

**Earth System Science Organization(ESSO)**  
**Ministry of Earth Sciences(MoES)**  
**Summary of Important Developments –June, 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 for which process of chartering a seismic vessel is continuing. 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.	--
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 &amp; 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
55	37

**Important policy decision taken and major achievements**

According to 2nd Stage Long Range Forecasts issued on 2nd June 2015, monsoon season rainfall for the country as a whole is likely to be deficient (88% of the long period average with a model error of  $\pm 4\%$ ). Southwest Monsoon set in over Kerala on 5<sup>th</sup> June 2015 and covered the entire country on 26<sup>th</sup> June 2015.

Dr. Harsh Vardhan, Hon'ble Minister for Science & Technology and Earth Sciences and Sh Devendra Fadnavis, Hon'ble Chief Minister of Maharashtra dedicated to the nation on 23<sup>rd</sup> June, 2015, a System of Air Quality Forecasting and Research(SAFAR) developed for Mumbai. The **SAFAR** provides location specific information on Air Quality in near real time and its forecast 24 hours in advance. It has capability to forecast 3 days (72hrs) in advance but 3 day's advance forecast will be issued only when there is some specific extreme event. It is complemented by the weather forecasting system designed by ESSO-IMD.

**Minimum Government, Maximum Governance**

Agromet Advisories were communicated to 102.7 lakhs farmers of the country through mobile SMS and IVR (Interactive Voice Response) Technology.

Various services/products were launched, viz. i) Mumbaichi-Hawa (Marathi) and Mumbai-Air (English): a booklet for common citizen to know about SAFAR services; ii) Mobile App for Mumbai: detailed SAFAR data in terms of Air Quality Index and health advisories; iii) online unified SAFAR Web Portal: detailed SAFAR data in terms of Air Quality Index and advisories.

Hon'ble Union Minister of Agriculture launched the Nowcasts Extreme Weather Alerts on 17-06-2015 at Krishi Bhavan, New Delhi for farmers to be uploaded by various ESSO-IMD centers registered in MKisan portal.

Publication module has been made online as part of integrated office automation system

**Atmospheric Observation Systems Network**

Observation Type	Target	Commissioned up to June, 2015	Existing	Total	Data reporting
Automatic Weather Station (AWS)	550	554	125	679	477
Automatic Rain Gauge(ARG)	1350	1291	--	1291	706
GPS Sonde	10	10+5 <sup>\$</sup>	1	16	16
Doppler Weather Radar(DWR)	15	10	5	15	9
Ozone	17	15	--	15	15
Other Rain Gauges excluding ARG and AWS	-	-	--	-	2117@
Aviation	--	72	--	72	72
Agro-meteorology	267	264	--	264	160

<sup>\$</sup> 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)

Digital Current Weather Instrument System for wind, QFE & QNH, Temperature, installed at RWY #27 of Mangalore airport. Pyrometers were installed at five radiation network stations viz. Kolkata, Bangalore, New Delhi, Patiala & Amritsar. GPS based Solar Trackers were also installed at two radiation network stations viz. Kolkata, New Delhi.

## **Atmospheric Processes, Modeling and Services**

### **Rainfall in June, 2015**

Rainfall was excess in 13, normal in 20 and deficient/scanty in 3 of 36 meteorological sub- divisions. The actual rainfall for the month was 54.4 mm with departure of +16% from the normal.

### **Cyclone storm 'Ashobaa' over Arabian Sea (07-12 June 2015)**

The Cyclone storm 'Ashobaa' (07-12 June 2015) developed over east central Arabian Sea from a monsoon onset vortex in the morning of 5<sup>th</sup> June 2015 and intensified into the cyclonic storm (CS) 'Ashobaa' in the morning of 8<sup>th</sup> June. It gradually intensified till the night of 10<sup>th</sup> June. Then, it started weakening from 11<sup>th</sup> onwards and moved towards northwest Arabian Sea and adjoining Oman Coast. Further, a Depression was formed over northwest Bay of Bengal (20-22 June 2015) and one more deep depression over Arabian Sea (22-25 June 2015) during the month.

### **Modelling**

The experimental real-time extended range predictions have been prepared on every five days and are made available in <http://www.tropmet.res.in/erpas/> This Multi Model Ensembles (MME) forecast has been prepared using CFS (T126 & T382) and GFS (T126 & T382). Each resolution of CFS and GFS is having 11 ensemble members. Madden-Julian Oscillation (MJO) forecast, minimum, maximum temperature forecasts and pentad wise temperature anomalies are also available in the same link.

A research study by the ESSO-Indian Institute of Tropical Meteorology (IITM) scientists points out a significant decreasing trend in the summer monsoon rainfall over the central Indian subcontinent during the past century. The study suggests an important role of the rapid warming in the Indian Ocean in weakening of monsoon circulation and rainfall. Using long-term observations and coupled model experiments, this research paper provides compelling evidence of the enhanced Indian Ocean warming having potential to weaken the land-sea thermal contrast, dampening summer monsoon Hadley circulation, and thereby reducing the rainfall over parts of South Asia.

### **Monsoon Weather Reports, Maps and Crop Yield Forecast**

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

Four Weekly and Cumulative Standardized Precipitation Index (SPI) maps were prepared for the weeks ending June 03, 10, 17 & 24.

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

Four Drought Outlook Weekly Maps for the week ending June 10,17,24 7 July 01 and three weekly aridity reports and maps for the week ending June 10,17,24 uploaded on IMD Pune website.

## **Geoscience Research**

### **Seismological Observational Network**

Observation Type	Target for XII Plan	Commissioned so far	Data reporting during the month
Seismic stations	130	85	55
GPS stations	40	27	19

### **Earthquake and Tsunami monitoring**

**Earthquake:** 25 earthquakes were monitored in the Indian region out of which 3 events were greater than magnitude (M) of 5.0.

**Tsunami:** 3 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 one event, within 15-18 minute for one event and within 18-20 minutes for the remaining event.

Indian Ocean Tsunami Early Warning Centre at ESSO-Indian National Centre for Ocean Information Service (INCOIS), Hyderabad participated in the Communications (COMMs) Test conducted by UNESCO on 10<sup>th</sup> June, 2015. During the test, Tsunami bulletins were disseminated by the Centre to 23 Indian Ocean rim countries through Email, Fax, GTS and SMS.

## **Ocean Observation System**

Type of Platform	Target	Commissioned till June, 2015	Data received during June, 2015
Argo Float	200	263	123*
Drifters	150	144	7*
Moored Buoys	16	26	17
Tide Gauges	36	25	21
High Frequency(HF) Radars	10	10	7
Current Meter Array	10	11	5
Acoustic Doppler Current Profiler(ADCP)	20	21	16
Tsunami Buoys	7	7	6
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	<b>Integrated Potential Fishing Zone (PFZ) advisories</b> (Sea Surface Temperature(SST), Chlorophyll., wind)	13
2.	<b>Ocean State Forecast(OSF)</b> -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)	25
6.	Coral Bleaching Alert System	10

The luminescence chronology of beach ridges in the central part of Kerala along the west coast of India has been made for the first time in order to reconstruct past sea-level highstands and coastline progradation. The study indicates that the sea level was between 3.5 and 4.5 m above present Mean Sea Level (MSL) during the Late Holocene period. It may also imply the emergence of the coast due to neo-tectonic activity as the sea-level curve for the east coast from reported ages indicates a mean elevation between 1.5 and 2.5 m.

## **Polar Science**

First team of Indian summer Arctic expedition left to Norway on 26 June 2015.

## **Topographic survey of EEZ**

Multibeam bathymetric survey was carried out for an area of 15,375 sq km. along with gravity core sediment samplings and grabs in Bay of Bengal during the month.

## **Marine Living Resources**

Onset of summer monsoon coastal upwelling along the southern tip of India during late May 2015 (El-Nino year) was tracked. Variability in upwelling and associated biological production was observed between the El-Nino Years. A comparative study showed that intensity of upwelling and planktonic standing stock was observed to be low this year compared to previous El-Nino year 2009. Larvae of economically important pelagic fishes (Clupiformes) were observed in the up-welled waters off Cape during May 2015.

Bloom of *Trichodesmium erythreum* was observed off Goa approximately ~60Km away from the coast. The observation was made during the 22<sup>nd</sup> May 2015 onboard FORV Sagar Sampada.

### **Ocean Technology**

A baseline survey for analysis of physico-chemical and biological parameters of the water from Buckingham Canal, Swarnamukhi River and open sea of Pamanji coast at the newly inaugurated Seafront facility near Nellore, Andhra Pradesh has been successfully completed for a period of one year on monthly basis.

Autonomous Coring System (ACS) sea trials were conducted wherein drilling qualification trial was conducted at 1057m water depth in KG basin, Bay of Bengal with drilling up to 24m below the sea floor. Similar trial was conducted at 816m water depth, offshore Chennai with drilling up to 40m below the sea floor.

### **Capacity Building and Outreach**

An Indian delegation led by Hon'ble Minister of State for Earth Sciences participated in 17<sup>th</sup> Congress of World Meteorological Organization held at Geneva during 25 May -12 June 2015. Dr L S Rathore was elected as member of Executive Council of World Meteorological Organization.

Two Training Programmes were organized under Gramin Krishi Mausam Sewa Project viz. (a) Crop Simulation Model based Crop Yield Forecasting system for sorghum with special reference to Karnataka and Maharashtra for SRFs/Technical Officers during 22-26 June 2015 at University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka and (b) Four week's Summer Placement programme for B. Tech. (Agri. Engg.) students was conducted from 1.6.15 to 26.06.15. A total of 17 candidates from different Agricultural Engineering Colleges participated in this training programme.

### **Promotion of Official Language**

A Parliamentary Committee inspected Met Centre(MC) Srinagar on 3rd June 2015 and Regional Met Centre(RMC) New Delhi on 30th June for implementation of Official Language (Hindi).

### **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	25	5	3	0
Sagar Manjusha	19	11(Annual survey and ISM audit)	2	0
Sagar Purvi	15	15(Bad Weather)	2	0
Sagar Kanya	21	9	1	0
Sagar Sampada	28	2	2	0

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

Subject	Publications			Ph.Ds				
	April 2015	-May 2015	June, 2015	Total	April 2015	-May 2015	June, 2015	Total
Atmospheric Sciences	22		12	34	-		-	-
Ocean Science and Technology	7		5	12	-		2	2
Polar Sciences	1		2	3	-		-	-
Geosciences and resources	1		1	2	--		-	-
Total	31		20	51	-		2	2