

Avalanche

Avalanche events in South Asia during 2007

Snow avalanches are the rapid downslope movement of snow, ice, and associated debris such as rocks and earth material. The forces generated by moderate or large avalanches can damage or destroy most man-made structures. The debris from even small avalanches is enough to block a highway or railroad. Therefore, avalanches are one of the biggest hazards in the mountainous terrain for both life and property. Many factors contribute to the development and movement of avalanches. *Point-release avalanches* occur when the weight of the snowpack exceeds the shear strength within it, and are very common on steeper terrain. In fresh, loose snow, the release is usually at a point and the avalanche then gradually widens down the slope as more and more snow is entrained, usually forming a teardrop appearance. This is in contrast to a *slab avalanche* that occurs when a large slab of snow breaks free from the layers beneath and starts moving downward at relatively high velocity. It is deadly and accounts for around 90% of avalanche-related fatalities. The third type is a *slush avalanche* that occurs when the snowpack becomes saturated by water. These tend to start and spread out from a point. As avalanches move down the slope, they may entrain snow from the snowpack and grow in size. The snow may also mix with the air and form a powdery cloud.

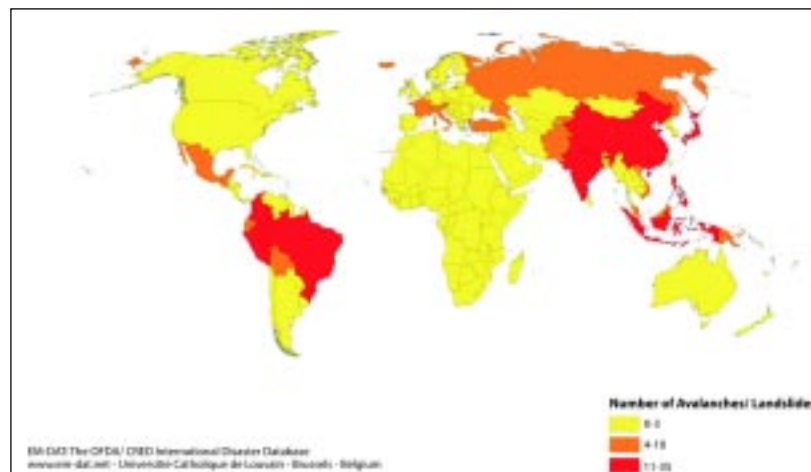


Figure 6.1: Country-wise number of occurrences of avalanche/landslide disasters between 1974 and 2003.

In the SAARC region, out of eight countries five face the menace of avalanches. These countries include Afghanistan, Pakistan, India, Nepal and Bhutan. Loss of life and property is common in the higher snow clad areas of these countries. Figure 6.1 shows that this part of the globe has one of the highest incidences of avalanche and landslides. Some of the prominent avalanche events, which occurred in the SAARC region during 2007 are described below.

Avalanche incidences in Afghanistan during 2007

On 19 March twelve people, including women and children, were killed in the avalanche in the central province of Ghor. Avalanche and floods were triggered by heavy rain and several villages were inundated on 17 March 2008. An aircraft was deployed to evacuate about 1,000 people. Snow avalanches associated with heavy precipitation damaged several mud houses in the rugged and remote province of Afghanistan.

According to the Afghanistan National Disaster Management Authority (ANDMA), thirteen people were killed by an avalanche in northeastern Afghanistan on 11 December. The total likely number of deaths could be 16. Four people were injured and 15 were rescued alive on 11 December.¹



Figure 6.2: Avalanche-affected provinces of Afghanistan

Avalanche incidences in Pakistan during 2007

About 60 people were killed in Chitral, Pakistan, during April 1-9 2007. The avalanches swept down mountains in the Chitral region of the Hindukush Mountains, 280 km north of Islamabad, after heavy snow was followed by rain. Chitral was in the grip of severe cold because of unprecedented snowfall and most areas were covered under a layer of more than 10 feet of snow. More than 60 people were killed and 15 were injured. A large number of cattle head perished due to severe cold and shortage of fodder. As many as 40 people were buried alive under the snow when an avalanche struck Washich village. Fifteen people were injured in the incident. Bodies were dug out by rescue teams of army, police, civil society organisations and local people. The avalanche also hit the remote village of Birgon. Three people were killed in Shah Salim village. The village is situated near the Badakhshan province of Afghanistan. People were also killed in the Terich valley of upper Chitral and the Arkari valley. A large number of people were reported to be dead in the Yarkhoon Lusht and Baroghil areas as the upper parts of the district remained covered under 12 feet of snow. Baroghil borders Afghanistan in the north and is situated at a distance of 250 km from the Chitral city. Avalanches constantly hit the area, making it very difficult to reach the area on foot. The Shah Salim village was also threatened by more avalanches; four people died when 25 houses were hit by an avalanche.



Figure 6.3: Heavy snowfall disrupts life in northern Pakistan
(Source: IRIN News¹)

Five bodies, four of them of a single family, were retrieved from the rubble of their houses in the Arkari valley and Washich village. Arkari valley's Sufraid village was hit by an avalanche, flattening a house to the ground. After hectic efforts, rescuers retrieved four bodies from the rubble of the house. The rescue work could not be initiated properly due to the continuing snowfall, and the injured could not be shifted to hospitals due to the closure of roads by landslides and avalanches at various places. Snow had blocked mountain roads, hampered rescue and relief efforts, and rescuers had to use helicopters to take food and other supplies to the affected areas. The relief operations were carried by helicopters of the Pakistan Army and the Aga Khan Foundation, who airdropped tents, blankets and essential commodities for the marooned people (Source: *DAWN*²).

Avalanche incidences in India during 2007

On February 18 a Junior Commissioned Officer (JCO) of the Indian Army along with three colleagues died in an avalanche. The JCO had gone missing along with three others after a heavy snowfall. They were on a routine patrol on the China border in Sikkim at more than 4,000 m above sea level. After a thorough search, all of them were declared missing on February 19 and were declared dead after the recovery of the bodies. On 25 September 2007 an Indian Army Colonel died in an avalanche in the Sonmarg area 100 km from Srinagar (Source: *The Tribune*). Additionally, at two places avalanche-related hazards have been reported by Snow and Avalanche Study Establishment (SASE), Chandigarh, India.

Table 6.1: Avalanche Accidents' Summary in J&K (2007)

Sl. No.	Date (Time)	Area	Place	Dead	Survivors
1.	06-02-2007 (1330 hrs)	Gulmarg Sector	Apharwat	01	-
2.	20-3-07 (0930 hrs)	Chowkibal Tangdhar Axis	Near Sadhna Pass	01	-

Source: SASE.

During the second week of December 2007, Kashmir Valley, India, remained cut off from rest of the country due to heavy snowfall in the higher reaches affecting the Srinagar-Jammu National Highway. This is a 300-km-long national highway, which is the only surface link between Kashmir and rest of the country. The snowfall occurred mostly around the Banihal tunnel, which is one of the highest points on the highway. The meteorological office informed that there was heavy snowfall equivalent to 53.8 mm of rainfall recorded at Banihal. Due to blockade of the highway the supply of essential commodities, particularly cooking gas and kerosene, got affected, creating hardships for the local inhabitants of the valley .

In India, SASE has developed an avalanche-forecasting technique using near real-time remote-sensing data and field-based observation from 48 observatories and 45 Automatic Weather Stations. It uses the MM5 weather-forecasting model, which provides information on the volume of snow, altitude, and catchment areas, based on which the forecast is made. Further attempts are underway to deploy Doppler Weather Radars with advanced polarimetric capability in the Himalayan region to monitor critical climate parameters including snowfall, which will help in improved weather forecasts for high altitude operations. The data from DWRs can be useful for the study of monsoon dynamics, avalanche prediction, detection of clear air turbulence and tracking of cloud burst, hailstorm, landslides and other severe weather events.

Basic Precautionary Measures for Safety from Avalanches

Avalanche safety is a continuous process, including route selection and examination of the snowpack, weather conditions, and human factors. Several well-known good habits can minimize the risk.

- (a) Avalanche risk reports issued by local authorities should be considered and all warnings should be taken very seriously.
- (b) The existing tracks should not be followed without proper evaluations; snow conditions are very dynamic and weather dependent.
- (c) Terrain may be thoroughly examined and obvious avalanche paths may also be noted where vegetation is missing or damaged, and presence of cornices or ice formations.
- (d) Traveling may be avoided at lower elevations due to possible movement in higher elevation resulting in avalanches.

Prevention

There are several ways to prevent avalanches and lessen their power and destruction. These are employed in areas where avalanches pose a significant threat to people, such as ski resorts and mountain towns, roads and railways.

- (i) Explosives are used extensively to prevent avalanches, especially at ski resorts where other methods are often impractical. Explosive charges are used to trigger small avalanches before enough snow can build up to cause a large avalanche.
- (ii) Snow fences and light walls can be used to direct the placement of snow. Snow builds up around the fence, especially the side that faces the prevailing winds. Downwind of the fence, snow buildup is lessened, thereby reducing the probability of development of an avalanche.
- (iii) When there is a sufficient density of trees, they can greatly reduce the strength of avalanches. They hold snow in place and when there is an avalanche, the impact of the snow against the trees slows down the velocity and impact. Trees can either be planted or they can be conserved to reduce the strength of avalanches.
- (iv) Artificial barriers can be very effective in reducing avalanche damage. One kind of barrier (snow net) uses a net strung between poles that are anchored by guy wires in addition to their foundations. These barriers are similar to those used for rockslides. Another type of barrier is a rigid fence-like structure (snow fence) and may be constructed of steel, wood or pre-stressed concrete. They usually have gaps between the beams and are built perpendicular to the slope, with reinforcing beams on the downhill side. Finally, there are barriers that stop or deflect avalanches with their weight and strength. These barriers are made out of concrete, rocks or earth. They are usually placed right above the structure, road or railway that they are trying to protect, although they can also be used to channel avalanches into other barriers. Also, earth mounds are placed in the avalanche's path to slow it down. This is one of the low-cost methodologies that has been practised in many places in Uttarakhand, India.

References

1. www.irinnews.org
2. www.dawn.com