

INTRODUCTION

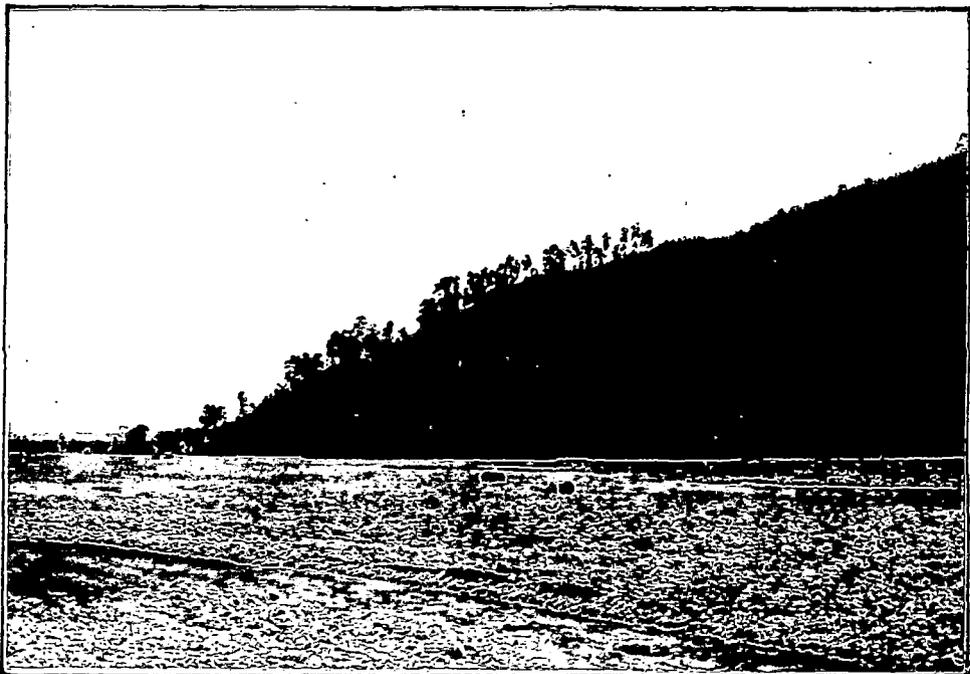
A. The Problem :

The Git Khola rises from the southern face of the Khampung peak (2,371 m) to the NE of Labha ($83^{\circ}39'40''E$ and $27^{\circ}5'20''N$) in Kalimpong sub-division of Darjeeling Dist. in West Bengal and flows southward meandering along incised valleys cut through dense jungles of the Tista-chel Reserved Forest. It is called the Gish Khola or Nala in the plains where it receives Lethi Nala on its left bank and the Ramthi Nala, Habang Nala and the Churonthi Khola on its right.

The Lish Nala to the West of the Gish rises from the southern face of the Songchonglu (1903 m.) peak to west of Lolegaon ($83^{\circ}33'E$ and $26^{\circ}59'40''N$) in Kalimpong Sub-Division of Darjeeling District in West Bengal and flows southwards along deep valleys cut through the dense jungle of



Pl.1 : The debouching point of the Gish on the plains. Note the V-shaped valley in the forest covered Siwalik and the bed of the Gish, which is covered with deposits of various sizes & shapes. The ankle deep water having moderate velocity is characterised by the turbulent flows.



Pl.2 : The debouching point of the Lish on the plains at Bagrakot. Note the gently sloping deforested Siwalik at the back-ground.

the Parbringtar and Nimbong R.F. and on its left it receives the Turung Khola at 450 m. flowing in from north-east.

Both the Gish and the Lish join the Tista to the north-west of Gajaldoba ($88^{\circ}36'E$ and $26^{\circ}47'N$) in Jalpaiguri District of West Bengal, displaying typical braided pattern.

The total discharges of both the rivers vary from a negligible amount of 1.92 cumecs in the dry season to 1994.09 in the rainy season. The catchments of these rivers are small (271 sq. km.) and they do not go beyond 8 km. or so from the foot of the hills. The average annual rainfall in the hilly catchments is 3051.94 mm. The upper part of the catchments is very delicately built being composed mainly of semi-crushed phyllite of Daling series and instead of being treated with the respect that was its due the area was subjected to the utmost maltreatment under the Khas Mahal and the inevitable occurred. Soil erosion has been heavy and some of the slips that formed increased in dimension from year to year and are still very active. After a great deal of arguments over many years during which the slips went on expanding merrily, only a part of the catchment area was transferred to the Directorate of Forests a few years ago. But since this transfer which no doubt put a stop to the felling of trees, grazing and cultivation, nothing tangible has been done to deal with the menacing slips. The Lish and the Gish rivers naturally carry considerable silt and gravels with the flood discharges and the total load jointly carried down stream has been

estimated to the tune of more than 0.08495 million cubic metre. The channels of the lower sections of the Lish and the Gish rivers, being on the plains, are virtually incompetent to cope with such ~~enormous~~ amount of debris received from the upper reaches and the river-beds are thus gradually elevated approximately at a rate of 50cm. per year. These debris containing boulders, some several tons in weights, and the derelict trees sometimes choke the principal waterways which eventually lead to the spilling of water across human habitation and cultivated fields. The road and railway bridges spanning these rivers at the foot of the hills as well as the embankments below the lines of communication act as a natural dams to the outlet and flow of these streams, so that the effect of spilling is multiplied manifold.

The picture is just the opposite during the non-monsoon months when the paucity of water hinders the local people from reaping any benefit out of the soil in conjunction with the rivers themselves. The over all economic situation of the area concerned is thus becoming bleaker day by day and the problem of proper scientific management of the basins needs an immediate and closer investigation.

B. The Area of Study :

With the above objective in view, the present thesis on, "A Study of the Fluvial Dynamics of the twin basins of the rivers Lish and Gish", has been undertaken by the author

since July 1931. Such a selection is in large measure a matter of person familiarity with the area. However, because these basins are still without major artificial controls against flooding, meandering, bank-erosion, etc., they afford an ideal situation for making direct observations of the various fluvial processes within the channels and over their entire flood-plains. Moreover, for the purpose of a comparison and to arrive at a better understanding between the two sets of physical phenomenon confined within slightly variable environmental conditions, selection of the above two basins have been preferred.

The area of the twin basins of the Lish & the Gish, thus, appears to be a leaf of 271 sq. km., bounded by the longitudes : $88^{\circ}31'E$ & $88^{\circ}43'E$ and the latitudes : $26^{\circ}47'N$ & $27^{\circ}6'N$, falling within the districts of Darjeeling and Jalpaiguri in the north of West Bengal. (Fig.1).

C. Methodology :

In order to study the above mentioned problems, the methodology adopted by the present researcher is a rationalistic one comprising of the details outlined as follows :

To understand the areal dimension of the basins, systematic mapping of the area of study has been done from the latest (1968) Survey of India Topographical Sheets (1:50,000). Detailed geological maps of the area under study and the maps of individual landslides prepared by the G.S.I. have been consulted to collect relevant information about lithology and

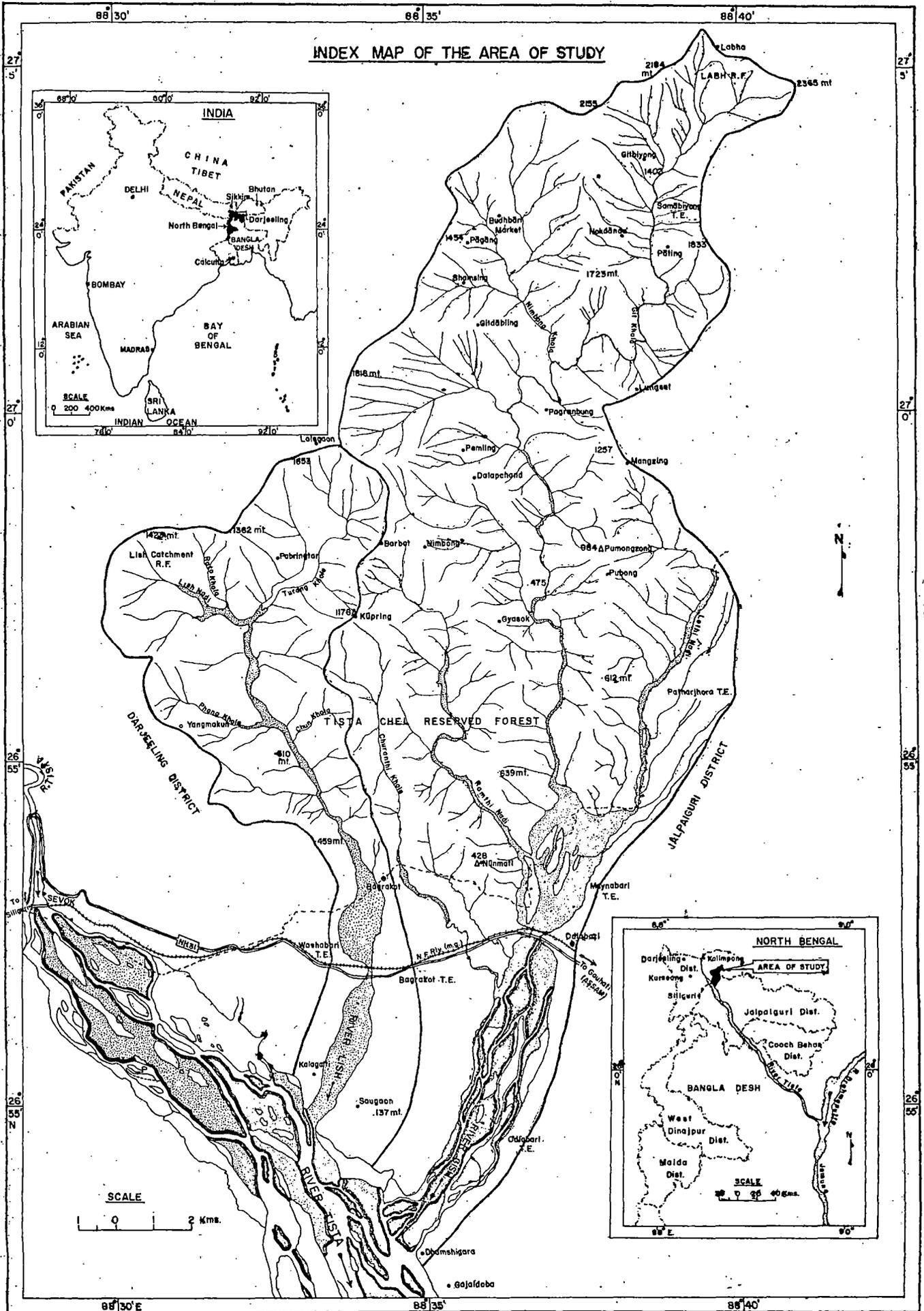


Fig. - 1

structure. The individual river wise as well as basin wise data have been compiled for a comparative morphometric analysis of the two basins. Mapping of each of the methods has been carefully done by following the grid method (1 sq. km.).

To collect primary data of various drainage parameters, a number of field studies have been organised both in the rainy as well as in the winter months and contouring of the lower reaches of the river has been done by theodolite. Such raw data have been processed in the laboratory to find out the cross-profiles, long-profiles, cross-sectional areas, wetted perimeters, hydraulic radii etc. of both the rivers. Simultaneously, velocities of flows of the rivers at various stations have been measured by current metre to compute the discharges at similar sites at the laboratory. Moreover, soil, bed and suspended load samples have also been collected from the cross-sectional sites for laboratory study and the land-use of the similar sites have been carefully noted for future reference.

To understand the rainfall, temperature, evapo-transpiration, humidity, etc., meteorological data of stations, in and around the basins have been collected from Regional Meteorological Office, Alipore, Calcutta; Siliguri; Bagdogra; Jalpaiguri; and from various tea-gardens in the area of study. For data regarding, discharge, sediment, gauge, river levels etc. of past years, the C.W.C. of Jalpaiguri have been consulted carefully and raw data have been collected and processed

for necessary mapping.

To compile the bibliography as well as the reference work, the libraries of North Bengal University; the Department of Geography, Calcutta University; the National Library; the Geological Survey of India; the River Research Institutes (Calcutta & Siliguri); the Regional Meteorological Office, Alipore; the Flood Control Commission, Jalpaiguri; have been thoroughly consulted.

In fine, in order to understand the problems under study, all the data, collected from the field and various institutional sources, have been analysed, processed and computed in the laboratory to predict the exact sequence of events and to provide a workable formula for their control and to offer corrective measures for the over all ecological stability of this specially vulnerable part of North Bengal.