BEFORE THE HON' BLE NATIONAL GREEN TRIBUNAL, PRINCIPLE BENCH, NEW DLEHI

ORIGINAL APPLICATION NO. 642/2024

NEWS ITEM APPEARED IN greaterkashmir.com Dated 29.04.2024 "Land sinking: A new environmental challenge in J & K"

Versus

Chief Secretary, Jammu & Kashmir & Ors. ...Respondents

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NOTARY V.L.SHUKLA Advocate & Notary Reg.No.27(01)/2003 GOVT. OF UTTARAKHAND (INDIA)

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RESPONSE AFFIDAVIT ON BEHALF OF THE RESPONDENT NO. 4

MOST RESPECTFULLY SHOWETH:-

I, Dr. Vineet Kumar Gahalaut working as Director in Wadia Institute of Himalayan Geology Dehradun, at Dehradun, Uttarakhand, under the replying respondent no.4, do hereby solemnly affirm and declare as under: -

1. That I am acquainted with facts and circumstances of the present case, and I am competent to swear the present compliance Affidavit on behalf of answering respondents in my official capacity.
2. That the response affidavit has been drafted by my counsel on the instructions received from me. The contents of the same have been read over to me and the same are true and correct, based on official records maintained in my office.
3. That the instant Application has been registered suo moto by the

Hon'ble NGT on the basis of the news item relating to alleged massive land sinking at Pernote Village in Ramban District of Jammu and Kashmir and massive construction activities, including road expansions and construction of tunnels in eco- fragile zones in various areas of J&K being the cause behind the abovementioned issue. The news item further mentions that if these activities are conducted without Environmental Impact Assessment (EIA), these are bound to disturb eco-system.

4. That in this regard, the answering Respondent respectfully submits that on 6.11.2024 respondent no. 4 received notice sent by This Hon'ble Tribunal through email.

5. That after receiving notice from this Hon'ble Tribunal the Director-WIHG (Respondent no. 4) has constituted a scientific committee with the following members to investigate the area and submit the report against the issues raised in the said OA No: 642/2024.

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Dr K.Luirei, Scientist-F

Dr Barun Mukherjee, Scientist-E, and

Dr Subhajit Saha, Scientist-B

6. That a landslide struck pernote village on the 25th of April 2024, in the Ramban district of UT of J & K. The event caused extensive damage to many houses, power lines, transmission towers, Ramban-Gool link road, and the water supply was also disrupted.

7. That a team of scientists from the Wadia Institute of Himalayan Geology, Dehradun, carried out a geological investigation around the affected slope at Pernote Village.

8. That the team of scientists consisting Dr K.Luirei, Scientist-F, Dr Barun Mukherjee, Scientist-E and Dr Subhajit Saha, Scientist-B prepared a detailed report contains the landslide causative factors and the recommendations. **Copy of the Report is annexed herewith an Annexure R4-A.**

9. Therefore, taking into consideration the above submissions made by the answering Respondent, it is prayed that this Hon'ble Tribunal may take on record and consider above submissions or pass any other appropriate order, which the answering Respondent shall duly comply with and thus render justice.

10. That answering respondent will abide by whatever direction/order passed by this Hon'ble Tribunal.

11. That answering respondent will file any further reply as and when directed by this Hon'ble Tribunal.

DEPONENT

NOTARY V.L.SHUKLA Advocate & Notary Regd.No.27/01/2003 GOVT. OF UTTARAKHAND

VERIFICATION:

Verified at Dehradun, Uttarakhand on this 27th day of January, 2025I, that the contents of the above response affidavit are true and correct as per the official records, nothing stated therein is false and nothing material has been concealed therefrom.

DEPONENT

S.No. 102/2025
This affidavit is sworn before me by
Shri Dr. V. K. Gahalaut
who is identified by Shri .....
at Dehradun on 27.1.2025

Smt.Vijay Laxmi Shukla
Advocate & Notary, D.Dun

Annexure R4-A

Respondent No: 4 Wadia Institute of Himalayan Geology, Dehradun.

OA: 642 of 20224.

News item titled "Land Sinking: A new environmental challenge in J&K" appearing in greaterkashmir.com dated 29.04.2024.

Introduction

Pernote village which was struck by landslide on the 25th of April 2024 falls in the Ramban district of UT of J & K. The event caused extensive damage to many houses, power line, transmission towers, Ramban-Gool link road, and water supply was also disrupted. A team of scientists from Wadia Institute of Himalayan Geology, Dehradun carried out geological investigation in and around the affected slope at Pernote Village. Pernote village with geographical coordinates of 33°l4'32.46"N and 75°12'28.76"E is located 4 km away from Ramban town and 130 km from Jammu. Ramban district is a part of Jammu division located at the Jammu-Srinagar National Highway (NH)-44, situated in the Pir-Panjal range of the Himalayan mountain chain. The district of Ramban is drained by Chenab River that flows NW, and its tributaries viz., Bichleri Nallah, Chengi Nallah, Ind Nallah, and Rajgarh Nallah. The terrain of Ramban district is rugged with steep hills showing variable elevations ranging from 300m to 2500m amsl, the area achieved highest elevation of ~ 2500m at the Patnitop southeast of the present landslide affected area.

Location and Geology

The geological succession of Ramban area show continuous lithounits with variable thickness comprising mainly of sandstone, mudstone, limestone, quartzite, slate, and ma-felsic rocks (Fig. 1). Regional strike of the bedrock is NW-SE and dips towards NE. The region forms a succession

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of sub-Himalayan belt comprising of Siwalik sediments and Murree Group which are overlain by Ramban Formation. In this region several characteristic tectonic zones as thrusts sheet have been noticed, the Murree Thrust (~Main Boundary Thrust) and the Panjal Thrust are the major structural units (Sharma et al., 1979; Karunakaran and Rao, 1979; Jangpani et al., 1986; Raiverman et al., 1994). Murree Thrust delineates the Tertiary rocks of Murree Group from the pre-Tertiary rocks of Ramban Formation and trends parallel to the Panjal Thrust. In the Ramban-Pernote area, the Lower Murree Formation largely shows unconsolidated thick sections, display cm to meter scale anticlinal and synclinal structures. On the basis of relative dominance of mudstone and sandstone, the Murree Group is divided into a Lower Murree Formation and Upper Murree Formation (Wadia, 1931). Lower Murree Group mostly consists of cyclic alternation of sandstone-siltstone and mudstone sequence, whereas, in the upper part sandstone and thick mudstones dominates. In places high mountain range in the Ramban, encompasses low grade metamorphic, igneous intrusive, and mafic bodies which are intercalated with pyroclastic material and lava flow (Wadia, 1931; Bhatia and Bhatia, 1973; Raina et al., 1990). Chenab River flows almost along the Murree Thrust in NW direction in the Ramban area.

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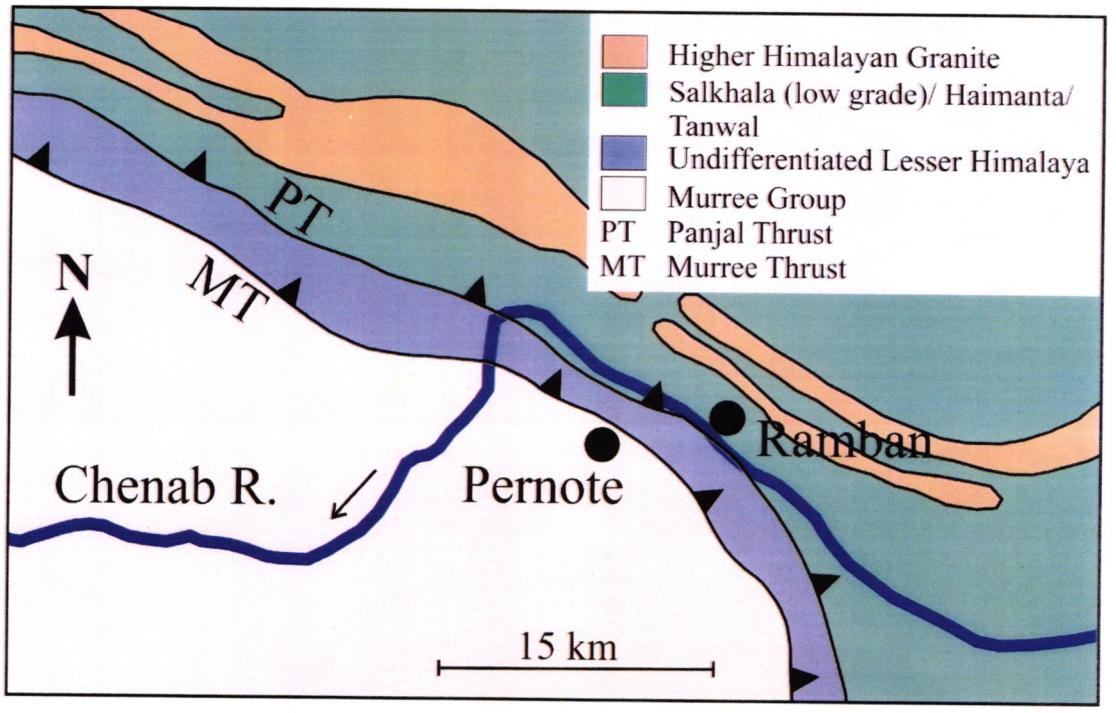

Fig. 1. Geological map of Ramban area (After Thakur and Rawat, 1992)

Landslide

Landslide and its related phenomena are common in mountainous region like the Himalaya and is govern by many natural factors such the i) slope angle and altitude, ii) lithology (slope material: rock, soils, and debris), iii) structure (weak zone), iv) hydrological conditions, and (v) seismicity in the areas. The forces operating on slopes are i) weight of the materials building the slope i.e. rock, soil, vegetation and manmade structures, which acts downward, and ii) shear strength of the materials. The slope angle greatly influences the strength of the driving force, the steeper the slope the greater the driving force. Water is not only the main agent for rock-weathering producing soft cohesionless and yielding materials but also the principal cause of landslides as it reduces the shear strength (force of resistance). Slope saturation can occur by intense rainfall, snow melt, changes in groundwater levels etc. Old landslide debris are potential sites for landslide as the infiltrating surface water creates a slip plane between the bedrock and the overburden, resulting the debris to

flow or slide down. The weight of the overburden increases the driving force and reduces the slope stability. Various anthropogenic activities including infrastructures, settlements, and vehicular movement exert active stress on the inclined slope. Cutting and deep excavations on the slopes, removal of soil cover and through deforestation increases slope instability.

Observations

Detail geological investigation was carried out along the Ramban - Gool transect via Pernote village (Figs. 1, 2). The landslide took place along this transect at Pernote village. At the site location of landslide the slide materials consist mostly of purple mudstones and sheared and fractured clasts of sub-mature to mature sandstones. The landslide affected area measures about 0.60 sq km; 1.25 km in length, 650m width and height of 450m to 500m. The landslide took place in debris of old landslide (Fig. 3). The overburden of the slope is made up of clasts of unconsolidated and heterogeneous rock fragments, which lack cohesion generated by old landslide (Figs. 4-7). Slip plane originate in the overburden and also affecting the underlying rock strata. The nature of the landslide is debris slide. At Pernote and its adjacent area, it is observed that during heavy rainfall most of infiltration through these water sensitive lithologies (alternation of mudstones, siltstones, and sandstones) usually oozes out as seepage.

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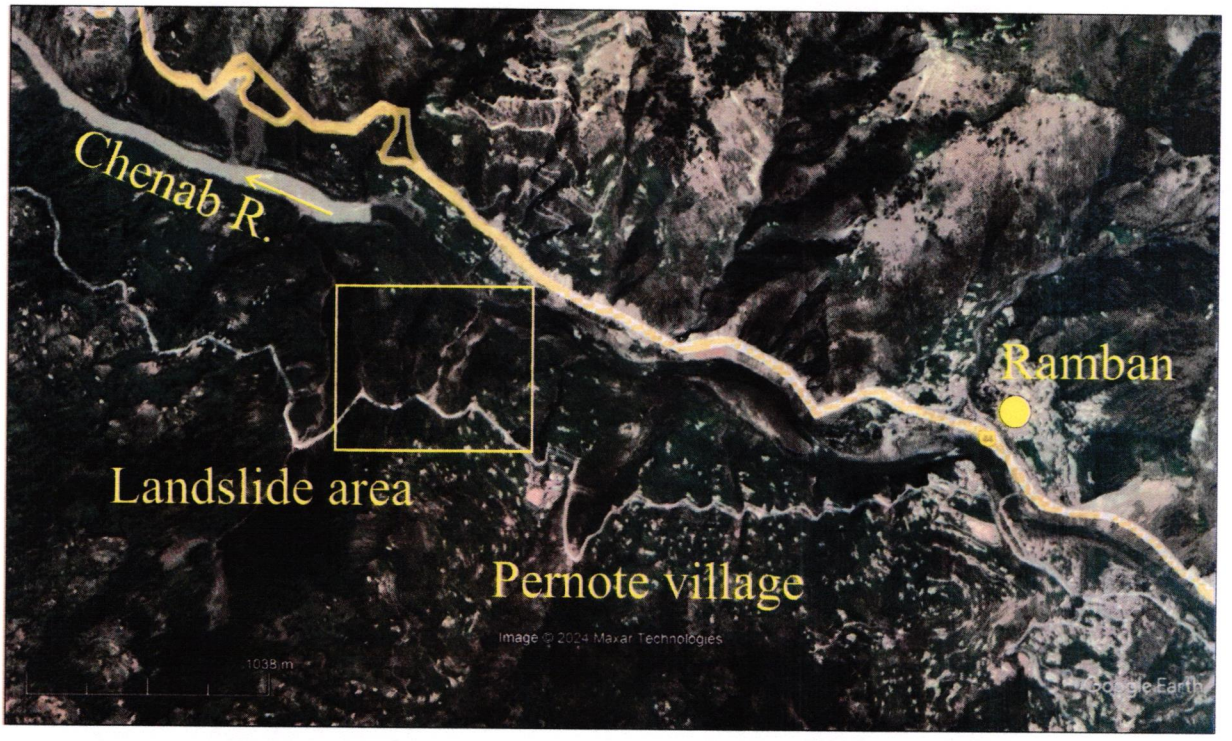

Fig 2. Google Earth Image illustrating part of Chenab valley of Jammu and Kashmir, UT of India; thick line is the Srinagar-Jammu National Highway (NH) 44. Inset box is location of Pernote village, Ramban district, J&K affected by landslide.

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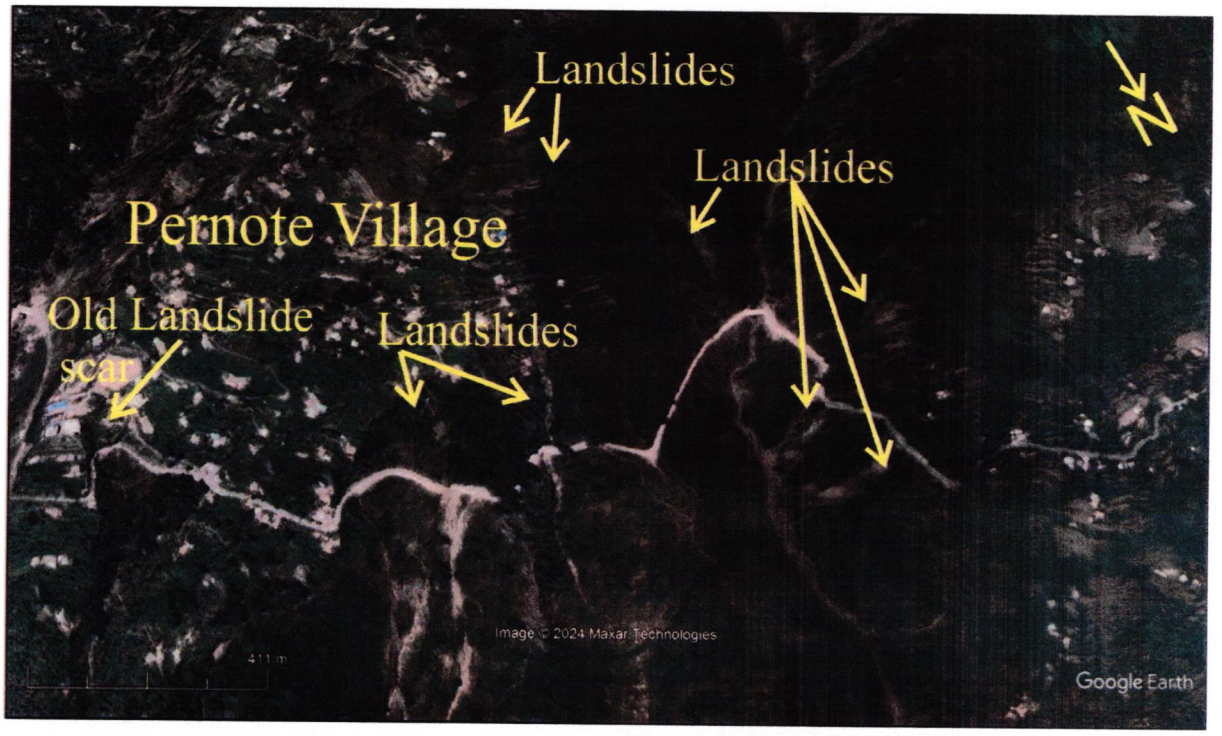

Fig. 3. Google Earth Image (18-03-2022) illustrating old and active landslides upslope and downslope of the Ramban-Gool road at Pernote village.

Geologically the landslide occurred at the top of the footwall block of the Murree Thrust (~MBT), and on the dip slope where the bedrock dips towards NE. Murree Thrust (~MBT) zone is one of the two zones in the Himalaya that is highly prone to landslides and affected by severe erosion due to shearing and weathering of the rocks. In general, the rocks in the fault zone are highly deformed and have been folded and repeatedly split along the thrust planes, which form thin and thick rock layers that are highly crushed and friable. The slope-forming materials consist of siltstone, sandstone, and mudstone; which exhibit low shear strength due to severe weathering and fracturing of the rock mass (Figs. 4-7). Further, the mudstone display prominent weathering where the materials are highly crushed. The weathered material mixed with rainwater, has slumped along the circular plane due to heavy load. The highly deformed alternations of sandstone, siltstone, and mudstone are overlain by huge thickness of old landslide debris.

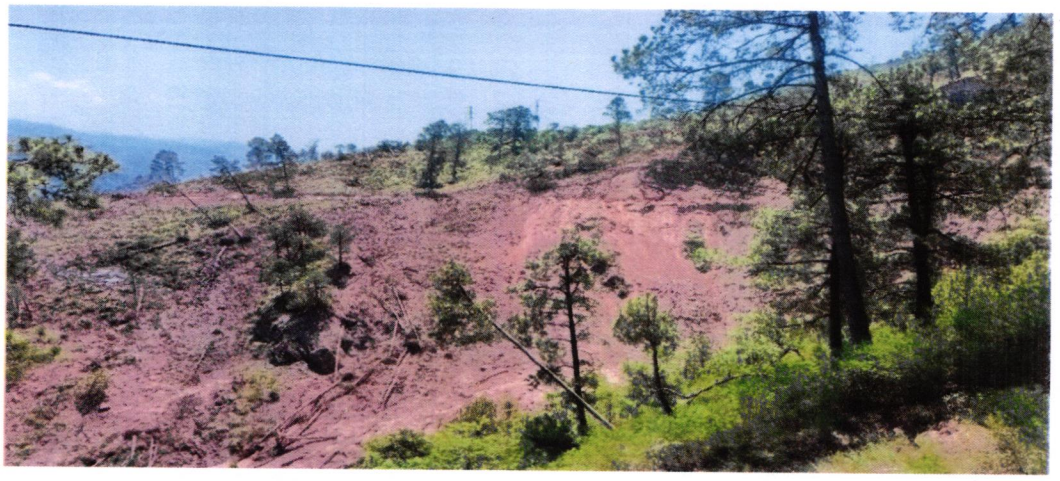

Fig. 4. The landslide occurred in loose and unconsolidated sediments of mudstone intermixed with clasts of broken sub-mature boulders of sandstone at the altitude of ~1165m asl.

Fig. 5. Illustrating large sliding zone comprised of loose debris of mudstone and sandstone.

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Fig.6. Field photograph illustrating slope and road affected by the landslide, with tilted and uprooted trees.

Fig. 7. Illustrating landslide affected slope; the displaced debris composed of clasts of mudstone, siltstone, and boulders of sandstone.

The competency and permeability contrast between the mudstones and sandstone restricts flow of water and reduce the stability of the slope. The clay minerals of the mudstone absorbed water and expanse, and the expansion volume begins to squeeze the pores in the mudstone, resulting in the reduction in the pore area of the mudstone. As such mudstone becomes saturated and being impermeable will developed circular slip planes and will slide/slump due to piezometric pressure,

this as a whole directly affect the bearing capacity of the slope forming materials. The saturated interface of mudstone and sandstone will also act as slip planes.

The slope of Pernote village and its adjoining areas falls in steep slope (30°-45°); the landslide took place in the steep slope of an old landslide scar (Fig. 3). A number of old landslide scars are observed in the slope where the present landslide occurred. Ramban area including Pernote village falls in the UT of Jammu and Kashmir which is located in a seismically active zone (Zone IV-V as per India's seismic zonation). However, no such geological phenomena, e.g., seismic activity, have been noticed or reported anywhere till now in the landslide-affected area. On the previous day, i.e., 24th April 2024, a moderate earthquake (~M 3) occurred near Doda, which is at a distance of 40 km from Pernote village (Fig. 8).

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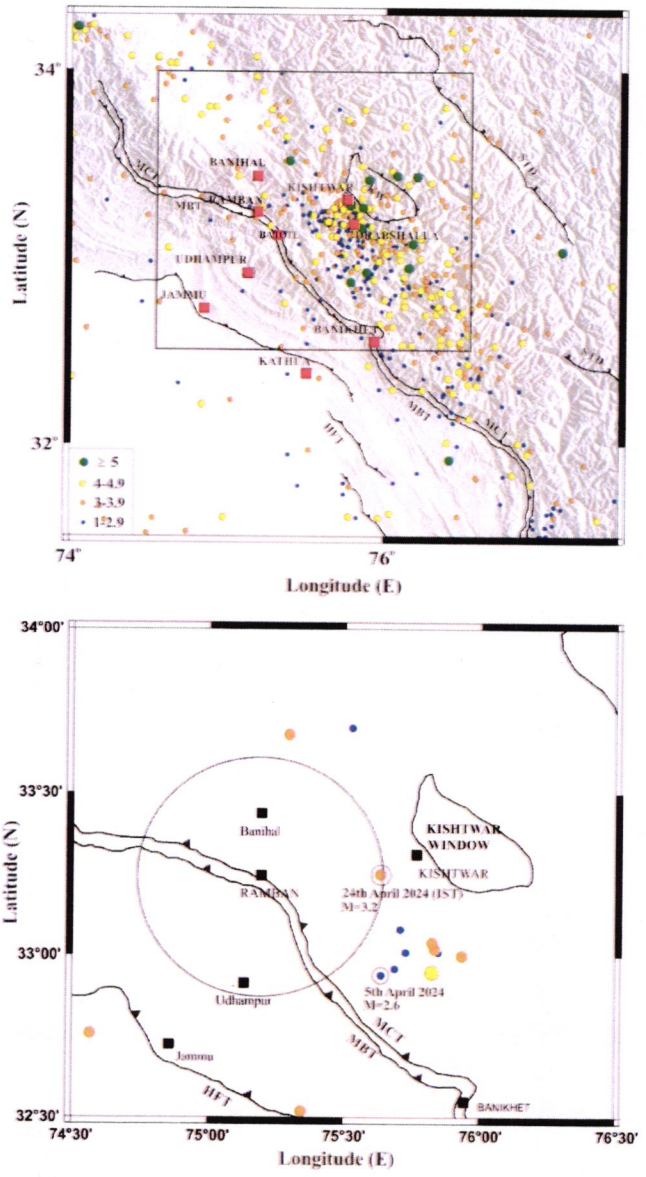

Fig. 8a. Shows the seismicity of the NW Himalaya during the period from 1963 to 2024 incorporating earthquake information from WIHG seismological network, catalog of National Center for Seismology (NCS), MoES, New Delhi and International Seismological Center (ISC). The filled circles with different sizes and colour indicate epicenters of local earthquakes of different magnitudes.

Fig. 8b. Shows the seismicity in the Ramban area occurred during 2024. The filled circles with different sizes and colour indicate epicenters of local earthquakes of different magnitudes. There was two earthquakes during April 2024 highlighted by encircled dot. The 24rd April 2024 earthquake of M 3.2 occurred at a distance of 40 km away from Ramban (represented by a big circle).

Topography of the area

Pernote village in Ramban district, Jammu & Kashmir, is an area with rugged terrain (Fig. 9). To better understand the topographical and geospatial characteristics contributing to these events, a GIS-based analysis is performed using the SRTM (Shuttle Radar Topography Mission) Data. Aspect maps reveal the orientation of slopes, which helps understand the microclimatic influences on soil stability, such as solar radiation and prevailing winds. Elevation contours, created at 100-feet intervals, provide a clear visual representation of the terrain's vertical profile, aiding in planning mitigation efforts. Curvature analysis highlights convex and concave landforms, offering insights into water flow patterns and areas that are likely to experience erosion or deposition. Steep slopes identified in the area indicate high susceptibility to landslides, as steeper gradients are more prone to soil erosion and gravitational pull (Fig. 8).

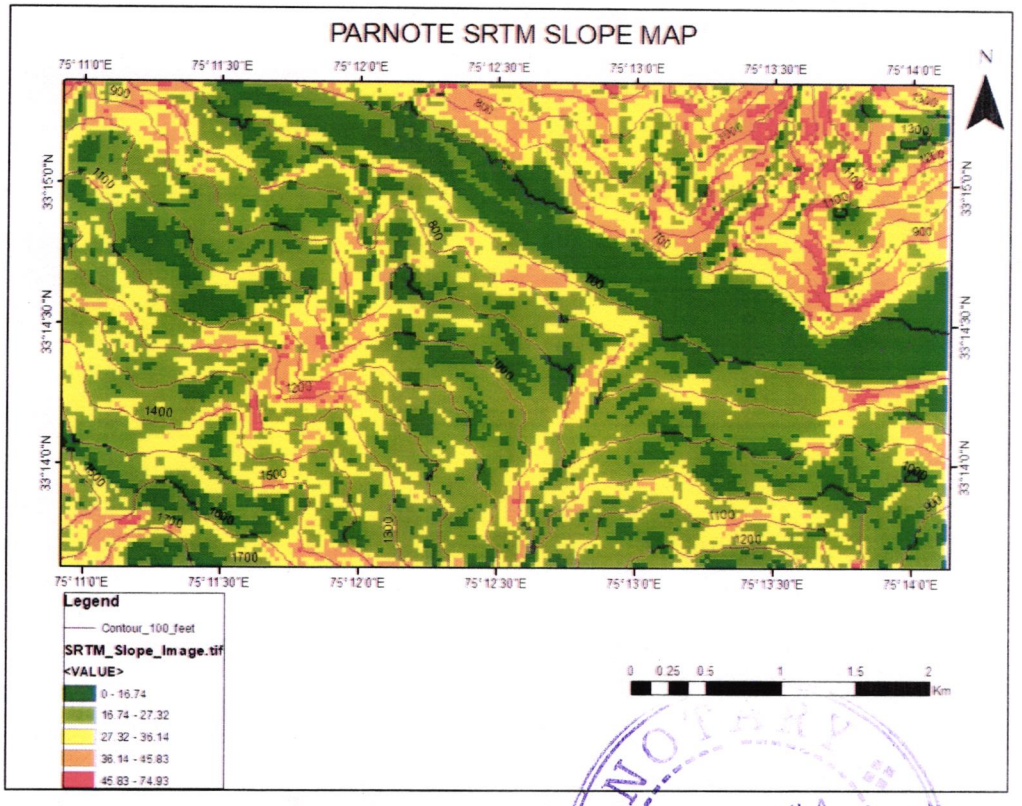

Fig. 9. Slope map of Pernote-Ramban area, UT, J&K.

Causative factors

The inherent geological condition of the terrain material forming the slope is the main factor for the landslide that took place at Pernote village on 25th April 2024 based on the following:

1. The landslide occurred at the footwall blocks of Murree Thrust where the rocks are highly sheared and fractured that are very friable.

2. The slope is made up of alternation of mudstone, siltstone, and sandstone. These intervening layers of mudstone in between the lithologies make the slope prone to landslides. Mudstone is often very soft and breaks up easily.

3. The thick loose overburden forming slope materials is made up of clasts of purple mudstones and sheared and fractured clasts of sub-mature to mature sandstones is of old landslide debris.

4. The slope of the region falls in steep to very steep slopes, which is sufficient to bring down the loose, swelled materials downslope during heavy rainfall, initiating the landslide.

Triggering factor

1. Prolonged rainfall was the triggering factor for the landslide, as the area received continuous rain before the landslide. The water-saturated sediments got swelled, and their low permeability reduces the shear strength of the sediments, resulting in the mass of sediment sliding along the steep slope.

Recommendations

1. The first step for slope stabilization is to get rid of the water by dewatering the affected slope and diverting the water away from the landslide area as water is the main agent for slope instability. Drainage work should be used both in surface and sub-surface.

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2. Barren upper slopes should be afforested – plantations of fast growing root/eucalyptus, alder, willow etc. to arrest the unconsolidated sediments.

3. Slope should be benched.

4. Use of bioengineering techniques to stabilize the affected slopes.

5. Impermeable materials such as mortar/asphalt/spray/geosyntheic clay liner to act as hydraulic barrier for freshly exposed slopes.

6. Retaining walls with weep holes and earth buttresses for base support

7. Slope angle >40° should be left undisturbed

8. Educating the locals through awareness programs on mitigation concepts and approaches.

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Team Leader of the Committee

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