

**Ministry of Earth Sciences (MoES)**  
**Summary of Important Developments –December, 2018**

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 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>	<p>A proposal has been received for krill fishing which is under examination.</p>

• **Cases of sanction for prosecution pending in the Ministry for more than three months:** Nil

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

• **Status of implementation of e-Governance :** Being implemented

• **Status of Public grievances:**

No. of Public Grievances redressed during the month	No. of Public Grievances pending at the end of the month
35	20

**8. Information on the specific steps taken by the Ministry/Department for utilization of the Space Technology based tools and applications in Governance and Development:**

Potential Fishing Zone advisories are generated using the satellite derived parameters viz. Sea Surface Temperature, and Chlorophyll. Further, data from Global satellite data are used on continuous basis for generating short range and medium range weather forecasts.

9. (i) **Confirmation that the incumbency details of all posts in the Ministry/Department and its organizations falling under the purview of the ACC have been updated on AVMS:** It is confirmed that the incumbency details of all the posts in the Ministry/Department and its organizations falling under the purview of the ACC have been updated on AVMS and are placed at Annex-II.

(ii) **Status regarding compliance of the directions of ACC:** It is also confirmed that the directions of ACC are complied with.

(iii) **Status of cases where recommendations from PESB have been received but the proposals are yet to be submitted to the ACC Secretariat:** NIL

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**Annex-I**

**Important policy decision taken and major achievements:**

1. New Coastal Research Vessel (CRV) **Sagar Tara** was launched by Smt. Nutan Goel, wife of Dr. Harsh Vardhan, Hon'ble Minister for Science & Technology, Earth Sciences, Environment and Forests & Climate Change on 25<sup>th</sup> December, 2018 at 04:00 hrs in Kolkata as per the shipbuilding tradition. Dr. Harsh Vardhan, Hon'ble Union Minister addressed the media during the pre-launching function on 24<sup>th</sup> December, 2018.
2. Dr. Harsh Vardhan, Hon'ble Minister for Science & Technology, Earth Sciences, Environment and Forests & Climate Change, inaugurated the newly constructed International Training Centre for Operational Oceanography (ITCO-ocean) Complex in the campus of Indian National Centre for Ocean Information Services (INCOIS) on 22<sup>nd</sup> December, 2018 and dedicated to the memory of Shri Atal Bihari Vajpayee, the former Prime Minister of India. The academic building is named as Atal Bhavan and the Guest House as Atal Atithi Griha.
3. Lightning Location Network established over Maharashtra is successfully expanded to other parts of the country with the installation of 28 sensors over different locations in Kerala, Tamil Nadu, Odisha, West Bengal, Assam, Nagaland, Meghalaya, Tripura, Rajasthan, Punjab, Delhi and Haryana. These sensors are integrated with Central processor located at Indian Institute of Tropical Meteorology (IITM). With this installation, presently, most of states that are vulnerable to lightning strikes have been covered.

Minimum Government, Maximum Governance:

- Dissemination of Agromet Advisories to user communities through SMS and IVR technology is continued in the country through Kisan Portal and under PPP mode. Presently, 40 million farmers in the country are getting advisories through SMS directly.
- Adverse-weather SMS warnings are being sent through mobile to the State Government officials / Disaster-related officials / Central Government organizations/common man.
- Daily forecast along with warning and city forecast for many cities are disseminated through email to all users including state authorities, electronic and print media.

## Atmospheric Observation Systems Network

Observation Type	Commissioned so far	Data Reporting
Automatic Weather Station (AWS)	682	317
Automatic Rain Gauge (ARG)	1350	521
GPS Sonde based RS/RW Stations	43	39
Doppler Weather Radar (DWR)	25	22
Ozone (Ozone Sonde + Total Ozone)	05	05
Surface Ozone over Delhi (Electrochemical Concentration Cell)	07	07
Nephelometer	12	12
Sky Radiometer	20	19
Black Carbon Monitoring Systems (Aethalometer)	16	15
Air Quality Monitoring System (SAFAR-Delhi)	10	10
Hydromet (IMD & Extra-departmental excluding AWS & ARG)	---	2462@
Aviation	79	79

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

### Atmospheric Processes, Modelling and Services

**Severe Cyclonic Storm “Phethai” over Bay of Bengal (10-19 Dec.):** The Severe Cyclonic Storm (SCS) Phethai originated from a low pressure area (LPA) which formed over Equatorial Indian Ocean (EIO) and adjoining central parts of south Bay of Bengal (BoB) in the evening (1730 IST) of 9<sup>th</sup> December. It lay as a well marked low pressure area (WML) over central parts of south BoB and adjoining EIO in the morning (0830 IST) of 11<sup>th</sup> December, concentrated into a Depression (D) over southeast BoB in the early morning (0530 IST) of 13<sup>th</sup> December, intensified into a deep depression (DD) over southeast BoB in the same mid-night, further intensified into a cyclonic storm (CS) “**Phethai**” (Pronounced as Pay-ti) in the evening (1730 IST) of 15<sup>th</sup> December and into a severe cyclonic storm (SCS) in the afternoon of 16<sup>th</sup> December. It maintained its intensity of SCS till early morning (0530 IST) of 17<sup>th</sup> December and weakened into a CS with maximum sustained wind speed of 70-80 kmph gusting to 90 kmph. After landfall, it moved north-northeastwards and weakened rapidly into a deep depression over west-central BoB off Kakinada coast in the evening (1730 IST) of 17<sup>th</sup> December. SCS Phethai was the seventh cyclone over north Indian Ocean during 2018 against normal frequency of about 4.5 cyclones per year during the satellite era (1961 onwards). Earlier, such occurrence of 7 cyclones in a year was witnessed in 1985. Heavy to very heavy rainfall occurred at isolated places over north coastal Andhra Pradesh and heavy rainfall at isolated places over Telangana on 16<sup>th</sup>. Heavy to very heavy rainfall occurred at a few places over north coastal Andhra Pradesh and heavy rainfall at a few places over Odisha & isolated places over Jharkhand on 17<sup>th</sup>.

First information about formation of low pressure area (LPA) over southeast BoB and neighbourhood around 9<sup>th</sup> December was issued in the Tropical Weather Outlook (TWO) dated the 5<sup>th</sup> December at 1230 IST (more than 4 days in

advance of formation of LPA). LPA formed at 1730 IST of 9th and at 0930 hrs IST of 13<sup>th</sup> with the formation of depression, it was indicated that the system would intensify into a deep depression during next 12 hours and into a cyclonic storm during subsequent 24 hours. The depression intensified into a deep depression at midnight (2330 IST) of 13<sup>th</sup> and into a CS in the evening (1730 IST) of 15<sup>th</sup>. In the bulletin issued at 0030 IST of 14<sup>th</sup> with the intensification of system into a DD, it was further predicted that it would intensify into a CS during next 24 hrs and into an SCS during subsequent 24 hrs.

**Rainfall:** Rainfall during the month of December, 2018 was large excess in 9, excess in 0, normal in 2, deficient in 8, and large deficient in 15 and no rain in 2 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month of December, 2018 has been recorded as 14.7 mm which is -11% of its Long Period Average (LPA) of 16.6 mm. Rainfall during the season from October to December, 2018 was large excess in 0, excess in 2, normal in 3, deficient in 13, and large deficient in 18 and no rain in 0 of 36 meteorological sub- divisions. The rainfall for the season from October to December, 2018 for the country as a whole has been recorded as 71.2 mm which is -44% of its Long Period Average (LPA) of 127.2 mm.

**Heavy Rainfall Activity:** Fairly widespread to widespread rain/snowfall was observed on one or two days and isolated to scattered on a few days over western Himalayan region; scattered to fairly widespread rainfall on one or two days and isolated to scattered rainfall on a few days with heavy rainfall on one or two days was observed over extreme south peninsular India; Isolated to scattered rainfall was observed over northeastern states on a few days and over central, east and rest peninsular India on one or two days of the month.

No. of Heavy rainfall events and (% correct) of spatial distribution of warnings during December 2018 is given below:

Lead Time	No. of heavy Rainfall (Events): 20 (Heavy rainfall events: 17, very heavy rainfall: 03)
	Overall (>64.4mm)
24 Hour	98%
48 Hour	97%
72 Hour	92%

**Western Disturbances (WDs) and associated weather:**

Eight (08) Western Disturbances had affected western Himalayan region during the period 3-8, 6-13, 13-15, 17-20, 19-21, 23-25, 26-29 and 29-31 December 2018. Out of these 8 WDs, one western disturbance, during 13-15 December, caused fairly widespread to widespread precipitation over western Himalayan region. Rest seven western disturbances caused isolated to scattered precipitation over western Himalayan region. No western disturbance caused bad weather over the plains during the month.

Thundersquall & Hailstorm activity during the month (till 0830 IST of 31-12-2018) is given in the following table:

S.No.	Region	TS Days	Maximum TS Activity	Hail	squall
1.	South Peninsular India	9	05 Dec	Nil	Nil
2.	Northwest India	3	11 Dec	Nil	Nil
3.	Northeast India	2	29 Dec	Nil	Nil
4.	East India	8	1, 5 & 17 Dec	Gangtok on 28 Dec	Nil
5.	Central India	2	10 Dec	Nil	Nil
6.	West India	0	-	Nil	Nil

Note: The convective activities mentioned above had been predicted and corresponding warnings were issued about 4-5 days in advance of the occurrence of the event.

**Temperature Scenario:** Cold wave to severe cold wave conditions were observed over most parts of northwest & central India; over many parts of west & east India and north peninsular India for about 13 days between 19-31 December 2018. The forecast of cold wave to severe cold wave were issued 2 to 3 days in advance and regular updates were also issued till 31<sup>st</sup> December. Considering the severity of cold wave, Red colour coded Warnings were also issued for some days for Punjab, Haryana and north Rajasthan. The lowest minimum temperature of -1.0 degree C was recorded at Hissar (Haryana) on 26<sup>th</sup> December 2018, over the plains of the country during the month.

**Fog:** Dense to very dense fog was observed at isolated places over lower region of Himachal Pradesh and over Punjab, Haryana, West Uttar Pradesh and north Rajasthan on a few days and over East Uttar Pradesh, Madhya Pradesh, Bihar, Chhattisgarh, Odisha, Assam & Meghalaya and Nagaland Manipur, Mizoram & Tripura on one or two days during the month. Shallow to moderate fog was observed at a few places over northern plains and northeast India on many days. Fog was mostly observed during morning time and was localised. Large scale fog with long duration was not observed during the month of December 2018.

As a new initiative, probabilistic forecasts of the visibility are generated by National Centre for Medium Range Weather Forecasting (NCMRWF) based on the NCMRWF Ensemble Model (NEPS).

### **Bulletins / Operational Reports/ Services**

All India Weather Bulletins, all India inference and severe weather warnings 124 each; one Press Release regarding seasonal temperature outlook for the month of December 2018 and January-February 2019; Current weather outlook and forecast for next two weeks (4) and All India weekly weather reports (4) were issued during the month.

Sixty-two (62) mountain weather bulletins including severe weather warnings for western and central Himalayan region were issued during the month.

A total of 31 Nowcast Guidance Bulletins were issued (daily once) during the month.

Daily All India Weather Summary and Weekly Weather Reports are being brought out on routine basis.

Climate Diagnostics Bulletin of India for November 2018 was brought out.

ENSO bulletin for December 2018 and Seasonal Climate Outlook for South Asia for the months of November 2018 to February 2019 and Consensus Statement on the Forecast Outlook for the Winter Season (December 2018 – February 2019) Precipitation and Temperatures over South Asia were issued.

### **Geoscience Research**

#### **Seismological Observational Network**

Observation Type	Target	Commissioned so far	Data reporting during the month
Seismic stations	115	115	106
GPS stations	40	30	27

#### **Earthquake and Tsunami monitoring**

Earthquake: 25 earthquakes were monitored in the Indian region out of which one event was greater than magnitude (M) of 5.0.

Tsunami: 4 seabed earthquakes (M> 6) with a potential to generate tsunami occurred. This information was provided within 12 minutes of occurrence in respect of all the 4 events.

#### **Ocean Observation System**

Type of Platform	Target	Commissioned till December, 2018	Data received during December, 2018
Argo Floats *	200	323	139
Drifters*	150	108	2
Moored Buoys	16	22	18
Tide Gauges	36	35	23
High Frequency(HF) Radars	10	10	10
Current Meter Array	10	11	2
Acoustic Doppler Current Profiler(ADCP)	20	20	17

Tsunami Buoys	7	9	4
Wave Rider Buoy	16	19	10

\*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)	29
2	Tuna Fishing Advisories	29
2	Ocean State Forecast(OSF)-Wave, Wind, Currents, SST, MLD and D20 forecasts	30
3.	Near Real time global ocean analysis (5-day averaged)	6
4.	Real time global ocean analysis (daily)	30
5.	Coral Bleaching Alert System	10

### **Topographic survey of Exclusive Economic Zone (EEZ)**

Area surveyed during the month: 14,450 sq. km.

### **Exploration of polymetallic sulfides**

India(Ministry of Earth Sciences) commenced training to 5 candidates from developing countries viz. Brazil, Sri Lanka, Mauritius, Somalia and Cameroon for exploration of polymetallic sulfides from deep sea as a part of International Seabed Authority (ISA) Training Program organized at National Centre for Polar and Ocean Research(NCPOR), Indian National Centre for Operational Oceanography(INCOIS), National institute of Ocean Technology(NIOT), Centre for Marine Living Resources and Ecology(CMLRE), and National Centre for Earth Science Studies(NCESS). The 2-month training programme has been formulated and being conducted by NCPOR as a part of an exploration contract between India and International Seabed Authority (UN Body) for polymetallic sulfides.

### **Ocean Technology**

The restored beach due to submerged dyke installation remained intact during the cyclones Gaja and Phethai and protected the Kadalur villages.

### **Capacity Building and Outreach**

The India-UK Water Centre (IUKWC) launched its first set of Grassroots Field Exposure Sessions in West Bengal between 10-15 December 2018 to understand the pressures on the water resource in some of the state's rural and urban environments. These sessions aimed to promote the assimilation of local knowledge and users experiences to progress the concept of co-production and co-design and facilitate user feedback into science and policy into the co-design of activities while addressing the themes of Managing agricultural water demand and Water Quality Management in West Bengal during visits to North 24 Parganas, South 24 Parganas and Kolkata Municipal areas by a team of 25 Indian and UK scientists. Scientist from Indian Institute of IITM scientists also participated in the event. IITM is coordinating the IUKWC from India.

ITCO-ocean organised the training course on "Geospatial Techniques for Coastal Mapping and Monitoring (Using QGIS)" during 26 - 30, November 2018. There were thirty seven (37) participants from India, Iran, Egypt, Oman, Indonesia, Philippines, Kenya, Vietnam, Saudi Arabia, Sri Lanka, Bangladesh, Singapore, Tanzania and Thailand. The faculties of this course were drawn from INCOIS.

2-Days Hindi workshop on "Uses and Importance of Technical Terminology on Polar and Ocean Research" organised on 27-28 December at National Centre for Polar and Ocean Research (NCPOR), Goa in collaboration with Commission for Scientific and Technical Terminology, New Delhi. More than 160 participants from 21 institutes participated in this workshop.

NCPOR celebrated Antarctica Day on December 1, 2018 to commemorate the signing of Antarctic Treaty in 1959. Flash Presentation Competition was organised for the NCPOR's young researchers/scientists. About 24 participants presented their research work in a simple and understandable manner. Hindi workshop was organized on 26<sup>th</sup> Dec 2018 at NCMRWF.

**Utilization of Ocean Research Vessels during the month**

Vessel	Days at Sea / Utilization	Maintenance/ Inspection /Scientific Logistics / Cruise Preparation	No. of Cruise
Sagar Nidhi	16	15(maintenance)	2
Sagar Manjusha	20	11(bad weather)	2
Sagar Purvi	14	17( maintenance, bad weather)	2
Sagar Kanya	31	0	1
Sagar Sampada	24	7	1

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

Subject	Publications			Ph.Ds		
	April - November, 2018	December, 2018	Total	April - November, 2018	December, 2018	Total
Atmospheric Sciences	118	18	136	4	-	4
Ocean Science and Technology	37	9	46	1	1	2
Polar Sciences	18	1	19	--	-	-
Geosciences and resources	6	-	6	-	-	-
Total	179	28	207	5	1	6

No.MoES/20/01/2017-Estt.  
Government of India  
Ministry of Earth Sciences

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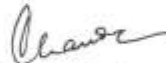
Dated, the 1<sup>st</sup> January, 2019

CERTIFICATE

(FOR THE MONTH OF DECEMBER, 2018)

It is certified that the detailed status regarding all the posts pertaining to Ministry of Earth Sciences have been updated on AVMS as on last day of the month of December, 2018. A summary of the status is given below:-

(a)	The total number of posts required to be entered on AVMS	- 06
(b)	Number of posts filled as on date	- 06
(c)	Number of posts totally vacant as on date	- 00
(d)	Number of posts under additional charge arrangement	- 00
(e)	Number of posts that would fall vacant during the next 6 months	- 00

  
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