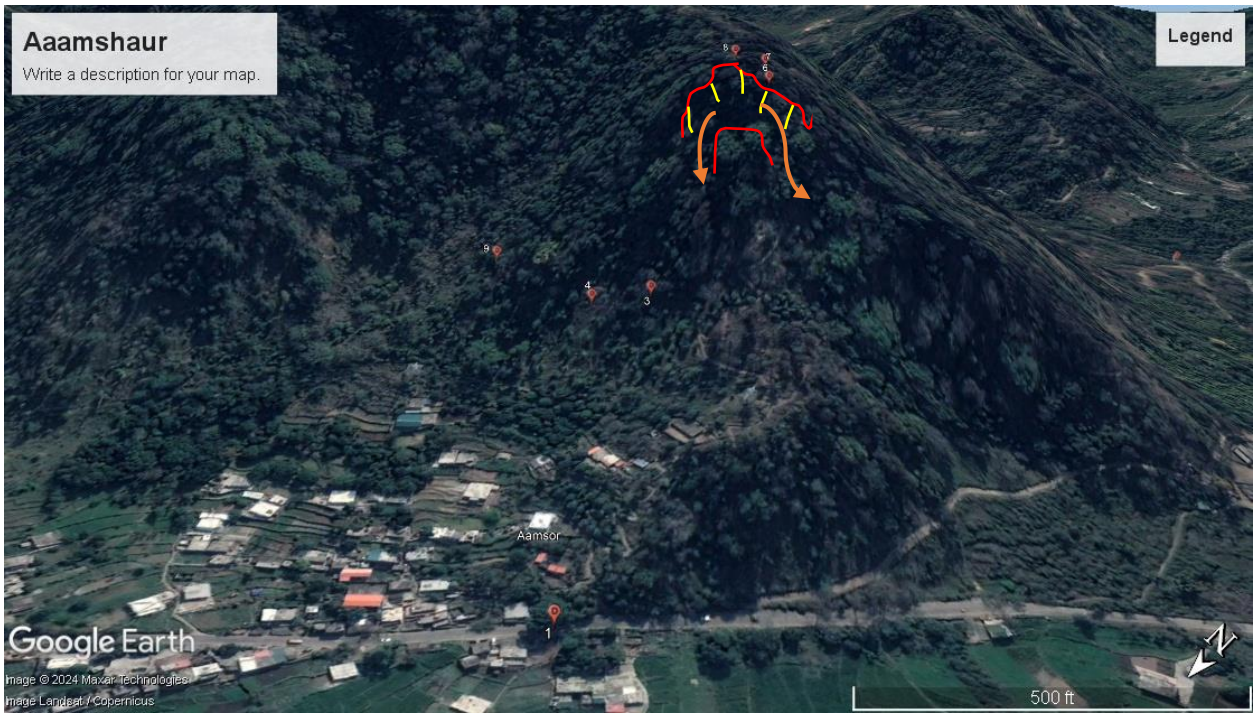

Field Reconnaissance Survey of Aamshaur Landslide

Uttarakhand Landslide Mitigation Management Center

August 2024

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INTRODUCTION: -

On 06 August 2024, an inspection was carried out of Aamshaur village landslide area district Pauri, Duggada block by the team comprising Mr. Prem Singh Negi, (Assistant Engineer), Mr. Sukhchain (Quality Engineer) ULMMC and representatives from Revenue Department Sangeeta Raj (Patwari) following instruction of Director, Uttarakahnd Landslide Mitigation Management Center through office order no 203/21/ULMMC/2024-25 dated 05 August 2024.

In the past due to heavy rainfall in midnight of 23rd October 2023, an event (rock fall) started and in the morning of 24th October Landslide occurred, which was of comprised soil mass with boulders flowed towards Jamragdi village road and some part to the residential areas, which is just downstream of the slope. **(Figure1).** During inspection on January 23, 2024, it was observed that the rock fall was towards the village, and the debris flow towards the village road. In the recent visit, on August 6, 2024, it was seen that due to the heavy rainfall, on 6th of July,2024 the debris passed through 5-6 houses partially damaging it, and reached to the National Highway (NH), which is the main route of Kotdwar to Duggada block**.(Figure 2).** The primary purpose of the present site visit is to evaluate the risk and condition of landslide to suggest recommendations for remediation measures.

Figure 1 Google earth image affecting part of target area

Figure 2 Debris reached up to NH

LOCATION:-

The site mentioned is located in the Duggada block of Pauri district, specifically in the village of Aamshaur. It is situated along the Kotdwar-Duggada (NH534) motor road, which is 10 Km from Kotdwar. The area is bounded within geographical co-ordinate 29°46'57.16"N and 78°35'16.26"E and 29°47'1.45"N, 78°35'14.37"E. with elevation 821.00 meter (approx.) and average slope of 70°.

Site Observation :-

In October 2023, between 23rd and 24th, heavy rainfall in the area triggered the landslide, affecting Amshaur village, located at the foot of the hill. On January 23, 2024, during our inspection, it was observed that Rockfall and debris flow had occurred from the hill slope. The debris flow was headed towards another village road (Jamrgadi), but fortunately, an old natural stream, approximately 60-80 cm (wide) in size, acted as a barrier, stopping the debris. Only a few boulders rolled down the slope. Later, during an inspection on August 6, 2024, it was observed that, may be due to the erosion caused by rainfall on July 6, 2024, in the old stream, the stuck boulders rolled down the slope towards the downstream . This led the debris flow towards the village, affecting houses and eventually reaching NH **(Figure3).**

Currently, the scarp area has widened by 2-2.5 meters, while the old stream has expanded to approximately 2 meters in width and 1.2 meters in depth, **(Figure4).** Its height near the village road is now around 1.5-1.8 meters. Residents have partially cleared the debris from the backside of their homes, but some debris remains around the houses. Meanwhile, previously uprooted trees have already reached the fields.

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Figure 3 Debris flow near the houses

Figure 4 Old natural stream condition

The following are the main point which are observed at site.

1:- Large broken parts of rocks were also seen at the sloping site, which broke away from the hill slope and are located on the fields after rolling down the slope.

2:- The old wire created check dam is being filled by the villagers and is being used for farming. which it appears that earlier there was a natural water way (stream).

3:- Old stream in which there may have been rain or water flow in the past.

4:-. There is presence of natural spring on the middle of the slope.

5:- The old walking path in middle of landslide, which goes to other village.

SUGGESTION:-

Mitigation measure can be done in two parts, which are short term mitigation and long term mitigation, For short term measure , topographical survey is to be done, and for long term it can be planned after doing detail investigation (Geological, Geotechnical, Geophysical).

Short term Mitigation –

1- Removal of unstable boulders, drift wood the flow area.
2- Cover the Scrap area by tarpaulin sheet, so that, during rain increase in scarp area can be prevented.
3- Installation of rock fall barrier in upstream side of village.
4- Installation of rain gauge with siren for warning.
5- Brest-wall and cross drainage for other village road.

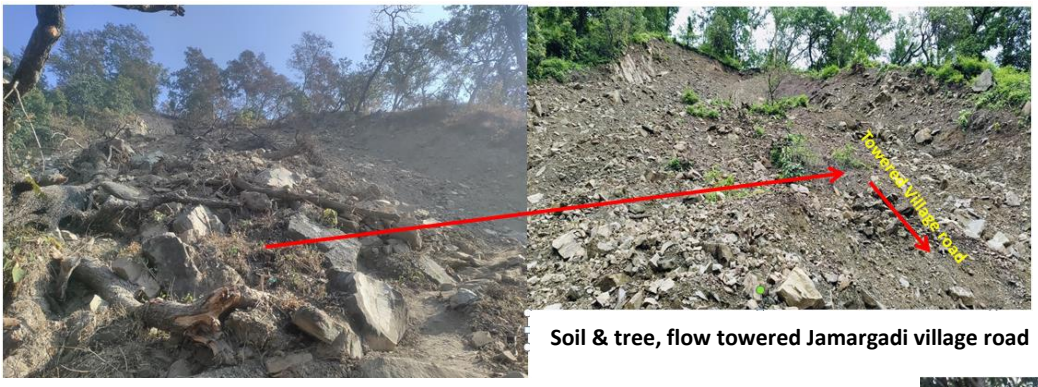
Long term Mitigation –

1- Gentile cutting of unstable area and cover by erosion control / vegetative matt with anchor pin and anchor bar.
2- Crib work or Gabion /Wet Masonry at failure part.
3- Earth retaining structure (wet masonry / Gabion/ framed)
4- Small wooden or steel fence work in collapsed area.
5- Water channel work in slope area and channelize with the rainwater with from uphill side Stream.
6- Plain cement concrete channel with drop work.
7- Non framed wire net.
8- Plantation work.

A broad tentative mitigation measure is shown in the figure as "suggestive mitigation plan" in report. However detailed investigation is required for a complete design of mitigation measure . (Figure A**)**

Photo Gallery

Damaged wall in cultivated land



Soil & tree, flow towered Jamargadi village road

Debris on Jamrgadi village Road

Large Boulder roll down from slope

Deposit soil shifted towered village

Natural spring on middle of slop failure

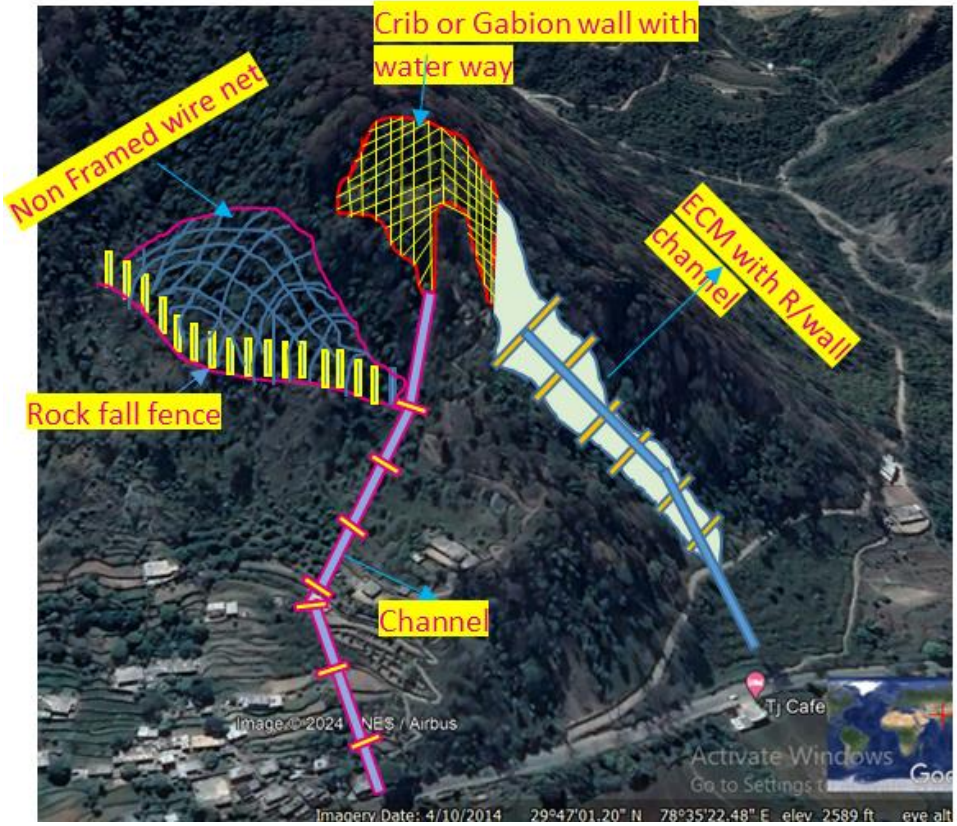


Figure – A Broad suggestive mitigation plan

Conclusion :- Based on the site inspection and past assessment in January 2024 and August 2024, it appears that the landslide in the upper part of the hill slope poses a threat to the lives and property of the villagers settled in the lower part. Therefore, it is essential to prepare an action plan and implement remedial measures as soon as possible. Additionally, during the current monsoon season, the scarp area should be covered with tarpaulin sheets to prevent area expansion and the large boulder which is obstructing water path, should be removed.