4. Topography of the Tunga River
TOPOGRAPHY OF THE TUNGA RIVER

A river is a natural stream of water, usually freshwater, flowing towards an ocean, a lake or another stream.

The geographical area of India is 3,287,590 sq km. The length of its Coastline is about 7500 km. The climate of India varies from tropical monsoon in south to temperate in north. Its terrain have upland plain (Deccan Plateau) in south, flat to rolling plain along the Ganges, deserts in west, Himalayas in north.

India is enviably endowed in respect of water resources. The country is literally criss-crossed with rivers and blessed with high precipitation, mainly due to the southwest monsoon, which accounts for 75% of the annual rainfall. There are thirteen major river basins (area more than 20,000 square kilometer) in the country, which occupy 82.4% of total drainage, contribute 85% of total surface flow and house 80% of the country's population. The classification of river basin based on the catchment area is given below (Bhardwaj, 2005).

Classification of river Basin in India

<table>
<thead>
<tr>
<th>River Basin</th>
<th>Catchments Area -Sq.km (%)</th>
<th>No. of Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>More than 20,000 (82.4)</td>
<td>13</td>
</tr>
<tr>
<td>Medium</td>
<td>Between 2000 – 20,000 (8)</td>
<td>48</td>
</tr>
<tr>
<td>Minor</td>
<td>Less than 2,000 (9.6)</td>
<td>52</td>
</tr>
</tbody>
</table>

India consists of 10 numbers of major river basins that flow in to Bay of Bengal. In this context of study, the River Tunga from southern India joins one of
the major river basin, called the Krishna river basin in the compound form as Tunga Bhadra and from there onwards, continues its flow towards Bay of Bengal.

The river is born in the Western Ghats on a hill known as Varaha Parvata at a place called Gangamoola, situated in Chikmagalur district. Three important rivers such as Tunga, Bhadra and Nethravathi take their origin here. Annual rainfall at Gangamoola is 550 to 750 cm. It lies between 13° 14' 54" N latitude and 75° 9' 41" E longitude. At this point there is no direct intervention of human or other activities with the river. From here, the river flows through two districts of Karnataka - Chikmagalur and Shimoga. It travels about 147 km long distance adjoining a tail of water discharges from few tributaries viz., River Vimla, Pallaki hole, River Silammo and River Malathi finally merges with the Bhadra River at Koodli, a small town near Shimoga City, Karnataka. The river is given the compound name Tunga Bhadra from this point onwards. Later, the Tunga Bhadra flows eastwards and merges with the Krishna river in Andhra Pradesh.

**Description of study area**

The study area is near to Shimoga town, climate of this region is moderate due to significant diurnal variations in the temperature. The recorded average annual rainfall is around 1,029 mm. Based on the topography, nature of river bed, water flow, sources of pollutants and human interference, six stations have been identified and selected for the present investigation and they were designated as Station-I, Station-II, Station-III, Station-IV, Station-V and Station-VI.
Sampling sites were fixed along the above stations for collection of water and dead and decaying organic matter from the sediment. The GPS position of the sampling stations of the study area is shown in the enlarged map of Tunga River. Certain photographs of the sampling stations, which show the existing status of the river are also provided (Plate 1 to 12).

Description of sampling stations

Station-I

Upstream zone of the river Tunga near Sharadamba shrine, Sringeri

This station is situated at 13° 27' 63" N longitude and 75° 26' 12"E latitude in the upstream near Sharadamba shrine, before this point the main stream adjoins with the tail of small tributaries such as river Vimla and Pallaki hole. Here, the river is free from discharge of industrial and domestic waste water. The water is clean and its flow is moderate, which inhabit a large amount of flora and fauna. In this station, the water is comparatively free from all the pollutants and contaminants and supports a large amount of fish fauna. The river bed is rocky,
Topography of the Tunga River

which leads to the heavy deposition of sand and silt in either side of the banks (Plate 1).

Station-II

Upstream zone of the River Tunga near Rameshwara shrine, Thirthahalli

This station is situated at 13° 48' 12" N longitude and 75° 24' 47" E latitude in the upstream near Rameshwara shrine, Thirthahalli town and about 60 kms away from station-I, before this point the river confluences with two other streams namely River Silammo and River Malathi. This station is also found to be free from discharge of industrial and domestic pollutants. This constitute unpolluted zone. The river bed consists of large boulders a large amount of sand and silt, deposited in either sides of the bank (Plate 2).

Station-III

Upstream zone of the River Tunga, near Sakarebylu

The above mentioned station is situated at 13° 49' 33" N longitude and 75° 53' 59" E latitude behind Shetti halli and at a distance of 40 kms away from Station-II. This site is free from industrial pollution and a small amount of domestic sewage enters in to this site from the local premises through an open sewer (Plate 3).

Station-IV

Upstream zone of the river Tunga near Gajanur dam site, Gajanur

This station is situated just behind the dam site and at 13° 48' 28" N longitude and 75° 29' 38" E latitude from a distance of 5 kms away from
station-III. Pollution occurs in this station in the form of deposition of solid waste and entry of domestic sewage on the banks (Plate 4).

**Station-V**

**Downstream zone of the river Tunga near Shimoga old Bridge, Shimoga**

This station is situated in the heart of the city next to a shrine and at 13° 58' 38'' N longitude and 75° 55' 21'' E latitude traversing distance of 10 kms away from station-IV. This station consists of lot of anthropogenic activities and seems to be most polluted than any other stations. Due to the high organic load input, the Dissolved oxygen (DO) content of the water seems to be very low in this station. The majority of pollution invades this station by open discharge of domestic sewage, local industrial wastes, and hospital wastes. In monsoon, due to the rapid flow and high yield, the river water recovers from the induced pollution very rapidly. In pre-monsoon, due to the minimal flow and low yield, the river water is found to be more polluted (Plate 5, 7 to 12).

**Station-VI**

**Downstream zone of the river confluencing point, Koodli**

This station is situated at 14° 38' 34'' N longitude and 75° 48' 39'' E latitude near the end point of the river stretch and has a distance of 20 kms away from Station-V, here the river confluences with another tributary Bhadra. In this station due to the confluence and self purification, the river get rid of organic pollutants. The DO in this station seems to be healthy and this station has got a considerable number of aquatic flora and fauna (Plate 6).
Topography of the Tunga River

INDIA

KARNATAKA

DRAINAGE NETWORK, WATERSHED BOUNDARIES
AND SURFACE WATER BODIES MAP OF
SHIMOGA DISTRICT

INDEX

NRDS CENTRE
SHIMOGA

SOURCE: KSRIDAC
AB SLUC (1998)
NATIONAL WATERSHED ATLAS
SCALE: 1:50,000
Topography of the Tunga River

MAP SHOWING THE SAMPLING STATIONS ALONG THE STRETCH OF THE RIVER TUNGA

NOTE: S1-S4 ARE UPSTREAM STATIONS. S5 AND S6 ARE DOWNSTREAM STATIONS.

S1-S6 MARKED POLLUTED ZONE

SAMPLING LOCATIONS

SAMPLING STATIONS (S1-S6)

DRAINAGE PATTERN

RIVER TUNGA

GANGAMOOLA

SHRINGERI

TIRTHAHALLI

SAKREBIYLI

GAJANUR

SHIMOGA

KODU

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Plate-1. A view of Tunga river at sampling Station-I near Sharadamba shrine, Sringeri

Plate-2. A view of Tunga river at sampling Station-II near Rameshwara Shrine, Thirthahalli

Topography of the Tunga River
Plate-3. A view of sampling Station-III of Tunga river near Sakarebylu

Plate-4. Sampling Station-IV behind Gajanur dam site, Gajanur
Plate-5. A view of sampling Station-V at Shimoga city, Shimoga

Plate-6. A view of sampling Station-VI at Koodli
Plate-7. Aerial view of river course at Station-V, near old bridge, Shimoga town

Plate-8. Open discharge of domestic sewage from the left bank into the river course at Station-V, near Shimoga old bridge
Plate-9. A view of entry of domestic and hospital waste water entering into the river course near right bank of Tunga river at Station-V, Shimoga
Plate-10. Direct entry of domestic and sewage effluents into the river Tunga at Station-V, Shimoga
Plate-11. A view of river course near sampling Station-V showing changes in the colour of water due to the addition of industrial and domestic effluents
Plate-12. Direct entry of domestic and industrial waste effluents entering into the river Tunga at Station-V near Shimoga