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GOVERNMENT OF INDIA
MINISTRY OF HOME AFFAIRS

LOK SABHA
STARRED QUESTION NO. *342

TO BE ANSWERED ON THE 25TH MARCH, 2025/ CHAITRA 4, 1947 (SAKA)

IMPACT OF AVALANCHES

†*342. SHRI TRIVENDRA SINGH RAWAT:

Will the Minister of HOME AFFAIRS be pleased to state:

(a) whether the Government is aware of the impact of frequent avalanches in the Himalayan regions;

(b) whether the Government proposes to implement any new policy to promote the use of modern technologies such as advanced drones and helicopters for rescue operations; and

(c) whether the Government is taking any special steps to strengthen the early warning system for natural disasters like avalanches?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF HOME AFFAIRS
(SHRI NITYANAND RAI)

(a) to (c): A statement is laid on the table of the House.

L.S.S.Q.NO. *342 FOR 25.03.2025

STATEMENT IN REPLY TO PARTS (a) TO (c) OF THE STARRED QUESTION NO. *342 FOR ANSWER IN LOK SABHA ON 25.03.2025

(a) to (c): The Government is aware of the hazard of avalanches in the Himalayan regions, which poses significant risks to human lives and property. Avalanches are a recurring natural phenomenon/disaster in high-altitude areas such as Jammu & Kashmir, Himachal Pradesh, Uttarakhand, and Arunachal Pradesh.

The Government effectively deploys technologies for improved early warning and forecasting of Avalanches in the hazardous zones. Defence Research and Development Organization (DRDO) is a national level agency for avalanche forecasting and is involved in the daily Operational Avalanche Forecasting for Defence users. Defence Geoinformatics Research Establishment (DGRE), Chandigarh under DRDO is also the nodal agency for studying and developing avalanche mitigation technologies. The methodologies include aerial reconnaissance/ ground surveys, which are further used as an input to prepare avalanche hazard maps. Regular operational avalanche warning is issued by DGRE to the Army and civilian population in the snow bound regions of north-west Himalayas. Additionally, the Indian Meteorological Department (IMD) supplies six-hourly weather updates to enhance situational awareness.

Automated weather stations and Doppler radars have been installed in vulnerable regions to improve forecasting capabilities.

DGRE has installed 72 Snow Meteorological Observatories. Further, 45 Automated Weather Stations (AWS) are operational, 100 (AWS) are under testing and 203 (AWS) are under installation. The data is regularly received from snow observatories at 3 hour intervals and at 1 hour interval from AWS at DGRE. This output and the expert opinion is used to draw avalanche forecast for different areas at least 24 hour in advance. DGRE has also developed its own Avalanche map indicating locations of potential avalanche sites located all over the Himalayas and is being used by Troops for their safe mobility in snow bound area. Engineering solutions are also being provided as per the user's requirements.

DGRE has developed following technologies for accurate avalanche predictions to safeguard lives in snow bound regions of Himalaya:

i. **AI and ML (Artificial intelligence and Machine Learning) based avalanche forecast.**
ii. **Increased Automatic Weather Station (AWS) network and surface observatories for snow bound areas.**
iii. **Avalanche Engineering Control structures.**

iv. Avalanche Early Warning Radars.

v. Common Alert Protocol (CAP) compliant online APP for avalanche warning dissemination.

vi. Forecast dissemination using satellite based communication for last mile.

vii. Multi scale material properties simulation.

viii. Process based 3D – Snowpack Modelling for stability of slope.

ix. Light weight rigid structure for avalanche defence.

x. InSAR based landslide warning technology.

As informed by DGRE, in a first in India, Avalanche monitoring radar has been installed in North Sikkim. The system can detect avalanches within three seconds of trigger.

National Centre for Medium Range Weather Forecasting (NCMRWF), under the Ministry of Earth Science (MoES) provides the high resolution weather forecasts from their global, regional and ensemble prediction systems to DGRE on daily basis. DGRE uses NCMRWF model output to drive their mountain weather model and Avalanche forecast model. In addition during the winter season, NCMRWF shares the coupled model's snow forecasts with DGRE. These snow and total precipitation forecasts are very useful for possible Avalanche forecasting at DGRE's end.

National Disaster Management Authority (NDMA) has released guidelines on Management of Landslides & Snow Avalanches in June 2009 to advise states on its response, preparedness and mitigation strategies. These guidelines have measures to reduce the impact of snow avalanches and early warning.

Common Alerting Protocol (CAP) based Integrated Alert System' has been initiated with an outlay of Rs. 454.65 Crore, for dissemination of geo targeted early warnings/alerts related to disasters to the citizens of India for all 36 States/UTs using various disseminating medium like SMS, Costal Sirens, Cell broadcast, Internet (RSS feed & Browser Notification), Satellite Receiver of GAGAN & NavIC etc., through integration of all alerting agencies, [IMD, Central Water Commission (CWC), Indian National Centre for Ocean Information Services (INCOIS), DGRE, Geological Survey of India (GSI) and Forest Survey of India (FSI)].

Besides early warning and preparedness, the Government deploy advanced technologies for rescue operations in avalanche-affected areas. These technologies such as Drone-Based Intelligent Buried Object Detection System and timely deployment of Helicopters enable rapid

response and efficient evacuation during emergencies. Similarly, the establishment of Disaster Management Control Rooms at the state and district levels ensures round-the-clock monitoring and coordination during rescue operations during Avalanche.

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