The Ministry of Environment, Forest and Climate Change has launched two programs, namely, National Carbonaceous Aerosols Program (NCAP) and Long Term Ecological Observatories (LTEO) Program to study black carbon impact on climate and monitor impact of climate change on flora and fauna respectively by using state of the art technologies. Sufficient funds have been provided for these projects under the scheme "Climate Change Action Plan".

The Centre of Climate Change Research (CCCR) at IITM focuses on development of new climate modeling capabilities to address global and regional issues concerning the science of climate change. The IITM Earth System Model - a global modeling framework for long-term climate investigations was developed indigenously at CCCR. It is the first climate model from India to contribute to the Coupled Modeling Inter-comparison Project Phase-6 (CMIP6) experiments and to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. This model is used for the future climate change projections over India.

The Coordinated Regional Climate Downscaling Experiment (CORDEX), an international scientific project led by IITM, aims to produce regional downscaled projections to better understand relevant regional/local climate phenomena, their variability and changes. The information for the South Asia region has been used to evaluate climate change impacts on processes that are sensitive to finer-scale climate gradients and the effects of local topography on climate conditions.

**Study to assess impact of climate change**

1964. SHRI HARNATH SINGH YADAV: Will the Minister of ENVIRONMENT, FOREST AND CLIMATE CHANGE be pleased to state:

(a) whether Government has conducted any study to assess the impact of climate change on different systems including agriculture in India during the last three years;

(b) if so, the details thereof; and

(c) whether any action plan has been chalked out by Government to combat ill effects of climate changes in coordination with the global agencies; and

(d) if so, the features of such action plan?

THE MINISTER OF STATE IN THE MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (DR. MAHESH SHARMA): (a) and (b) Intergovernmental Panel on Climate Change (IPCC), a body jointly formed by the World Meteorological Organisation and the United Nations Environment Program, periodically assesses the global climate change. Scientists from all over the world, including India, contribute

to the IPCC assessment reports. Nationally, a study was conducted by the Ministry of Environment, Forest and Climate Change titled "Climate Change and India: A 4X4 Assessment – A Sectoral and Regional Analysis for 2030s" which provides assessment of impacts of climate change on four key sectors of Indian economy, namely, agriculture, water, forests and human health in four climate sensitive regions of India, *viz.* the Himalayan region, the Western Ghats, the Coastal region and the North-Eastern Region.

The Department of Science and Technology (DST) has launched studies on assessment of impact of climate change on different ecosystems. DST has established two thematic task forces to undertake studies to assess the health of Himalayan ecosystem in the areas of water, ice, snow, including glaciers and agriculture. In addition, State Climate Cells have been set up in 20 States for undertaking vulnerability assessment, training, public awareness and capacity building. Under National Mission on Strategic Knowledge for Climate Change, eight Centers of Excellence have been set up at various leading national institutions to conduct studies in different areas of climate science and adaptation.

(c) and (d) India is a Party to the United Nations Framework Convention on Climate Change (UNFCCC), its Kyoto Protocol and the Paris Agreement. India is meeting its commitments under the aforesaid instruments. Through eight missions under the National Action Plan on Climate Change, being implemented by various Ministries, the Government is addressing climate change concerns in the area of solar energy, energy efficiency, sustainable habitat, water, Himalayan ecosystem, Green India, sustainable agriculture and strategic knowledge for climate change.

Rainfed Area Development under National Mission for Sustainable Agriculture (NMSA) focuses on integrated farming system for enhancing productivity and minimizing risks associated with climate variability. National Innovations in Climate Resilient Agriculture (NICRA) under NMSA aims at demonstration of climate resilient technologies and creating awareness among farmers and other stakeholders to minimize climate impacts on agriculture.

Further, India's Nationally Determined Contributions under Paris Agreement, submitted in October, 2015, for post-2020 period envisages reduction of its emission intensity of GDP by 33 to 35% by 2030 from 2005 level, achieve about 40% cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030, and create an additional carbon sink of 2.5 to 3 billion tons of $CO_2$ equivalent through additional forest and tree cover by 2030.