

**BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI**

Original Application No. 93/2023

In re: News item published in Newspaper 'The Hindu' dated 04.02.2023 titled "19 families shifted after houses in J & K village develop cracks"

Date of hearing: 25.05.2023

**CORAM: HON'BLE MR. JUSTICE SUDHIR AGARWAL, JUDICIAL MEMBER
HON'BLE DR. A. SENTHIL VEL, EXPERT MEMBER**

ORDER

1. None appear for either side.

2. Cognizance in this matter was taken suo motu in the light of a media report published in daily newspaper, "Hindu" dated 04.02.2023 with the title "19 families shifted after houses in J & K village develop cracks" observing that damage has taken place to 21 structures in Doda District of Chenab Valley in Jammu & Kashmir; earth has started slipping and causing damage to most of the houses in the area which has led to displacement of inhabitants; and geological survey of the area is underway to ascertain the causes of incident.

1. Tribunal found that the facts noticed in the above media report were serious and call for stringent, preventive and remedial measures inter-alia to regulate the location and nature of constructions in the interest of safety of the inhabitants. Referring to an earlier order, passed by this Tribunal, dated 31.01.2023 in O.A. No. 51/2023, *In re : News item published in The Tribune dated 16.01.2023 titled "Joshimath disaster*

a warning for Mussoorie” and some other matter where similar problems were considered, Tribunal constituted a joint Committee comprising Chief Secretary, J&K, representative from Wadia Institute of Himalayan Geology Dehradun, Govind Ballabh Pant National Institute of Himalaya and Environment, National Institute of Hydrology (NIH), Roorkee, Prof. J.S Rawat, Kumaon University, Almora, Space Application Centre, Ahmedabad, National Institute of Rock Mechanics, Bangalore, CPCB and ACS Environment, J&K who was to act as nodal agency for coordination and compliance.

2. Committee was required to suggest remedial measures to prevent environmental damage in the light of carrying capacity, hydro geology study, geo-morphological studies and also covering other allied and incidental issues. It was also permitted to take assistance from any other expert/institution and also to interact stake holders including the inhabitants/members of civil societies.

3. Pursuant to the above order dated 17.02.2023, vide letter dated 24.05.2023 sent by Principal Secretary, Forest Ecology and Environment Department, J&K, report of the Committee constituted by this Tribunal has been submitted.

4. Observations of the Committee along with recommendations are as follows:-

“Observations of the committee along with the recommendations are elaborated below:

Doda district located in the eastern part of the Jammu region in the Union territory of Jammu & Kashmir, is comprised of 16 Tehsils. The district is bounded by Kishtwar to the northeast, Kathua to the south, Ramban to the northwest, Udhampur to the southwest, and Anantnag to the north. The total geographical area of the district is 2306 [sq. km](#), and the administrative center of the district is situated in Doda, which is approximately 160 km away from Jammu. Due to its

distinctive geo climatic conditions, Doda has historically been susceptible to natural disasters such as floods, droughts, landslides, and earthquakes, as indicated by the disaster matrix presented in Table 1. Throughout history, Doda District has experienced a number of disasters, one of the most recent being the 2017 cloudburst in Tehsil Thathri.

Table 1: Recorded incidents of disasters within District Doda.

Type of Disaster	Month / Year	Affected Area	Details of damages caused		
			Deaths	Injury	Structures Damaged
Earthquake	May, 2013	Entire district	-		70074
Cloudburst	Apr, 2014	Thathri & Kahara	06	01	09
Flood/Rain	Sep, 2014	Entire district	01	05	1304
Flood/Rain	Feb, March, April, 2015	Entire district	07	09	1706
Cloudburst	April, 2015	Bhagwah	06	-	01
Cloudburst	Jul, 2017	Thathri	06	02	09

(Source: District Disaster Management Plant (DDMP), Doda, Rather A. H., 2018)

According to Ansari et al (2022, <https://doi.org/10.1007/s40098-022-00694-0>), Doda, Udhampur, Ramban and Reasi within Jammu Region are more vulnerable to earthquakes because of the centrally positioned Main Central Thrust and Udhampur Fault in the Region. Other high-risk locations include the northern outskirts of Doda and Kishtwar and the north-western part of Jammu, where mild earthquakes of magnitude $M_w \geq 5.0$ have been detected regularly in Kishtwar Window and Main Frontal Thrust. The affected area of Thathri falls in Survey of India Topo sheet number 430/16, and the geographical coordinates are $33^{\circ} 08' 45.21''$ N, $75^{\circ} 47' 3.12''$ E with elevation of approx. 997 m. The Nai Basti, Thathri area, is situated on the left bank of the Chenab River just above the NH244 and below a village road (Figure 1), and has a general slope of $65\text{-}70^{\circ}$.

1.2 InSAR analysis of Thatri Area, Doda District, J & K

An InSAR (Interferometric Synthetic Aperture Radar) based survey was conducted to understand the evolution of land deformation at Thathri and surrounding regions. The objectives of the analysis were to examine evolution of land displacement since January 2023. Time-series data sets from Sentinel-1 (January 2023-April 2023) satellites were processed using Small Baseline Subset Interferometry (SBAS) technique to map the surface deformation.

Interferograms were corrected for topographic and phase unwrapping errors for obtaining reliable deformation time-series. Finally, areas having coherence < 0.4 were masked to further reduce noise due to land surface changes. Map showing surface

deformation along the line of sight of the satellite during 202301-06 and 2023-04-26 is shown in Figure 2. InSAR analysis did not show any surface deformation associated with the ground cracks / rock slides in the study region.

2. General observations of the affected area by the Expert Committee

The committee conducted a detailed field survey of the affected area of Nai Basti, Thathri, Doda District, Jammu and Kashmir during 08-09 May, 2023 accompanied by the Sub-divisional Magistrate (SDM) Thathri and the Conservator of Forests, Chenab Circle with their respective teams. The specific observations of the committee are as follows:

- The affected settlement at Nai Basti, Thathri (24 affected houses/structures) was established majorly on Shamlat land (i. e. village pasture land) prior to 2014 when Thathri became a municipality, as informed by SDM Thathri. As such, there were no extant construction by-laws applicable and no retaining wall with weep holes, or planned drainage or sewage disposal structures were observed in the affected area, except unplanned PVC pipes for the purpose of sewerage disposal to the road side drainage downslope. As per local officials, soil bearing capacity assessment, other feasibility studies, etc. also would not have been carried out prior to the construction of these structures.*
- The physical inspection of cracks by the committee at various locations within the affected area revealed horizontal, lateral and vertical displacements with maximum value of cracks more than 50 cm. The total affected area is noted to be approximately 8000 m².*
- The SDM Thathri and local residents informed the committee that the incident initiated on 1st February, 2023 and continued till 5th February, 2023. No new cracks are reported from 6th February, 2023 onward. The total number of structures affected is 24 including 3 completely damaged structures, 1 I having major cracks and 10 having minor cracks. The slope of the affected area is towards north and approximately 65-70°. The affected area is pre-dominantly on schist bedrock overlain by thin layer of soil. The layer of the river born material exposed towards the crown of the landslide is not much affected by the landslide as only small cracks and subsidence are observed on the road (Figure 4). The Chenab River valley between Lalhote and New Thatri is made up mainly of slate, phyllite, schist, marble and orthogneiss. The landslide affected slope at New Thatri is made up mainly of weathered schist intervened by un-weathered schist in between. The foliation dips moderately towards the south. The bedrock is traversed by two important joint sets forming wedges towards the daylight slope (Figure 4). The bedrock data from the immediate adjoining slope is also made up of highly weathered schist that dips moderately to gently towards the south with wide*

open fractures. The slope dips steeply towards the north. The Quaternary deposits and morphology of the Chenab River valley suggest that the valley is susceptible to landslides. Observation of landslide and lacustrine deposits in the slopes a height of about 200 m from the present river bed suggest that the Chenab River was blocked by landslides from time to time. The south facing slope that is the right bank slope of the Chenab River is more susceptible to landslides as number of old and active landslides are observed. Steep slopes are observed on both sides of the river valley the south facing slope being steeper than the north facing. Geological traverses were carried out along the road sections of the Nai Basti Thathri area. The main rock types are schists and gneisses (Figure 5 c&b) of Salkhala Formation belonging to Proterozoic age. The exposed rocks are slightly to moderately weathered in nature as per ISRM 1978. The details of the discontinuities are given in Table 2 and 3.

Table 2: Discontinuities observed in the exposed schistose rock at the NH-244

Joint Set	Dip direction / Dip Amount	Spacing (cm)	Persistence (m)	Roughness*	Aperture (mm)	Infilling	WG*	Ground Water	Remark
Foliation	N140° /50°	40-100	5-15	S/U	Tight-2	None	WI-III	Dry	Foliation joint
J1	N050°/40°	10-30	5-10	S/U	Tight-2	None	WI-III	Dry	Critical joint
J2	230°/60-65°	10-20	>10	S/U	1-3	None	WI-III	Dry	Prominent joint
J3	N340°/40°	-	2-5	S/U	1-3	None	WI-III	Dry	Random joint
S/U* Smooth undulating, WG* Weathering grades									

Joint Set	Dip direction / Dip Amount	Spacing (cm)	Persistence (m)	Roughness*	Aperture (mm)	Infilling	WG	Ground Water	Remark
Foliation	N160° /50°	8-20	5-15	R/U	Tight	None	WI-III	Dry	Foliation joint
JI	N 150°/90°	10-30	5-15	R/U	Tight	None	W-I	Dry	Prominent joint
R/U* Rough undulating, WG* Weathering grades									

- The committee further noted that the affected area did not have any ground water springs/streams, and no ground water borewell.
- The committee further examined the report produced by GSI, GoI, wherein the total rainfall was reported to be 201.2 mm during 20th January to 31st January, 2023. This heavy rainfall spell might have resulted saturation of the soil/rocks which might have triggered slides.
- Minor cracks were observed by the committee on the road above the affected area, and in the adjoining structures.

Recommendations by the Expert Committee

- *No further civil construction within the affected area of Nai Basti may be allowed. In view of the coming monsoon season, the affected area needs to be under observation of district administration. In case of any new sign of major cracks in houses outside the affected area, residents to be evacuated immediately. Moreover, as a precautionary measure, people living in houses outside the affected area and adjoining houses/structures not yet affected may also be asked to relocate to a safer place.*
- *A retention wall of around 400 m with weep holes may be constructed near the base of the land slide area (at the toe of the slope) at the road level to stop any further slope failure.*
- *All cracks to be filled up with the cement slurry well before the onset of monsoon to control the percolation of rain water/ surface water and to monitor any further displacements.*
- *The natural diversion and drainage channels within the area may be restored or renovated immediately so that the surface run-off could be diverted. Proper drainage and sewer plan for the entire area to be developed and implemented.*
- *Any further construction outside of the affected area only to be allowed after geotechnical assessments such as soil bearing tests, etc. Since the affected area is situated just above the Chenab river channel, to stop the river erosion, Gabion Wall with a suitable dimension may be constructed on the riverside.*
- *The area lacks high resolution geotagged data of natural and man-made resources. Hence, a "geo-portal" containing the data/information of all the concerned departments/research institutions/agencies in one common platform may be developed (at 1:10,000 scale) by the district GIS cell in collaboration with Department of RS & GIS, Jammu University or such other agencies for better planning, management and regular monitoring.*
- *Geomorphic map which could depict the spatial distribution landforms such as colluvial cones, colluvial fans, alluvial terraces, colluvial fans underlain by alluvial terraces, etc. composed of Quaternary deposits i.e., colluvium and alluvium is to be developed for the area under reference at 1:10000 scale for sustainable planning and development of all civil engineering works, their regular monitoring and management.*
- *Detailed Landslide Hazard Zonation of the entire new Thathri town is to be carried out, preferably by Geological Survey of India, in view of similar type of geological and geomorphologic setup in the Thathri area.*
- *No subsurface engineering activity may be allowed within an area circumscribing 500 m of the affected location.*
- *The present residents of the affected 24 houses of Nai Basti Thathri may be rehabilitated to a suitable safer location within the framework of applicable laws.*

4. Suggestion by the Expert Committee

In steep mountainous terrain, geo-morphologically a hill spur has three components: crest, mid crest and foot slope. All these three components have distinct hydro-geomorphic processes and landforms. The area under reference lies on foot slope of Thathri hills spur. Figure 6 depicts the hydro-geomorphic cross-section of the foot slope zone of the Thathri hill spur which depicts: i) rain water recharge zone made-up of Quaternary landforms, i.e., colluvial fan underlain by the Chenab river terraces having very high infiltration capacity; and ii) sub-surface flow paths of infiltrated water causing earth creeping due to steadily increasing pore water pressure during rain resulting in development of multiple cracks, sinking of land, landslides and rock falls causing damages to buildings and roads constructed on this highly ill-suited site (may be due to ignorance of the local people and government also). It is suggested that for the sustenance of the environment, the Thathri type foot slope zones (Figure 6) of hill spurs in the entire District Doda should be mapped using geospatial technologies at 1:10,000 scale by which such ill-suited sites may avoided for civil engineering works in future.”

5. The letter of Principal Secretary has said that the report of the Committee was considered in a meeting held on 22.05.2023 under the Chairmanship of Chief Secretary, J&K and draft report in principle has been agreed in the said meeting. The decisions taken in the said meeting are recorded in para 4 of the letter dated 24.05.2023 which are as under:-

- “a No further constructions within the affected area of Nai Basti may be allowed.*
- b. The recommendations of the committee may be conveyed to the local population for a stake-holder consultation by the District Administration within 15 days, so that further action on the recommendations of the committee could be taken.*
- c. Draft report was agreed in principle to be submitted to the Hon'ble Tribunal.”*

6. We find that authorities are in the process of consulting stake holders including local population for taking further action pursuant to report. Consultation with local residents and other stake holders was permitted by this Tribunal also in its earlier order dated 17.02.2023. Since the said deliberation is under process, we find it appropriate to

grant three months further time to the authorities to finalise the matter, prepare a plan for implementation of the recommendations made in the above report and submit to this Tribunal. Chief Secretary may set up a Special Task Force of the concerned Heads of Department to finalise modalities of execution. The action plan may have short and long term executable action points. As per requirement, technical assistance may be taken from any of the Member/Institution as per the Committee constituted as well as from any other Institution. If the entire report after hearing the stake holders is accepted and/or reasons are placed before us for any otherwise action proposed by the authorities, an action taken report shall be submitted by 15.09.2023 by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/ OCR Support PDF and not in the form of Image PDF.

7. List for further consideration on 18.09.2023.

8. A copy of this order be forwarded to the Chief Secretary, J&K, Wadia Institute of Himalayan Geology Dehradun, Govind Ballabh Pant National Institute of Himalaya and Environment, National Institute of Hydrology (NIH), Roorkee, Prof. J.S Rawat, Kumaon University, Almora, Space Application Centre, Ahmedabad, National Institute of Rock Mechanics, Bangalore, CPCB and ACS Environment, J&K by email for compliance.

Sudhir Agarwal, JM

Dr. A. Senthil Vel, EM

May 25, 2023
Original Application No. 93/2023
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