Evaluation of Physicochemical Characteristics and Metal Contamination Risks in Netravathi and Gurupura River Basin: Overview of Risk Assessment

[1]Nitesh
Department of Civil Engineering
A J Institute of Engineering and Technology
Mangalore, India

[3]Sridevi R
Department of Civil Engineering
A J Institute of Engineering and Technology
Mangalore, India

[2]Deeksha
Department of Civil Engineering
A J Institute of Engineering and Technology
Mangalore, India

[4]Prajna
Department of Civil Engineering
A J Institute of Engineering and Technology
Mangalore, India

***Abstract*— The Netravati River roots at Bangrabalige valley, Yelaneeru Ghats in Kudremukh which is in Chikkamagaluru district of Karnataka, India. This river drifts through the well-known place Dharmasthala. This river is believed as one of the holy rivers of India. The Gurupura River which is also known as Phalguni River or Kulur River is a river in Karnataka, India. It instigates in the Western Ghats and is a branch of the Netravati River, which joins into the Arabian Sea, south of Mangalore. It gotten its name from the town Gurupura, located near Mangalore.**

The field changes of river water quality and the metal pollution of Netravathi and Gurupura river basin were examined. Water samples were bought from 5 different locations from river gurupura and 4 different locations from river nethravathi along theflow path of river in the basin and the physicochemical (pH, solids, turbidity, hardness, chloride, dissolved oxygen, electrical conductivity, sulphate) and metal (Pb, Iron, Zn) features were examined. The results were related with maximum acceptable limit values suggested by World Health Organization (WHO). This study intentions to evaluate the water quality status in river Netravathi and gurupura. It is essential to regulate direct flow of wastewater in rivers to reinstate natural health.

Keywords*— Netravathi River, Gurupura river, physicochemical, metal, water quality.

I. INTRODUCTION

Water is the significant natural source which is found on earth, without water it is not imaginable to live. Natural freshwater forms like rivers, lakes, and wetlands are the key foundation of water to complete the day-to-day water request for household, agriculture and also industrial activities. The Netravati River performances as the main water source to Mangalore and Bantwal. It's been projected that more than 40 Lakh publics are dependent on the Netravati River to meet their daily necessities. Certainly, people living in these regions are dependent majorly on farming. The aquatic life of this river is valued for fishing. As assessed, 7 lakh farmers have grown paddy fields on the 35,000 hectares of land near Netravati River. Similarly, the bank of the river assists as the source of sand, which is naturally even. The bank of the river tossesaway this sand which is accessible to publics for job-related purpose on thebanks of the Netravathi River. This sand is used in future for construction of buildings. Under the world's biodiversity conservation project, lot of inland waterways or canals for nearby villages such as HongadaHolae, Shiradi, Keri Holae, YettinaHolae and Yedakumeri have been expected to be constructed.

II. MATERIALS AND METHODOLOGY

A. Sample and sampling techniques

Samples were accumulated to test the chemicals that are present in the water. Samples were accumulated from various places of river Netravathi and Gurupura and denoted as NS1, NS2, NS3, NS4 and GS1, GS2, GS3, GS4, GS5.

Samples were collected in 1000ml (1litre) properly cleaned white plastic bottles with well-fitted covers. The bottles containing the samples were well secured and labelled, affirming the source, date, and time ofcollection. Collected samples were positioned in shielded bottles and elated to the Environmental Engineering laboratory for investigation. This laboratory is preferred due to the accessibility of equipment and desired skill.

Fig 1: Samples collected from locations

B. Description of study area

Physicochemical limitations of water samples brought from nine different points on River Netravathi and River Gurupura

were investigated. The samples were brought in sealed plastic bottles and elated to the workroom where they will be subjected to several study. Brought water samples were kept in the workroom. The heavy metals were investigated and the residue quality were evaluated by means of a varied series of environmental quality guides.

To cover all the main locations of river nethravathi and gurupura it was divided into nine different sampling stations and the samples were collected. The values obtained from various tests are foremost related between each other and with the WHO and IS 10500 – 2012 drinking water Standards.

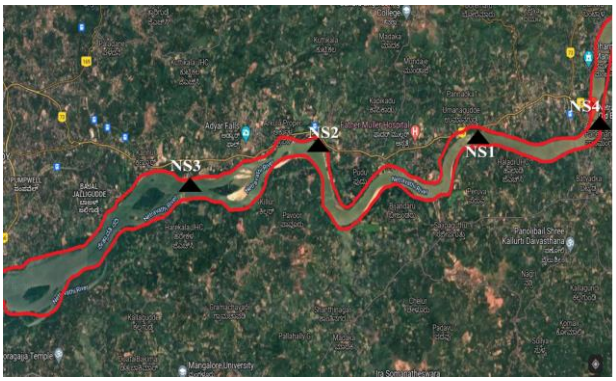

Fig 2: Netravathi River (study area) Source: Google Map

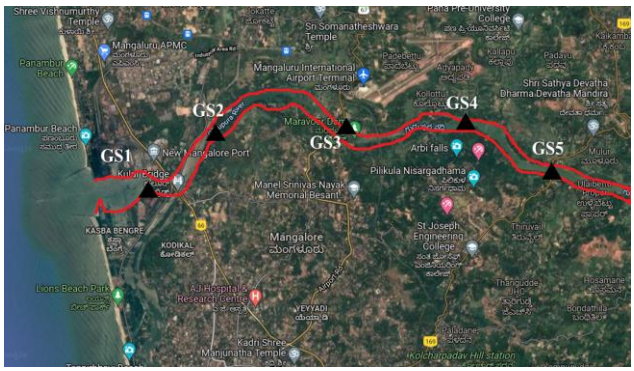

Fig 3: Gurupura River (study area) Source: Google Map

C. Locations

Table 1: Sample numbers and their locations

NS1	Near Tumbe Dam
NS2	Parangipete
NS3	Ferry line
NS4	Near Nethravathi Bridge
GS1	Kulur bridge
GS2	Padpu
GS3	Maravoor bridge
GS4	Near adyapadi dam
GS5	Gurupura bridge

D. Flowchart

Conceptual frame Work

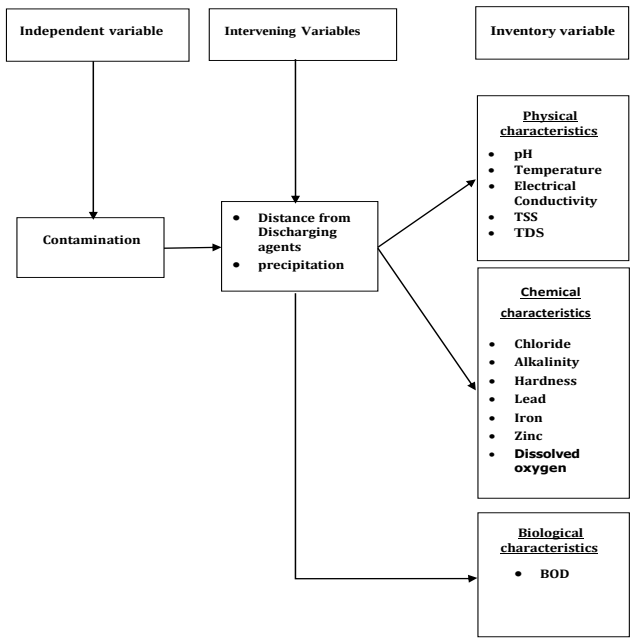

Fig: Conceptual framework

III. METHODOLOGY

A. Analytical procedure

The potable water quality permits on site testing of various limits of water samples, which includes pH, Dissolved oxygen (DO) and Total dissolved solid (TDS). Other parameters like Alkalinity ($HCO3^{-}$), chlorinity (Cl^{-}) and total hardness were investigated.

IV. RESULTS AND DISCUSSION

a) pH

The results in Table 1 shows that the pH in river water fluctuated from 6.2 to 7.5. The mean pH during the study was within the guidelines and in acceptable range.

Table 2: values obtained for pH test conducted

	NS1	NS2	NS3	NS4	GS1	GS2	GS3	GS 4	GS5
pH	7.2	7.5	6.4	6.59	6.6	7.1	6.4	7.3	7.2

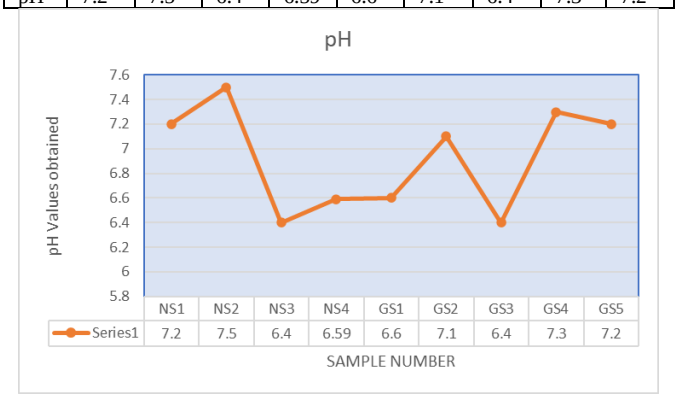

Fig 4: graph drawn for pH test conducted

b) Total alkalinity

The results from Figure shows that the Total alkalinity levels within the prescribed limits. The total alkalinity was obtained to be in the range of 49 to 165 mg/l.

Table 3: values obtained for Total alkalinity test conducted

	NS 1	NS 2	NS 3	NS 4	GS 1	GS 2	GS 3	GS 4	GS 5
Total Alkalinity	80	62	80	138	165	49	58	60	50

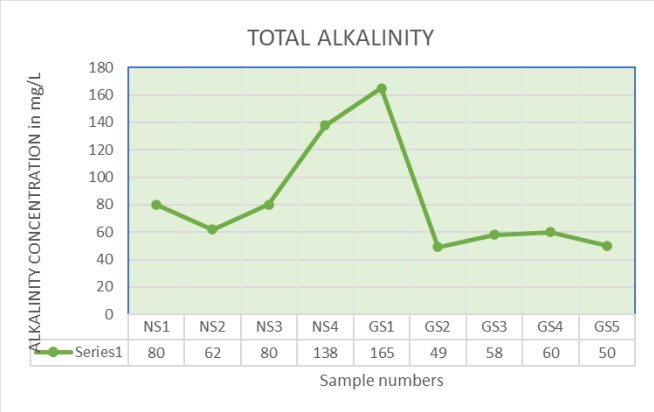

Fig 5: graph drawn for total alkalinity test conducted

c) Total hardness

Hardness is one of the important properties. The examined water samples come under the extreme permissible range of 600mg/L (IS 10500 -2012).

Table 4: values obtained for Total hardness test conducted

	NS 1	NS 2	NS 3	NS 4	GS 1	GS 2	GS 3	GS 4	GS 5
Total Hardness	56	50	0	0	0	62	56	120	110

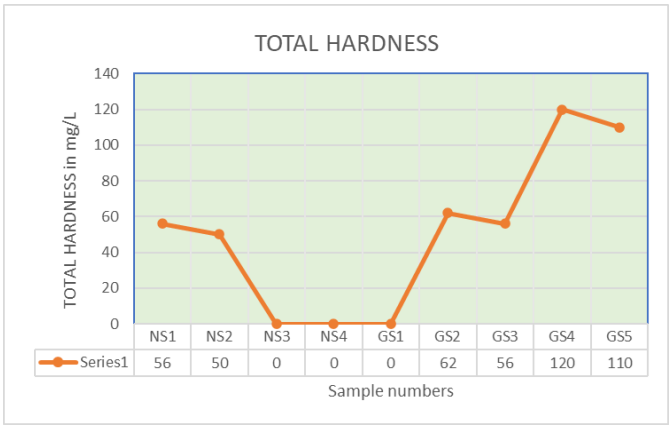

Fig 6: graph drawn for total hardness test conducted

d) Biochemical oxygen demand

Biochemical Oxygen Demand (BOD) is used to evaluate the amount of oxygen challenging excess in water. BOD was also found to be in the range.

Table 5: values obtained for BOD test conducted

	NS 1	NS 2	NS 3	NS 4	GS 1	GS 2	GS 3	GS 4	GS 5
BOD	7.2	7.3	6	7.1	6.2	6.2	7.4	7.4	6.4

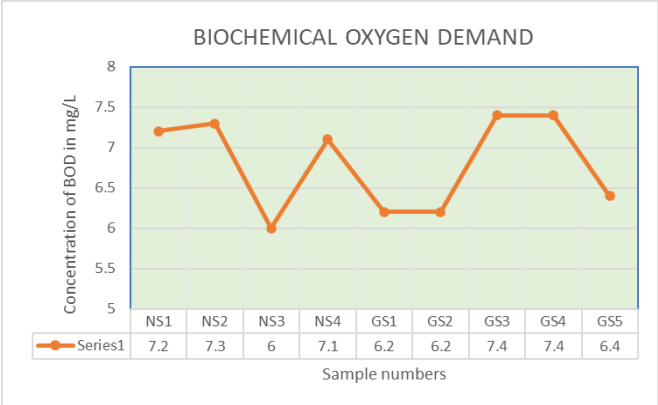

Fig 7: graph drawn for BOD test conducted

e) Dissolved oxygen

The results from Figure shows the Dissolved oxygen levels. DO of water samples were found to be in the range.

Table 6: values obtained for DO test conducted

	NS1	NS2	NS3	NS4	GS1	GS2	GS3	GS4	GS5
DO	7.4	7.5	6.2	7.4	8.5	6.4	7.6	7.6	6.7

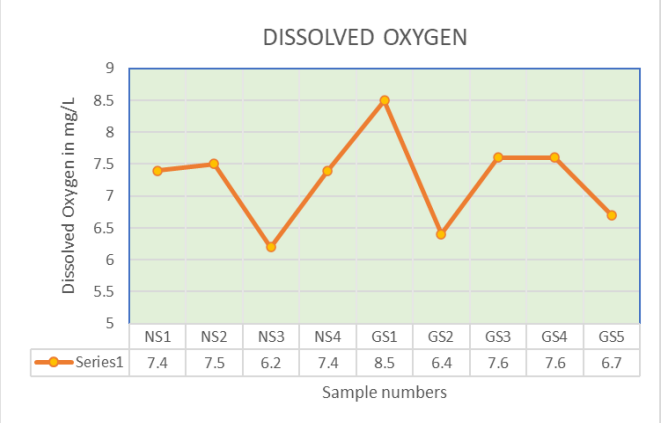

Fig 8: graph drawn for DO test conducted

f) Chloride

The results from Figure shows that the Chloride levels are within the prescribed limits.

Table 7: values obtained for chloride test conducted

	NS 1	NS 2	NS 3	NS 4	GS 1	GS2	GS3	GS4	GS5
Chloride	67.97	27.99	0	0	0	31.99	46.98	53.98	43.98

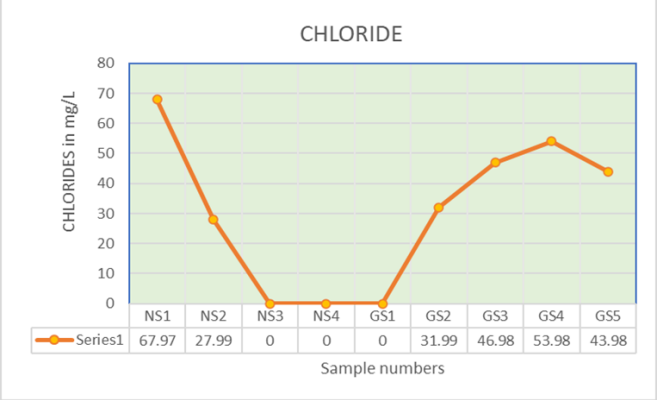

Fig 9: graph drawn for chloride test conducted

g) Turbidity

World Health Organization (WHO), says that the turbidity in drinkable water should not be greater than 5NTU, and must be preferably less than 1NTU.

Table 8: values obtained for turbidity test conducted

	NS 1	NS 2	NS 3	NS 4	GS 1	GS 2	GS 3	GS 4	GS 5
Turbidity	1.2	1.3	6	1.2	7	1	6	1.4	1.6

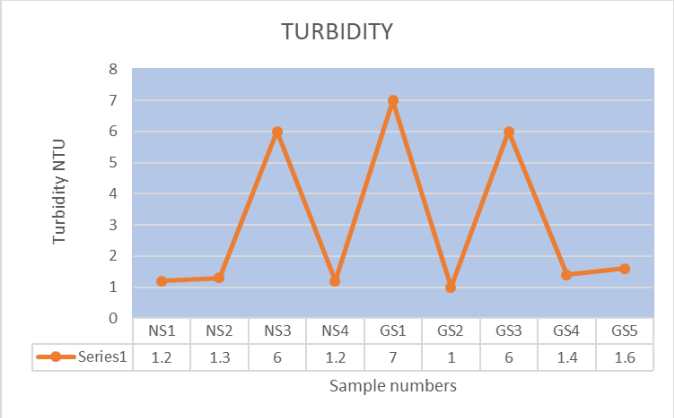

Fig 10: graph drawn for Turbidity test conducted

h) Iron

The current suggested range of iron in water is 0.3mg/l (ppm) which is dependable on palate and presence rather than on any unfavorable well-being consequence.

Table 9: values obtained for Iron test conducted

	NS 1	NS2	NS3	NS4	GS1	GS2	GS3	GS4	GS5
Iron	0.3	0.4	0.45	0.35	0.5	0.4	0.45	0.38	0.37

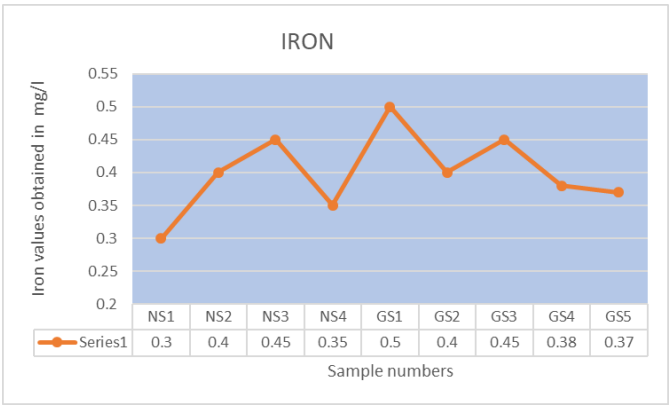

Fig 11: graph drawn for Iron test conducted

i) Electrical Conductivity

Electrical conductivity (EC) is a degree of water size to transport electrical current. Conferring to WHO values, EC value must not surpass 400µS/cm.

Table 10: values obtained for EC test conducted

	NS 1	NS2	NS3	NS4	GS1	GS2	GS3	GS4	GS5
Chloride	300	200	540	220	800	320	580	300	320

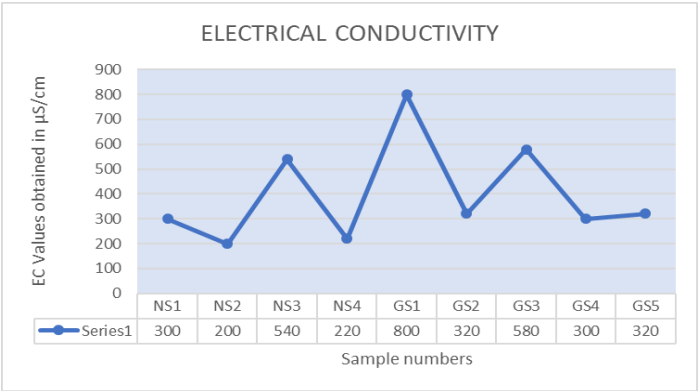

Fig 12: graph drawn for EC test conducted

j) Total dissolved solids

The maximum permissible level in the absence of a better source of water is 2000mg/L. Total Dissolved solids refer to any inorganic salts, metals, magnesium, calcium etc.

Table 11: values obtained for TDS conducted

	NS 1	NS 2	NS 3	NS 4	GS 1	GS 2	GS 3	GS 4	GS 5
Turbidity	1200	900	2200	1500	3050	890	2300	900	1050

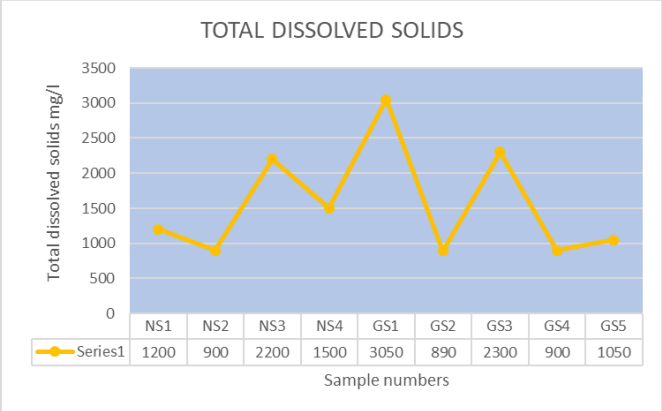

Fig 13: graph drawn for Total dissolved solids test conducted

V. CONCLUSION

In this study, water quality of River nethravathi and gurupura river and its appropriateness as consumable water was estimated. The organized outcomes of physicochemical limitations were related with the standard recommendable values proposed by World Health Organization (2012). The noticed chemical dissimilarities might be for the reason that of rock-water exchanges, ion-exchange reactions. The investigation of over-all content of heavy metals and their movement displays that the deposits from Netravati River and Gurupura catchment basin are somewhat polluted with heavy metals. Deposit pollution in this study was measured using ecological hazard indices. It can be fixed from the investigation that the weakening of water quality and heavy metal pollution in the sub basin of Netravathi is mostly for the reason that of the increase in development and farming practices, which differs the river hydrological systems. To avoid such heavy pollution of the study area, it is vital to contrivance judicious monitoring and to evolve remediation strategies for supportable changes and administration of the river.

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