

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOKSABHA
UNSTARRED QUESTION NO. 3060
TO BE ANSWERED ON FRIDAY, 6th AUGUST, 2021**

EXTREME RAINFALL EVENTS DURING MONSOON

3060. SHRI RAVNEET SINGH BITTU:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether it is a fact that the extreme rainfall events during monsoon have increased three-fold in recent decades in the country;
- (b) if so, the details thereof along with the reasons therefor;
- (c) whether it is a fact that as per a recent research, the Arctic sea ice loss is triggering extreme September rains in India and if so, the details thereof;
- (d) whether the Government is taking any measures to counter this change in weather pattern caused by sea ice reduction in the Arctic Ocean region; and
- (e) if so, the details thereof and if not, the reasons therefor?

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

- (a)-(b) India Meteorological Department (IMD) has carried out an analysis of observed monsoon rainfall variability and changes of 29 States & Union Territory at State and District levels based on the IMD's observational data of recent 30 years (1989- 2018) during the Southwest monsoon season from June to September (JJAS) and issued a report on 30 March 2020. The reports on observed rainfall variability and its trend for each State and Union Territory are available in IMD website (<https://mausam.imd.gov.in/>) under "PUBLICATIONS" as well as in IMD Pune website.

The highlights of the report are given below:

- There are many districts in the country, which show significant changes in southwest monsoon and annual rainfall during the recent 30 years period (1989-2018). With regard to the frequency of heavy rainfall days, significant increasing trend is observed over Saurashtra & Kutch, Southeastern parts of Rajasthan, Northern parts of Tamil Nadu, Northern parts of Andhra Pradesh and adjoining areas of Southwest Odisha, many parts of Chhattisgarh, Southwest Madhya Pradesh, West Bengal, Manipur & Mizoram, Konkan & Goa and Uttarakhand.
- Five states viz., Uttar Pradesh, Bihar, West Bengal, Meghalaya and Nagaland have shown significant decreasing trends in southwest monsoon rainfall during the recent 30 years period (1989-2018).

- The annual rainfall over these five states along with the states of Arunachal Pradesh and Himachal Pradesh also show significant decreasing trends.
 - Other states do not show any significant changes in southwest monsoon rainfall during the same period.
- (c) Yes. A recent study indicates the fact that at least part of the variability in the September extreme events in India can be influenced by the Arctic sea ice extent, particularly in the Kara Sea region of the Arctic. The fast melting of sea ice in the Kara Sea region during the summer opens up the ocean cover (less sea-ice). This increased open ocean cover under the summer-time solar radiation allows more convection, heat release and thus alters the overlying atmospheric circulation. Such atmospheric circulation changes, mainly in the upper atmosphere, travel long distances at a very fast speed towards subtropical Asia and influence the same over the Indian landmass. The associated changes in the upper atmospheric circulation, along with warm Arabian Sea temperature, can facilitate both the enhanced moisture convergence by the westerly monsoon winds over the Arabian Sea and the intensification of convection over central and west India and thereby resulting in extreme rainfall events.
- (d) Yes Sir.
- (e) The study has been published very recently (June 2021). At this stage, further efforts are being made to understand this and also other possible sea ice influences on monsoon in more detail.

The main objective is to understand potential factors that influence the monsoon and thus ultimately improve the forecast of monsoon. The study is a step forward towards improving the monsoon forecast. Further studies are being carried out to identify and improve the capability of numerical models in representing such processes that influence the monsoon.
