Survey Report on Mastari Village, Uttarkashi District

Uttarakhand Landslide Mitigation and Management Center (ULMMC)

August 2023

INTRODUTION

On 08/August/2023, an inspection of Mastari village district Uttarkashi was carried out by a team comprising Mr. Prem Singh Negi, Assistant Engineer and Mr. Deepak Bhatt, Surveyor of ULMMC; representatives from DDMA, Mr. Sradul Gusain and Mr.Virender Panwar, Surveyor Geology and Mining Department as per the instruction by Joint Secretary, Disaster Management and Rehabilitation, Section -2 through letter no 143/70/XVII-(B-2)/2023. The inspection was carried out to assess the problem of subsidence and sub-surface water flow in the village.

LOCATION

The site mentioned above is located in the Bhatwari Tehsil of Uttarkashi district, in the village of Mastari Gaon. It is situated along the Kankari-Kulori motor road, which diverges from the Uttarkashi-Lambgaon motor road at a distance of 10 kilometers. This site is situated at a distance of 5 kilometers from the point of diversion.

The geographical coordinates of the central part of this location is 30°42'43.01"N latitude and 78°27'54.16"E longitude (GPS Location by Google Earth)

HISTORY

After the earthquake that occurred in the year 1991 in Uttarkashi district, a preliminary survey was conducted for the first time on the aforementioned site by the geologist, Mr. D.P. Sharma, on 27th September 1997. Over time, due to the requests and protests from the villagers and their movements, the Geological Survey of India (GSI) carried out a comprehensive survey of the village in the year 2015. A detailed report of this survey was submitted.

Further, in 2021, as part of the Uttarakhand Disaster Recovery Project - Additional Financing (UDRP-AF), a survey was conducted involving Mr. G.V.R.G Acharyulu, a geologist, along with Mr. Manish Semwal, an expert in Slope Stabilization. In the year 2023, an inspection was undertaken by Mr. G.D. Prashad, Deputy Director (Geologist), in accordance with the directions of the District Magistrate, considering various geological aspects.

In addition to this, a joint inspection team comprising representatives from PWD, geologists, and SDM also conducted an assessment of the area. It is also reported that that on 27th July 2023, the GSI collected soil samples for geotechnical testing purposes.

The inferences drawn from all the reports indicated that excessive rainfall on the upper slopes of the village has led to the overflow of water due to raised water levels. This excessive water flow may be due to obstruction of water flow due to presence of natural topography of the area. The presence of subsurface water flow is also influenced by the nature of sub-surface geological strata. Additionally, the surface water flow can be increased during heavy rainfall, thereby saturating the ground.

This consistent pattern as reported earlier highlights the significant impact of raised water levels and the potential consequences.

SITE OBSERVATION

The following observation are made during the present site inspection:

1-: The village is having approximately 50-60 households, and the entire village is covered by irrigated and unirrigated land on all sides.

2-: To the west of the site, there is a seasonal stream, with a catchment area of approximately 15.00 hectares. (From Google earth)

3-: In the eastern part of the village, quartzite rock formations are visible, while in the central part of the village, large boulders were observed, suggesting the possibility of an old landslide.

4-: In the central part of the village, near the Nagrajara temple, there is a natural water spring with two outlets, ranging in diameter from 15 mm & 50 mm. During the rainy season, the discharge of water increases, but during the dry season, only as much water flows as from a 15 mm diameter hole, as informed by the villagers.

5-: In the village, two houses were found where there is a natural spring water flows beneath the floors. It has also been noted that the water flow occurs only during periods of heavy rainfall, as both of these houses are situated on the lower side of the natural spring. These houses are more than 40 years old.

6-: The spring water flows from the central part of the village, traversing through cultivated land, and eventually reaches the diversion road. A higher discharge is noticeable in the upper region, but as it reaches the road, the discharge diminishes significantly. There might be water

seepage occurring between the village and the road, causing a gradual infiltration of water into the ground.

7-: Cracks have been observed in 3 to 4 houses in the village, particularly affecting areas where new construction has been joined onto existing structures. Most of these houses are located towards the eastern side of the village.

8-: During the dry season, for the extraction of water from the natural spring, a 300x300mm chamber along with a 100mm PVC pipe has been constructed in the interior part of the village. Additionally, provisions have been made to cover the pipe during the rainy season to prevent overflow, with the use of cement concrete channels.

9-: For the purpose of irrigating the land in the village, water is collected in a tank without any proper lining, using diversion channels. Subsequently, this water is transported to the fields without adequate arrangements. It has also been observed that there is no proper management of water flows along the village roads.

10-: Due to the presence of cultivated land on the upper section of the elevated terrace, which has a gentle slope, it is possible that under conditions of heavy rainfall, runoff water from the upper slope might infiltrate into the soil of the cultivated area. Additionally, because of the nature of topography the village may have an increase in water level the during the heavy rain.

RECOMMENDATION & CONCULSION

1-: As mentioned in the aforementioned report, it is stated that geotechnical and geophysical investigations are to be conducted, which would be appropriate for the problematic locations. In this context, soil samples have been already collected by the Geological Survey of India (GSI) on July 27, 2023. The report is awaited from the GSI.

2-: If possible, the cracks can be measured between the rainy and dry seasons by some simple technique may be installing some crack meters. This will indicate whether actually the development of cracks is associated with rains and sub-surface water flow.

3-: The water used for irrigation and exiting from the houses, as well as the water from springs, should be safely disposed to downstream through well-constructed channels.

4-: In order to prevent excessive vertical cutting of a hill slope for any construction purpose, a safe slope-cutting approach can be employed that involves creating a breast wall and drainage system on the slope. This strategy is particularly important during the rainy season when there is a higher likelihood of surface water accumulation and increased chances of seepage due

to saturated soil conditions. This will help in maintain the integrity of the hill slope while addressing potential seepage issues caused by seasonal rainfall.

5. A geophysical investigation is suggested to determine the depth and nature of sub-surface flow.

5-: One or two boreholes would be appropriate for determining the water depth at the site, both in the middle and upper parts of the village.

6-: It would also be advisable to remove the large overhanging boulder located on the slope in the village.

PHOTO GALLARY

Figure 1- Weathered rock formation on the north-eastern side

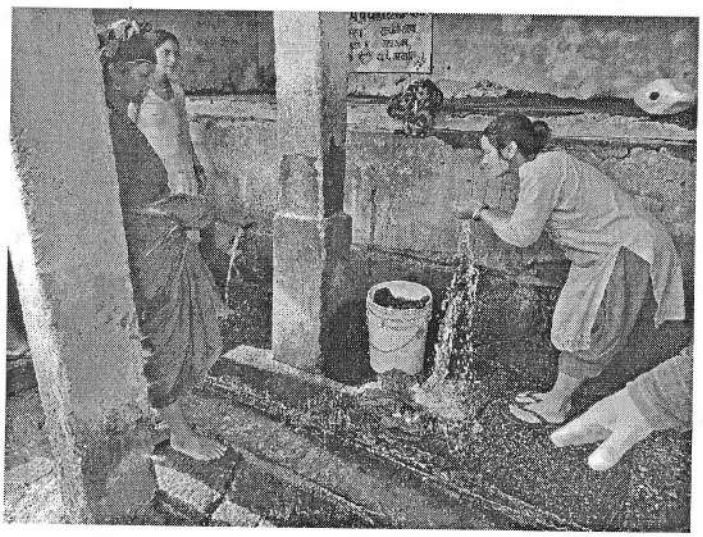


Figure -2 Natural spring at the center of the village

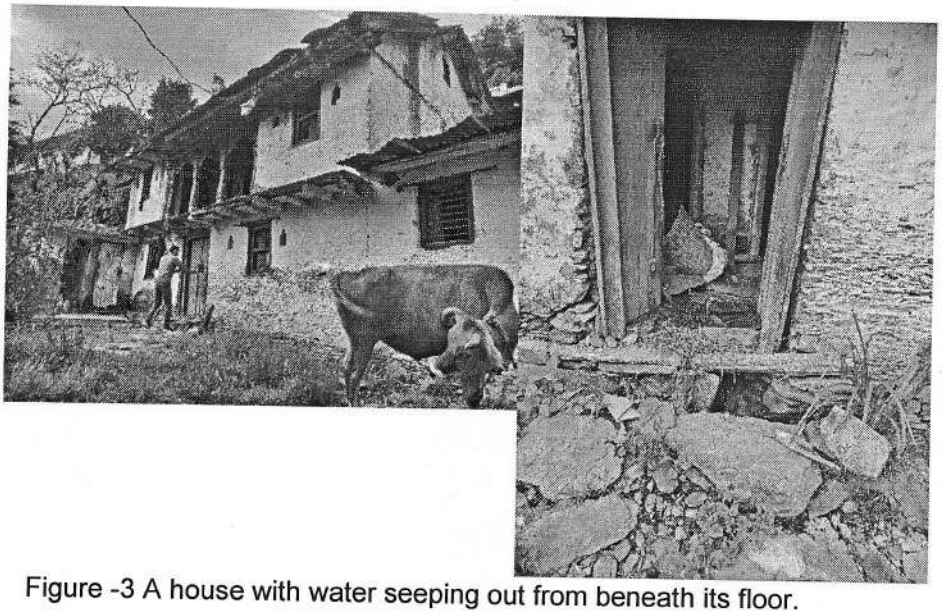


Figure -3 A house with water seeping out from beneath its floor.

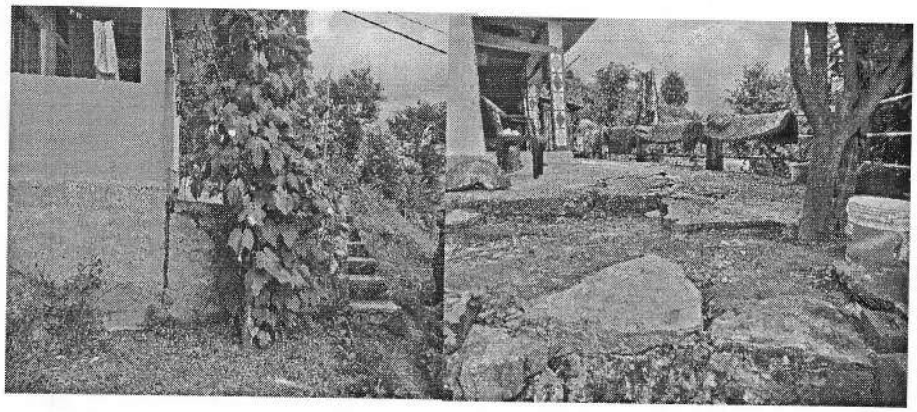


Figure -4 Minor Crack on the outer courtyard

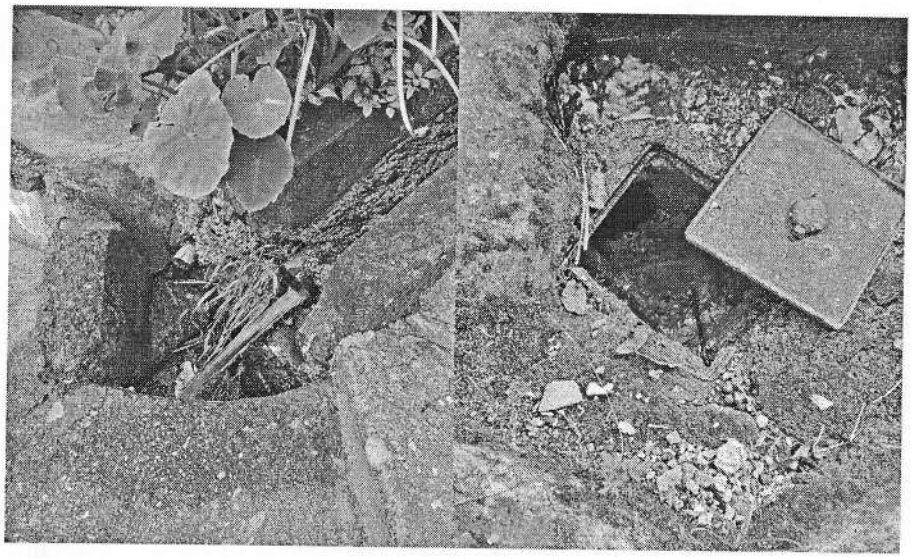


Figure-5 Spring water flowing through a PVC Pipe with Chamber.

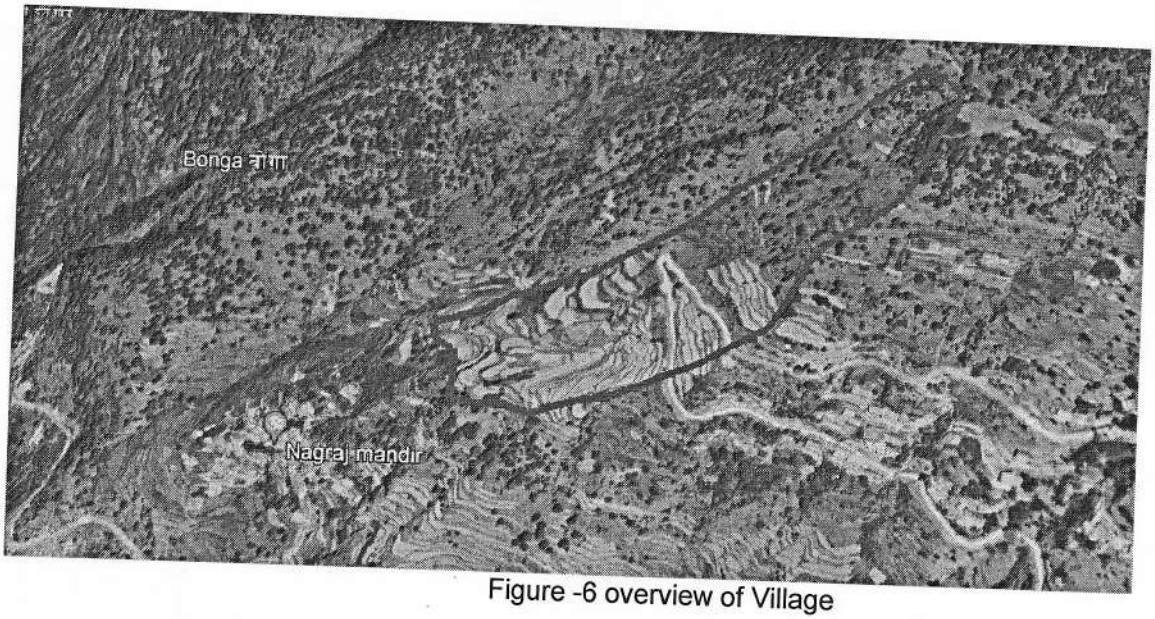
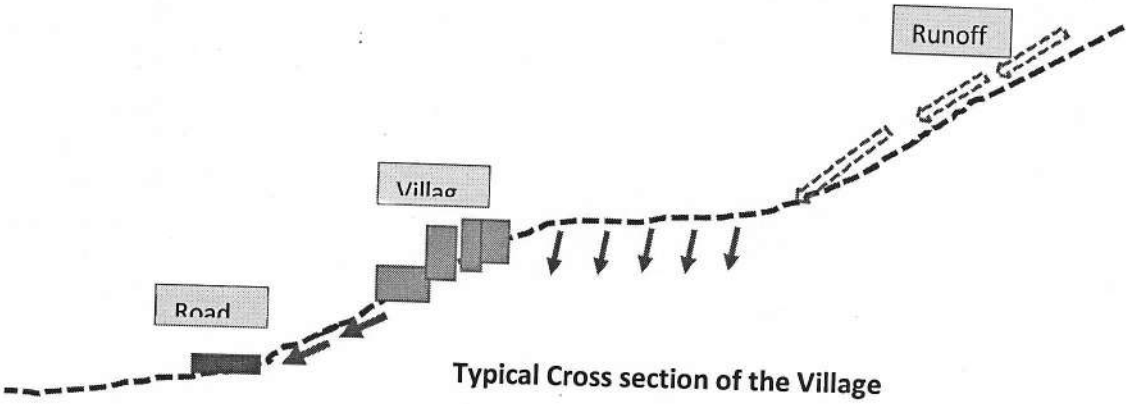


Figure -6 overview of Village



Typical Cross section of the Village

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