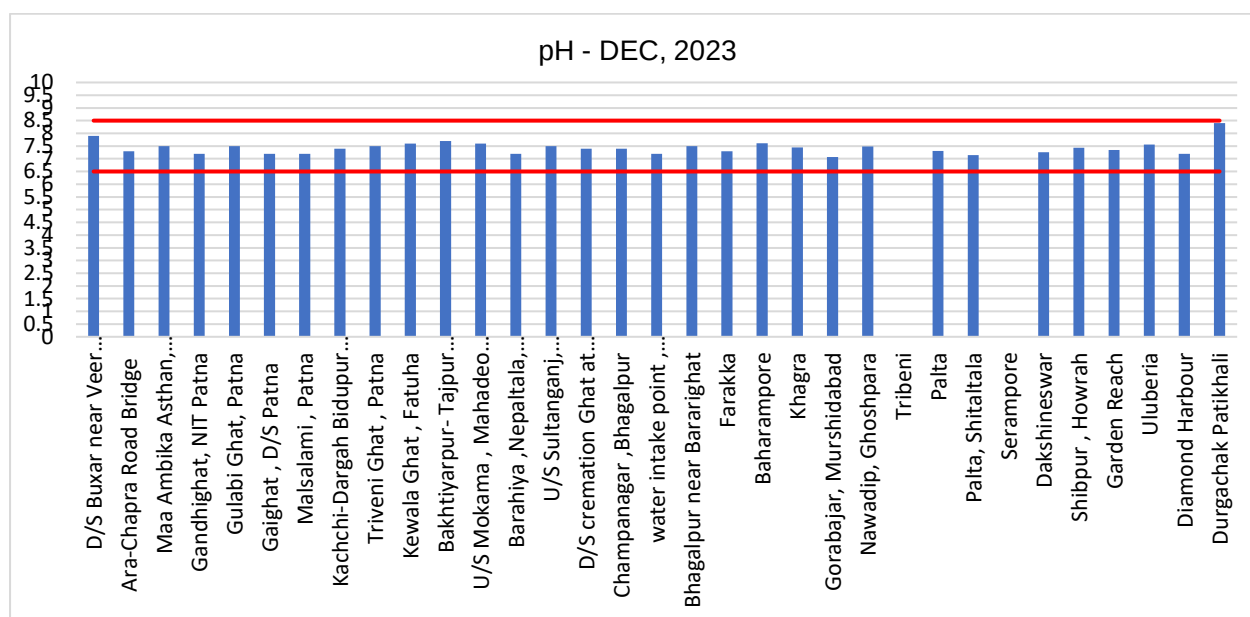


Fig.5.280. pH value for December,2023

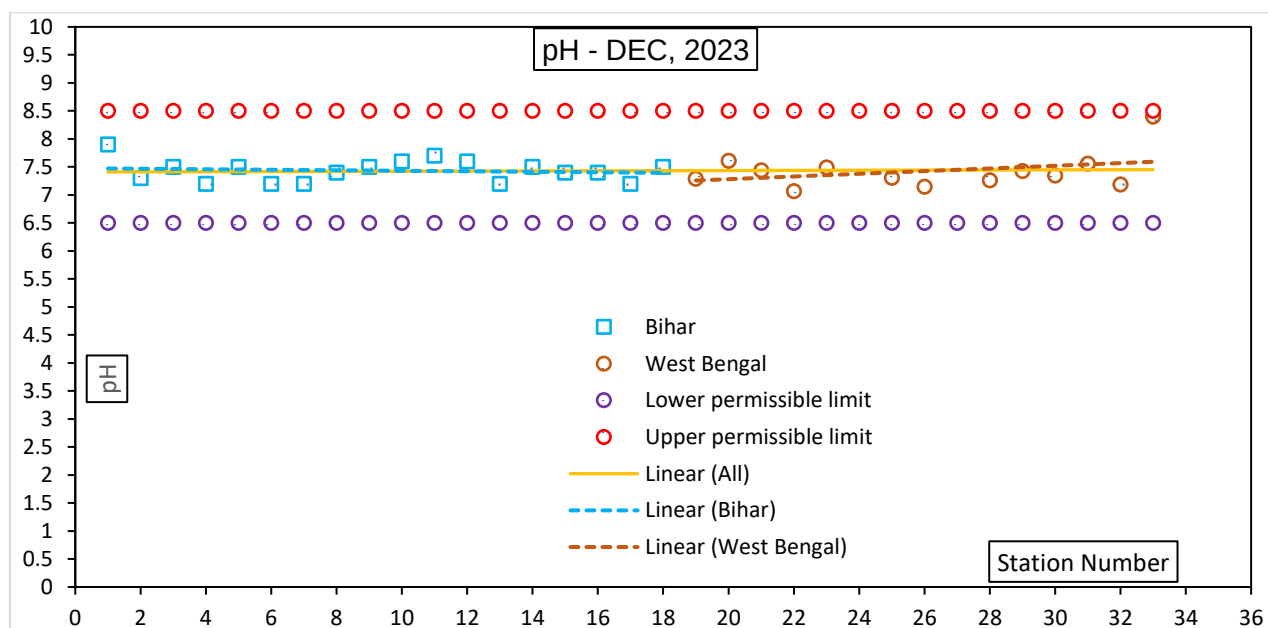


Fig.5.281. Trend Line analysis of pH value for December,2023

The pH values were found in the range of 7.07 – 8.4 for December, 2023. It is seen that the permissible pH value for Class B (6.5 to 8.5) exceeded the permissible limit once for the month December, 2023. From Trend Line analysis curve the pH value for Bihar is decreasing and for West Bengal it is increasing.

Parameter 4: Fecal Coliform

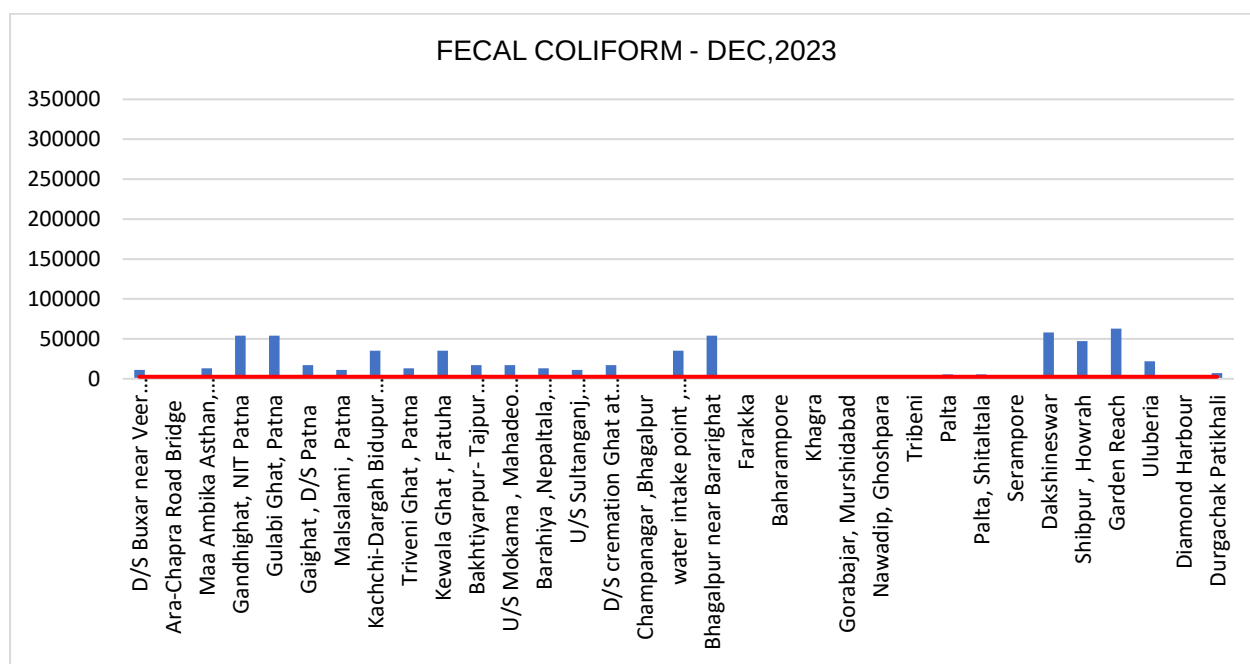


Fig.5.282. Fecal Coliform value for December,2023

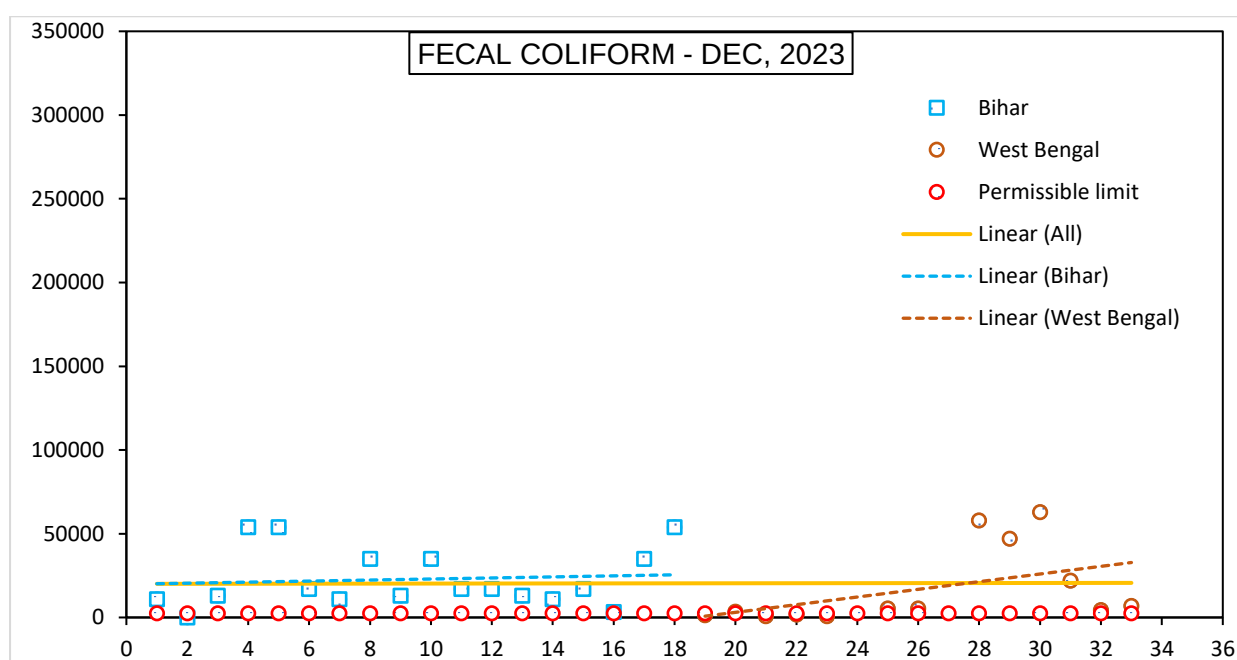


Fig.5.283. Trend Line analysis of Fecal Coliform value for December,2023

The Fecal Coliform in River Ganga for all the locations is not within the permissible range. Most of the time the value has exceeded maximum permissible standard limit 2500 MPN/100 ML. The maximum value of fecal coliform observed is 63000 for December, 2023. From Trend Line analysis curve the Fecal Coliform value for Bihar is increasing and for West Bengal it is increasing.

Water Quality scenario of river Ganga

Table 38: Analysis of Water quality (BOD & DO) Scenario of river Ganga

Location	Year	BOD			Dissolved O ₂ (DO)		
		Class_ B & C (Limit <3mg/l)		% safe in a year	Class B (Limit >5 mg/l)		% safe in a year
		Safe months	Unsafe months		Safe months	Unsafe months	
(1) D/S Buxar near Veer Kunwar Singh Road Bridge	2021	11	1	91.67	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(2) Ara-Chapra Road Bridge	2021	11	1	91.67	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(3) Maa Ambika Asthan, AAMI, SARAN	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(4) Gandhighat, NIT Patna	2021	12	0	100	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(5) Gulabi Ghat, Patna	2021	11	1	91.67	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(6) Gaighat , D/S Patna	2021	12	0	100	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(7) Malsalami , Patna	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(8) Kachchi-Dargah Bidupur near Road Bridge	2021	12	0	100	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(9) Triveni Ghat , Patna	2021	12	0	100	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(10) Kewala Ghat , Fatuha	2021	11	1	91.67	12	0	100
	2022	12	0	100	12	0	100

	2023	12	0	100	12	0	100
(11) Bakhtiyarpur-Tajpur Bridge near Athmalgola	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(12) U/S Mokama , Mahadeo Asthan	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(13) Barahiya ,Nepaltala, Maranchi	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(14) U/S Sultanganj, Ajgaibinath Mandir, Bhagalpur	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(15) D/S cremation Ghat at Sultanganj , Bhagalpur	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(16) Champanagar ,Bhagalpur	2021	11	1	91.67	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(17) water intake point , Bhagalpur	2021	9	3	75	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(18) Bhagalpur near Bararighat	2021	11	1	91.67	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(19) Farakka	2021	11	1	91.67	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(20) Baharampore	2021	9	3	75	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(21) Khagra	2021	9	3	75	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100

(22) Gorabajar, Murshidabad	2021	10	2	83.33	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(23) Nawadip, Ghoshpara	2021	10	2	83.33	12	0	100
	2022	11	1	91.67	12	0	100
	2023	12	0	100	12	0	100
(24) Tribeni	2021	5	7	41.67	11	1	91.67
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(25) Palta	2021	10	2	83.33	9	3	75
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(26) Palta, Shitaltala	2021	5	7	41.67	8	4	66.67
	2022	4	8	33.33	12	0	100
	2023	12	0	100	12	0	100
(27) Serampore	2021	9	3	75	10	2	83.33
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100
(28) Dakshineswar	2021	7	5	58.33	8	4	66.67
	2022	7	5	58.33	12	0	100
	2023	10	2	83.33	12	0	100
(29) Shibpur , Howrah	2021	8	4	66.67	9	3	75
	2022	9	3	75	12	0	100
	2023	10	2	83.33	12	0	100
(30) Garden Reach	2021	11	1	91.67	9	3	75
	2022	8	4	66.67	12	0	100
	2023	12	0	100	12	0	100
(31) Uluberia	2021	8	4	66.67	8	4	66.67
	2022	11	1	91.67	12	0	100
	2023	11	1	91.67	12	0	100
(32) Diamond Harbour	2021	11	1	91.67	11	1	91.67
	2022	8	4	66.67	12	0	100
	2023	12	0	100	12	0	100
(33) Durgachak Patikhali	2021	12	0	100	12	0	100
	2022	12	0	100	12	0	100
	2023	12	0	100	12	0	100

Table 39: Analysis of Water quality (pH & Fecal Coliform) Scenario of river Ganga

Location	Year	pH			Fecal Coliform		
		Class B (Limit 6.5-8.5)		% safe in a year	Class B (Limit <2500 MPN/100 ML)		% safe in a year
		Safe months	Unsafe months		Safe months	Unsafe months	
(1) D/S Buxar near Veer Kunwar Singh Road Bridge	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	2	10	16.67
(2) Ara-Chapra Road Bridge	2021	12	0	10	3	9	25
	2022	11	1	91.67	10	2	83.3
	2023	12	0	100	6	6	50
(3) Maa Ambika Asthan, AAMI, SARAN	2021	12	0	100	2	10	16.67
	2022	12	0	100	1	11	8.33
	2023	12	0	100	1	11	8.33
(4) Gandhighat, NIT Patna	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(5) Gulabi Ghat, Patna	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(6) Gaighat, D/S Patna	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(7) Malsalami, Patna	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	3	9	25
(8) Kachchi-Dargah Bidupur near Road Bridge	2021	12	0	100	0	12	0
	2022	11	1	91.67	0	12	0
	2023	12	0	100	1	11	8.33
(9) Triveni Ghat, Patna	2021	12	0	100	1	11	8.33
	2022	12	0	100	0	12	0
	2023	12	0	100	3	9	25
(10) Kewala Ghat, Fatuha	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0

	2023	12	0	100	1	11	8.33
(11) Bakhtiyarpur-Tajpur Bridge near Athmalgola	2021	12	0	100	3	9	25
	2022	12	0	100	5	7	41.67
	2023	12	0	100	0	12	0
(12) U/S Mokama, Mahadeo Asthan	2021	11	1	91.67	1	11	8.33
	2022	12	0	100	1	11	8.33
	2023	12	0	100	2	10	16.67
(13) Barahiya, Nepaltala, Maranchi	2021	11	1	91.67	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	2	10	16.67
(14) U/S Sultanganj, Ajgaibinath Mandir, Bhagalpur	2021	12	0	100	1	11	8.33
	2022	12	0	100	1	11	8.33
	2023	12	0	100	0	12	0
(15) D/S cremation Ghat at Sultanganj, Bhagalpur	2021	11	1	91.67	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(16) Champanagar, Bhagalpur	2021	11	1	91.67	3	9	25
	2022	11	1	91.67	4	8	33.33
	2023	12	0	100	1	11	8.33
(17) water intake point, Bhagalpur	2021	11	1	91.67	0	12	0
	2022	12	0	100	3	9	25
	2023	12	0	100	0	12	0
(18) Bhagalpur near Bararighat	2021	11	1	91.67	0	12	0
	2022	12	0	100	1	11	8.33
	2023	12	0	100	0	12	0
(19) Farakka	2021	12	0	100	7	5	58.33
	2022	12	0	100	9	3	75
	2023	12	0	100	12	0	100
(20) Baharampore	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	1	11	8.33
(21) Khagra	2021	12	0	100	0	12	0
	2022	12	0	100	6	6	50

	2023	11	1	91.67	12	0	100
(22) Gorabajar, Murshidabad	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	4	8	33.33
(23) Nawadip, Ghoshpara	2021	12	0	100	2	10	16.67
	2022	12	0	100	4	8	33.33
	2023	11	1	91.67	10	2	83.33
(24) Tribeni	2021	12	0	100	0	12	0
	2022	12	0	100	1	11	8.33
	2023	12	0	100	1	11	8.33
(25) Palta	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(26) Palta, Shitaltala	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	11	1	91.67	1	11	8.33
(27) Serampore	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(28) Dakshineswar	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(29) Shibpur , Howrah	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(30) Garden Reach	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(31) Uluberia	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(32) Diamond Harbour	2021	12	0	100	0	12	0
	2022	12	0	100	0	12	0
	2023	12	0	100	0	12	0
(33) Durgachak Patikhali	2021	12	0	100	0	12	0
	2022	9	3	75	0	12	0
	2023	12	0	100	0	12	0

Table 40 : River Water Quality at different locations during January 2021 to December 2023 as Min - Max					
Sl. No.	Locations	BOD (mg/l)		DO (mg/l)	
		Min	Max	Min	Max
1.	D/S Buxar near Veer Kunwar Singh Road Bridge	0.9	6.4	3.1	11.9
2.	Ara-Chapra Road Bridge	0.8	3.9	3.7	11.5
3.	Maa Ambika Asthan, AAMI	0.7	2.8	5.6	9.6
4.	Gandhighat, NIT Patna	1.0	3.2	5.6	9.5
5.	Gulabi Ghat, Patna	1.0	3.2	4.4	9.3
6.	Gaighat , D/S Patna	1.0	3.0	4.3	9.9
7.	Malsalami , Patna	1.0	2.9	5.6	10.0
8.	Kachchi-Dargah Bidupur	1.0	3.0	4.5	11.3
9.	Triveni Ghat , Patna	1.0	3.0	4.5	12.6
10.	Kewala Ghat , Fatuha	1.3	3.0	5.3	9.2
11.	Bakhtiyarpur- Tajpur Bridge	0.8	2.9	5.4	12.0
12.	U/S Mokama , Mahadeo Asthan	1.0	2.8	5.4	13.1
13.	Barahiya ,Nepaltala, Maranchi	1.0	2.9	5.1	13.4
14.	U/S Sultanganj, Ajgaibinath Mandir	1.0	2.7	5.6	10.5
15.	D/S cremation Ghat at Sultanganj	1.0	2.9	5.5	10.8
16.	Champanagar ,Bhagalpur	1.0	2.9	6.0	11.0
17.	water intake point , Bhagalpur	1.0	6.6	5.8	9.9
18.	Bhagalpur near Bararighat	1.2	6.6	3.7	10.0
19.	Farakka	1.1	4.7	5.1	9.8
20.	Baharampore	1.3	3.85	5.1	9.9
21.	Khagra	1.0	3.5	5.2	9.7
22.	Gorabajar, Murshidabad	1.1	3.3	1.1	3.3
23.	Nawadip, Ghoshpara	1.0	3.9	5.4	9.4
24.	Tribeni	1.4	3.85	4.6	9.9
25.	Palta	1.25	3.65	4.3	9.9
26.	Palta, Shitaltala	1.2	4.55	4.0	9.9
27.	Serampore	1.1	4.1	4.2	9.9
28.	Dakshineswar	2.0	4.15	4.6	7.7
29.	Shibpur , Howrah	1.7	4.0	4.0	7.8
30.	Garden Reach	1.75	4.35	4.0	7.4
31.	Uluberia	1.25	4.9	4.1	7.8
32.	Diamond Harbour	1.7	3.7	4.3	6.96
33.	Durgachak Patikhali	0.75	2.85	5.3	7.6

Table 41: River Water Quality at different locations during January 2021 to December 2023 as Min-Max					
Sl. No.	Locations	pH		Fecal Coliform	
		Min	Max	Min	Max
1.	D/S Buxar near Veer Kunwar Singh Road Bridge	7.33	8.43	2300	240000
2.	Ara-Chapra Road Bridge	6.96	8.7	130	160000
3.	Maa Ambika Asthan, AAMI	6.6	8.1	780	240000
4.	Gandhighat, NIT Patna	7.2	8.3	17000	350000
5.	Gulabi Ghat, Patna	7.21	8.36	13000	160000
6.	Gaighat , D/S Patna	7.2	8.4	3300	160000
7.	Malsalami , Patna	7.18	8.48	1300	240000
8.	Kachchi-Dargah Bidupur	7.3	8.52	2300	160000
9.	Triveni Ghat , Patna	7.23	8.4	1100	160000
10.	Kewala Ghat , Fatuha	7.34	8.27	2300	240000
11.	Bakhtiyarpur- Tajpur Bridge	7.0	8.34	33	54000
12.	U/S Mokama , Mahadeo Asthan	7.19	8.59	1300	160000
13.	Barahiya ,Nepaltala, Maranchi	7.2	8.55	1300	160000
14.	U/S Sultanganj, Ajgaibinath Mandir	7.2	8.44	79	240000
15.	D/S cremation Ghat at Sultanganj	7.3	8.52	3300	240000
16.	Champanagar ,Bhagalpur	6.02	8.58	1100	160000
17.	water intake point , Bhagalpur	7.19	8.55	790	160000
18.	Bhagalpur near Bararighat	7.05	8.54	1300	160000
19.	Farakka	7.24	8.47	110	4900
20.	Baharampore	7.02	8.46	1700	170000
21.	Khagra	6.94	8.38	320	220000
22.	Gorabajar, Murshidabad	7.07	8.39	790	130000
23.	Nawadip, Ghoshpara	6.95	8.58	210	130000
24.	Tribeni	7.39	8.6	1300	79000
25.	Palta	7.09	8.44	5400	240000
26.	Palta, Shitaltala	7.09	8.45	2400	330000
27.	Serampore	7.18	8.48	3300	240000
28.	Dakshineswar	6.81	7.94	31000	170000
29.	Shibpur , Howrah	6.84	7.98	13000	79000
30.	Garden Reach	6.85	7.95	23000	130000
31.	Uluberia	6.95	7.99	4500	49000
32.	Diamond Harbour	6.93	7.98	1300	7800
33.	Durgachak Patikhali	6.42	8.67	4600	24000

Table 42: River Water Quality at different locations during January 2021 to December 2023 as Bathing Standard in percentage (%)					
Sl. No.	Locations	BOD	DO	pH	Fecal Coliform
1.	D/S Buxar near Veer Kunwar Singh Road Bridge	97.22	97.22	100	5.56
2.	Ara-Chapra Road Bridge	97.22	97.22	97.22	52.78
3.	Maa Ambika Asthan, AAMI	100	100	100	11.11
4.	Gandhighat, NIT Patna	100	97.22	100	0
5.	Gulabi Ghat, Patna	97.22	97.22	100	0
6.	Gaighat , D/S Patna	100	97.22	100	0
7.	Malsalami , Patna	100	100	100	8.33
8.	Kachchi-Dargah Bidupur	100	97.22	97.22	2.78
9.	Triveni Ghat , Patna	100	97.22	100	11.11
10.	Kewala Ghat , Fatuha	97.22	100	100	2.78
11.	Bakhtiyarpur- Tajpur Bridge	100	100	100	22.22
12.	U/S Mokama , Mahadeo Asthan	100	100	97.22	11.11
13.	Barahiya ,Nepaltala, Maranchi	100	100	97.22	5.56
14.	U/S Sultanganj, Ajgaibinath Mandir	100	100	100	5.56
15.	D/S cremation Ghat at Sultanganj	100	100	97.22	0
16.	Champanagar ,Bhagalpur	97.22	100	94.44	22.22
17.	water intake point , Bhagalpur	91.67	100	97.22	8.33
18.	Bhagalpur near Bararighat	97.22	97.22	97.22	2.78
19.	Farakka	97.22	100	100	77.78
20.	Baharampore	91.67	100	100	2.78
21.	Khagra	91.67	100	97.22	50
22.	Gorabajar, Murshidabad	94.44	100	100	11.11
23.	Nawadip, Ghoshpara	91.67	100	97.22	44.44
24.	Tribeni	80.55	97.22	100	5.56
25.	Palta	94.44	97.22	100	0
26.	Palta, Shitaltala	58.33	88.89	97.22	2.78
27.	Serampore	91.67	94.44	100	0
28.	Dakshineswar	66.67	88.89	100	0
29.	Shibpur , Howrah	75	91.67	100	0
30.	Garden Reach	86.11	91.67	100	0
31.	Uluberia	83.33	88.89	100	0
32.	Diamond Harbour	86.11	97.22	100	0
33.	Durgachak Patikhali	100	100	91.67	0

Chapter 6

Conclusions

Water Quality parameter has been plotted to assess the suitability of river water of four different parameters for outdoor bathing (Class B) in Ganga River. In this Study data (Physical, Chemical and Biological parameters) have been collected from West Bengal Pollution Control Board and Bihar State Pollution Control Board during the period of January 2021 to December of 2023. From the analysis it is found that some (D/S Buxar near Veer Kunwar Singh Road Bridge, Ara-Chapra Road Bridge, Maa Ambika Asthan, Triveni Ghat , Kewala Ghat , Bakhtiyarpur- Tajpur Bridge , U/S Sultanganj, Champanagar -Bhagalpur, water intake point – Bhagalpur, Farakka, Gorabajar-Murshidabad, Nawadip-Ghoshpara, Tribeni) location points in river Ganga is suitable for outdoor bathing. The study reveals that the water quality of river Ganga is still polluted; however little bit of change has been observed in last few years. The unsuitability of water is due to the high value of sub-indices of BOD and Fecal coliform. The study recommends the urgent need for continuous monitoring of the river water and identifying the pollution sources to protect the river water from further contamination. The data reveals that the overall BOD value in West Bengal is more than the BOD values of Bihar, this is true for all the three years. In case of other parameters (DO, pH, Fecal Coliform) the overall values in West Bengal is less compared the values in Bihar.

Chapter 7

References

1. Chatterjee, S. N., Das, D., & Mandal, D. R. (2014). Physicochemical properties of and bacteriological examination of river Ganga in and around Howrah District, West Bengal, India. *International Journal of Environmental Biology*.
2. Chaudhuri, K., Manna, S., Sarma, S. K., Naskar, P., Bhattacharya, S & Bhattacharya, M. (2012). Physicochemical and biological factors controlling water column metabolism in Sundarbans estuary, India. *Aquatic Biosystems*.
3. Kumar, A., Bisht, B. S., Joshi, V. D., Singh, A. K., & Talwar, A. (2010). Physical chemical and bacteriological study of water from rivers of Uttarakhand. *Journal of Human Ecology*.
4. Anh, P.T., C. Kroeze, S.R. Bush, A.P.J. Mol, 2010. Water pollution by intensive brackish shrimp farming in south-east Vietnam: Causes and options for control. *Agricultural Water Management*, 97(6): 872-882.
5. Bureau of Indian Standards (2012) Specification for drinking water. IS:10500, New Delhi, India
6. Gupta, N., Gupta, D.K., Kumar, R., & Garg, A.K. (2016). Assessment of Physico-chemical Characteristics River Ramganga to Determine its Pollution Status at Different Experimental Stations. *International Journal of Plant Research*, 9(Special), 95-101. <https://doi:10.5958/2229-4473.2016.00042.2>
7. Kim, A.G. and Cardone, C.R., (2005), Scatterscore: a reconnaissance method to evaluate changes in water quality, *Environmental Monitoring and Assessment*, 111, pp 277-295.
8. Larry w (2006) World water day: A billion people worldwide lack safe drinking water
9. Negi, R. K., Rajput, A. (2013), Impact of pulp and paper mill effluents on the river Ganges, Bijnore, UP, India, *Journal of Entomology and Zoology Studies*, 1 (5), 70-73.
10. Liou, S. M., Lo, S. L., & Wang, S. H. (2004). A generalized water quality index for Taiwan. *Environmental monitoring and assessment*, 96, 35-52.
11. Md. J. B. Alam, M. R. Islam, Z. Muyen, M. Mamun, S. Islam (2007). Studies on Water quality parameters along different points of Surma Rivers.
12. Mittal, S. K., & Ratra, R. K. (2000). Toxic effect of metal ions on biochemical oxygen demand. *Water Research*, 34(1), 147-152.

13. Negi, R. K., Rajput, A. (2013), Impact of pulp and paper mill effluents on the river Ganges, Bijnore, UP, India, *Journal of Entomology and Zoology Studies*, 1 (5), 70-73.
14. Pesce S. F. and Wunderlin D. A., (2000), Use of water quality indices to verify the impact of Cordoba City (Argentina) on Suquia River, *Water Research*, 34, pp 2915-2926
15. Purkait, S., Ganguly, M., Aktar, M. W., Sengupta, D., Chowdhury, A. (2009), Impact assessment of various parameters polluting Ganga water in Kolkata region: a study for quality evaluation and environmental implication, *Environ. Monit. Assess.*, 155 443 - 454.
16. Sarkar, B., Islam, A., & Das, B. C. (2020). 13 Anthro-Footprints. *Anthropogeomorphology of Bhagirathi-Hooghly river system in India*, 433.
17. Schubert, R. H. (1980). Studies on factors limiting self-purification of water. I. Experimental studies on the effects of degradable and toxic substances on the ways of microbial self-purification of water. *Zentralblatt Für Bacteriologie Microbiologie Und Hygiene Abt Originale B*, 171, 497–511.
18. Stambuk-Giljanovik, N., (2003), Comparison of Dalmation water evaluation indices, *Water Environment Research*, 75(5), pp 388-405.
19. Tsegaye, T., Sheppard, D., Islam, K.R., Johnson, A., Tadesse, W., Atalay, A., and Marzen, L., (2006), Development of chemical index as a measure of in-stream water quality in response to land-use and land cover changes, *Water, Air, and Soil Pollution*, 174, pp 161-179.
20. Zhang, Z., F. Tao, J. Du, P. Shi, D. Yu, Y. Meng. (2010). Surface water quality and its control in a river with intensive human impacts—a case study of the Xiangjiang River, China. *Journal of Environmental Management*, 91(12): 2483-2490