

**Earth System Science Organization(ESSO)
Ministry of Earth Sciences(MoES)
Summary of Important Developments –August, 2015**

1. **Important policy decisions taken and major achievements during the month :** Provided in Annex I.
2. **Important policy aspects / matters held up on account of prolonged Inter- Ministerial consultations/ delays, etc.:** Nil
3. **Compliance of Cabinet/ Cabinet Committees:**

S.No.	Number of Cabinet/ Cabinet Committee decisions pending for compliance	Proposed action plan/timelines	Remarks
1.	Dt. 8/5/2009 India's submission for an Extended continental Shelf prepared by Ministry of External Affairs(MEA)	First partial submission based on article 76 of the UNCLOS, was submitted in UN on 11 May, 2009. Second partial submission requires new geophysical survey. Depending on fair weather conditions, survey is expected to be over by June, 2015. The data processing, analysis, Interpretation and report preparation will be completed by December 2016. The claim would be submitted by April, 2017.	The 1 st phase of geophysical survey has been completed.
2.	Dt. 27/8/2009, Continuation of programme Polar Science:-Expedition to Antarctica	Planned yearly summer (Nov.-April) and winter expeditions(Nov-Nov) to Indian Station Maitree and Bharti to be continued during the XII Five year Plan period. Winter team would continue to stay at the stations till next summer.	--
3.	Dt 19/5/2010 Acquisition of Ice-class Research Vessel	Note for Cabinet approved. The agreement is being finalised.	--
4.	Dt. 26/4/2012 Monsoon Mission	Under implementation till April, 2017. Studies on the existing model and incorporation of changes in the model to improve skill by 2015. Setting up an Indian model buy 2017 followed by investigations.	--
5.	Dt.28/11/2013 Scientific Deep Drilling in Koyna	Under implementation till 2018. This includes preparatory phase for scientific deep drilling in 2014, setting up of research lab by 2016, setting up of borehole observatory, scientific deep drilling and coring, geological logging by 2018 followed by scientific investigations	--
6.	Dt.28/11/2013 International Ocean Discovery Programme- MoU between National Science Foundation and Ministry of Earth Sciences	Under implementation till 2019. This includes signing of MoU in Aug. 2014, Scientific Drilling for Indian Proposal in Arabian sea in 2015 followed by investigations.	--

4. Compliance of COS decisions:

S.No.	Number of COS decisions pending for compliance	Proposed action plan/timelines	Remarks
1.	<p>Dt 14/08/2014 PROPOSAL FOR KRILL FISHING</p> <p>MoES, in collaboration with MEA, will study the experience of different countries showing varied interest in krill fishing so that India could learn from their experiences. MEA, in collaboration with MoES, will examine and identify the countries with which India can collaborate for krill fishing. MoES will ascertain the interest of Indian industry in krill fishing and also explore the feasibility of Indian companies collaborating directly with foreign companies MoES will study legislations enacted by other member countries before finalising the draft legislation as part of international convention obligations.</p> <p>MoES will bring out a paper on krill fishing giving a detailed account of demand analysis, financial viability, interest of industry, experiences of other countries, criteria for fishing license, existing knowledge gap, etc. Thereafter, the CoS will meet again to decide whether India should engage in commercial krill fishing.</p>	<p>The Ministry has examined the aspect of Krill fishing. Japan & Norway have developed expertise and these countries have been tentatively identified for collaboration on Krill fishing. Their experiences have been obtained. Indian Industries have been approached for Krill fishing to ascertain their interests. However, so far we have not received any response. The draft paper is prepared and suggestions of Cabinet Secretariat have been obtained.</p>	--

5. Cases of sanction for prosecution pending in the Ministry for more than three months: Nil

6. Particulars of cases in which there has been a departure from the Transaction of Business rules of established policy of the Government: Nil

7. Status of implementation of e-Governance : Under process

8. Status of Public grievances:

No. Of Public Grievances redressed during the month	No. Of Public Grievances pending at the end of the month
50	14

Important policy decision taken and major achievements

The Cabinet approved the establishment of International Climate Variability and Predictability (CLIVAR) Monsoon Project Office (ICMPO) at Indian Institute of Tropical Meteorology(IITM), Pune to: i) implement CLIVAR Research Opportunities such as intraseasonal, seasonal and interannual variability and predictability of monsoon systems, ii) oversee the CLIVAR crosscutting capabilities such as improving atmospheric observing systems and monsoon prediction and predictability in the coupled and ocean, atmospheric models; iii) support CLIVAR panels such as Monsoons Panel and Indian Ocean Region Panel; iv) liaise with all international monsoon-related activities, support to the Drought Interest Group, etc.

The latest high resolution (T382 spectral resolution) research version of the coupled model (CFS Version 2) has been used to generate the experimental forecast for the 2015 South West Monsoon season rainfall (over Indian region) using the August initial conditions with 50 ensembles. The prediction indicated below normal rainfall.

Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX) 2015 Aircraft observations were made during the month of July 2015 from Kolhapur in the triangular area between Kolhapur, Mahabaleswar and Sholapur in Maharashtra. Total 75 hours of airborne observations of aerosol, cloud microphysics, aerosol and gaseous chemistry have been carried out. Vertical profiling of clouds in the rain shadow area, aerosol and cloud observations over Mahabaleswar, and over the Arabian sea was also carried out. For the first time, Green House Gases and aerosol chemistry observations over these locations were made. With the completion of Phase III 2015, CAIPEEX project has resulted in 820 hours of airborne observations over Indian region and is a major achievement.

Minimum Government, Maximum Governance

Agromet Advisories were communicated to 1154.17 lakhs farmers of the country through mobile SMS and IVR (Interactive Voice Response) Technology.

e-office software has been uploaded and its use is encouraged in the Ministry.

Atmospheric Observation Systems Network

Observation Type	Target	Commissioned up to August, 2015	Existing	Total	Data reporting
Automatic Weather Station (AWS)	550	555	125	680	441
Automatic Rain Gauge(ARG)	1350	1291	--	1291	623
GPS Sonde	10	10+5 ^{\$}	1	16	16
Doppler Weather Radar(DWR)	15	17	5	22	13
Ozone	17	15	--	15	15
Other Rain Gauges excluding ARG and AWS	-	-	--	-	2180@
Aviation	--	72	--	72	72
Agro-meteorology	267	264	--	264	160

^{\$} Installed at Ahmedabad, Bhopal, Nagpur, Kolkata, Bhubaneshwar covering the monsoon trough region

@ Data received from various agencies viz. Air Force, Railways, Central Water Commission, State Agriculture, State Irrigation and ESSO-India Meteorological Department (IMD)

Atmospheric Processes, Modeling and Services

Rainfall in August, 2015

Rainfall was excess in 3, normal in 10 and deficient/scanty in 23 of 36 meteorological sub- divisions. The actual rainfall for the month was 204.2 mm with departure of -22% from the normal.

The remnant of cyclone (Komen) lay over Bangladesh and neighbourhood on 1st August 2015. It moved over to Jharkhand across Gangetic West Bengal on 2nd and weakened into a well-marked low pressure area in the evening of 2nd. It again concentrated into a depression over East Madhya Pradesh on 3rd and weakened into a well-marked low pressure area over Madhya Pradesh on 5th August.

Modelling

An Advanced version of National Centre for Medium Range Weather Forecasting (NCMRWF) Regional Unified Model (NCUM-R) at 4 km resolution has been implemented. The model that covers approximately 65-101°E, 4-40°N grid (Indian domain) runs with initial and boundary conditions interpolated from latest 17 km resolution global Unified Model (NCUM-G). The land use/land cover and orography are based on ISRO and GLOBE 1 km data respectively. Three day forecasts are generated every day from 00 UTC initial conditions.

IMD-NCMRWF operational daily merged satellite-gauge rainfall analysis procedure was modified and tested for new GPM satellite data since the life of TRMM satellite has come to an end. The superior GPM satellite data coupled with improved resolution from 0.5 to 0.25 lat/lon grids is expected to offer better base for rainfall forecast verification. The codes were tested for 10 days before implementation at IMD Pune who will make it operational from 01 September 2015.

NCMRWF has started providing GEFS (Global Ensemble Forecasting System) based real time forecast rainfall data for entire Himalayan region to the Snow and Avalanche Study Establishment (SASE) of DRDO.

Monsoon Weather Reports, Maps and Crop Yield Forecast

Daily All India Weather Summary and Weekly Weather Reports have been brought out.

Climate Diagnostics Bulletin of India for May 2015 and Pre-monsoon season (March-May) 2015 has been brought out. Four Weekly and Cumulative Standardized Precipitation Index (SPI) maps were prepared for the weeks ending August 05, 12, 19 & 26.

Climate Diagnostics Bulletin of India for June 2015 has been brought out.

Weekly Drought Outlook Maps and Aridity Anomaly Reports & maps for the week ending August 05, 12, 19 & 26 uploaded on IMD Pune website. Two Biweekly Aridity reports and maps for the period July 30- August 12 and August 13-26, 2015 also have been issued.

Crop yield forecast was developed at planting stage (F1) for Kharif 2015 for 14 states (Andhra Pradesh, Telangana, Assam, Bihar, Chhattisgarh, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh and West Bengal) for submission to Mahalanobis National Crop Forecast Centre (MNCFC) on 28th Aug. 2015.

IMD make new High Wind Speed Recorder (HWSR) system indicating station level pressure value along with wind Direction and Wind Speed has been successfully tested and first such a system was installed for field trial at Vishakhapatnam.

IMD make Current Weather Instrument System (CWIS) was installed and made operational w.e.f. 13.8.2015 from 0300 UTC for aviation services at Bhubaneshwar airport.

Geoscience Research

Seismological Observational Network

Observation Type	Target for XII Plan	Commissioned so far	Data reporting during the month
Seismic stations	130	85	52
GPS stations	40	27	19

Earthquake and Tsunami monitoring

Earthquake: 17 earthquakes were monitored in the Indian region out of which 6 events were greater than magnitude (M) of 5.0.

Tsunami: 5 major seabed earthquakes (M > 6) with a potential to generate tsunami were monitored. This information was provided within 12 minutes of occurrence of the earthquakes for all the events.

Ocean Observation System

Type of Platform	Target	Commissioned till August, 2015	Data received during August, 2015
Argo Float	200	263	123*
Drifters	150	144	6*
Moored Buoys	16	26	15
Tide Gauges	36	25	19
High Frequency(HF) Radars	10	10	5
Current Meter Array	10	11	5
Acoustic Doppler Current Profiler(ADCP)	20	21	16
Tsunami Buoys	7	7	5
Wave Rider Buoy	16	11	9

*The remaining floats/drifters have completed their life time and as such no data can be received from them.

Ocean Science Services

No	Types of forecasts	No. of advisories issued during the month
1	Integrated Potential Fishing Zone (PFZ) advisories (Sea Surface Temperature(SST), Chlorophyll., wind)	28
2.	Ocean State Forecast(OSF) -Wave, Wind, Currents, SST, MLD and D20 forecasts	30
4.	Near Real time global ocean analysis (5-day averaged)	6
5.	Real time global ocean analysis (daily)	31
6.	Coral Bleaching Alert System	10

Polar Science and Cryosphere

Studies pertaining to monitoring of Kongsfjorden and arctic precipitation, climate change and zooplankton ecology have been undertaken during second summer batch of Indian Arctic expedition.

Glaciological Studies have been undertaken during the Himalayan glacier expedition 2015 which includes Ground Penetrating Radar (GPR) survey to estimate the ice thickness and snow thickness respectively in ablation zone of Sutri Dhaka glacier, differential GPS survey on Sutri Dhaka glacier for generation of high resolution Digital Elevation

Model(DEM), Diurnal measurement of discharge have recorded at hydrological site of Sutri Dhaka glacier, weather monitoring, monitoring of stakes network.

Topographic survey of Exclusive Economic Zone(EEZ)

About 12900 sq. km area was surveyed by deploying vessel ORV Sagar Kanya in Arabian sea. Also 2 gravity core sediment sampling and 6 SVP+CTD casts (Sound Velocity Profiling) operations were completed.

Marine Living Resources Programme (MLRP)

New Record of deep sea fish: Three newly found deep sea samples of female specimens of lantern fish *C. penicillatus* were collected along the Andaman Coast of India (6° 83' N, 93° 73' E), from a depth range of 320-350 m. *C. penicillatus* is the only member in the *Chanaux pictus* group that occurs outside the Atlantic Ocean.

Capacity Building and Outreach

One day brainstorming meeting was organized by the Indian Institute of Tropical meteorology (IITM) on "Observational campaign for understanding and predication of winter FOG", on 13 August, 2015 at IITM. A series of presentations were delivered by the scientists from IMD – Delhi, IIT-Delhi, IIT- Bombay, IIT- Madras, NCMRFW-Delhi, IISER- Mohali, IITM- Pune and ICIMOD, Nepal respectively on the operational, climatology, experimental and modeling aspects of fog.

Utilization of Ocean Research Vessels during the month

Vessel	Days at Sea / Utilization	Maintenance/ Inspection /Scientific Logistics/ Cruise Preparation	No. of Cruise	No. of Port Calls / Port Stay/ Statutory survey
Sagar Nidhi	5	24(drydock)	1	2
Sagar Manjusha	18	9	2	4
Sagar Purvi	6	13	2	12
Sagar Kanya	25	6	1	0
Sagar Sampada	21	10	2	0

Publications in Science Citation Index(SCI) journals and PhDs awarded

Subject	Publications			Ph.Ds		
	April –July 2015	August, 2015	Total	April –July 2015	August, 2015	Total
Atmospheric Sciences	48	19	67	1	4	5
Ocean Science and Technology	13	15@	28	2	2	4
Polar Sciences	7	1	8	-	-	-
Geosciences and resources	3	--	3	-	-	-
	71	35	106	3	6	9

@The international Journal "Deep Sea Research II " brought out special issue 2015, Volume 118, Part B: Understanding the Southern Ocean Processes and ecosystem responses – Results from Indian Expeditions.