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Water Analysis of Different River Basin

Mr. Manohar, Chaithra S, Kaveri, V Kubera
Assistant Professor, Department of Civil Engineering
Students, Department of Civil Engineering
Rao Bahadur Y. Mahabaleswarappa Engineering College, Ballari, India

Abstract: *This Project report investigates the application of This study evaluates water quality in Tungabhadra, Malaprabha, and Krishna rivers through physico-chemical analysis at upstream/downstream sites in Karnataka. Samples tested for acidity, alkalinity, chlorides, total hardness, BOD, and total solids reveal downstream deterioration from sewage, industrial effluents, and agricultural runoff. Key findings include BOD levels of 18-22 mg/L and chlorides up to 134.18 mg/L, exceeding safe limits for direct use. Standard APHA methods confirm pollution impacts, recommending treatment and monitoring for sustainable river management.*

Keywords*:* Tungabhadra River, Krishna Basin, water quality, BOD, physico-chemical parameters, pollution

I. INTRODUCTION

Rivers form lifelines for southern India's agrarian economies, yet face severe pollution from urbanization and industrialization. Tungabhadra River (531 km), formed by Tunga-Bhadra confluence at Koodli near Shimoga, supports irrigation via Tungabhadra Dam at Hospet (15°16'N, 76°24'E, 467 m elevation) but receives sewage and effluents, reducing DO and elevating toxins. Malaprabha (304 km, 11,549 km² catchment) originates at 792 m in Belgaum's Western Ghats, joining Krishna at Kudala Sangama amid agricultural runoff. Krishna River (1,288 km, second-largest peninsular basin at 258,948 km²) traverses Maharashtra, Karnataka, Telangana, and Andhra Pradesh, sustaining 67 million via dams like Almatti. Seasonal dynamics exacerbate issues: monsoons boost discharge and erosion; summers concentrate pollutants via low flow. Literature highlights non-point sources (agriculture, urban waste) as primary degraders in these basins. This research assesses suitability for drinking, irrigation, and ecology using standard parameters.

Tungabhadra dam is located Tungabhadra across river in Hospet, Hospet, also known as Hosapete, is a Vijayanagara District in central Karnataka, India. It is located on the bank of Tungabhadra River. The city is spread over an area of about 70.12 km2. Hospet city is situated at the geographical position of 15° 16′ 0″ North 76° 24′ 0″ East and an altitude of over 467 m above sea level. India similar to other resources, this river is also environmental stress due to siltation, human encroachment, high micro phytic population and sewage input from various sources there are number of drains discharge lodes of sewage domestic waste water and industrial effluents directly into the river Tunga, The Tunga River originates in the Western Ghats, on a hill known as Varaha Parvata, at a place called Ganga Moola of Chikkamagalur district in Karnataka state. The Ganga moola hill is surrounded by thick forests called as Bhagavathi Forest. The river is given the compound name Tungabhadra from this point onwards. The main goal of the present research paper was to develop and test a method to separate the relative impact of human activities on the quality of river water. Bhadra rises near Samse in the Aroli hill range of Kudremuka, Bhadra joins Tunga at Kudli in Shimoga district. The river is transboundary and flows about 531KM from its origin in Karnataka state.

II. LITERATURE SURVEY

1. M. M. Babu et al; "A Water Quality Assessment and Modelling of the Indian River Tungabhadra", 2023:

Every river gets polluted as it moves from its source to the end. Hence, the quality of the water requires investigation for the usability. In the present work 40.69 km stretch of the river Tungabhadra in the Vijayanagar district of the Karnataka, India was chosen for testing the water quality. The samples' physical, chemical and biological

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characteristics were tested from eight sites for each month during summer rainy & winter seasons. A biochemical oxygen demand dissolved oxygen (BOD-DO) equation was estimated using the de-oxygenation and reaeration constants. The results showed that the physical and chemical parameters were within the limits of the us ability standards for all the sampling stations during all seasons

2. Vinayak Krishnamurti Naik and S. Manjappa Received 23 September 2007
Transport, settling and quantity of solutes in rivers, streams, lakes and reservoirs are the important aspects in water-quality modelling. This has been the major concern for the researchers, scientists and engineers for the last 50 years who actively involved in water quality modelling. Consequently, characterization of hydrodynamics and water budgets has been an essential component in the water–quality modelling. This paper presents on the simulation model for sediment transport, solids budget, bottom sediment as a distributed system under steady-state condition, and resuspension of solids due to currents etc. The solids considered for the study was mainly allochthonous as these are inorganic in nature and the rate of decomposition is negligible. The data collected refers to the part of the research work on Malaprabha River, near Belgaum – a district headquarters in the State of Karnataka, India. This river is a non-perennial one, and the flow is very less during the pre-monsoon period, which is favourable for application of these sediment models. The results obtained for the resuspension and burial velocities showed marked variations during the different seasons of the year. Resuspension velocities predominated during the monsoon period resulting in the no settlement of the solids and the burial velocity during the non-monsoon period. As the river receives raw sewage from an adjoining town – Khanapur, and also the agricultural discharges, it is worth to quantify the sediment deposition in the stream.

3. Doddamani Hanumanthanaik1 , Babu Giriya Gowda 2022
During Vijayanagara dynasty (about 400 years back), Raya canal has been built and serving the irrigation needs of the local population of the Hospet Taluk of Bellary district, Karnataka, India. The urban development of Hospet town has been taken place right up to the canal boundary and in certain places; the canal land has also been encroached. A large number of open channels and pipelines etc., have been directly connected to the canal and at many locations, the canal plays an important role as a drainage line or seepage disposal point. The canal water is polluted from disposal of untreated sewage, seepage of agricultural wastes, domestic wastes, washing activities, storm water drainage, cattle farming wastes and dumping of liquid & solid wastes. The people residing on either side of the Raya canal were using the water extensively for the purpose of washing, bathing, drinking, fishing, cattle feeding etc. To understand the situation, at four different sample stations, (S1 to S4) along the course of Raya canal, water samples were collected on monthly basis to determine and evaluate seasonal changes in the physicochemical parameters like pH, EC, Temp, TH, TA, BOD, COD, chloride, nitrate, phosphate and DO. The comparison of statistics with the standard values prescribed by WHO (2004), ISI (1983), for drinking water and BIS (1991) for irrigation purpose; revealed the high level of BOD, COD, TA and low level of DO in the water content causes a hazardous effect on both aquatic and human lives

III. MATERIALS AND METHOD

STUDY AREA

1. TUNGABHADRA RIVER

The Tunga River originates in the Western Ghats, on a hill known as Varaha Parvata, at a place called Ganga Moola of Chikmaglur district in Karnataka state. The Gangamoola hill is surrounded by thick forests called as Bhagavathi Forest. Three important rivers, the Tunga, the Bhadra and the Nethravathi have their origin here. From here, the river flows 147 km long through four districts in Karnataka, Dakshina Kannada, Udupi, Chikmagalur and Shimoga. The River Tunga merges with the Bhadra river at Koodli, a small village near Shimoga. The river is given the compound name Tungabhadra from this point onwards. The Tungabhadra flows eastwards and merges with the Krishna River in Andhra Pradesh. Rivers Tunga and Bhadra are the principal tributaries of Krishna in Karnataka along with other tributaries like Ghataprabha, Malaprabha and Bhima

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2. MALAPRABHA RIVER

The Malaprabha sub-basin lies in the extreme western part of the Krishna basin. It extends between 74 ° 15′ and 75° E longitudes and 15° 30′ and 15° 45′ N latitude in Belgaum district of Karnataka. Malaprabha river originates from the Choral ghats (A section of the western ghats) about 35 km south-west of Belgaum district in Karnataka, at an elevation of 792 m. The total catchment area up to the first dam site (study area) is 3300 sq. km. However, number of open wells and bore wells available are quite limited.

The entire river basin experiences a semi-arid type of climate, spread in the hilly, Northern dry, and Northern Transition zones of the agro-Climatic Zones of Karnataka State, and it is very warm during the summer, especially in April and May, with temperatures ranging between 350 and 40°C in the eastern part of the river basin. The annual normal rainfall of the Malaprabha basin area is over 759 mm spread over 50 days, which receives monsoon rainfall as much as our nation with slight variations. Deep black cotton soils are ubiquitous in the basin area. Jowar, besides other drought-resistant inferior small millet crops, is traditionally the predominant crop. Geographically, deep black cotton soils, Unpredictable monsoonal rainfall, droughts, and famines are part of the lives of people in the study region. The present study is a natural region that occupies 6.02% of the Karnataka state. As per the 2011 census, the population of the Malaprabha River Basin is 3.38 million (5.53% of the state's total population), of which 77.66% are rural and 22.34% are urban. The dominance of rural populations makes the regional economy mainly agrarian. The basin's 68.37% of the workforce (61.75% of males and 79.55% of females), however, is still dependent on agriculture and its allied activities for their livelihood. The economic development and prosperity of the masses depend mainly on agriculture

3. KRISHNA RIVER

The Krishna River originates from the Mahabaleshwar range of the Western Ghats in Maharashtra, India. The river embarks on a remarkable 1,400-kilometer journey. It traverses through the Indian states of Maharashtra, Karnataka, Telangana, and Andhra Pradesh. It ultimately merges into the Bay of Bengal at the town of Krishnapatnam

The Krishna River basin is the second largest river basin in peninsular India and stretches over an area of 258948 km2. The basin is located in the states of Karnataka (113271 km2), Andhra Pradesh (76252 km2) and Maharashtra (69425 km2). The basin represents almost 8% of surface area of the country of India and is currently inhabited by 67 million people. The major tributaries of the river include the Bhima River in the north and the Tungabhadra River in the south. The river terminates at the Krishna delta in the Bay of Bengal

COLLECTION OF WATER SAMPLE

1. Site Selection: Choose a well-mixed zone in the middle of the river/stream, away from banks, stagnant areas, or recent disturbances, facing upstream.
2. Equipment: Use clean, appropriate containers (sterile for microbes, lab-supplied), a pole/sampler if wading isn't safe, and a cooler for transport.
3. Rinsing (Field Rinse): Before the final sample, rinse the bottle at least three times with river water, shaking and discarding each time, to remove contaminants and temperature shock.

4. Collection:

4.1. Submerge the bottle (or sampler) 0.3m (about a foot) below the surface, in the middle of the flow.

4.2. Remove the cap underwater, fill completely (or leave a small headspace for some tests), and cap it while still submerged.

4.3. Labelling & Storage: Label bottles clearly on the side (not the lid) with site, date, time, etc., and store immediately in a cooler with ice packs, away from light.

TEST

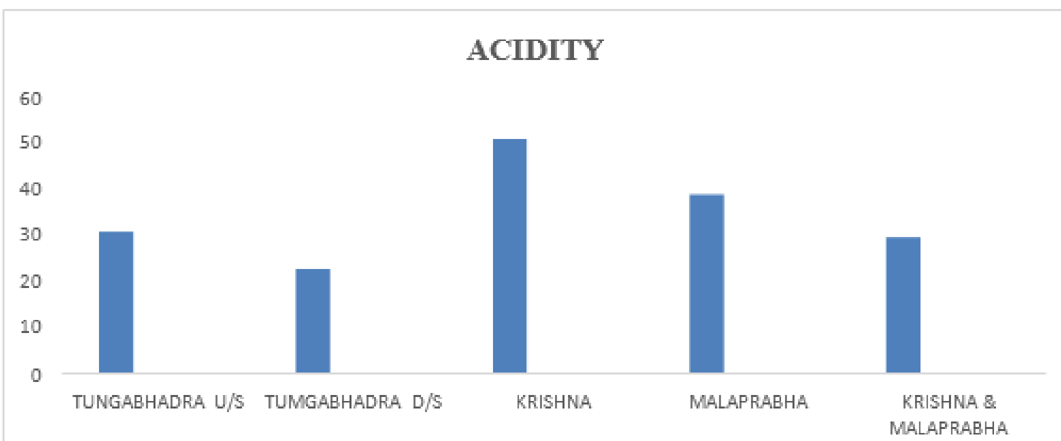
1. ACIDITY
2. ALKALINITY

3. TOTAL HARDNESS
4. CHLORIDES
5. DISSOLVED OXYGEN
6. BIOCHEMICAL OXYGEN DEMAND
7. TOTAL SOLIDES

RESULTS

Test	STANDRED VALUES	Tungabhadra U/P	Tungabhadra D/S	Krishna	Malaprabha	Krishna and malaprabha
ACIDITY mg/l	0 - 50	30.4	22.4	50.4	38.4	29.2
ALKALINITY mg/l	200 - 600	104	160	28	92	66.4
CHLORIDES mg/l	250	93.61	76.5	112.3	125.67	134.18
TOTAL HARDNESS mg/l	200 - 600	94.4	84	281.2	294.2	309.2
TOTAL SOLIDES mg/l	500	0	0	0	0	0
BOD mg/l	100 - 350	18	18	20	22	20

1. ACIDITY



The graph shows the acidity levels of water samples collected from different river basins. The highest acidity is observed in the Krishna River, followed by the Malaprabha River. Tungabhadra River shows moderate acidity, with lower values at the downstream location compared to upstream. The combined Krishna–Malaprabha basin exhibits intermediate acidity levels, indicating variation in water quality among the studied rivers.

2. ALKALINITY

The graph represents the alkalinity levels of water samples collected from different river basins. Tungabhadra River shows higher alkalinity at the downstream location compared to upstream, indicating an increase along the flow. Krishna River records the lowest alkalinity among the studied rivers, while Malaprabha River shows moderate

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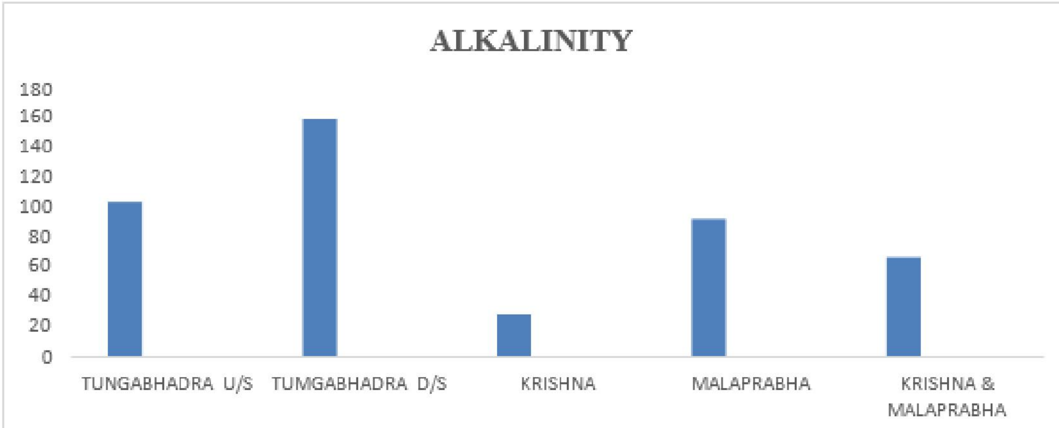
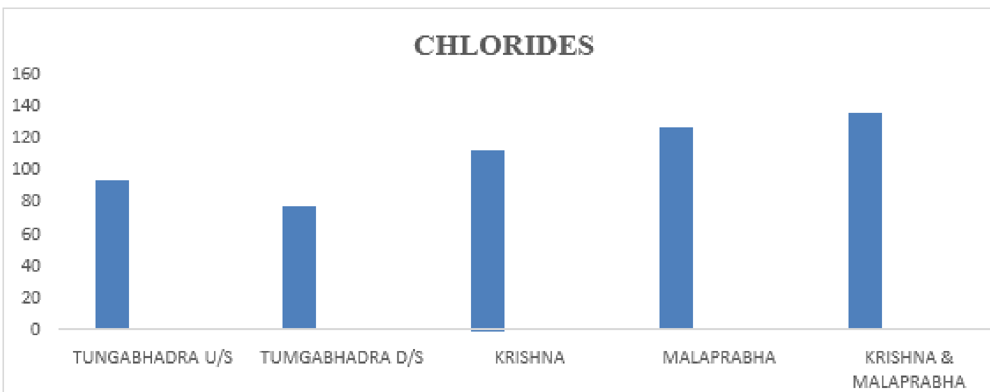
alkalinity values. The combined Krishna–Malaprabha basin exhibits intermediate alkalinity levels, reflecting variation in buffering capacity and water quality across the river basins.

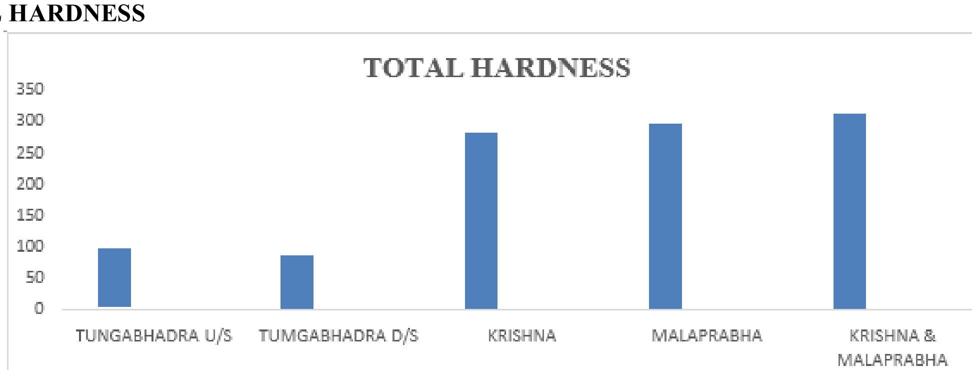


3. CHLORIDES



The graph illustrates the chloride concentration in water samples collected from different river basins. The Tungabhadra River shows higher chloride levels at the upstream location compared to downstream. Krishna River records moderate chloride concentration, while Malaprabha River shows relatively higher chloride levels among the individual rivers. The combined Krishna–Malaprabha basin exhibits the highest chloride concentration, indicating variation in salt content and possible influence of anthropogenic activities across the studied river basins.

4. TOTAL HARDNESS

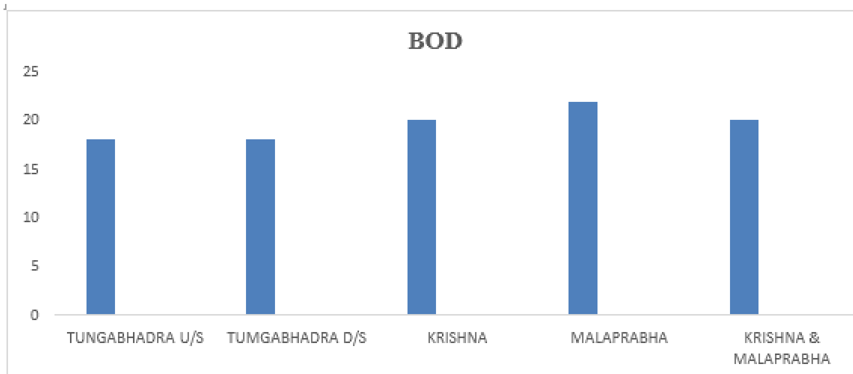


The graph shows the variation of total hardness in water samples collected from different river basins. Tungabhadra River exhibits comparatively low total hardness at both upstream and downstream locations. Higher hardness values are observed in the Krishna and Malaprabha rivers, indicating greater concentration of calcium and magnesium salts. The combined Krishna–Malaprabha basin records the highest total hardness, reflecting increased mineral content and variation in water quality among the studied river basins.

5. TOTAL SOLIDES

The analysis shows that total solids were absent in all the water samples collected from Tungabhadra River (upstream and downstream), Krishna River, Malaprabha River, and the combined Krishna–Malaprabha basin. This indicates negligible presence of suspended and dissolved solids at the sampling locations, suggesting clear water conditions and minimal particulate pollution during the study period

6. BOD



The graph depicts the biochemical oxygen demand (BOD) levels of water samples collected from different river basins. Tungabhadra River shows moderate BOD values at both upstream and downstream locations. Higher BOD levels are observed in the Krishna and Malaprabha rivers, indicating increased organic pollution. The combined Krishna–Malaprabha basin records the highest BOD, reflecting greater organic load and reduced water quality compared to the other studied rivers.

IV. CONCLUSION

The present study evaluated the water quality of the Tungabhadra, Malaprabha, and Krishna rivers by analyzing important physico-chemical parameters from water samples collected at upstream and downstream locations using standard laboratory methods. Parameters such as pH, acidity, alkalinity, total hardness, chlorides, dissolved oxygen (DO), biochemical oxygen demand (BOD), and total solids were assessed to understand the overall river water condition. The results reveal that water quality varies significantly with location and intensity of human activities. While pH values were generally within permissible limits, indicating neutral to slightly alkaline water, variations in alkalinity and hardness reflect the influence of geological formations and agricultural runoff. Elevated chloride concentrations, especially at downstream locations, indicate the impact of domestic sewage and industrial effluents.

Further analysis shows that dissolved oxygen levels decrease in polluted stretches of the rivers, indicating stress on aquatic life and deterioration of water quality. Higher BOD values at downstream locations confirm the presence of organic pollution caused by sewage and wastewater discharge. Seasonal variations and river flow conditions play a crucial role in the dilution and concentration of pollutants. The findings are consistent with previous literature, which identifies non-point sources such as agricultural runoff and urban waste as major contributors to river pollution. The study emphasizes the need for regular monitoring, effective wastewater treatment, controlled industrial discharge, and increased public awareness. Overall, immediate attention and sustainable management practices are essential to protect and preserve the ecological health of these river systems.

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