

**Earth System Science Organization(ESSO)
Ministry of Earth Sciences(MoES)
Summary of Important Developments –July, 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 by 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
80	28

Important policy decision taken and major achievements

Ocean State Forecast Service was developed and set up for Seychelles and Sri Lanka. Hon'ble Minister for Science & Technology and Earth Sciences, Dr. Harsh Vardhan inaugurated this service in New Delhi on July 10, 2015. ESSO-INCOIS is now providing 3-day forecasts (at 3-6 hour temporal resolution) on winds, waves, currents, temperature in map form for Seychelles and Sri Lanka. Location specific forecasts are also being provided for important strategic locations in Seychelles (18 locations) and Sri Lanka (22 locations).

2nd Ministerial Conference of Regional Integrated Multi-hazard Early Warning Systems(RIMES) for Afro-Asian Region was hosted by Ministry of Earth Sciences, New Delhi on 10th July, 2015 wherein Ministers, their representatives and senior officers from 22 countries participated to finalise the RIMES Master Plan (2016-2020) involving country specific capacity development activities for rendering improved quality of multi-hazard services with technical cooperation support led by India under the cooperation agreement on RIMES.

On July 13 2015, Dr. Harsh Vardhan, Honourable Minister of Earth Sciences and Science and Technology inaugurated the newly created class 10000 metal-free clean laboratory called "Isotrace Laboratory". The Isotrace Laboratory is first of its kind and will contribute to the major research programs like GEOTRACES and other cryospheric and geoscientific project in the country.

The 12th edition of the International Symposium on Antarctic Earth Sciences (ISAES) was held in Goa from July 12-17, 2015. The ISAES is an initiative of the Scientific Committee on Antarctic Research (SCAR), and is aimed at showcasing Antarctic geoscience research and for planning future studies in the Polar realm. The Symposium was inaugurated by Dr. Harsh Vardhan, Honourable Minister of Earth Sciences and Science & Technology Govt. of India, on 12th July, 2015. During the symposium, 26 scientific sessions were organized related to Antarctica which were attended by 200 participants from 30 countries and 170 participants from India. Eleven plenary talks were also held during the Symposium.

Minimum Government, Maximum Governance

Agromet Advisories were communicated to 114.17 lakhs farmers of the country through mobile SMS and IVR (Interactive Voice Response) Technology.

ESSO-India Meteorological Department has an intranet which is used for various works online such as leave, telephone and other reimbursements, updating reports and monitoring procurements etc.

Email is extensively used for official communications by the scientists while video conference facility is being used for meetings with national/international collaborating agencies/institutes.

Atmospheric Observation Systems Network

Observation Type	Target	Commissioned up to July, 2015	Existing	Total	Data reporting
Automatic Weather Station (AWS)	550	554	125	679	450
Automatic Rain Gauge(ARG)	1350	1291	--	1291	670
GPS Sonde	10	10+5 ^s	1	16	16
Doppler Weather Radar(DWR)	15	10	5	15	9
Ozone	17	15	--	15	15
Other Rain Gauges excluding ARG and AWS	-	-	--	-	2180@
Aviation	--	72	--	72	72

Agro-meteorology	267	264	--	264	160
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\$ 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)

Installation of Digital Station Barometers (total 14 Nos.) at 9 stations under RMC Mumbai, at 2 stations under RMC Nagpur and at 3 stations under RMC New Delhi completed. New Distant Indicating Wind Equipment (DIWE) installed at Daman and Samba Airport, Belgaum.

Atmospheric Processes, Modeling and Services

Rainfall in July, 2015

Rainfall was excess in 7, normal in 6 and deficient/scanty in 23 of 36 meteorological sub- divisions. The actual rainfall for the month was 241.9 mm with departure of -16% from the normal.

A Cyclonic Storm KOMEN developed over northeast Bay of Bengal and crossed Bangladesh coast between Hatia & Sandwip between 1930 to 2030 hrs. IST of 30th July, 2015. It weakened into a deep depression in the early hours of 31st July, 2015 over Bangladesh and moved west-northwestwards towards Gangetic West Bengal. Under its influence, widespread rainfall activity with isolated heavy to very heavy falls was observed over Odisha, Gangetic West Bengal and North-Eastern States of Manipur, Mizoram, Tripura, Meghalaya & South Assam.. The warning and advisory bulletins were issued to national and state disaster managers and media.

A depression formed over East Rajasthan & neighbourhood on 27th July and concentrated into a deep depression over southwest Rajasthan & adjoining Gujarat on 29th July. Thereafter, it moved north-northeastwards and weakened into a depression over West Rajasthan & neighbourhood on 29th July. It further weakened into a well-marked low pressure area on 30th July. Under its influence, heavy to very heavy rainfall with extremely heavy falls at a few places occurred over south Rajasthan and Gujarat and isolated heavy over West Madhya Pradesh and north Rajasthan. The warning bulletins were issued well in advance to concerned authorities.

Modelling

The Gridpoint Statistical Interpolation (GSI) scheme of data assimilation in the ESSO-NCMRWF Global Forecast System (NGFS) has been upgraded to a Hybrid-Ensemble version. The experimental runs using 80 member Ensemble Kalman Filter (EnKF) ensembles are being carried out from 20 May 2015 till date. The results when compared to operational NGFS runs exhibited noticeable improvement in medium range forecast skill of the model. The forecast track of the cyclone Ashobaa too was found to be improved.

Real time Quantitative Precipitation forecasts (QPF) over Krishna-Bhima Basin are being provided at 6 hours interval up to 72 hours to Government of Maharashtra for real time flood forecasting applications.

Under, Indo-U.S. collaboration a CFS based Grand Multi Model Ensemble Prediction System (CGMME) has been developed at ESSO-Indian Institute of Tropical Meteorology(IITM) with better Statistical skill than the best participating single-model ensembles (SMEs) configuration, owing to increased ensemble spread resulting in reduction of overconfidence errors.

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 June initial conditions with 50 ensembles. The prediction indicated below normal rainfall for rest of the summer monsoon season JAS (July to September).

An application has been developed at ESSO-NCAOR (National Centre for Antarctic and Ocean Research(Goa)) to read and segregate the archived / stored MARA binary data (generated by RADAR) into two parts, viz. data description and data towards pre-processing, analysis and visualizing the data. Another application was developed

using Django framework to read archived / stored database towards pre-processing and visualizing weather data. An algorithm developed using python to plot graph for the generated data for wind speed and wind direction.

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.

Weekly Drought Outlook Maps and Aridity reports & maps for the week ending July 08,15,22,29 were uploaded on IMD Pune website. Two Biweekly Aridity reports and maps for the period 2-15 and 16-29 July 2015 also have been issued to M/o Agriculture & IITM.

El Niño/Southern Oscillation (ENSO) bulletin for the month of July were issued.

Seasonal Climate Outlook of South-Asia for the period August-November 2015 were issued.

Crop Yield Forecast for Kharif 2015 for Jute for 3 states (Assam, Bihar, West Bengal) and sugarcane at F1 state for 5 states (Gujarat, Haryana, Maharashtra, Karnataka, and Uttar Pradesh) communicated to Department of Agriculture and Cooperation(DAC) on 11th July 2015.

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	20

Earthquake and Tsunami monitoring

Earthquake: 19 earthquakes were monitored in the Indian region out of which 8 events were greater than magnitude (M) of 5.0.

Tsunami: 2 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 both events.

Ocean Observation System

Type of Platform	Target	Commissioned till July, 2015	Data received during July, 2015
Argo Float	200	263	123*
Drifters	150	144	7*
Moored Buoys	16	26	19
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	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)	24
2.	Ocean State Forecast(OSF) -Wave, Wind, Currents, SST, MLD and D20 forecasts	30
4.	Near Real time global ocean analysis (5-day averaged)	5
5.	Real time global ocean analysis (daily)	22
6.	Coral Bleaching Alert System	10

Polar Science

Second summer batch of scientists left for the Indian Arctic expedition and have reached Himadri, Ny-Ålesund on 30th July 2015. First summer batch of Indian scientists returned back from Himadri, after successful completion of CTD measurements and the water, sediments, phytoplankton, snow and aerosols sampling. All the proposed objectives were achieved.

Indian Arctic observatory deployed in July 2014 was successfully retrieved on 15th July 2015. This observatory that is designed and deployed by NIOT-OOS has functioned well and recorded one year data continuously which is a major achievement in the area of insitu observation. A New Arctic observatory (Ind ARC II) with additional biogeochemical sensors & acoustic sensors was deployed successfully.

Sagar Manjusha was awarded the “National Maritime Search and Rescue Award” on 17th July, 2015 for the rescue/tow operation successfully executed by Sagar Manjusha staff/on board VMC team based on the rescue plan provided by VMC shore team. All coordinated efforts resulted in saving the sinking fishing vessel and 12 fishermen.

Dr. Harsh Vardhan, Honourable Minister of Earth Sciences and Science and Technology and Secretary, MoES interacted with Indian Scientists at Antarctic Stations, Maitri and Bharati on 13 July 2015.

Capacity Building and Outreach

Foundation Day function of Ministry of Earth Sciences was held on 27th July, 2015 at Vigyan Bhawan, New Delhi with Dr. Harsh Vardhan, Honourable Minister of Earth Sciences and Science & Technology as Chief Guest. Dr. Y.S.Chowdary, Honourable Minister of State for Earth Sciences and Science & Technology presided over the function in which Dr. V.K.Sarswat, Member, Niti Aayog participated as Guest of Honour. On this occasion, Dr. V.K.Sarswat delivered a foundation day lecture. Prof. C.P.Vendhan, Prof. O.P.Sharma, Dr. G.R.Ravindra Kumar, and Shri Arun Chaturvedi were also honoured with National awards. Certificates of Merits and awards were given to various scientists and administrative staff of autonomous institutes and the Ministry. Further, the successful schoolchildren of the drawing competition organized by the Ministry as a part of Earth Day celebration were also awarded.

A four-day workshop in Earth Sciences for high school teachers of Goa was held at ESSO-NCAOR during July 2-5, 2015. The workshop was held in collaboration with the International Geoscience Education Organisation (IGEO). Around 20 teachers had participated in the Workshop. Prof. Chris King (UK) and Prof. Nir Orion (Israel) engaged the workshop participants and gave practical demonstrations in Earth Science-related subjects to the participants.

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	11	20(drydock)	1	0
Sagar Manjusha	12	8	2	11
Sagar Purvi	5	12	2	14
Sagar Kanya	22	9	1	0
Sagar Sampada	19	12	1	0

Sagar Manjusha was awarded the “National Maritime Search and Rescue Award” on 17th July, 2015 for the successful rescue/tow operation of the sinking fishing vessel and 12 fishermen.

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

Subject	Publications			Ph.Ds		
	April –June 2015	July, 2015	Total	April –June 2015	July, 2015	Total
Atmospheric Sciences	34	14	48	-	1	1
Ocean Science and Technology	12	1	13	2	-	2
Polar Sciences	3	4	7	-	-	-
Geosciences and resources	2	1	3	-	-	-
Total	51	20	71	2	1	3