Landslide in Murree Hills

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Abstract

Murree Hills were visited in the later part of April to investigate the causes of land-slide which brought severe destruction to the building and roads this year. The geological factors responsible for these mishaps were studied and remedial measures are recommended for planning future development work.

Introduction

Landslides, in the hilly regions, are the common features during rainy season. This year as reported in the Dawn of the 22nd April, the Murree hills were subjected to severe landslides during March—April period, which caused extensive damage to the buildings and roads.

The author alongwith two colleagues, Safdar Khan and Qasim Jan had visited that area to study the various geological aspects which help to cause slumping. The severely damaged part lies towards the West and North west of thc Murree hill station. The main road linking Murree with Rawalpindi was damaged at two points west of Murree near 'Chatees Meel'. The metalled road, most of which is built over un-consolidated material, had been broken and due to slumping has slided about 100 ft downslope. Many houses in Kashmiri Mohallah were also damaged and about a dozen of them were completely washed out. A complete block of Cecil Hotel was also damaged. It was reported by the locals that there have been more than ten phases of mud flows due to uninterrupted raining.

The major factors that helped to cause these mishaps were studied and geological aspects of these phenomena were observed. The purpose of this study was to point out major factors which are responsible for causing such mishaps. For a detailed study the author needed more time which he could not spare due to other commitments in the departmental affairs. Therefore, a priliminary report is produced here for a general information of the readers.

Topography

The elevation of the Murree Hills ranges from 5000 to 6500 feet. The winter precipitation is in the form of snow whereas the summer months record maximum rainfall. Therefore in modeling

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the topographic form both the above mentioned geological agents are active in this area. Topography in this region is structurally controlled and all the streams flow parallel to the regional strike which is about N 60° E. The drainage system has a barbed pattern. The tributary streams along the valley slopes have a very steep gradient, and it is along one such incipient tributories that the slumping occured.

Geology

Murree Hill is the type area for Murree series of North Western part of Indo-Pakistan subcontinent which shows enormous thickness in these hill ranges. The Murree formation on lithological grounds, is divided into two parts; the lower and upper Murrees. The lower Murrees consist of indurated deep purple and red sandstones, generally flaggy with splintry shales and deep red clay with veinlets of calcite. The upper Murrees contain soft and coarse sandstone with inner cores of gray colour shale and clay. Red and purple shales which are nodular, are frequently recorded alongwith clay. This formation is underlain by a well marked conglomeratic bed which is exposed in a few section in the nallas in the area under observation.

Structurally, Murrees are folded into oblique isoclinal types of folds which are considerably squeezed in the disturbed areas. The Murrees are involved in the thrust also and usually they are overlain by the older rocks. From the texture and composition of the rocks it appears that Murree sediments were originated from the soils which were subjected to sub-aerial weathering. Some of the old workers have pointed out that the source metarial of the Murrees may be from the purana formation of peninsular India.

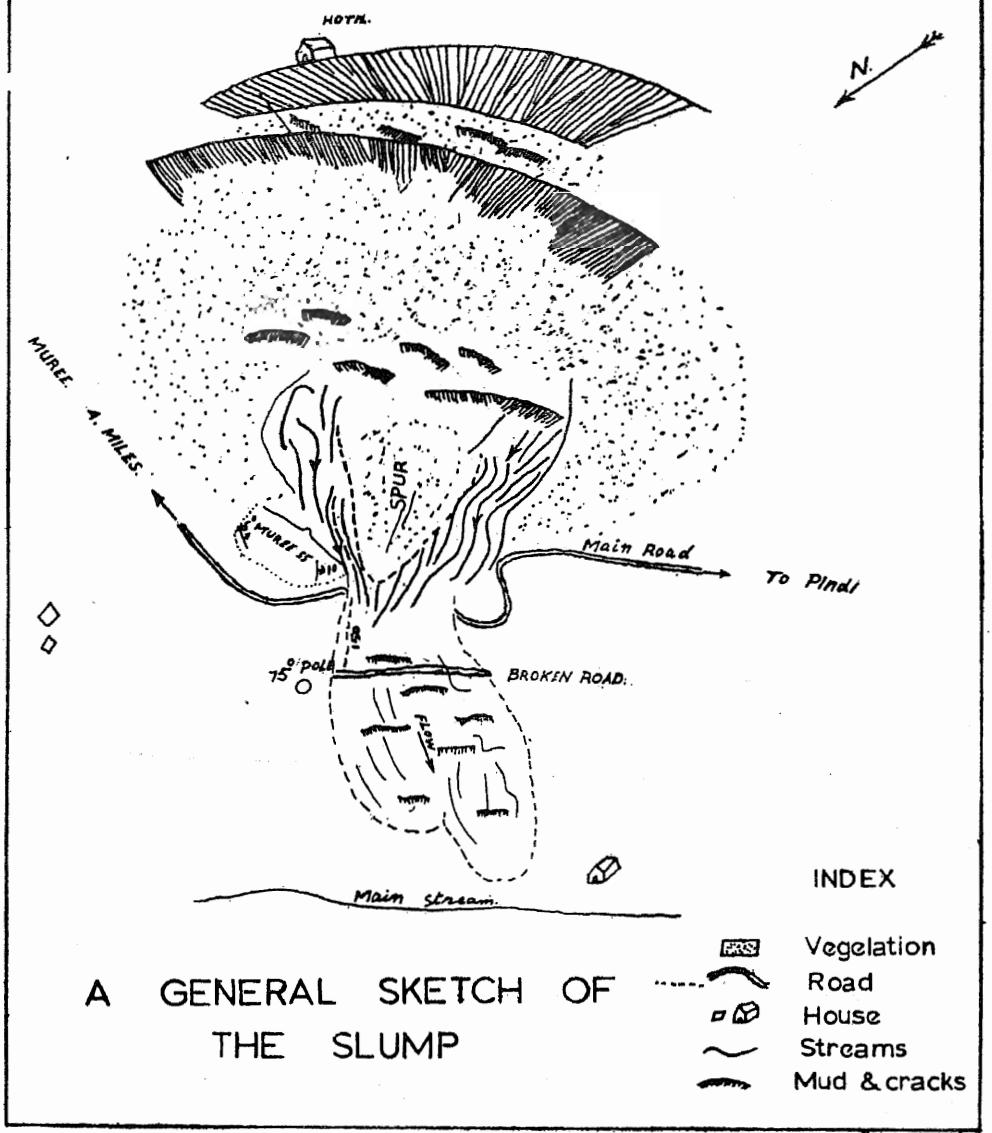
Due to higher proportion of clays in the Murree, the beds when wet become slippery and creat favourable conditions for movements of its overburdon which ultimately give rise to large scale landslides.

Causes of Landslides

Mud-flows in the clay horizon of the Murree formations are the main characteristic features during the rainy season. The causes of mud-flow are the presence of excessive amount of clays and frequent occurrence of structural cavities in this formation. During rainy season the water percolates through these locally developed joints and minor cavities. These openings carry the finer sediments andre-deposit them over the lower horizons. Studying the area from

erosional point of view the author observed that the differential erosion of strata of varying stability have left over hanging material of a harder strata which eventually had broken away and thus causing the slide.

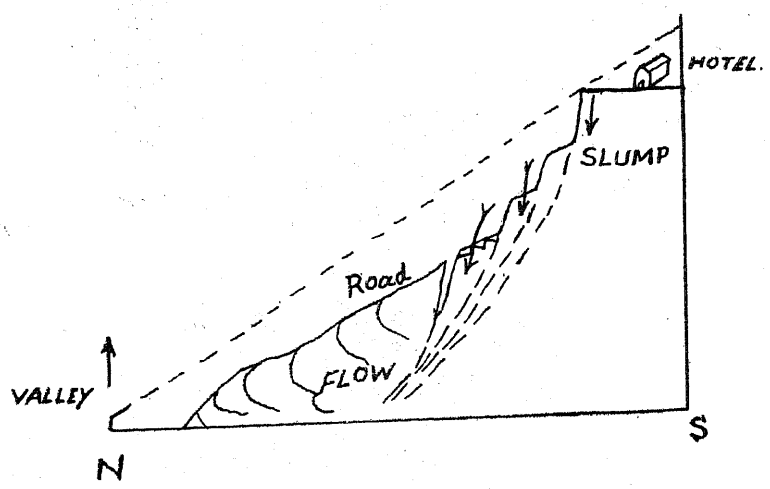
Fig. 1



A GENERAL SKETCH OF THE SLUMP

In the Murree hills the area which has suffered more showed huge transportation of finer sediments in the form of mud-flows. Another important factor is the construction of buildings and roads over the unconsolidated material which consists of weathered debris derived from the adjacent rock. Thus talus are covered by recent soil which usually support thick vegetation. The percolation of water in such soil is very high and thus it has an easy access to the bottom of these deposits. This results in weakening and disturbing the stratigraphic equilibrium of the starta by removing the finer material and replacing the vaccume by the coarser debris. This arrangement ultimately disturb the whole structure and produce many weak zones along which landslides occur. A few slumped areas observed in the Murree hills showed a displacement of over 150 feet. However, there is no indications of the development of slip-planes in the area subjected to mud-flows.

Fig. 2.



VERTICAL SECTION OF THE 'FLOW'

Conclusion and Recommendations

The study of the above mentioned geological factors in the Murree Hills, confirmed that the slumping is the result of the mass movement of loose material which disturbed the stratigraphic equilibrium. The mud-flow this year was execessive due to continuous raining. The slopes with high gradients containing the un-consolidated material were more prone to successive slumping. The thick vegetated area which contain appreciable amount of finer material helps to facilitate these movements along the weak zones. Since the sliding is natural it must be regarded as an inevitable part of the general geologic cycle. The following four possible preventive and remedial measures should be kept in mind for future planning.

1. For firm foundation, the space containing unconsolidated material should be abandoned. If such space cannot be spared, then proper measures should be taken for using mechanical methods to consolidate the material and if need be, to raise walls for checking the movements.

2. The edges of the slopes where rocks dip away from the hills are more prone to slumping. Such sites must be overlooked for constructing road or building.

3. The steep slopes are more exposed to sculpturing agents, which should be treated properly because gravitative forces are more active due to high gradient and such sites very often gave rise to landslides.

4. Special care should be taken for constructing new roads because Murree being a hill station cannot afford any dislocation of communications. A fresh survey is recommended for new alignments, especially at those places which are frequently subjected to mud-flows and landslides. The alignment should not have a steep gradient and also those spots should be spared where the rocks are structurally disturbed and dip slopes are away from the hill.

Acknowledgement

I owe a special debt of gratitude to Dr. R.A. Khan Tahirkheli for critical revision of my script. I am also thankful to my colleagues Safdar Khan and Qasim Jan for assisting me in the field work.