GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
RAJYA SABHA
UNSTARRED QUESTION NO. 3242
ANSWERED ON 21/08/2025

INITIATIVES TO STRENGTHEN CLIMATE FORECASTING

3242. SHRI G.C. CHANDRASHEKHAR:

Will the Minister of **EARTH SCIENCES** be pleased to state:

(a) whether farmers are being provided timely alerts and advisories related to climate variability and extreme weather events;
(b) whether Government is conducting any study or research to predict climate change trends in advance;
(c) if so, the details of such studies and their findings;
(d) if not, the reasons therefor; and
(e) the steps taken to strengthen long-term climate forecasting and agro-meteorological advisory systems to help farmers adapt to changing climatic conditions?

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

(a) Yes. India Meteorological Department (IMD) runs a scheme, viz. Gramin Krishi Mausam Sewa (GKMS) to render weather forecast-based operational Agrometeorological Advisory Services (AAS) involving several leading organizations such as Indian Council of Agricultural Research (ICAR), State Agriculture Universities (SAUs), Indian Institute of Technology (IIT), State agriculture departments, NGOs, etc., for the benefit of the farming community. This scheme assists farmers in making informed decisions regarding their day-to-day agricultural operations to minimize crop damage and losses due to unusual weather and take advantage of favorable weather and climatic conditions.

Under GKMS, 130 Agromet Field Units (AMFUs) covering 127 agroclimatic zones located at various SAUs, IITs, institutes of ICAR, etc., are operational across the country. IMD provides medium-range weather forecasts for rainfall, temperature, relative humidity, cloud cover, wind speed and direction at district and block levels for the next five days, along with the subsequent week's rainfall and temperature outlook at the meteorological sub-division level. Based on observed and forecasted weather, AMFUs prepare biweekly Agromet Advisories (every Tuesday and Friday) for their respective districts to help the farming community make appropriate decisions on farm operations.

Along with the biweekly bulletins, daily weather forecast and nowcast information are also issued by the Regional Meteorological Centers (RMCs) and Meteorological Centers (MCs) of IMD. Impact-based forecasts (IBFs) for agriculture are also being prepared by AMFUs based on the severe weather warnings for different districts of various States and UTs across the country issued by the National Weather Forecasting Centre (NWFC), New Delhi and RMCs and MCs of IMD.

Agromet Advisories are disseminated through a multi-channel dissemination system, including print and electronic media, Doordarshan, radio, internet and SMS under Public-Private Partnership (PPP) initiatives. SMS-based alerts and warnings along with suitable remedial measures, are being sent during extreme weather events like cyclones, deep depressions, etc. through the Kisan Portal. Technological advancements have further enhanced accessibility, enabling farmers to receive location-specific forecasts through mobile apps such as 'Meghdoot' and 'Mausam.' Social media platforms like WhatsApp also facilitate real-time dissemination of weather updates and advisories. Additionally, IMD has integrated its services with IT platforms of 18 state governments, allowing farmers to access information in both English and regional languages.

IMD, in collaboration with the Ministry of Panchayati Raj (MoPR), has recently launched Panchayat-level weather forecasts covering nearly all Gram Panchayats in India. These forecasts are accessible through digital platforms such as e-Gramswaraj (https://egramswaraj.gov.in), Meri Panchayat app, e-Manchitra of MoPR and Mausamgram of IMD, MoES (https://mausamgram.imd.gov.in).

(b)-(c) Yes. The Government has taken various initiatives to conduct studies on climate change and climate trends. The Ministry of Earth Sciences has established the Centre for Climate Change Research at the Indian Institute of Tropical Meteorology (IITM) to study climate change and develop climate models for predicting and projecting the changes in climate. The Ministry of Earth Sciences (MoES) has carried out a detailed climate change assessment and prepared a report entitled "Assessment of Climate Change over the Indian Region" (https://link.springer.com/book/10.1007/978-981-15-4327-2). As per the report, the global average temperature has risen by around 1°C since pre-industrial times. Warming since the 1950s has already contributed to a significant increase in weather and climate extremes globally (e.g., heatwaves, droughts, heavy precipitation, and severe cyclones), changes in precipitation and wind patterns (including shifts in the global monsoon systems), etc. Global climate models project a continuation of human-induced climate change during the twenty-first century and beyond. If the current GHG emission rates are sustained, the global average temperature is likely to rise by nearly 5°C and possibly more by the end of the twenty-first century. However, the temperature rise will not be uniform across the planet; some parts of the world will experience greater warming than the global average. Such large changes in temperature will greatly accelerate other changes that are already underway in the climate system, such as the changing patterns of rainfall and increasing temperature extremes.

India's average temperature has risen by around 0.7°C during 1901-2018. By the end of the twenty-first century, the average temperature over India is projected to rise by approximately 4.4°C relative to the recent past (1976-2005 average) under the RCP8.5 scenario. In the recent 30-year period (1986–2015), temperatures of the warmest day and the coldest night of the year have risen by about 0.63°C and 0.4°C, respectively. By the end of the twenty-first century, temperatures of the warmest day and the coldest night of the year are projected to rise by approximately 4.7°C and 5.5°C, respectively, relative to the corresponding temperatures in the recent past (1976-2005 average) under the RCP8.5 scenario. The frequency of summer (April-June) heat waves over India is projected to be 3 to 4 times higher by the end of the twenty-first century under the RCP8.5 scenario, as compared to the 1976-2005 baseline period. In response to the combined rise in surface temperature and humidity, amplification of heat stress is expected across India, particularly over the Indo-Gangetic and Indus river basins.

The summer monsoon precipitation (June to September) over India has declined by around 6% from 1951 to 2015, with notable decreases over the Indo-Gangetic Plains and the Western Ghats. There has been a shift in the recent period toward more frequent dry spells and more intense wet spells during the summer monsoon season. With continued global warming and anticipated reductions in anthropogenic aerosol emissions in the future, CMIP5 models project an increase in the mean and variability of monsoon precipitation by the end of the twenty-first century, together with substantial increases in daily precipitation extremes. Climate model projections indicate a high likelihood of increase in the frequency (>2 events per decade), intensity, and area under drought conditions in India by the end of the twenty-first century under the RCP8.5 scenario.

(d) Does not arise.

(e) As mentioned in reply of part (a) of the question, AMFUs prepare and issue agromet advisories twice a week (every Tuesday and Friday) in both the Regional and English languages for their respective districts. These advisories include major crops of the respective districts and consist of appropriate advisories based on prevailing weather and expected changes in weather conditions, and help the farming community to make appropriate decisions on their day-to-day farm operations.

To enhance long-term climate forecasting and agro-meteorological advisory systems for farmers adapting to changing climatic conditions, the agromet advisories include location-specific targeted recommendations, such as selecting the most appropriate crop varieties, including drought-tolerant, pest-resistant, and flood-resistant varieties. Additionally, suggestions regarding adaptation and mitigation strategies, including shifting sowing and harvesting dates, optimizing intercultural practices like weeding and hoeing, and recommending the best times and methods for irrigation, particularly emphasizing water-efficient techniques, are also provided.

To strengthen long-term climate forecasting, climate change projections are developed at the Indian Institute of Tropical Meteorology using the IITM Earth System Model.

These climate projections are publicly available under the following link;

https://esg-cccr.tropmet.res.in/thredds/catalog/esg_dataroot6/catalog.html
https://esg-cccr.tropmet.res.in/thredds/catalog/esg_dataroot4/cordex/catalog.html

Additionally public data dissemination through dedicated tools and data dissemination systems are undertaken by the Ministry of Earth Sciences at IITM and IMD for advancing climate preparedness. These are available under the following link;

https://mausam.imd.gov.in/responsive/agromet_adv_ser_state_current.php
https://dsp.imdpune.gov.in/
https:/ardc.tropmet.res.in

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