**GOVERNMENT OF INDIA**
**MINISTRY OF EARTH SCIENCES**
**LOK SABHA**
**UNSTARRED QUESTION No. 466**
**TO BE ANSWERED ON WEDNESDAY, FEBRUARY 6, 2019**

# EARTH SCIENCEPLANS/PROJECTS

**466 SHRIMATI KAMLA DEVI PAATLE:**

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

**(a) the details of the earth science plans/projects implemented/under implementation by the Government during each of the last three years and the current year.**
**(b) the details of the funds sanctioned, allocated and utilized under the said schemes during the said period, State-wise;**
**(c) the progress made under these plans/projects during the said period**
**(d) whether the Government is satisfied with the progress made thereon; and**
**(e) if not, the remedial measures taken by the Government in this regard?**

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

**(a) The Ministry of Earth Sciences (MoES) holistically addresses all the aspects relating the Earth System Science for providing weather, climate, ocean, coastal state, hydrological and seismological services. The services include forecasts and warnings for various natural disasters like tropical cyclones, storm surge, floods, heat waves, thunderstorm and lightning and earthquakes etc. In addition, the ministry has the mandate of making ocean survey for living and non-living resources and exploration of all the three poles (Arctic, Antarctic and Himalayas). The five major programs of the MoES are as follows:**

**(i) Atmospheric and Climate Research, Observations Science Services (ACROSS)**
**(ii) Ocean Services, Modelling Application, Resources And Technology (O-Smart)**
**(iii) Polar and Cryosphere Research (PACER)**
**(iv) Seismology and Geoscience Research (SAGE)**
**(v) REACHOUT**

**(b) The expenditure profile for the last 3 years is shown in the table below. The activities undertaken by the MoES are for the entire country and not state wise.**

| Year | BE | RE | Actual Expenditure |
|---|---|---|---|
| 2015-16 | 1622.68 | 1420.98 | 1296.80 |
| 2016-17 | 1672.45 | 1579.11 | 1459.76 |
| 2017-18 | 1719.48 | 1597.69 | 1547.73 |
| 2018-19 | 1800.00 | 1800.00 | 1320.00* |

***As on 31/12/2018**

**(c) Some of the major achievements made under the these plans/projects are as follows:**

- **Improved Weather and Cyclone Predictions**

  - ✓ **The loss of lives during the last 4 years due to tropical cyclones has reduced to less than hundred as compared to the thousands during the previous decade. This large reduction in casualties is attributed to substantial improvement in our capability in monitoring and prediction of tropical cyclones.**
  - ✓ **During 2014-17, the 24, 48 & 72 hr cyclone track forecast errors were 85, 137 & 204 km respectively which are 22-26% less than the errors during 2010-13.The 24 hour Tropical Cyclone Landfall forecast error reduced to 40 kms during 2013-17 from about 90 Km during 2008-12.**
  - ✓ **Early warning system and preparedness plan for extreme heat events have resulted in the decrease in the number of deaths from about 2400 in 2015 to about 220 in 2017.**
  - ✓ **Anew early warning system of air quality in Delhi was developed in collaboration with National Center for Atmospheric Research (NCAR), USA and was launched on 15 October 2018. The system will assimilate data from around 36 monitoring stations and satellite data on stubble burning and dust storms. These warning services were provided to Central Pollution Control Board (CPCB).**

- **Development of advanced dynamical prediction systems for Seasonal prediction of Monsoon ; Extended range prediction (for next 20 days) and Short & medium range prediction (up to 10 days) under the National monsoon mission.**
- **Crop specific agro-meteorological advisories in vernacular languages are provided to about 40 million farmers. In 2014, this number was just 7 million farmers.**
- **The Indian National Centre for Ocean Information Services (INCOIS) provides PFZ advisories to about 4 lakh fishermen on a daily basis to help them to easily locate the areas of abundant fish in the ocean. In 2014, this number was just 1 lakh fishermen.**
- **Ocean State Forecasts ( forecasts of waves, currents, sea surface temperature, etc.) to fisher folk, shipping industry, oil and natural gas industry, Navy, Coast Guard and other stakeholders have improved considerably during the last 4 years. INCOIS/MoES also provides the OSF services to several Indian Ocean rim countries including Sri Lanka and Seychelles. At present, the ocean state forecasts are provided to approximately 16 lakh users on daily basis.**
- **The Indian Tsunami Early warning Centre (ITEWC) has been designated as Tsunami Service Provider(TSP) for the Indian Ocean.India is providing bulletins to 25 countries on the Indian Ocean rim. *Major highlight of the warning centre is 100% detection of Tsunamis about threat threshold and NO FALSE ALARMS of Tsunamis.***
- **The coastline of India is undergoing changes due to various anthropogenic and natural interventions. Precise information on shoreline changes is essential to address the various coastal problems such as coastal erosion, closure of river / lagoons /creeks mouths, etc.The National Centre for Coastal Research (NCCR) has prepared a status report on shoreline changes for the period 26 years (1990 to 2016).**
- **The Centre for Marine Living Resources and Ecology (CMLRE) has taken-up two intensive projects during 2017-20: (a) Marine Ecosystem Dynamics of Eastern Arabian Sea (MEDAS), a mega multi-disciplinary ecosystem approach based time-series study involving multi-institutional expertise; and (b) Resource Exploration and Inventorization System (REIS)**
- **The Deep Sea Technologies group of the National Institute of Ocean Technology (NIOT) is involved in developing manned and unmanned underwater vehicles along with allied technologies for the exploration and exploitation of deep ocean mineral resources such as poly-metallic manganese nodules, gas hydrates, hydrothermal sulphides etc and other oceanographic, polar and industrial applications.**

- ✓ **A crawler-based mining machine with a flexible riser was developed and demonstrated successfully at 500 metres A mining machine has now been upgraded for 6,000 m water depth and undergoing field trials..**
- ✓ **To test the strength of the soil at those depths an *in-situ* soil tester also has been developed and deployed up to a maximum depth of 5,462 m at the polymetallic nodule site in the Central Indian Ocean.**
- ✓ **A Remotely Operated Vehicle (ROV) was developed to aid the exploration of the deep ocean minerals at depths of 5,500 m.**

- **Development of indigenized technologies for producing clean drinking water from the ocean. Currently there are three desalination plants operational at Kavaratti, Agatti and Minicoy which are individually producing 1 lakh litres of water per day. Recently NIOT has started work for establishment of six more plants at Androth, Amini, Chetlat, Kadamat, Kalpeni and Kiltan Islands with a capacity of 1.5 Lac Litres per day at a cost of Rs 187.87 Crs.**
- **The Beach Restoration project in Puducherry has been successfully completed by scientists at National Institute of Ocean Technology (NIOT). Demonstration of submerged reef at Puducherry has resulted in formation of a wider beach at Puducherry.**
- **The National Seismological Network now comprises of 115 seismological observatories spread across the country and the earthquake detection capabilities are improved to a minimum threshold earthquake magnitude of 3.0. The Seismic Microzonation work related to Geophysical investigations has been initiated for the four selected cities, namely, Chennai, Bhubaneswar, Coimbatore, and Mangalore. In addition, mocrozonation for the 8 more cities, considered to be important from seismic point of view, is being taken up separately on priority through academic and research organizations in India. The list includes, Patna, Meerut, Amritsar, Agra, Varanasi, Lucknow, Kanpur and Dhanbad.**
- **The Borehole Geophysical Research Laboratory (BGRL), Karad near Koyna, Maharashtra has completed the drilling of 3.0 km pilot hole for seismological observations. These observations will help in better understanding of the mechanics of faulting, physics of reservoir triggered earthquakes and preparing an earthquake predictive model.**

- **The National Centre for Earth Science Studies (NCESS) has initiated setting up Critical Zone Observatories at three different hydroclimatic regions in the south India: 1) Munnar – Humid high-altitude observatory; 2) Silent Valley Twin Watershed – tropical east and west flowing humid to semiarid transition region; and 3) Trichy - Cauvery delta region.**
- **Annual Indian Scientific expedition to Antarctica (ISEA) was launched to carry out various scientific projects under cryosphere and ice core studies, remote sensing studies, lacustrine studies, and environmental studies.**
- **Expeditions to the Arctic region has led to the generation of continuous long term data from the Arctic and brought up several new aspects on the physical and optical properties of aerosols, associated processes, and their radiation interaction over the Polar region.**
- **In order to understand glacier impact on hydrology and climate of Himalaya region, six benchmark glaciers (Sutri Dhaka, Batal, Bara Shigri, SamudraTapu, Gepang and Kunzam) of Western Himalaya have been monitored since 2013 on long term basis. Field station Himansh at Sutri Dhaka, Chandra basin is used as base for all operational activities to carry out Glaciological studies in the Himalaya**
- **To support on-going operational and research activities in atmospheric and ocean modelling, MoES has acquired the HPC facility of 6.8 Peta Flops (PF) and has been installed at two of its constituent units: 4.0 Peta Flops HPC facility at Indian Institute of Tropical Meteorology (IITM), Pune and 2.8 Peta Flops facility at NCMRWF, Noida. India is now placed at the 4th position after Japan, UK and USA for dedicated HPC resources for weather/climate community.**
- **The Ministry supported various R & D activities in the thrust areas of different components of Earth System Sciences that are theme and need based. The Ministry also supported various seminars/workshops/conferences to create awareness amongst the public, students, academicians and user communities about the various fields of Earth System Science.**

**(d) Yes Madam**

**(e) Does not arise**

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