

## PROJECT SYNOPSIS

ON

### “MORPHOMETRIC ANALYSIS OF VARAHI RIVER BASIN”



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## 1. INTRODUCTION

Morphometric analysis of a river basin is a quantitative way of describing the characteristics of the surface forms of a drainage basin and provides important information about the region's topography and the underlying geological structures. It plays an important role in hydrological investigations for delineating zones of adequate groundwater potential and selecting sites for the construction of artificial recharge structures and check dams. Morphometry also plays an important role in flood control planning.

In the present study, an attempt has been made to discover the stream properties of the Varahi River Basin, Udupi District, Karnataka, using various stream attributes such as the areal and linear parameters. Proposal of recharge structures such as check dams and vented dams along the course of the river is to be made, a proposal for lift irrigation project has been made near the village of Siddapura.

This study also focuses on the water quality analysis for bore wells and open wells. 40 water samples have been collected from different locations in the basin and laboratory tests are carried out for pH, TDS, EC, TH, Mg, Ca, Cl, Na, K,  $\text{HCO}_3$ , and  $\text{SO}_4$ . After conducting the tests water classification has been made using Piper's Trilinear plot, USSL classification, Gibb's Classification, Wilcox Classification, and drinking water classification as per IS 10500: 2012.

**Keywords: Morphometry, Hydrometeorology, Hydro-geo chemistry, Piper's Trilinear plot, Gibbs classification, USSL classification, Drainage Density, Drainage texture, Bifurcation Ratio, Stream length.**

## 2. OBJECTIVES

The study “Morphometric analysis of Varahi River basin” includes the following objectives.

1. To discover the Morphometric properties of the river basin such as linear and aerial aspects.
2. Identification of suitable sites for the construction of water storage structures such as check dams, vented dams etc.
3. To conduct water quality analysis to examine the properties of the water samples and to classify as per drinking water standards adhering to IS 10500:2012.
4. To carry out the Hydrometeorological study in order to find the required number of Rain gauge stations in the basin.
5. Proposal of lift irrigation project at suitable site in the basin

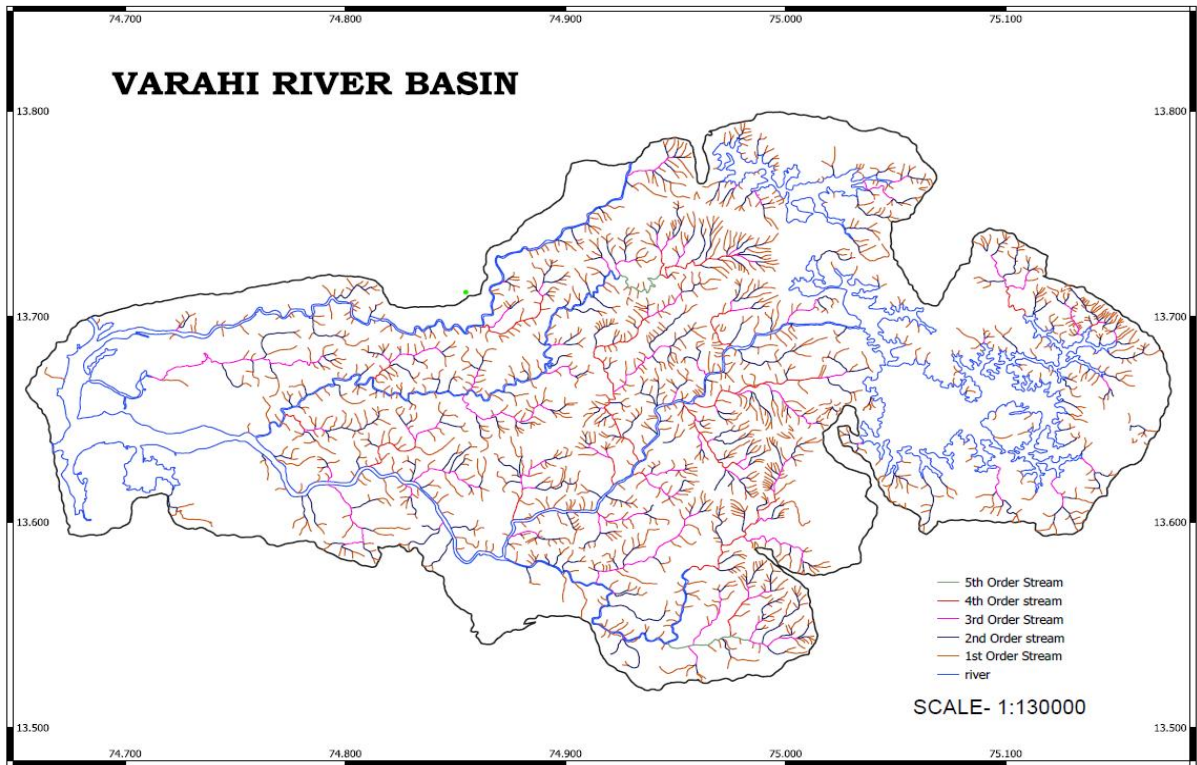
### 3. METHODOLOGY

Before the commencement of the project, first of all, it is necessary to collect the required technical information from authorities. For this study the topo sheets 48K9, 48K10, 48K13, 48K14, 48O1, and 48O2 are acquired through Survey of India open maps series. The maps are processed, georeferenced and clipped for the required area using QGIS software, the drainage network map has been traced out along with tracing the sub basins for the river basin. The rainfall data has been collected from the Deputy Commissioner's office, Disaster management division, Udupi District, the data has been collected for 12 years to conduct the Hydrometeorological study.

To conduct the water quality analysis 40 different samples are collected from sources such as open wells and bore wells at different locations in the vicinity of the basin. The samples are collected and preserved in pre washed 1-liter containers. A survey has been carried out in order to propose the lift irrigation project and based on the aerial and linear morphometric aspects the proposal has been made. The water classification diagrams are obtained from Grapher software and Diagrammes software.

Sl. No.	Parameters	Method
1.	EC	Conductivity meter
2.	TDS	Theoretically
3.	pH	Average of litmus paper, pH meter
4.	Chlorides	Titration using 0.0141N AgNO <sub>3</sub>
5.	Total Hardness	Titration using 0.01N EDTA
6.	Calcium	Titration using 0.01N EDTA
7.	Magnesium	Titration using 0.01N EDTA
8.	Bi-carbonates	Titration using 0.02N H <sub>2</sub> SO <sub>4</sub>
9.	Carbonates	Titration using 0.02N H <sub>2</sub> SO <sub>4</sub>
10.	Sodium	Flame Photometer
11.	Potassium	Flame Photometer
12.	Sulphate	Colorimetric analysis/ Turbidimetric analysis

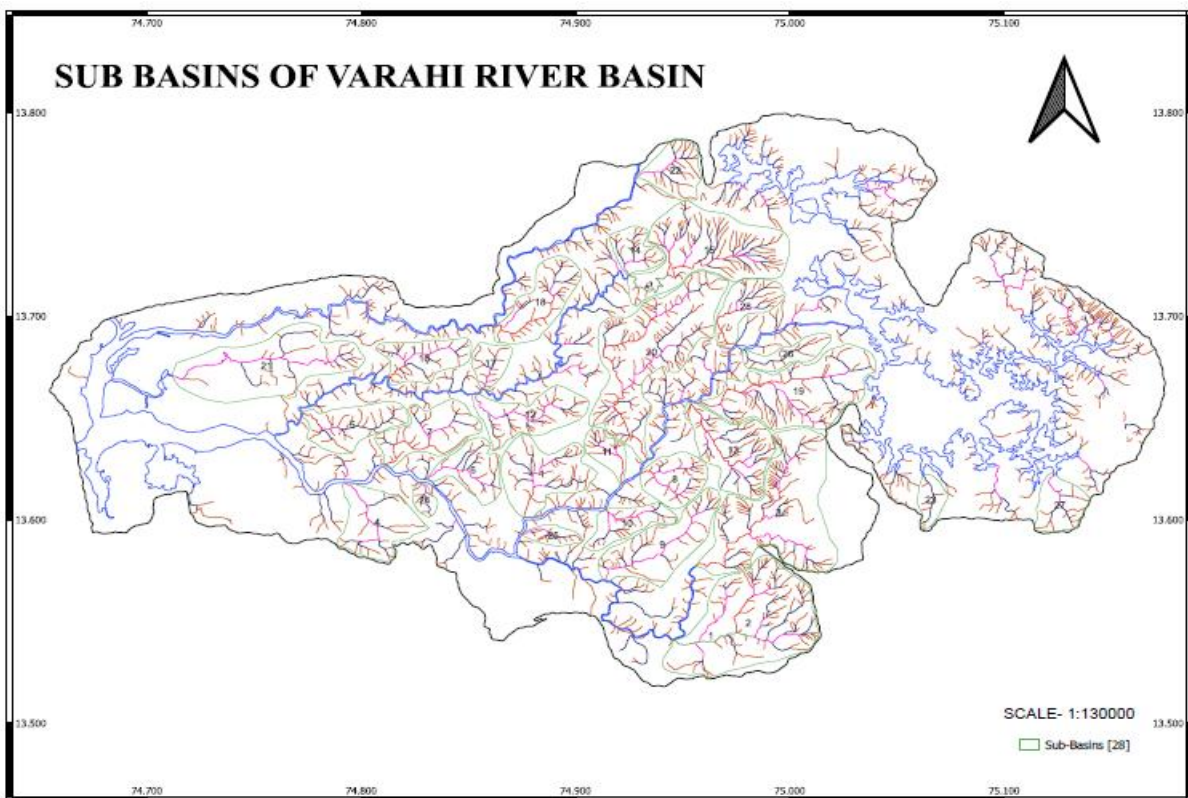
The Drainage network map, Sub- basins map and the locations of water sample collection are

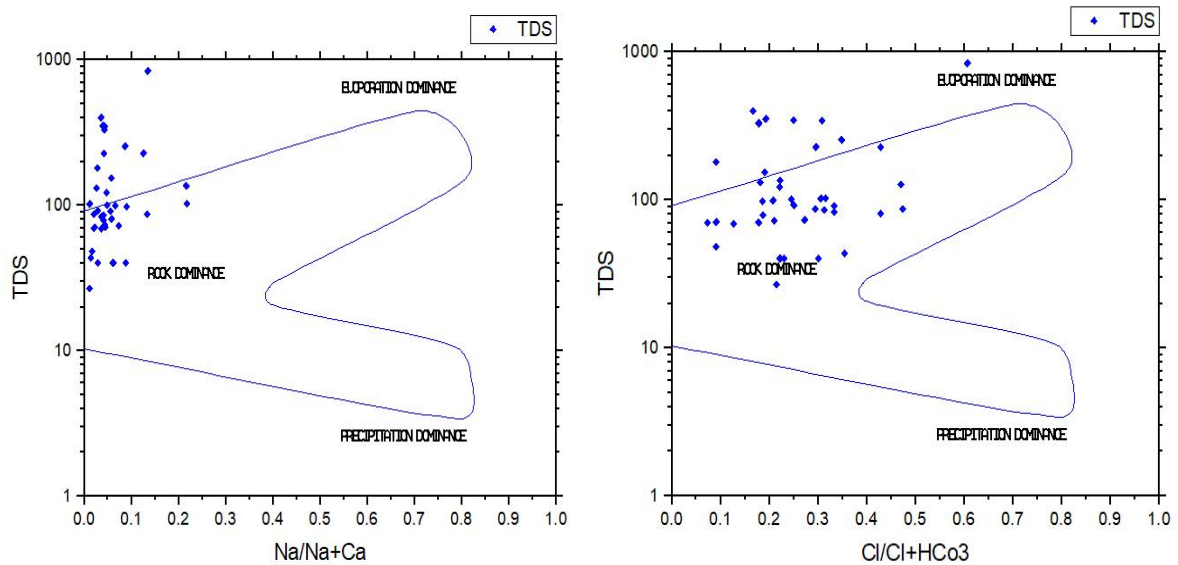
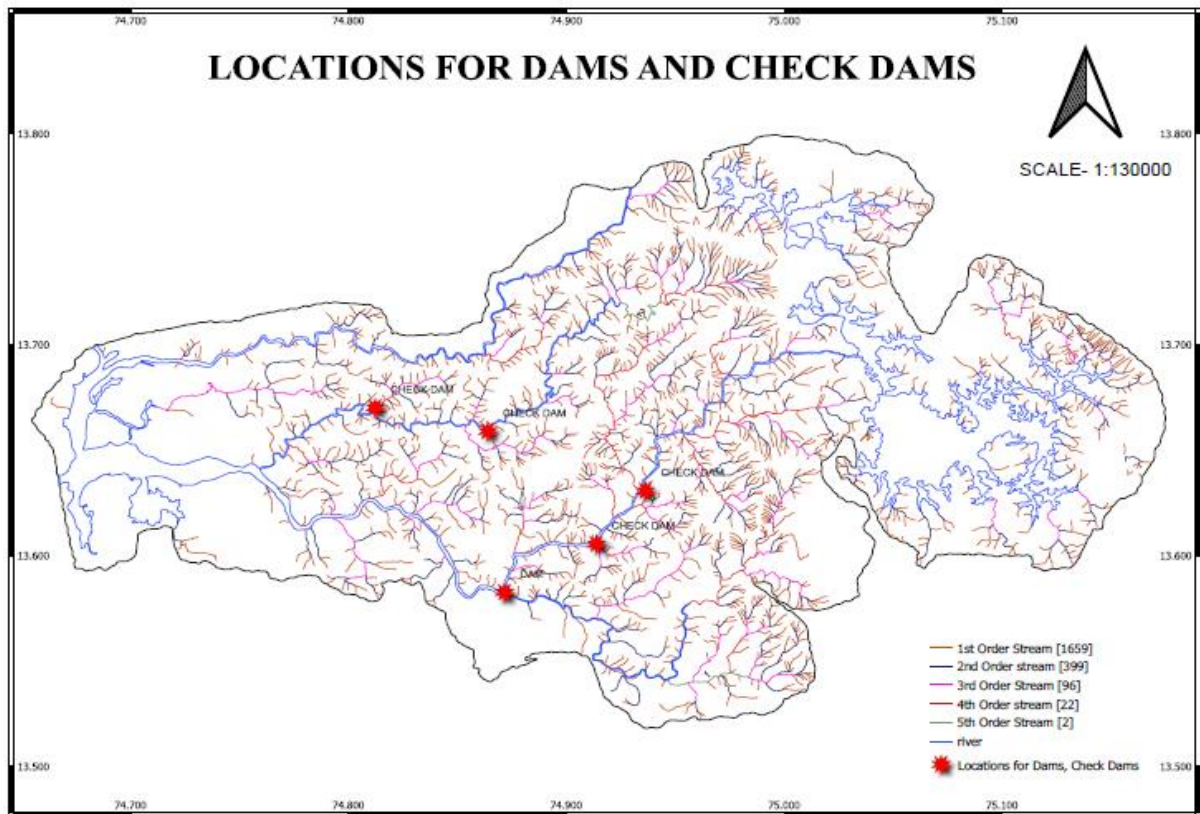


shown below.

**Fig 1: Drainage network map of Varahi river Basin**

**Fig 2: Sub-basins of Varahi River basin**







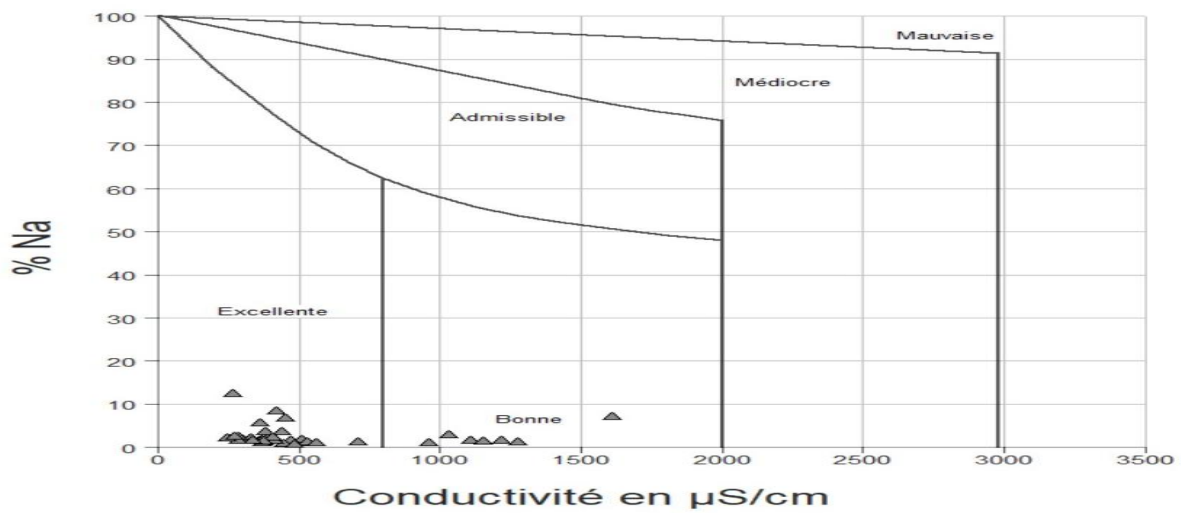
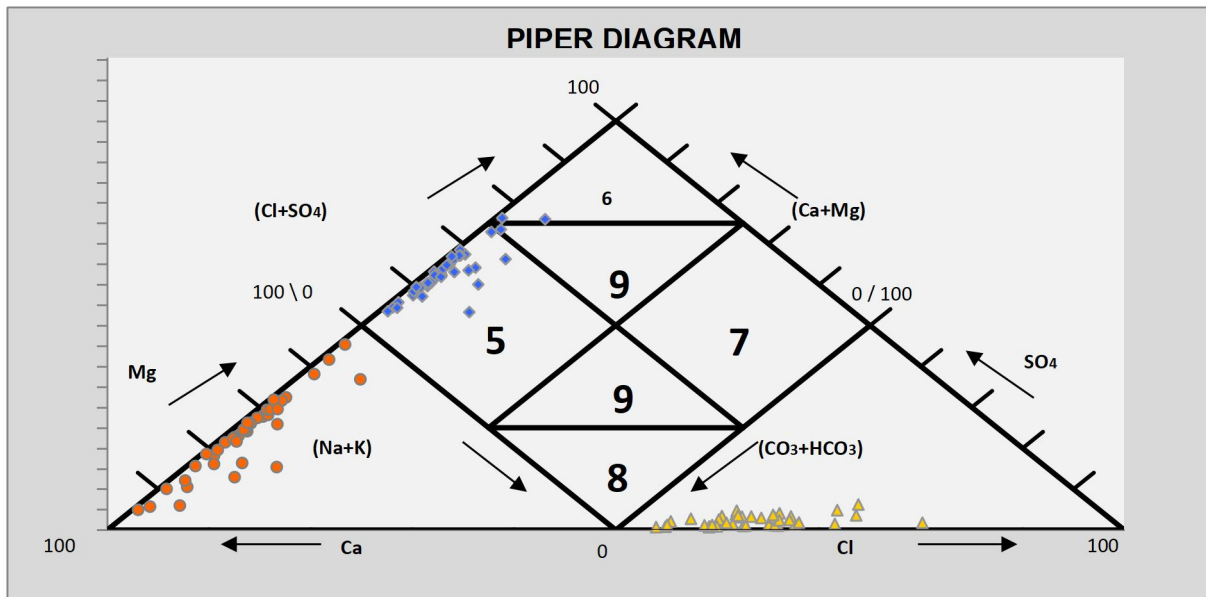


Fig 4: Piper's Trilinear plot

Fig 5: Wilcox Diagram

Fig 6: USSL classification

#### 4. RESULTS AND CONCLUSIONS

The Varahi River Basin lies in the districts of Udupi and Shimoga. The geology of the Varahi River basin is characterized by precambrian (Archean) rocks and the Phanerozoic formations. Dharwar Craton which is the coastal stretch of the Western Dharwar Craton. Laterites cover extensive part along the coastal tract as well as foothills of Western Ghats.

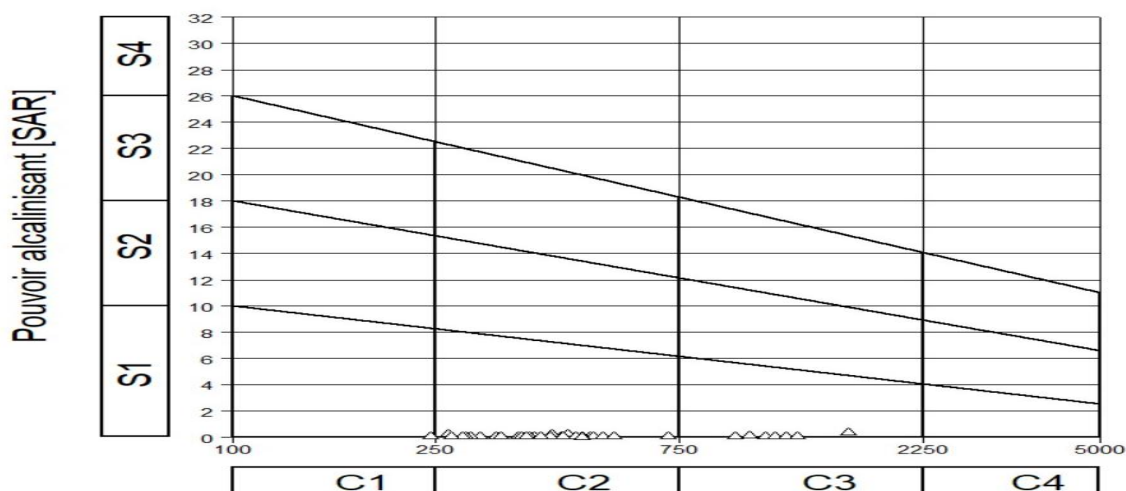
The morphometric parameters are calculated using the drainage network map and the sub-basin maps of Varahi River basin and identification of locations for check dams has been done.

Some water sample observations are:

- Since the collected water sample are mostly of open well and bore wells the electric conductivity does not exceed the permissible limit as per IS 10500: 2012
- The pH concentration lies between 6.5- 7.5, which is permissible.
- The samples 23, 27, 28, 32, 34 slightly exceed the permissible limit of Magnesium which also makes the water hard

As per BIS 10500: 2012 almost all the water samples match the drinking water standards.

As per the Hydrometeorological study it is found that the basin requires around 23 rain gauge stations considering 10% error. The average run off is also calculated for 18 years of rain fall



data from the year 2005 to 2022.

The study, Hydro-geo chemistry gives the water classification such as Gibb's classification, Handa's classification, Wilcox diagram, Piper diagram for the collected water samples using the results of the Hydro- chemical analysis.

A proposal for a lift irrigation project is made for Varahi River basin which helps in the irrigation planning in light of that, Jala Samvardhana Samithi of Siddpaur has proposed a plan of action to make use of the Varahi River water at the downstream side of the Sandur dam.

## 5. SCOPE FOR FURTHER STUDY

The present analysis can be considered only a beginning in the geomorphological studies pertaining to Varahi River. Hence following broad fields can be suggested for future work in the area, A detailed investigation of factors influencing the drainage density like rainfall, relief, rock type and mean slope of basin and land use.

- Development of models to relate stream flow, characteristics of yield and flow etc..
- Remote sensing applications in geomorphological studies.
- Development of correlations equations between various aspects and parameters.
- Feasibility study may be carried out for the construction of check dams in order to augment the water table.
- Development of the socio-economic conditions of the area.
- Detailed survey can be carried out to develop the transportation network to the adjoining remote villages.
- Hydrological and geochemical investigations can be made for both surface and subsurface waters