GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
RAJYA SABHA
UNSTARRED QUESTION No. 789
TO BE ANSWERED ON MONDAY, FEBRUARY 11, 2019

EFFECTS OF GLOBAL WARMING

789. SHRI KIRODI LAL MEENA:

Will the Minister of EARTH SCIENCES be pleased to state:

(a) whether the abnormal weather conditions like Tsunami, heavy rains and drought are the outcome of global warming;
(b) if so, the details thereof and the regions which have been worst affected by the climate change;
(c) whether Government has conducted any scientific study regarding climate change due to global warming and its adverse impact on the country;
(d) if so, the outcomes thereof;
(e) the details of the discussions held at various international fora and agreements entered into; and
(f) the action plan of Government to tackle the challenges of climate change?

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

(a) Although not a direct cause and effect type relationship, events like heavy rainfall and drought in different parts of the country may have possible linkages with the concurrent global warming.Climate-model simulations predict an intensification of extreme precipitation in almost all areas of the world under global warming. Local variations in the magnitude of this intensification are evident in these simulations.

Tsunami is not an outcome of global warming, it is a geological hazard which is caused due to sub-marine earthquake, landslide and meteoritic impact. Though tsunami impact is not directly attributed to global warming, coastal inundation by tsunamis can exacerbate the impact on coastal zones due to future sea level rise.

(b) **Regions which are more prone to such events in the changing climate, include Central India, northern Indian regions and Western Himalayas (extreme rainfall) and north and northwest India and neighboring Central India (moderate droughts and expansion in semiarid regions).**

Global warming is also a driver for sea level rise around the globe. According to International Panel on Climate Change (IPCC) fifth assessment report (AR5) global sea level is rising at an average rate of 1.8 mm/yr over the last century.

However, the sea levels are changing at different rates along the Indian coast as per the studies carried out at Indian National Centre for Ocean Information Services (INCOIS).The rate of change of sea level at 11 major ports as observed using the sea level gauges is shown in the table given below.

Sl. No.	Location	Rate of change of sea level (mm/year)	Duration of data used (years)
1.	Chennai	0.33	1916-2005
2.	Diamond Harbour	5.16	1948-2005
3.	Haldia	2.89	1972-2005
4.	Kandla	3.18	1950-2005
5.	Kochi	1.30	1939-2005
6.	Mumbai	0.74	1878-2005
7.	Paradeep	1.03	1966-2005
8.	Port Blair	2.20	1916-1964
9.	Vizag	0.97	1937-1988
10.	Okha	1.50	1964-1991
11.	Vizag	0.97	1937-2005

Another study carried out at INCOIS based on satellite altimetry and model simulations showed that during the last decade (2003-2013) the North Indian Ocean (NIO) experienced an alarming sea level rise at a rate of 6.1 mm/year.

(c) **Yes there have been several scientific studies on these fronts and their adverse impacts on the country. Sudden occurrences of rainfall and temperature extremes, shifts in semiarid regions etc. are some of the recent findings which may have possible linkages with climate change.**

(d) **Studies have reported significant rising trends in the frequency and the magnitude of extreme rainfall over different regions of India against a backdrop of global warming. More intense droughts are mainly observed over north and northwest India and neighboring Central India. The warmer SSTs over the tropical oceans are found to be significantly associated with the variability of meteorological droughts over India. Further it was found that significant increasing trend in the intensity and areal coverage of moderate droughts over India during the recent decades. Also expansion in the area of the semiarid regions in the different parts of country during the recent decades due to the changing regional precipitation patterns in association with rising temperatures due to global warming.INCOIS has carried out some coastal vulnerability studies as part of Tsunami Early Warning System. Coastal Vulnerability Index (CVI) mapping (at 1:100000 scale) was carried out to assess the probable implications of the sea level rise along the Indian coast. Besides, INCOIS has also generated the Multi-Hazard Vulnerability Maps (MHVM) for mainland of India (at 1:25000 scale). These MHVMs are indicative maps of probable coastal flooding due to ocean related disasters that can cause coastal inundation.**

(e) **Ministry of Environment, Forest and Climate Change (MoEF& CC) Government of India has been successful in establishing bilateral relations with several countries on areas of environment, clean technology and climate change. Some of the major agreements in this area include agreement on cooperation on addressing climate change between India and China signed in October 2009, Joint Statement between India and United Kingdom on Energy and Climate Change to promote secure, affordable and sustainable supplies of energy signed in November 2015.**

Further, India is a party to number of Conventions, Protocols, International Treaties, Multilateral Environment Agreements like United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD), Convention on Biological Diversity (CBD), and Montreal Protocol on substances that deplete Ozone layer. India has signed the Paris Agreement on Climate Change on 22 April 2016, which is a milestone in global climate cooperation.

In the climate change negotiations, India has always been a strong advocate of an ambitious and durable agreement based on the principles of equity and common but differentiated responsibilities. In the run up to the Paris Agreement, India engaged constructively and proactively with developing countries, including BASIC (Brazil, South America, India, China) countries, Like Minded Developing Countries (LMDC) and Group of 77 and China for protecting the interest of developing countries in the new agreement. India has been able to secure its interest in the Paris Agreement.

(f) Recognizing the challenge of Climate Change, the Government is implementing National Action Plan on Climate Change (NAPCC) which has eight missions in specific areas of solar energy, energy efficiency, water, agriculture, Himalayan eco-system, sustainable habitat, green India and strategic knowledge on climate change. Three of these Missions namely the Missions on solar energy, enhanced energy efficiency and sustainable habitats focus on mitigation, while the rest are focused on adaptation. Thirty two States/Union Territories have prepared State Action Plan on Climate Change (SAPCC) consistent with objectives of NAPCC and taking in to account State's specific issues relating to climate change. The SAPCCs prepared by States/ UTs inter-alia indicate sector specific and cross sectoral priority action and focus on adaptation of vulnerable areas in their respective jurisdictions.

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