

THE FIELD TRIP

The field trip took place on the 30th of May 1996. The participants had an opportunity as Tertulias were organized for observation of the field. The participants that were not in the field were not possible. They have been according to the schedule with their observations. The photographs observed between Dolalghat and Kodari.

Part Two

Observation of Glacial Deposits at Balephi

The first stop was at Kilometer 69. Dr. Pugh observed that this was the first sample of mixed glacial deposit soil in the valley. Horizontal drains had been built for the installation of the site. Dr. Pugh observed that along the river bank, the underlying deposits were probably of glacial origin (see plates 1 to 3).

Three stops were made around the Balephi area. The first stop was at a large boulder before Balephi, which was referred to by the local people as the *Penchi Kanya* (the virgin rock). This boulder was referred to by the project team as the *Hanuman Boulder* (see plate 4). It was estimated to weigh from 50,000 to 70,000 tons. It lies close to the highway near Km 71 and is constituted of augen gneiss. This type of rock outcrops 40km upstream in Kodari and

at other places away (13-20km) in the foothills of the Sulichhi. The project hydrologists did not believe it possible that fluvial transportation had taken place over such distances. The river gradient was too steep. This had led to the proposition that it could only have been transported by glacier. The geology differed from the surrounding rocks and from those at the roadside. At the stop made after Balephi, it was observed that, up to a depth of 40 metres, glacial materials had been found. Drastic changes in the profile of the bedrock had been observed between

THE FIELD TRIP

The field trip took place on the 9th of May 1996. The participants had an early start. Ten sites were scheduled for observation and discussion, although several stops that were not on the schedule were made. (As far as possible, we have recorded the observation areas according to schedule with brief observational notes.) The photographs in this section are all of the sites observed between Dolalghat and Kodari.

Observation of Glacial Deposits at Balephi

The first stop was at Kilometre 69. Dr. Pugin observed that this was the first sample of mixed glacial deposit soil in the valley. Horizontal drains had been built for stabilisation of the site. Dr. Pugin observed that along the river bank, the underlying deposits were probably of glacial origin (see plates 1 to 3).

Three stops were made around the Balephi area. The huge boulder before Balephi, which was referred to by the local people as the *Pancha Kanya* (five virgins) rock, was referred to by the project team as the Hanuman boulder (see plate 4). It was estimated to weigh from 60,000 to 70,000 tons. It lies close to the highway near Km 71 and is constituted of augen gneiss; this type of rock outcrops 40km upstream in Kodari and

at shorter distances away (15-20km) in the tributaries of the Sunkoshi. The project hydrologists did not believe it possible that fluvial transportation had taken place over such distances; the river gradient was too low. This had led to the proposition that it could only have been transported by glacier. The geology differed from the surrounding rocks and from those at the roadside. At the stop made after Balephi, it was observed that, up to a depth of 80 metres, glacial materials had been found. Drastic changes in the profile of the bedrock had been observed between areas.

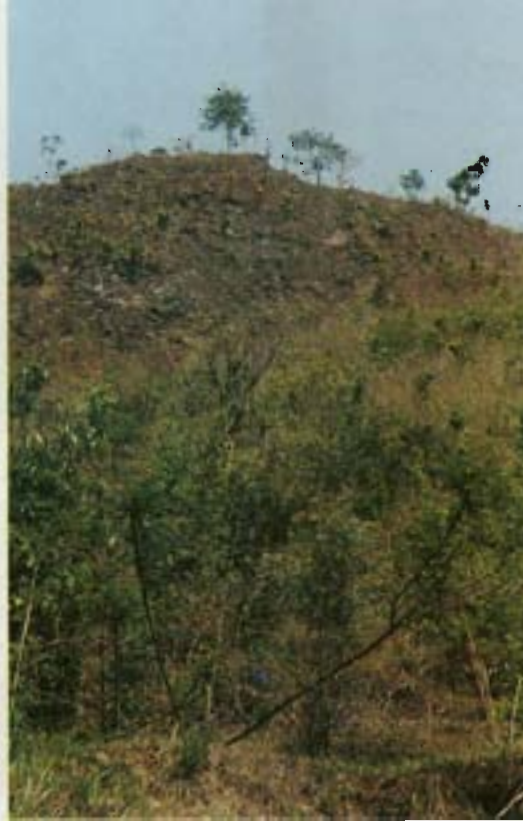


Plate 1



Plate 2



Plate 3



late 4

There was some discussion at this point. One of the observations was that the phenomenon observed could be due to the fact that the valley was sinking. The Main Central Thrust might be rising quite quickly in this area. It was then countermanded that, if this were indeed the case, why did the profile of the Bhote Koshi Valley tally with the one currently under observation? This introduced some lively discussions among the group. Reference was made to the profiles of the Lesser Himalayan and Midlands' residual soils. It was observed that colluvial soil can occur up to 10 or 20 metres, but certainly not up to 200 metres. In some areas in the research area, they had sounded up to a depth of 200 metres and bedrock was still not found.

It was concluded that the findings were unusual and warranted further investigation and confirmation by research in similar valleys.

Observation of Glacial Deposits at Lamosangu

The group stopped at Km79 to observe a site just before Lamosangu where electrical sounding had been carried out up to 55 metres. There was a sizeable flat area. The deposits were diamict overlaid by interstratified gravel. Pollen (grass) associated with a steppic cold climate had been found in a pond sediment horizon. Soils found were associated with a cold climate and, up to 40 metres down, the soil had low resistivity. The total depth of deposits was not known but bedrock had not been detected up to 500 metres (see plate 5).



Plate 5

Observation of Landslides and Glacial Deposits at Kilometre 83 - Sankoshi Confluence

This was a probable kame terrace (viz., sub-aquatic sediments deposited on the lateral margins of glaciers). The seismic profile along the river was conducted over a trough typical of glaciers. Electrical sounding had been carried out up to 15 metres without reaching the bedrock. On the opposite side of the river from the road, the morphology was typically glacial. The water table was below the river. It was observed that seasonal crops had been planted and were growing robustly despite the fact that there had been no rain and the land was not irrigated. Project team members recalled that the area was swampy when they first investigated it. This was because of the high water table and clay close to the ground surface. There was a great deal of toe erosion. It was observed that bioengineering techniques could improve this site, but it would revert to the present conditions after one or two years. Following this site, mudslide and fluvio-glacial deposits were also observed.

Observation of Kame Terrace and Glacio-Lacustrine Deposits at Kilometre 92 and Malati *Khola*

In the Malati area, a number of stops took place. Loess deposits were observed and, in the Malati catchment area, the frontal moraine of a cirque glacier. The moraine was observed to consist of carbonic rock clasts. It formed a pyramid visible from the road. The large rock outcrops had features typical of glacial erosion. In addition, the group observed glacial till material below a large boulder on the left bank of the river. The material had characteristics of shear action of the cirque glacier. The outcrops were broken and fissured as a result of the pressure caused by the cirque glacier. Landslides and glacial deposits between Kilometres 96 to 98 were also observed.

Observation of Till at Kilometre 102

This spot was close to the road bridge at Kilometre 102 on the right bank of the Chaku *Khola* (a left bank tributary of the Bhote Koshi). The morphology of most of this outcrop was median moraine. It is situated at the junction of two old glaciers, i.e., the Chaku and Bhote Koshi glaciers. Material samples had been collected and morphometrical and grain size distribution investigations corroborated that the material was till.

Observation of Lodgement Till at Kilometre 104

This area was on the right bank of the Lang *Khola*. The material here was very thick (60m) and, the landslide itself about a kilometre

long. Material typical of glaciation indicated that the thickness of the material probably resulted from a progressing glacier.

Kodari

The material observed above Km 112 in Kodari was hard-clast supported diamicton. The high compaction was taken as an indication of glacial origin and morphometrical studies were undertaken to determine that the material was glacial till.

The Return Journey

On reaching Kodari, it was decided that two or three sites would be visited on the return journey. The project team members also suggested that the participants might like to look at a possible landslide hazard mitigation site that they proposed to work on if the project went into a second phase. The group agreed to this idea. The group was also able to view an engineering team drilling on a dam site near Kilometre 109.

The engineers discussed the difficulties they were having with members of the group. There was a certain amount of scepticism concerning whether this was a good place for a dam or whether it might be destroyed in the same way as the Friendship Bridge in 1987.

One of the most interesting stops on the return journey was the observation of the landslide below the village of Naguche. It was hoped that a second phase of the project would be sanctioned and that measures to mitigate this landslide hazard would be undertaken. Mr. Wagner explained that this village had a mixture of ethnic groups (*Tamang, Kshetri, and Newar*), but the people had been cooperative and unanimous about their desire to control the slide. It was easy to see why. The slide began below some terraced fields endangering the village school. Exacerbation of the slide could possibly result in the village school falling into the river.

Naguche was the final stop on the field trip. It had been a long day and an extremely interesting one.