

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
STARRED QUESTION NO. *158
TO BE ANSWERED ON WEDNESDAY, 27TH JULY, 2022**

ACCURATE WEATHER FORECAST

***158. SHRI PRATAPRAO JADHAV:
SHRI SUDHEER GUPTA:**

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether a cloud burst and flash flood near holy Amarnath Cave in Jammu and Kashmir has resulted in loss of many lives and several people are still missing and if so, the details thereof;
- (b) whether it is true that Indian Meteorological Department (IMD) failed to forecast the precise weather conditions near the Holy Amarnath Cave, Jammu and Kashmir and if so, the facts thereof;
- (c) whether the IMD possesses Doplar Radar which are used in high altitudes for precise weather forecasting and if so, the details thereof;
- (d) if not, whether the Government proposes to purchase more such Radars for precise weather forecast in high altitude areas; and
- (e) the steps taken by the IMD/Government to forecast correct weather conditions and stop such catastrophes in the future?

ANSWER
THE MINISTER OF STATE (INDEPENDENT CHARGE) FOR
MINISTRY OF SCIENCE AND TECHNOLOGY
AND EARTH SCIENCES
(DR. JITENDRA SINGH)

(a)to (e): A Statement is laid on the Table of the House.

STATEMENT LAID ON THE TABLE OF THE LOK SABHA IN REPLY TO (a) to (e) of
STARRED QUESTION NO. *158 REGARDING "ACCURATE WEATHER FORECAST" TO BE
ANSWERED ON WEDNESDAY, JULY 27, 2022

- (a) During 1730 and 1830 hrs of IST on 8th July, there had been an intense spell of rain/shower at/near the Holy Cave which was highly localized. Rainfall recorded by IMD's Automatic Weather Station (AWS) located 50 meter below the Holy Cave had been 25 mm within one hour. It was a short, intense and sudden shower over the area. However, it does not satisfy the criteria for cloud burst. The cloud burst events are considered when the rainfall occurs at the rate of 10 cm/ hour or more over a geographical area of approximately 20-30 square km. But there could have been higher rainfall satisfying this criteria of cloud burst in the upper reaches for which data are not available. The combination of both the in situ weather and flow from the upper reaches could have been resulted in the flash flood near Holy Amarnath Cave. Centralized data on the loss of lives and missing people are not available with this ministry.
- (b) No Sir. The Yatra which was to be commenced from 0330 hrs IST of 8th July was not released based on the forecast of rainfall activity given by India Meteorological Department (IMD) and the rainfall was experienced. After the rain stopped, the Yatra manager released Yatra at 0500 hrs IST as per the advice from IMD. The Yatra went well throughout the day as the weather had been fair, till the occurrence of the one hour intense rainfall spell as mentioned above. However, occurrence of rainfall over the area during the period of incidence was predicted by IMD with lower intensity. The occurrence of the cloud burst is not predictable worldwide.
- (c)-(d) Yes Sir. IMD have Doppler Weather Radars (DWR) installed in high altitudes like that in Srinagar (Jammu & Kashmir), Jammu (J&K), Leh (Ladakh) Kufri (Himachal Pradesh), Mukteshwar (Uttarakhand) and Surkhanda Devi (Uttarakhand). Another DWR is being installed at Banihal top (J & K) which will become operational shortly.
- In addition to these, action is in progress to install radars at Murari Devi (Himachal Pradesh), Jot (Himachal Pradesh) and Lansdowne (Uttarakhand). These Doppler Weather Radars in high altitudes help in precise weather forecasting in nowcasting range (upto one or two hours).
- (e) IMD follows a seamless forecasting strategy. The short to medium range forecast and warning at district and station level are issued by state level Meteorological Centres (MCs)/Regional Meteorological Centres (RMCs) with a validity of next five days and are updated twice a day. The short to medium range forecast is followed by very short range forecast of severe weather up to three hours (nowcast) for all the districts and 1089 cities and towns. These nowcasts are updated every three hours.

While issuing the warning suitable colour code is used to bring out the impact of the severe weather expected and to signal the Disaster Management about the course of action to be taken with respect to impending disastrous weather event. Green color corresponds to no warning hence no action is needed, yellow color corresponds to be watchful and get updated information, orange color to be alert and be prepared to take action whereas red color signals to take action.

Intense rainfall activity is one of the reason for landslides, flash floods etc. For addressing such impacts due to extreme weather events, IMD is implementing Impact Based Forecast (IBF) which give details of what the weather will do rather than what the weather will be. It contains the details of impacts expected from the severe weather elements and guidelines to general public about do's and don'ts while getting exposed to severe weather. These guidelines are finalised in collaboration with National Disaster Management Authority (NDMA) and is already implemented successfully for cyclone, heat wave, thunderstorm and heavy rainfall. Work is in progress to implement the same for other severe weather elements.

In order to cater the services of hydro-meteorological events occurring in short duration of time, IMD is issuing Flash Flood Guidance (FFG) by which a diagnostic value within a watershed required to produce flooding at the outlet of the catchment is estimated, to support the flood warning services. Flash Flood Guidance System had been operationalized with effect from October 2020 and accordingly daily guidance bulletin is generated and disseminated to the users including Central Water Commission (CWC) in every six hours on routine basis. Also IMD provides actual rainfall information in different spatial and temporal scale like districts, States & meteorological subdivisions level and daily, weekly & seasonal scale to support flood monitoring.

The existing observational network and on going forecasting facilities for mountain region under the Integrated Himalayan Meteorology Programme (IHMP) are given in **Annexure-I**.

The services extended by IMD specifically for Shri Amarnathji Yatra are given in **Annexure-II**.

Current Status of Meteorological Services for Himalayan Region

1. Observational Network

A total number of 158 AWSs and 243 number of ARG are working in Himalayan region. These are in addition to the Departmental Surface observatories and Part time observatories functioning over the region.

2. Radar Network

The details of DWRs working in Himalayan region is given below.

DOPPLER WEATHER RADARs in Himalayan Region		
S.No	State/UT	Location of RADAR
1	Jammu & Kashmir	Jammu
2	Jammu & Kashmir	Leh
3	Jammu & Kashmir	Srinagar
4	Himachal Pradesh	Kufri
5	Uttarakhand	Mukteshwar
6	Assam	Mohanbari
7	Meghalaya	Sohra
8	Tripura	Agartala

3. Forecasting Services

- a) Mountain Weather bulletins are issued two times a day for Western Himalayan Region comprising of the divisions of Jammu, Kashmir, Ladakh, Himachal Pradesh (High hills and Lower hills), Uttarakhand (Garhwal and Kumaon region).
- b) District level forecast for the subdivisions along the foothills of the Himalayas for five days with outlook for another two days are issued on daily basis by concerned Meteorological Centers.
- c) District level/location specific Nowcast for the region are also issued as and when required by the concerned Meteorological Centers.
- d) Current weather observation and forecast for seven days for important cities along the foothills issued daily.
- e) Highway forecast issued and updated daily.
- f) Forecast for Pilgrimage during concerned period.
- g) Special press releases on expected severe weather in Himalayas, as and when required.
- h) Issue Mountain expedition forecast (with 6 hours forecast of precipitation, temperature, wind speed & direction)for the various peaks of Himalayas (Mount Everest, MAKALU, TRISHUL, SATOPANTH and many more) for its users like, Indian ARMY, ITBP, Indian NAVY, CISF, SSB, ONGC, BSF etc. It is highly appreciated by its users due to its usefulness.

- i) In addition to these, historical information about rainfall, temperatures, Western Disturbances etc.; detailed meteorological analysis of extreme precipitation events over Himalayas in winter as well as in monsoon season and their documentation.
- j) Bulletins related to Forecast Demonstration Project on winter weather systems containing meteorological analysis of all weather systems & associated weather like, Cold wave, FOG, FROST etc. and expected weather over the region during next 9-10 days are specially done during 1st December to 28th / 29th February, from 2016

The forecast and warnings are disseminated through:

- National IMD website (<https://mausam.imd.gov.in>) and regional IMD websites.
- Social Media: Facebook & Twitter handles of IMD and NDMA and WhatsApp Groups.
- Electronic and Print media.
- Multi-media messages are generated for dissemination to general public for awareness and mitigation measures.

4. Hydromet Services

Hydromet Services for Himalayan Region

IMD has a specialized Hydromet Division for Rainfall Monitoring and other related activities providing critical support in the field of Agriculture, Water Resources Management, Disaster management etc. A collaborative approach with other organizations in the operational and research aspects of Flood and Flash Flood Forecasting has led to a well established support framework for the stake holders both at the National and sub-regional Level

A. Rainfall Monitoring :

A total of more than 5211 dedicated stations of WMO standards including that of Himalayan region are there under rainfall monitoring network. The station wise rainfall data from all the Departmental and part time observatories, rain-gauge stations of States and various Central agencies are received, processed and compiled for generating rainfall statistics at different temporal and spatial domains as per the categories given in the table below:.

Categorization of Subdivision-wise /Country-wise Rainfall		
CATEGORY	% DEPARTURES OF RAINFALL	Colour Code
Large Excess (LE or L. Excess)	≥ 60%	
Excess (E)	≥ 20% and ≤ 59%	
Normal (N)	≥ - 19% and ≤ + 19%	
Deficient (D)	≥ - 59% and ≤ - 20%	
Large Deficient (L. Deficient)	≥ - 99% and ≤ - 60%	
No Rain (NR)	= - 100%	
No Data (*)	Data Not Available	

Rainfall statistics are generated for the spatial domains like Country as a whole, States & UTs (37), Meteorological Subdivisions (36), Districts (690), River sub basins and four broad homogenous regions of India viz. North-West India, Central India, South Peninsula and North East India and for Temporal domains viz. Daily, Weekly, Monthly, Seasonal and Annual.

B Flood Meteorological Services of IMD for Riverine Flood

India Meteorological Department has established 14 specialised Flood Meteorological Offices (FMOs) in the flood prone areas equipped with the capabilities to provide hydro meteorological support for total 153 river sub-basins to Flood Forecasting Divisions (FFDs) of Central Water Commission (CWC) to help them issuing “Riverine Flood warnings/Flood alerts”. Out of these Six(6) FMOs namely, Lucknow, New Delhi, Patna, Srinagar, Jalpaiguri and Guwahati provide this support for 58 river sub basins under the Himalayan region. As per requirement of CWC, IMD is providing sub-basin-wise ‘Quantitative Precipitation Forecast (QPF) through Hydromet Bulletins for the following QPF categories.




QPF categories (mm)	Colour Code
0	
0.1-10	
11-25	
26-50	
51-100	
>100	

QPF forecast is generated 3-7 days in advance by using high resolution dynamical model viz. WRF ARW for day-1 to day-3, GFS for day-1 to day-7, NCUM for day-1 to day-7. In addition to the deterministic forecast, IMD also generates probabilistic QPF based on one of the best ensemble forecasting systems with the resolution of 12x12 Kms. IMD also provides grid point model rainfall forecast to Central Water Commission for running their hydrological models for flood forecasting.

C South Asia Flash Flood Guidance System

India Meteorological Department has highly advanced capabilities with respect to computing power, Numerical Weather Prediction, vast observational network (ground, air and space based), and an internationally acclaimed Weather Forecasting System. Therefore, WMO has entrusted India with the responsibility of Regional Centre of South Asia Flash Flood Guidance System for coordination, development and its implementation.

Guidance for flash floods in the form of Threats (6 hours in advance) and Risks (24 hours in advance) is provided by Regional Centre to National Meteorological & Hydrological Services, National and State Disaster Management Authorities and all other stake holders for taking necessary mitigation measures to reduce the loss of life and property in the Himalayan Region countries and Sri-Lanka. This enables all the member countries for issuing impact-based flash flood forecasting at watershed and also city level as per the following color codes.

Low Probability	<30% probability of flash flood occurrence	
Moderate Probability	30 - 60% probability of flash flood occurrence	
High Probability	> 60% probability of flash flood occurrence	

This service was implemented on test basis in Monsoon 2020 and the example of the bulletins generated is given in **Annexure-IX**. After seeing its satisfactory performance, the South Asia Flash Flood Guidance System (SAFFGS) was launched in October 2020.

5. Establishment of New Meteorological Center

A new Meteorological Centre (M.C.) has been established at Leh, the capital city of Ladakh to provide weather services for the administration and the people of Ladakh and it has been inaugurated on 29th December 2020.

The activities of MC. Leh are,

- The location specific forecast.
- District level forecast and warning for all the districts of Ladakh, UT.
- The nowcast (very short range forecast) for Gilgit, Skardu, Chilas, Kharmang, Khaplu, Hunza, Muzaffarabad, Shigar, Ghizer (Ghakuch), Astore, Nagar, Mirpur, Kotli, Hattian(Jhelum Valley), Bagh, Bhimbar&Nilam, Leh, Kargil etc.

WEATHER SERVICES FOR AMARNATH YATRA 2022
PREPAREDNESS OF IMD

Preparation & Services being rendered by IMD for safe & smooth conduct of annual Sh. Amarnath Yatra with respect to meteorological observation, prediction and warning services are given below:

OBSERVATIONS: (Surface observatory/ AWS vs Manual)

- (i) Fifteen Automatic weather stations (AWS) & Surface Observatories enroute Yatra (from Jammu- Holy Cave) at Jammu, Udampur(AWS), Kishtawar (AWS), Batote (Manual), Ramban (AWS), Banihal (Manual), Anantnag/ Qazigund(Manual), Kokernag (Manual), Phalgam(Manual), Chandanwari, Sheshnag, Panjtarni, Srinagar, Shalimar & Baltal (AWS).
- (ii) AWS at Holy Cave, Baltal, Panjtarni, Chandanwari and Sheshnag will be revived well before the Yatra commences whereas other AWSs are permanently established.

Satellite Observation

- (i) Every 15 minutes satellite Images and products showing clouds along all Yatra routes are uploaded in the specially designed web page for Amarnath Yatra by IMD.

Radar Based:Observation

- (i) In addition to the DWR at Srinagar having range of 100 km, a state of the Art X-Band Doppler Weather Radar covering Radial Range of 100 Kms is installed and made operational in Jammu since Sept 2021. These radars cover the whole valley and plains of Jammu baring those areas behind high mountains (like Sheshnag, Sonmarg, Panjtarni & Holy Cave). This is helpful in issuing nowcast (very short range forecast upto 3 hrs for the area
- (ii) Radar products are made available on Yatra Webpage in IMD Websites.

Forecast:

- (i) Route wise location specific short-range forecast in the form of Meteogram are made available in the IMD website.
- (ii) Utilising AWS and other surface observations, Radar & Satellite data and models, the Nowcast are issued every 3 hourly basis..
- (iii) Forecasts with validity period of 24 Hrs. are issued in the morning around 3.30AM (before Yatra) and evening at 5 PM daily.
- (iv) **Medium Range:** A 5-day forecast also are issued daily to have a general idea of the weather over the route for preparedness and planning.
- (v) **Warnings:** In anticipation of a Severe Weather, like heavy Rain/Wind etc, the warning is issued in nowcast and short to medium range scale.

Forecast and Warning Dissemination:

- (i) IMD has installed three (03) LED (6 feet x 3 feet) Weather Display Boards, one each at Nunwan & Baltal and another one at the Holy Cave for display of observation, forecast and warning.

- (ii) 3 hourly Weather forecast by SMS /(Whatsapp Group Meant for A-Yatra) to all yatra Managers (Approx. 250 persons). Every year SASB provides the list of officials to whom forecasts is issued like (CEO SASB, Divisional Commissioner Kashmir/Jammu, All Camp Directors, Police, CRPF, Army, Media, etc.).
- (iii) Meteorological Centre (MC), Srinagar disseminates daily forecast via E-mail, SMS, Yatra Whatsapp Group, Telephone and in the event of inclement weather, forecast is sent by FAX and also personal communication with CEO, Addl. CEO, DCs& Camp Directors by phone as well. Social media is also used for information dissemination.
- (iv) Like previous years, MC Srinagar sends Radar & Satellite based Nowcast (3hourly) through SMS /(Whatsapp Group Meant for A-Yatra) to all yatra managers throughout the Yatra period daily. In the event of potential hazardous weather condition, MC Srinagar issues Weather Warning to yatra managers.

DEDICATED WEB PAGE:

- (i) The dedicated Web page link for the Yatra is made operational in IMD website (<https://mausam.imd.gov.in>) and RMC New Delhi website (<https://mausam.imd.gov.in/newdelhi/>) prior to the commencement of the yatra.
