

The 2023 Jajarkot Earthquake, Nepal– First Situation Report

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1 Rationale

Nepal is situated in a region prone to frequent seismic activity due to the convergence of the Indian Plate and the Eurasian Plate. This geological phenomenon has led to a series of earthquakes, some of which have been particularly destructive, resulting in significant loss of life and extensive damage.

One of the most devastating earthquakes in recent Nepalese history occurred in April 2015, with its epicenter located in Gorkha, near the capital city of Kathmandu. Measuring 7.8 on the Richter scale, this earthquake caused widespread devastation, claiming numerous lives and displacing countless individuals. Although central Nepal bore the brunt of this calamity, western Nepal has also experienced occasional medium to large earthquakes, with a seismic gap in the region since 1505. Both the spatial and temporal clustering along the Himalayan frontal thrust indicate non-uniform deformation along the Himalayan arc. Considering the substantial time elapsed (>800 years), the central gap might be primed for another earthquake, necessitating serious consideration in the seismic hazard assessment for both Nepal and India, spanning from western Nepal to the Deharadoon area. Throughout Nepal and the western Indian Himalayas, the southern part of the MFT (Main Frontal Thrust) is currently locked, although numerous deformed terraces suggest that elastic deformation is fully transferred toward the frontal structure. The primary rupture is primarily associated with the MFT, while secondary ruptures are expected through several active faults within the Lesser and Higher Himalayas.

While seismic activity remains prevalent throughout Nepal, significant variations are observed laterally. Extensive studies on microseismic activity have revealed that Nepal experiences intense microseismic activity, particularly in the eastern and far-western regions. A prominent characteristic of microseismicity in Nepal is the narrow seismic belt that closely follows the topographic front of the Higher Himalaya, extending from west to east across the country. This belt predominantly consists of earthquakes with magnitudes ranging from 2 to 4. The geometry and activity of this belt exhibit lateral variations, appearing relatively narrow and straight over a distance of approximately 550 km in central Nepal. In eastern Nepal the seismic belt shifts about 50 km to the north. It becomes more diffuse and intricate in the Far West

(see Figure 1). Despite Nepal's continued vulnerability to seismic activity, ongoing efforts are dedicated to mitigating risks and enhancing the nation's resilience to earthquakes and related disasters.

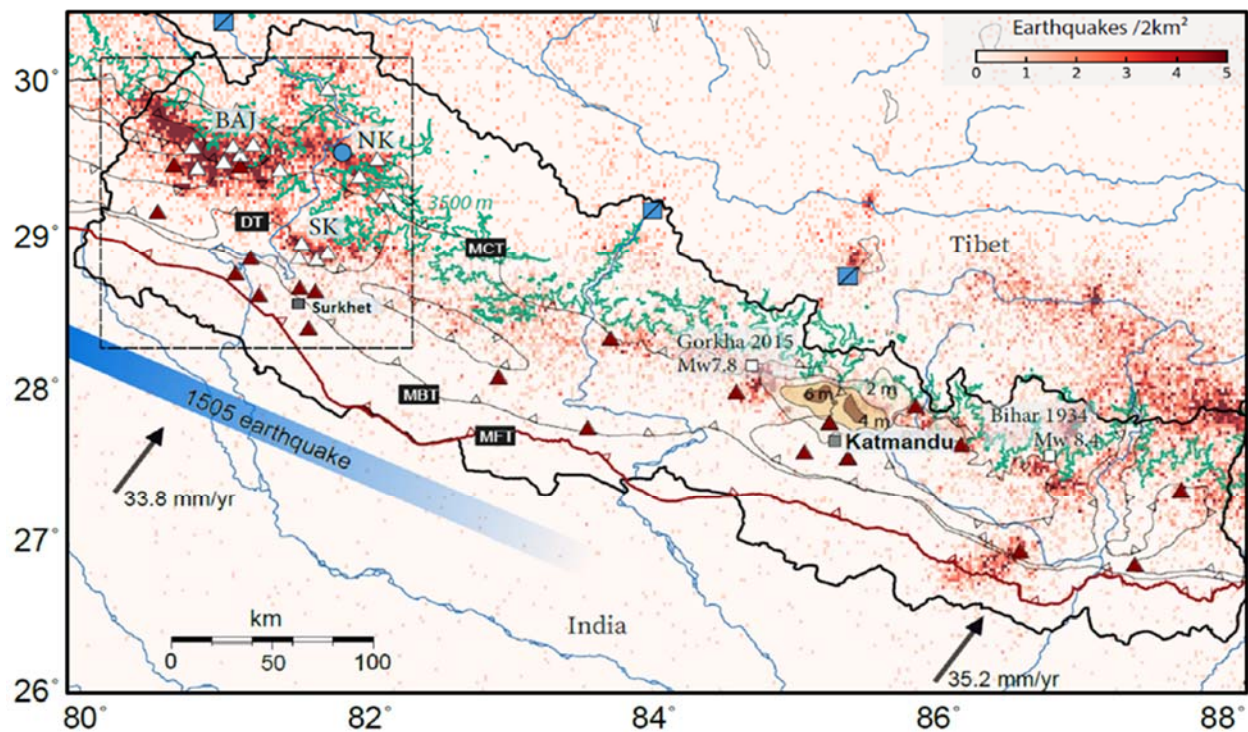


Figure 1, Density of earthquakes per 2 km² recorded by the national and regional Nepalese seismological centers from 1994 to 2014. Faults: MFT = Main Frontal Thrust, MBT = Main Boundary Thrust, MCT = Main Central Thrust, DT = Dadeldhura Klippe. NK = North Karnali, SK = South Karnali, BAJ = Bajhang (After Laporte et al., 2021).

2 The 2023 Jajarkot Earthquake

At 23:47 hours on November 3, 2023, a 6.4 ML earthquake originating from a depth of 15.7 km hit various areas in the Jajarkot and Rukum Pashchim districts of the Karnali Province in western Nepal. The epicenter was located near Ramidanda in Jajarkot district, with subsequent significant aftershocks following the initial seismic event. Strong tremors were experienced in Kathmandu and neighboring Indian cities, including New Delhi (Figure 2 and Figure 3).

The number of casualties resulting from the potent 6.4 magnitude earthquake that struck western Nepal shortly before midnight on Friday has increased to 157 as of Saturday evening. Nepal Police have reported that 170 individuals sustained injuries in the seismic activity that affected Jajarkot, Rukum Pashchim, and nearby districts in the Karnali Province. As of 5:00 PM on Saturday, 105 individuals have perished in the

Jajarkot district, which serves as the epicenter of the earthquake, with an additional 52 reported deaths in the neighboring district of Rukum Pashchim.

On November 6, 2023, an impactful aftershock measuring 5.8 on the local magnitude (ML) scale occurred around Ramidanda in the Jajarkot district at 16:31. As a result, previously damaged houses have been further compromised. The situation has become critical, particularly for the children, who are experiencing significant mental distress and fear for their safety.

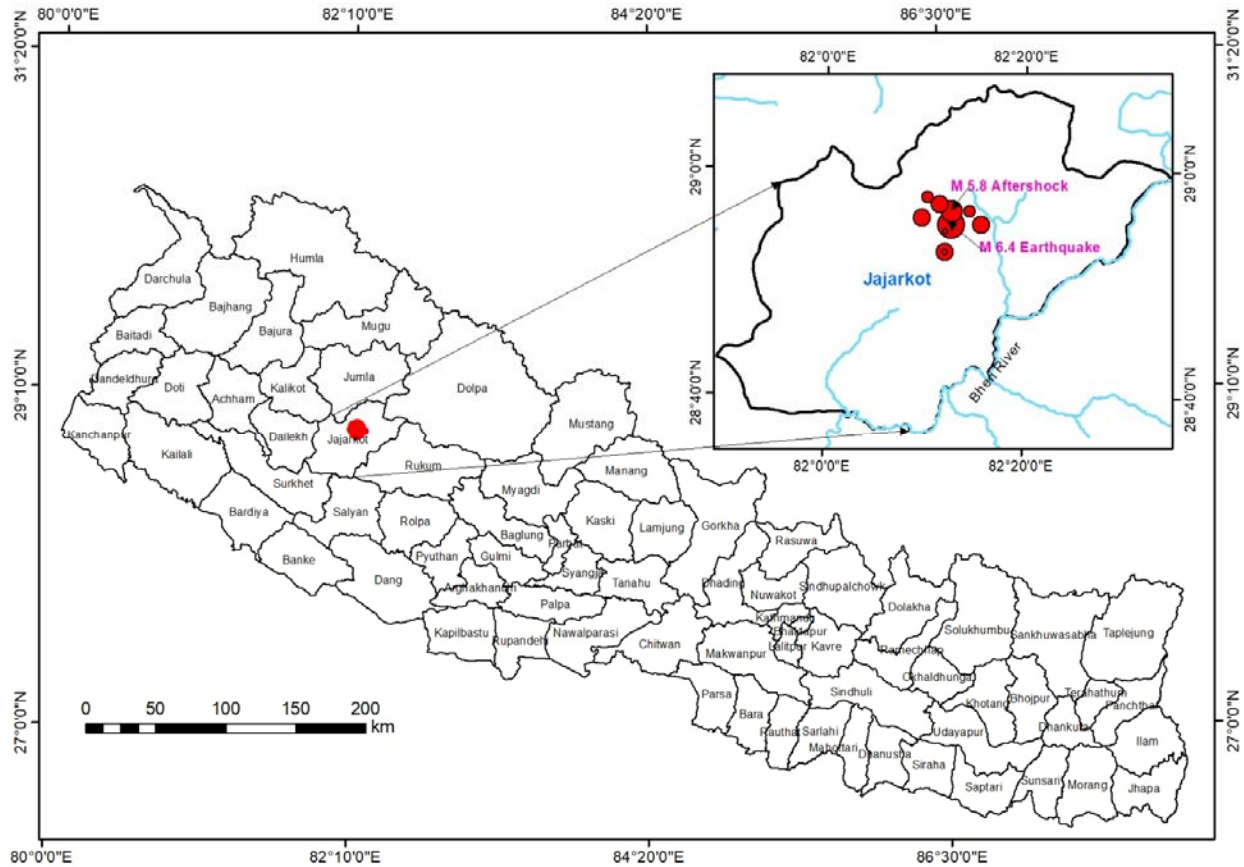


Figure 2, Main event and aftershocks in Jajarkot district. The earthquake epicenters are concentrated in 10 km area. Ruptured zone seems narrow.

In an attempt to protect themselves, some children have resorted to jumping from windows to escape the buildings, emphasizing the urgency of the situation. The impact of the earthquake is evident in the district headquarters of Jajarkot, Khalanga, where several previously cracked houses have now been completely destroyed. This scenario underscores the immediate requirement for support and assistance to aid the affected families and communities as they grapple with the aftermath of this devastating earthquake.

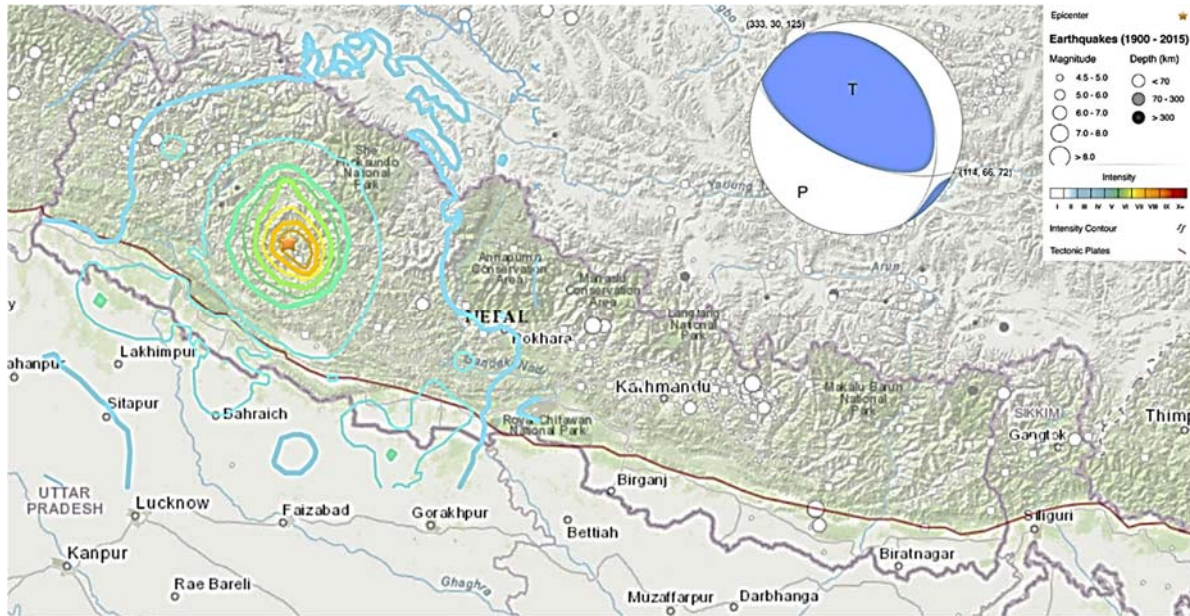


Figure 3, Intensity map and Moment Tensor of the 2023 Jajarkot Earthquake, Nepal produced by United States Geological Survey (modified after USGS, 2023).

3 Devastation and aftershocks following the 2023 Jajarkot Earthquake

Approximately 400 aftershocks have been recorded subsequent to the earthquake centered in Jajarkot recorded by 16:00 of November 7 after the main shock. Among these aftershocks, 8 were of a magnitude greater than 4. The National Earthquake Monitoring and Research Center of Nepal reported a total of 159 aftershocks until the morning of November 4, following the 6.4 magnitude earthquake that hit Jajarkot at 11:47 PM on Friday night. The powerful 6.4 magnitude earthquake and subsequent aftershocks have led to extensive damage to various residential and governmental structures in the affected areas of Jajarkot and Rukum Pashchim. Traditional residential buildings, constructed using stone and mud mortar, endured significant destruction due to the quake (Table 1). Notably, important administrative buildings like the District Administrative Office in Jajarkot were severely impacted. The effects also stretched to educational institutions and health service centers in the Jajarkot district. In total, 332 injuries are reported till the November 7 evening.

4 Reason of High Death Toll and House Damages

While the 2023 Jajarkot Earthquake might not be considered significant in terms of its magnitude and area coverage, it resulted in a high death toll in the Jajarkot and Rukum Pashchim districts. This was primarily due to the timing of the earthquake, occurring at midnight when most people were asleep, and the prevalence of old non-engineered mud and mortar buildings, as depicted in Figure 4. The extent of

the damage to these mud mortar buildings following the earthquakes is portrayed in Figure 5. Common damages to these rural buildings following the earthquake typically include structural cracks, wall collapses, roof damage, and complete collapse (Figure 6). These buildings experienced the destruction of mud and mortar walls, as well as the collapse of weak or poorly constructed roofs. Additionally, most of these non-engineered buildings were partially or completely collapsed, leading to significant structural instability and potential risks for local people.

Table 1, Loss of life and house, data obtained till November 6 evening.

District	Death	Injured	House Fully Destroyed	House Partly Destroyed
Jajarkot	105	112	2685	905
Rukum Pashchim	52	132	NA	NA
Rukum Purwa	0	0	118	5
Salyan	0	2	97	25
Rolpa	0	1	17	0
Nawalparasi Purwa	0	0	1	0
Dailekh	0	3	1	1
Dang	0	0	6	0
Baitadi	0	3	0	1
Jumla	0	3	0	0
Pyuthan	0	0	29	0
Total	157	256	2954	937

5 Rescue Operation and Health Facilities

The joint security forces, comprised of personnel from the Nepal Army, Nepal Police, and the Armed Police Force, are currently engaged in active efforts to conduct rescue and relief operations in the areas affected by the recent earthquake. In support of these missions and the distribution of relief aid, the Nepal Army has deployed five helicopters and an aircraft. Moreover, over 25 doctors from Lumbini Province have been dispatched to the affected regions in Jajarkot and Rukum Pashchim districts (Dp-Net, 2023). To facilitate these efforts, the provincial government of Lumbini has established a specialized rescue team and made arrangements for transporting critically injured patients to Lumbini Provincial Hospital if required. For swift medical assistance, ambulances are stationed at Ranjha Airport in Nepalgunj, Banke, and the Nepal Army helipad. Health facilities have confirmed ample blood supply, while the district administration office in Banke has designated Bheri Hospital as a specialized facility to cater to severely injured patients. Additionally, in Kathmandu, Bir Hospital and the National Trauma Center are fully equipped to manage emergency cases. The National Academy of Medical Sciences (NAMS) has affirmed the readiness of

emergency services, operating theaters, and intensive care units at both Bir Hospital and the National Trauma Center.



Figure 4, Rural buildings in Barekot and Nalgad municipalities of Jajarkot district (Photographs taken in June 2023)



Figure 5, Typical rural building damages after the earthquake (Photo: Manju Joshi)



*Figure 6, Typically damage pattern of mud mortar type buildings in Nalgad Municipality, Jajarkot district
(Photo: Dr. Lok Bijaya Adhikari)*

In an effort to support the ongoing search and rescue operations in the earthquake-affected districts of Jajarkot and West Rukum, the Government of Nepal has approved a financial relief package of Rs100 million. Continued endeavors are being made to locate and assist the victims of the earthquake who have either lost their lives or sustained injuries. This includes actively searching for and identifying those affected, conducting relief and rescue operations for the injured, and managing various aspects, particularly in healthcare, to provide immediate and sustained assistance.

All relevant local authorities, municipal officials, administrative staff, and other employees have been instructed to promptly report to their respective offices and fulfill their assigned duties. They have also been advised to remain present and refrain from taking any leave during this critical period.

The District Disaster Management Committee (DDMC) has implemented a unified approach, known as the one-door policy, for the systematic distribution of relief items. This approach involves the collection of relief materials by various partners at the DDMC, followed by their allocation to local entities based on their specific needs. Nepal Police and representatives from pertinent humanitarian agencies collaborate to facilitate this process. The DDMC has prioritized the rapid dispatch of relief materials to the field subsequent to the registration process, ensuring prompt distribution to those affected.

A diverse array of vital commodities and provisions, such as tents, tarpaulins, blankets, food items, and sleeping bags, have been delivered to the earthquake-stricken regions as part of these efforts.

6 Major facilities after Jajarkot Earthquake

During the recent Emergency Telecommunication Cluster (ETC) meeting, the government announced measures to facilitate free phone calls and SMS for users of Nepal Telecom in the earthquake-affected regions of Jajarkot and Rukum Pashchim. The objective is to ensure the seamless flow of information within the impacted areas by extending complimentary communication services to all customers. Additionally, a provision for distributing free SIM cards, accompanied by free call and SMS services for a period of five days, has been organized, as detailed in the official press release.

According to the Nepal Electricity Authority (NEA), electricity supply has been reinstated in all regions of Jajarkot and Rukum Pashchim, except in areas where buildings have collapsed due to the earthquake. The disruption of power supply was a result of damage to poles and transmission lines. Rescue efforts are ongoing in locations where structures have been affected, and the power supply has been deliberately disconnected to prevent further incidents in these areas prone to accidents. While the power supply has been suspended in more severely damaged zones, other areas continue to have normal electricity supply.

7 Women and Children in Post-Earthquake Scenarios

Following the earthquake, various issues linked to gender disparities have been identified. Women and children encounter numerous obstacles in obtaining essential services and ensuring their safety. These challenges encompass insufficient toilet facilities, inadequate transportation infrastructure, limited shelter options, and restricted access to sanitary amenities. Women face particular struggles in maintaining personal hygiene, especially during menstruation, and confront privacy concerns during daily activities. Additionally, the shortage of tents forces women to share cramped living spaces with men, leading to safety and protection risks.

8 School and Road Damages after the Earthquake

The earthquake had an impact on a total of 213 school buildings. Among these, 91 schools were completely destroyed, while 122 schools suffered partial damage (Dp-Net, 2023). Additionally, the Jajarkot Earthquake caused a rupture in many area of the Chinchu-Jajarkot Road (Figure 7). A few landslides were also triggered after the earthquake and blocked the road for two days (Figure 8).

9 Free bus service from Kathmandu to Earthquake-affected Districts

The government has implemented a program to provide complimentary bus services, enabling the transportation of family members to the earthquake-stricken regions of Jajarkot and Rukum (West) from Kathmandu. Specifically, a free bus service has been established from the new bus park at Gongbu, Kathmandu, catering to the family members of those affected by the earthquake, allowing them to return home promptly. This service will be operational from this evening until November 5 (Sunday). Individuals intending to utilize this complimentary bus service are encouraged to adhere to the guidelines specified in the government's official notice.

10 Market Functioning after Earthquake

Most of the shops and markets are currently closed due to the earthquake's impact and the fact that it is a Saturday. The earthquake has had a significant impact on the core market area, leading to its closure. While food items are still available in people's homes and the local market, there is a shortage of non-food items such as tarpaulin in the market. As a result, there is an immediate need for external relief and support in the form of non-food items such as tarpaulin sheets.

11 Bibliography:

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Figure 7, Typical cracks on road after the earthquake (source of top photo: RSS, Nepal and bottom photo: Dr. Lok Bijaya Adhikari)



Figure 8, Landslide triggered by Jajarkot Earthquake, Nalgad Municipality

(Photo: Dr. Lok Bijaya Adhikari)