

PHYSIO CHEMICAL ANALYSIS OF GOMTI RIVER WATER IN DIFFERENT LOCATION OF LUCKNOW REGION

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Abstract- Gomti River rises in Pilibhit District, U.P. It passes through district of Kheri, Hardoi, Sitapur, Lucknow, Barabanki, Sultanpur, Jaunpur and finally merges with Ganga. The world is struggling with a major type of pollution, both inorganic and natural. Healthy soil, calm water and calm air are the soul of life. Soil, water and air are often not soft or clean, but they pose risks to human health. Gomti receives large parts of untreated sewage, agricultural sewage, brings many pesticides, fertilizers, road wash-out bringing oil, asphalt, sediments and many kinds of heavy metals. From commercial runoff to domestic runoff, the river becomes a major landfill. After traveling approximately 150 miles (240 km), Gomti enters Lucknow where he travels sixteen km. Its buoyancy is particularly dependent on rainfall and consequently the buoyancy of the river could be very forgiving at some point during the monsoon. The river receives large amounts of human and commercial pollution as it flows through the densely populated areas (approximately 18 million) of Uttar Pradesh. High concentrations of pollutants in the river are wreaking havoc around the Gomti and threatening its aquatic life. Before Gomti reaches Lucknow, it receives waste from Sitapur Distillery and Sugar Industry. All distillery, dairy and vegetable oil industries that discharge sewage directly into Gomti and except also household sewage are discharged into Gomti River.

A total of eight sampling sites between Guaghat upstream and Piparaghat were selected for this review. Parameters such as temperature, total suspended solids (TSS), total dissolved solids (TDS), pH, hardness, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate, nitrite, chlorine, alkalinity, calcium, magnesium and some heavy metals. Changes in the comfortable water of the Gomti River were noted due to changes in the number of parameters. Heavy metals were found, in particular iron, chromium, copper and lead, nickel. This look at video display devices on the ground related to land use/land cover and water-friendly multi-parameter space masks is organized with the use of geospatial information systems (GIS) and remote sensing techniques.

The base map was compiled using the Survey of India topographic sheets at a scale of 1:50,000. The land

use/land cover map is created from satellite television imagery for PC and a GIS software program such as ARC GIS 9.3. Soil water samples were collected at the selected locations and analyzed for a unique physico-chemical analysis and a water enjoyment index was created. The Water placesant Index (WQI) is then calculated according to WHO requirements to classify suitability for drinking water.

Keywords: Total suspended solids (TSS), total dissolved solids (TDS), pH, hardness, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD) etc.

1. INTRODUCTION

The Gomti River, an alluvial circulation of the Ganga Plain and one of the significant feeders of the Ganga, begins offevolved near Mainkot, from Gomat Taala lake otherwise called 'Fulhar Jheel' in Madhotanda, round 30 km, three km east of the Pilibhit city in Uttar Pradesh at a upward push of 185 m. The waterway guides thru a chiseled valley southwards thru the areas of Sitapur, Lucknow, Barabanki, Sultanpur, and Jaunpur previous to assembly the Ganga circulation at Kaithi, District-Ghazipur, lining Varanasi (at a upward push of sixty one m.) next to crossing 940 km, in south-east heading. Different Tributaries of River Gomati are Gachai, the Sai, the Jomkai, the Barna, the Chuha, the Saryu, the Giri, the Kalyani, and the Kathna.

Water Resources in India

India is blessed with desirable rainfall nicely allotted over 5-6 months with inside the yr. The common annual rainfall with inside the united states is 1170 mm with a extensive variety among 100 mm in wilderness regions of Rajasthan to ten thousand mm in Cherapunji. The general to be had candy water with inside the united states is 4000 billion m³ consistent with annum. Out of this, over 1047 billion m³ water is misplaced because of evaporation, transpiration and runoff, reducing the to be had water to 1953 billion m³ and the usable water to 1123 billion m³. It is demanding to be aware that most effective 18% of the rainwater is used effectively even as 48% enters the river and maximum of which reaches the ocean. Out of the

general usable water, 728 billion m³ is contributed from floor water and 395 billion m³ is contributed through replenishable floor water. Against the above supply, the water fed on throughout the yr 2006 in India became 829 billion m³ that is in all likelihood to boom to 1093 billion m³ in 2025 and 1047 billion m³ in 2050, as envisioned through the Government of India (2009). As the capacity for growing the quantity of utilisation of water is hardly ever 5-10%, India is bound to stand intense shortage of water with inside the close to future.

Table-1: Per capita water availability in India

Year	Population(Million)	Per capita water availability (m ³ /year)
1951	361	517
1955	395	4732
1991	846	2209
2001	1027	1820
2025	1394	1341
2050	1640	1140



Figure 1: Gomti River

Gomti at Lucknow

The geological diploma of the Gomti sub-bowl lies among 79° 59' to 83° 14' east longitudes and 25° 25' to 28° 40' north scopes of the country. The Gomti sub-bowl of the Ganga bowl has a entire catchment place of 29,865 sq.km. Greater a part of the floor location of the Gomti Basin is with the aid of using and big level, slanting in the direction of South and South East with elevation moving from 2 hundred m to 62 m above suggest ocean level. For round 450 km from the beginning, the distinction withinside the upward push is round one hundred m and for the extra stretch of 500 km, there's a peak assessment of 25 m.

Gomti basin - HO Network

The surroundings of Gomti Basin is sub-tropical, monsoonal. Winters (October to February) are cool and dry with intermittent hazes and mild showers, summers (March to early June) are sweltering and dry, and the

rainstorm season (middle June to September) is heat and sticky, with successive weighty precipitation. The complete Gomti bowl is underlain with the aid of using thick alluvial dregs of the Quaternary age. The alluvial residue include of rocks, stones, rock, sand, sediment, dust and kankars. The unconsolidated unit is probably moreover partitioned into extra younger alluvium and extra set up alluvium. The extra younger alluvium possesses the present-day flood fields even as the extra set up bunch entails raised divides basically the doab segments. The extra set up alluvium is portrayed with the aid of using kankar knobs at profundity anyways it's far just like the extra younger alluvium. According to assessment 2011, the all out population of Gomti Basin is 277.15 lakh out of which 51.27 lakh (18.5%) is metropolitan and 225.89 lakh (81.5%) is rustic. Out of absolutely the population, 51.7% are male and 48.3% are female.

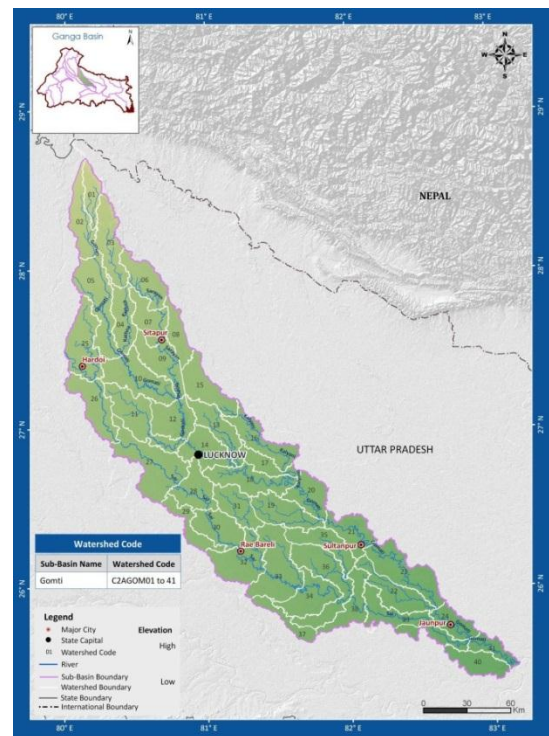


Figure 2: Lucknow map

Pollution

The Gomti and its floodplain, winding thru an undeveloped place

The Gomti in Lucknow district

The Gomti River is polluted at numerous factors of its direction thru the 940-kilometre (580 mi) stretch of alluvial plains in Uttar Pradesh. The fundamental reasssets of pollutants are business waste and effluent from sugar factories and distilleries and home wastewater and sewage. The river and its tributaries, which includes

Kukrail Drainage, accumulate massive quantities of human and business pollution as they float thru a place of approximately 18 million people. High pollutants ranges threaten the Gomti's aquatic life. On 25 July 2008, the basis stone of a 345-million-litre (91,000,000 US gal)-ability sewage remedy plant changed into laid.

The plant, promoted as Asia's largest, failed; in 2014 it changed into reportedly walking at 10 percentage of ability, and past the plant (close to Bharwara) untreated sewage and strong waste entered the river. The plant changed into meant to intercept the 23 fundamental herbal drains coming into the Gomti.

River Gomati

The Gomati river, one of the fundamental tributaries of Ganga river originates close to Mainkot in Gomati Tal approximately three km east of Pilibhit metropolis with inside the district of Pilibhit located with inside the North-west U.P. at an elevation of two hundred m above mean sea degree at range 28034' North and longitude 80017' East. The location of foundation is ready 50 km South of the Himalaya foothills. The river flows with inside the brilliant alluvial undeniable, that's of Pleistocene-Holocene foundation, and redistributes the weathered sediments of the Gangetic alluvial undeniable derived from Himalaya (Kumar and Singh, 1978). The river flows thru the districts of Pilibhit, Shahjahanpur, Sitapur, Lucknow, Barabanki, Sultanpur and Jaunpur, overlaying a complete distance of approximately 940 km earlier than becoming a member of the river Ganga close to Udyar Ghat in Kaithi village, district Ghazipur approximately 30 km North of Varanasi. The river is characterised through sluggish float for the duration of the year, besides the monsoon season, whilst heavy rainfall causes a manifold growth with inside the runoff. Most of the sediments are transported during excessive river discharge, in monsoon period. The Gomati river catchment place is approximately 30,437 sq. km. Sai river is its fundamental tributary having about 43% of the overall catchment place of Gomati basin.

Pollution Sources of River Gomati

The anthropogenic discharges represent a regular polluting source, while floor run-off is a seasonal phenomenon, in large part tormented by weather within the basin. Domestic sewage from 5 class-I towns, few class-II towns and many towns, effluents from numerous varieties of industries are discharged into the river Gomati for the duration of its length. About 78% of the pollutants is as a result of the disposal of uncooked sewage, effluents and sludge. The fundamental reassets of river Gomati pollutants are given below:

1. Small and fundamental drains, wearing sewage of adjacent regions

2. Untreated business effluents

3. Chemical fertilizers, pesticides, pesticides as floor run-off from nearby agricultural fields.

4. Surface run-off from regions on which city strong wastes are dumped.

Water Quality Status of Gomti River

Gomti is going through extreme hassle of pollutants because of discharge of sewage and business effluent. The in advance evaluation of water pleasant finished through branch of Irrigation; UP in 2016 and 2019 respectively display excessive degree of pollutants in Lucknow and Jaunpur. The principal pollutants manage board (CPCB) video display units the floor water pleasant of Gomti river and its tributaries – Gomti at Sitapur upstream, at Lucknow upstream and downstream, at Varanasi and Sai at unnao after drain outfall on recurring basis. Parameters measured are physical (temp, pH, ec), bacteriological (overall coliform and faecal coliform) and natural pollutants (DO, BOD) and COD. In UP, large rivers like Ganga, Sarju, Betawa, Rapti, Gomti, Sai and its tributaries are the primary reassets of water supply. The stretch of Gomti river from Gaughat to Pipraghat confirmed reducing fashion of dissolved oxygen. Gaughat confirmed the most DO content material while Pipraghat confirmed the minimum. The DO at Gaughat is most due to the fact the water at this site is least polluted from business, sewage and home waste. However, whilst river reaches Pipraghat, it receives closely polluted because of discharges from numerous cis and trans drains emptying into the river spherical the year. Increasing fashion of BOD changed into determined from upstream to downstream webweb sites of Lucknow. Decomposition of natural matter^{18, 19} is essentially an cardio process, so the call for and requirement of oxygen will increase ensuing lower withinside the dissolved oxygen, thereby growing BOD and COD. Lower fee of BOD at Gaughat changed into found due to the negligible pollutants on the upstream site. Use of detergents results in growth withinside the phosphate content material withinside the river water that causes increase of algae. Algal increase in water led to reducing of DO because of which the call for of oxygen will increase which results in the decomposition of natural count incomplete. The content material of BOD will increase from Nishatganj drain to Pipraghat because of heavy disposal of business wastes. The webweb sites of Gomti river from Gaughat to Pipraghat additionally confirmed an growing fashion in COD. The call for of oxygen for the decomposition of biodegradable and non biodegradable natural count will increase from upstream to downstream. COD content material changed into to be better at Upstream barrage and Pipraghat webweb sites. These rivers passes thru nearly all the large towns of UP. The sewage water, home and business wastes from the large towns are being disposed in those rivers. Investigation of

the physico-chemical and organic parameters enables in assessing the fame of water pleasant.

Restoration Plan for Gomti River

1.The above take a look at leads to indicate some critical movement techniques to be taken up on precedence foundation for Gomti River. This can be notable initiative to repair the river.

2.Demarcate the complete flood-plain, right from the beginning to the confluence with the Ganga.

3.Freeze its land-use with the aid of using buffering. No violation of the land use change.

4.Remove the unlawful encroachments withinside the flood-plain. Declare 500m from river midstream as no production zone. To be used simplest for plantation.

5.Declare the beginning in addition to confluence of all 24 important tributaries as "Eco-fragile areas".

6.Remove the silt deposited withinside the riverbed alongside the important settlements.

7.Use decentralized remedy inside the zones and makes use of the water for non-potable purposes.

8.Use fashionable low value remedy withinside the drain itself.

9.Strict tracking of the fifty six sugar factories placed across the river in Sitapur and above. They case important pollutants load withinside the river.

2. REVIEW OF LITERATURE

Singh et al. (2005b) executed a take a look at on a 630 km stretch of river Gomti, to take a look at the distribution of heavy metals in sediments and the partitioning of their chemical species among 5 geochemical phases (exchangeable fraction, carbonate fraction, Fe/Mn oxide fraction, and natural fraction) the use of Tessier's analytical sequential extraction technique. Most fractions withinside the sediments related to the carbonate and the exchangeable fractions had been among 11 and 30% besides in some instances in which it changed into greater than 50%. According to the Risk Assessment Code (RAC), the sediments having 11-30 carbonate and exchangeable fractions are at medium hazard. The concentrations of cadmium and lead at mid Lucknow, Pipraghat, Sultanpur U/S and Sulthanpur D/S are among 31 and 50%. They for this reason pose a excessive hazard to the environment. Since the concentrations of cadmium and lead at Neemsar (Cd fifty six.79%; Pb 51%) are better than 50%, the RAC as very excessive. In maximum instances, the common metallic concentrations had been decrease than the fashionable shale values.

The environmental pollutants degree is growing every day with the passage of time. Where ever the floor water is important supply for supplying water now no longer simplest for consuming motive however additionally for commercial and agricultural makes use of (Singh and Shukla, 2010). It is envisioned that about one 1/3 of the world's populace use groundwater for consuming (Ahmad and Mishra, 2014) in order that the floor water is constantly being exploited (Singh and Shukla, 2010). Primarily the floor water changed into secure to drink however after the time changed into passed floor water receives polluted with the aid of using leaching of chemical species e.g., phosphate, nitrate, insecticides and different poisonous factors like heavy metals because of huge discharge of untreated commercial effluent thru drains, agricultural septic tanks, home waste water and sulabh shauchalayas fields. Polluted water is in the main chargeable for sicknesses like hepatitis, jaundice, typhoid dysentery and diarrhoea etc. (Siddiqui et al., 2015).

Due to over exploitation of floor water with the aid of using human for his or her very own desires it has began out to shrink. Ground water high-satisfactory relies upon on use of land and high-satisfactory of the waste water tired into the river of terrain. Due to our irresponsible behaviour high-satisfactory of floor water is deteriorating every day (Siddiqui. et al., 2015). Lucknow is the capital of Uttar Pradesh. The country Uttar Pradesh includes geomorphic devices that's Ganga plains and Bundelkhand plateau (GWYBUP, 2014). All Around 85% of the land-location of Lucknow City is located on the Central Ganga alluvial plain, and stretches throughout each banks of the Gomti River. The Lucknow town is underlain with the aid of using a huge thickness of Quaternary alluvial sands (at fine of medium-grade) with occasional interbedded silty clay aquitards.

3. MATERIALS AND METHODOLOGY

Study place

Lucknow, the capital of Uttar Pradesh (India), is located withinside the piece of focal Gangetic simple among North scopes 26 three hundred and 27 a hundred and East longitudes eighty three hundred and eighty one 13' (Fig. 1). The town has a moist subtropical surroundings with a fab dry wintry weather from December to February and a heat summer time season from April to June. The temperature limits shifted from 48.nine C in the mid 12 months to 1.sixty seven C withinside the less warm time of 12 months. The town receives round 900 mm of every year precipitation for the maximum element from the southwest rainstorm among July and September. The town's upward thrust shifts from a hundred to one hundred thirty m above imply ocean stage and with the aid of using and massive inclines closer to the east. Lucknow is one of the quickest growing town withinside the united

states of america with population projection of 4.7 million out of 2031 from 2.eight million in 2011]. Quick impromptu urbanization has made numerous troubles because it places large stress ashore, water, lodging, transport, wellbeing, schooling and so forth. This growing population notably influences regular property of the place mainly on water excellent and amount. New water is the foremost ordinary property for the existence but overexploitation and outlandish utilization of water has caused weakening of nature of water.

trying out and research. Water Samples are amassed and investigated from the proposed regions as soon as each month January-February. Tests are tested for physicochemical characteristics which are pH, Turbidity, Electrical Conductivity, Total broke down Solids, Total Suspended Solids, Dissolved oxygen, BOD, COD, Total Hardness, Calcium Hardness, Alkalinity, Chloride, Sulfate, Nitrate, Fluoride, and so forth. The Eight locales have been selected for the water exceptional obstacles withinside the Gomti River. Tests from 8 focuses have been amassed withinside the Gomti River, Coordinates of every instance factor location have been stored withinside the area thru handset GPS.

Sampling Procedure

The floor water checks have been amassed in pre wiped clean polyethylene bottles or tarson of 1000mL restriction. Appropriate method turned into observed as depicted through APHA AWWAWPFC (twenty third release) for the inspecting and the research cause for the selected obstacles to avoid any defilement at some stage in assortment, stockpiling and genuine warranty of convergences of the groundwater checks. Each selected hand siphon for trying out turned into located on for some thing like five min to cast off any pollutants. Each instance withinside the amassed boxes turned into covered firmly to live farfar from spillage and defilement from any contaminations at some stage in managing and transportation. The jugs have been sufficient named through date and regions, the wellspring of water i.e Hand siphon, and so forth to understand trying out factor at some stage in compound exam. Every one of the amassed examples have been safeguarded in bloodless and moved to the lab wherein they have been positioned away withinside the cooler at 4°C till applied for specific substance research. For weighty metals exam the instance is taken independently in tarson box of 500ml restriction. Test is weakened with Concentrated Nitric Acid and in a while it is dissected for weighty metals.

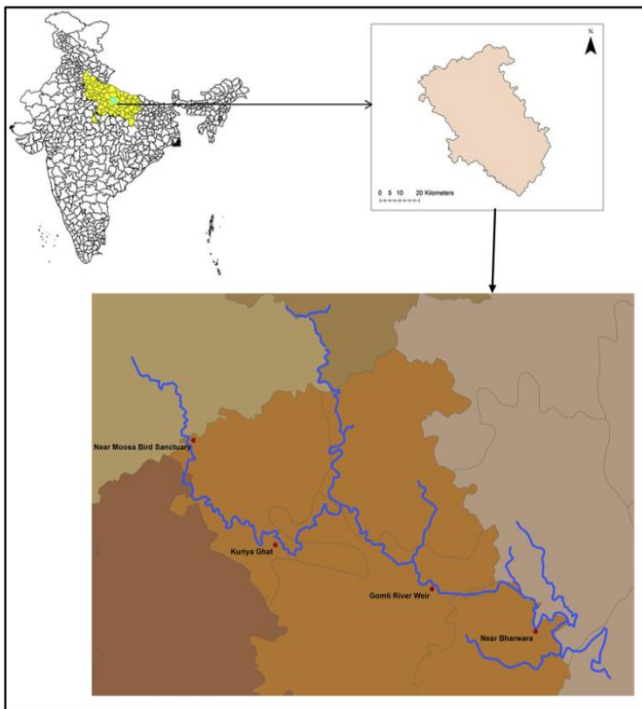


Figure 3: Lucknow in India map

Lucknow is reduce throughout through diverse streams. Gomti, the substantial circulation, streams from North-West to South-East thru the point of interest of town. It is one of the substantial wellsprings of public water deliver withinside the town alongside groundwater. Age of sewage and suitable remedy and elimination of this waste is the extreme trouble withinside the town. Inadequately depleted sewerage framework and absence of remedy restriction of sewage remedy gadgets has delivered approximately extreme debasement the character of circulation water.

Site Description:

Lucknow is the capital of Uttar Pradesh. The assessment place covers the Gomti River in piece of Lucknow town of Uttar Pradesh lies among 80.899893 to 80.968180 N scope 26.886799 to 26.833321 E longitude. To absolutely examinations the Physical, Chemical Parameters and weighty metals withinside the Gomti River of Lucknow town, 8 extraordinarily locations are moreover selected for



Figure 4: Samples

Calculation of water Quality Index(WQI)

Water great index (WQI): - Water great index (WQI) is treasured and precise score to depict the general water great fame in a unmarried time period this is beneficial for the choice of appropriate remedy method to satisfy the concerned issues. The idea of water great index (WQI) become brought via way of means of Horten. WQI is described because the score that reflects the composite influence of the different parameters.

Data requirement

The WEAP version become used to simulate destiny water great variables withinside the 12 months 2030 to evaluate alternative control rules withinside the Gomti River basin. For water great modeling, a extensive variety of enter facts including factor and non-factor pollutants sources, their places and concentrations, past spatio-temporal water great, wastewater remedy plants (Central Groundwater Board), population, historical rainfall, evaporation, temperatures (Indian Metrological Department), drainage networks [29], river waft-stage-width relationships, river length, groundwater, floor water inflows, land use/land cover (State water board) and grasp plan is provided.

Daily rainfall become accrued at IMD Meteorological Station, for the duration from 1980 to 2016. Daily common circulate waft facts in 2011–2016 were measured at 5 stations, particularly Bharwara, River Weir, Pipraghat, Kuriyaghat, Manjhigat and Near Moosa

RESULTS AND DISCUSSION

Table: 1 Showing Heavy Metal estimation of River Gomti in Lucknow

Sr. No	Sampling Sites	As (mg/l)	Cu (mg/l)	Fe (mg/l)	Cd (mg/l)
1.	Gaughat	0.0375	0.0145	0.665	0.0181
2.	Hussainabad	0.062	0.061	1.021	0.021
3.	Gulalaghat	0.04	0.0325	0.077	0.0199
4.	Kuriyaghat	0.029	0.018	0.725	0.0198
5.	Pakkapul	0.070	0.0315	0.92	0.021
6.	Mohan Meakin	0.046	0.017	0.85	0.0163
7.	Mankameshwar	0.049	0.0525	0.715	0.0202
8.	Daliganj	0.079	0.0195	1.075	0.023
9.	Hanuman setu	0.039	0.024	0.8015	0.0208
10.	Boat club	0.0305	0.0185	0.405	0.0242
11.	LakshmanMela ground	0.0495	0.026	0.72	0.01755
12.	Monkey Bridge	0.06	0.023	1.685	0.0197
13.	Parag	0.036	0.0255	1.485	0.0176
14.	Baikunth Dham	0.0385	0.024	1.545	0.0144
15.	Gomti baragge	0.0705	0.026	1.525	0.0223

Heavy metals at selected stations of river Gomti in Lucknow

In the gift study, most hydrogen ion concentration worth was at Mohan meakin (8.59) that was slightly more than fascinating limit and minimum value was at Daliganj (6.88). pH was at intervals permissible limit at all stations.

Analytical study of pH in rain water for the determination of contaminated or pure zone was additionally done by Gaddamwar (2021). pH of the water is that the live of the H⁺ ion activity of the water system. It indicates whether or not the water could be acidic, neutral or base-forming in nature. Dissolved element concentration is a outstanding Indicator of pollution (Basavaraddi et al., 2021). Fish and different aquatic animals rely upon DO, that hooked in to the water temperature. the utmost waste water was determined at Kuriyaghat i.e. four mg/l and minimum at Parag i.e. 1.7.mg/l. the utmost fascinating limit for chlorides is 250 mg/l with relaxation up to a thousand mg/l. The maximum worth of the chloride was recorded at website Mankameshwar i.e. 62.65 and minimum at Parag 2.61 mg/l. Most of the values of the water samples were at intervals the permissible limit except Gaughat, Laxman mela ground. The presence of soiled material from homothermic animals reminiscent of Escherichia coli or enteric bacteria pneumoniae are the indicator of potential danger of health risks those soiled possess (Singh et al., 2021). the utmost range of total coliform count was found at Laxmanmela ground i.e. 1600 MPN index/100 milliliter and minimum at Gaughat i.e. 92.5 MPN index/100 ml. Suspended sediment concentration (SSC) and Total Suspended Solids (TSS) are preponderantly wont to quantify concentrations of suspended solid-phase material in surface waters (Grey et al., 2021). the utmost worth was at Parag at i.e. 678.5 mg/l and minimum at site Gaughat i.e. 417.5 mg/l. The parameter was at intervals permissible limit. the utmost fascinating limit for Total Suspended Solids is five hundred mg/l. The tolerance limit for Total Dissolved Solids is 500 mg/l. The maximum worth of TDS analyzed at website Parag i.e.620 mg/l that was on the far side the permissible limit and minimum at Gaughat 357.5 mg/l and was within permissible limit.

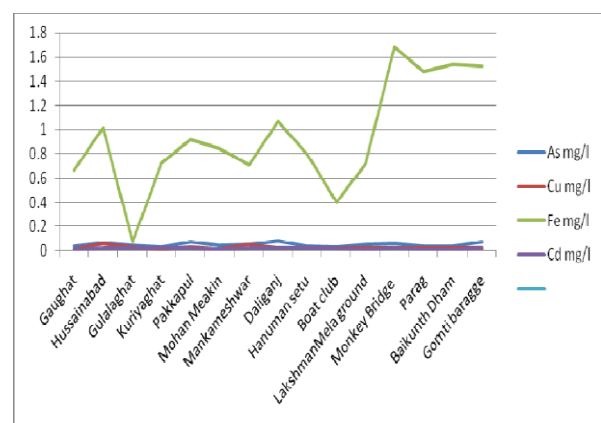


Figure 5: Graphical Representation

Precipitation change

The comparative results of the monthly precipitation pattern are shown in Fig. 4. The observed annual precipitation for the years 2015 was 844.8 mm. On the other hand, the projected annual precipitation for the year 2030 using MRICGCM3 GCM under RCP 4.5 and RCP 8.5 was 883.1 mm and 831.8 mm respectively. On the other hand, the same projected precipitation value using MIROC5 GCM with RCP 4.5 and RCP 8.5 was 802.0 mm and 822.1 mm respectively. These values clearly indicates that annual precipitation in the simulation from GCM output is not much different than that of current observed one.

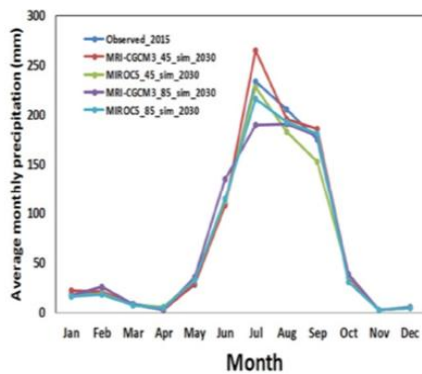
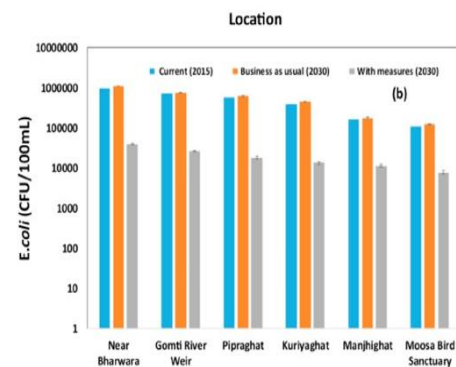
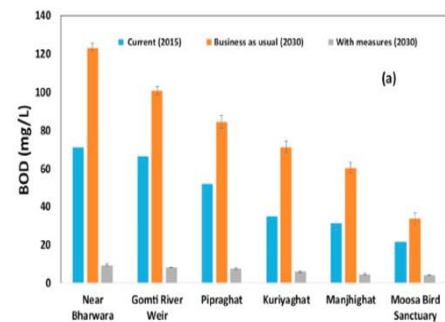


Table no. 2 Summary of all the criteria considered for different scenarios in future water quality simulation.

Scenario	Components
Business as usual	Climate change + population growth + WWTP of 145 MLD (19% collection rate)
With mitigation measures	Climate change + population growth + WWTP of 1119 MLD (100% collection rate)

The simulation results for the water quality parameters (BOD and E. coli) using these two scenarios. Here, small bars on the simulated water quality show the range due to change in GCM and RCP. With the currently existing wastewater treatment plant (Capacity of 145 MLD and mere coverage of 19% of total population in the study area), the current status of

water quality throughout the river is very poor if compared with local guideline for i.e. swimmable category (BOD<3 mg/L and E. coli<1000CFU/100mL) [33]. For 2015 (current stage), the simulated value of BOD varies from 21.5 to 71.4 mg/L clearly indicates that all the water samples are moderately to extremely polluted with class B. Looking into the result from scenario 1 i.e. business as usual, the effect of climate and population changes are prominent in water quality status. It is deteriorating further in 2030 when compared to the current situation. Due to both climate and population changes, the water quality expressed as BOD and E. coli will be deteriorating by an average of 70.8% and 10.6 % respectively on an average in 2030 when compared to the current situation. Further, the effect of each individual parameter i.e. population growth and climate change is analyzed by keeping other parameters constant. For example, when calculating the individual effect of population growth, the value of rainfall as a representative of climate change in this case by year 2030 kept constant and vice-versa. The obtained results are shown in Table 3, where it is very clear that population growth has a bigger contribution to water quality deterioration than climate change.



4. CONCLUSION

In this examination, Various barriers are broke down in lab and plotted on map making use of GIS addition strategy. It enables song down the sort of diverse barriers at diverse regions. We will have tested water excellent at diverse analyzing focuses. It likewise assists with monitoring down the wellspring of the contamination. This pay attention likewise figured WQI is going from 180.02 to 313.186. The base really well worth has been

recorded for Gaughat trying out factor even as finest has been recorded for Gomti Barrage area. In view of the WQI desk simply Gaughat and Piparaghat area's circulation water have Moderately infected water as a long way as excellent even as different 5 regions have Severely Polluted Water and Gomti Barrage have water that is Unsuitable for human use. The excessive really well worth of WQI has been visible as due to Calcium, sulfate, alkalinity, Iron and Chromium in floor water. The better upsides of Total Dissolved Solids, Total hardness and alkalinity are due to draining of waste from metropolitan Residents. This multitude of factors may gift health danger on lengthy haul and might corrupt nature of ingesting water, alongside those strains predicted to be handled for ingesting purpose. Customary checking of groundwater excellent, abolishment of unlucky garbage elimination practices have to be there in Lucknow city. The Study likewise demonstrates the ease of WQI in assessing the circulation water nature of the circulation water.

This paintings gave an in depth image of water excellent of Gomti River in Lucknow City, India for each cutting-edge (2015) and destiny (2030) time the use of distinctive state of affairs analyses. Simulated end result virtually indicated that Gomti River is fairly to critically polluted for the duration of the stretch whilst as compared with magnificence B given through Uttar Pradesh Pollution Control Board (UPPCB) for 12 months 2015. In addition, for the enterprise as regular state of affairs, the excellent repute turns into worse through 12 months 2030. However, thinking about the state of affairs with mitigation measures as mentioned in neighborhood grasp plan for water sources control, the excellent of water will enhance significantly. However, water excellent at downstream regions like Pipraghat, Gomti River Weir and Near Bharwara does now no longer follow suited water excellent of sophistication B, and wishes similarly attention. Some of the different ability motives in the back of the negative repute of water excellent are: a) at cutting-edge stage, in spite of the sizable capability of present WWTPs, the wastewater coming to those plant life aren't enough due to negative sewerage collection charge or negative connection among every family and predominant sewerage line. The purpose in the back of that is the non-willingness to pay the high-priced connection fee through the neighborhood residents; or even once, related they ought to pay extra cash in phrases of water or sewerage remedy bills; b) loss of right coordination among distinctive actors/stakeholders concerned in water control to implement the grasp plan (water infrastructure) in a well timed manner.

The Gomti River in Lucknow City, India, turned into an vital supply of water for the distinctive makes use of few many years ago. However, due to the speedy international modifications, cutting-edge repute of the river is very

crucial from environmental, aesthetic and business utilization factor of view. Henceforth, this studies paintings centered on assessing the cutting-edge as properly as predicting its destiny state of affairs the use of distinctive situations even as thinking about key drivers of world modifications particularly weather extrude and populace growth. Water Evaluation and Planning (WEAP), a numerical simulation tool, turned into used to model river water excellent the use of situations viz. enterprise as regular (BAU) and state of affairs with mitigation measures. Water excellent simulation turned into carried out alongside 24 km stretch of the Gomti River from downstream of Near Moosa Bird Sanctuary to Near Bharwara. Comparison of simulated water excellent parameters for the cutting-edge and BAU repute virtually shows that the water excellent through 2030 will rapidly become worse and might be now no longer appropriate for plenty aquatic lives in phrases of simulated water excellent parameters. Results from state of affairs with mitigation measures advocate cutting-edge deliberate wastewater remedy plant life and regulations are now no longer enough sufficient to acquire suited river water excellent inside magnificence B and as a result name for fast and inclusive action

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