

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
STARRED QUESTION No.*45
TO BE ANSWERED ON WEDNESDAY, FEBRUARY 6, 2019**

COLLABORATION IN EARTH SYSTEM SCIENCE

***45 SHRI RAHUL SHEWALE:
SHRI SANJAY DHOTRE:**

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether the Government has achieved the objectives of Memorandum of Understanding (MoU) signed between the Earth System Science Organisation and the University Corporation for Atmospheric Research (UCAR), USA**
- (b) if so, the details thereof and if not the reasons therefore along with the salient features of the said MoU;**
- (c) the extent to which India and the United States have collaborated in the field of Earth System Science through sharing of technical knowhow to address the scientific challenges so far along with the present status of the proposal of developing Wind Profiler System as agreed between the two countries under the said MoU;**
- (d) the other details of the benefits earned by the country in the field of Research & Development from the said MoU so far; and**
- (e) the other steps taken by the Governments of both the countries for cooperation in the field of Earth System Science?**

**ANSWER
MINISTER FOR MINISTRY OF SCIENCE AND TECHNOLOGY AND
MINISTRY OF EARTH SCIENCES
(DR. HARSH VARDHAN)**

(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 PARTS (A) TO (C) OF THE LOK SABHA STARRED QUESTION NO. *45 REGARDING 'COLLABORATION IN EARTH SYSTEM SCIENCE' FOR ANSWER ON 06TH FEBRUARY, 2019.

- (a)– (d) **A Memorandum of Understanding (MoU) between the Earth System Science Organization-Ministry of Earth Sciences (ESSO-MoES) and the University Corporation for Atmospheric Research (UCAR), USA was signed on 24th September 2014, for a period of five years for cooperation in Earth System Sciences.**

The MoU provides a mechanism to jointly undertake research and developmental work to address Earth System Science issues of common concern through exchange of excellent scientific knowledge and technological knowhow existing in the two countries. Collaborations are expected to include aircraft and radar technology, now casting of severe weather events, hydrometeorology, satellite data, oceanic and climate research, urban flooding as well as capacity building through scientific lectures and distance learning.

In line with the joint activities outlined in the MoU, four scientists from India were deputed to National Center for Atmospheric Research (NCAR), a research lab managed by UCAR for capacity building. The Joint collaboration between MoES and UCAR has resulted in Development of an Early Warning System for Air Pollution at Delhi. This system was made operational in October 2018 and received wide appreciation from users.

Regarding development of wind profilers (radars for measuring vertical profiles of winds) for India, NCAR expressed their interest and confirmed they could take up the collaborative work on the development of Wind profiler only in the year 2020, due to the manpower constraints and other major commitments.

- (e) **India and United States of America (USA) have two more on-going joint collaborations in Earth Sciences. MOES and National Ocean and Atmospheric Administration (NoAA) entered into a Memorandum of Understanding in 2008 on Earth Sciences and Observations. Under this, 10 joint research and development activities as Implementation Agreements (IA) have been undertaken in the field of monsoon, ocean observations, tropical cyclone, Tsunami, Predictive Capabilities on Marine Fisheries and Harmful Algal blooms, development of an ocean wave modeling and assimilation system for the Indian Ocean Region. In 2018, this agreement between India and USA has been extended for next 10 more years.**

Under this MOU, the following major achievements have been made:

- (i) Prediction Systems have been set up for seasonal, extended-range and short range dynamical predictions with specific emphasis on monsoon variability. India now has one of the best capabilities for sub-seasonal and seasonal predictions and improved climate forecasts. A modified version of the same modeling system is also used for climate change studies and will be the basis for an Indian entry in the next IPCC Climate Change Assessment report.**

- (ii) The Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA) which involves the deployment of buoys in the Oceans have greatly contributed to our understanding of the importance of the Indian Ocean in the regional and global climate system. A total of 39 RAMA buoys have been deployed till date. The data derived from these buoys have also provided essential support in the development of operational climate forecast models, weather and climate prediction, ocean data assimilation, ocean state forecasts, reanalysis efforts and satellite validation.**

A Memorandum of Understanding (MoU), was signed between MoES and United States Geological Survey (USGS) on 1st November 2018, to enable the sharing of expertise available with both organizations and adoption of the latest state-of-the-art technology in the field of Earth Sciences. The cooperation under this MoU is envisaged through various modes viz. exchange of technical information, visits, training, and cooperative research consistent with ongoing programs of both MoES and USGS.
