

Ministry of Earth Sciences (MoES)
Summary of Important Developments –October, 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 & 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
68	36

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

Annex-I

Important policy decision taken and major achievements:

1. Hon'ble Minister of Earth Sciences, Science & Technology, Environment, Forest & Climate Change, Dr. Harsh Vardhan laid the foundation stone on October 22, 2018 for the world's first ever Ocean Thermal Energy Conversion (OTEC) powered pilot demonstration desalination plant at Kavaratti, Lakshadweep being undertaken by NIOT, MoES. The electricity is proposed to be generated utilising the temperature difference between the sea surface water and deep sea water. Upon completion, this will be self sustainable plant which will not require any external grid power, and will provide more than one lakh litre per day of potable drinking water to the local population.
2. Hon'ble Minister of Earth Sciences, Science and Technology, Environment, Forest & Climate Change, Dr. Harsh Vardhan unveiled an Air Quality Early Warning System for Delhi on 15th October 2018 in New Delhi. The air quality prediction system was developed by the scientists of MoES with technical support from the National Centre for Atmospheric Research (NCAR) and the Finnish Meteorological Institute (FMI). This system is designed to predict extreme air pollution events and give alerts to take necessary steps as per the Graded Response Action Plan (GRAP) of the Government of India. During the event, Hon'ble Minister also released the high resolution Emission Inventory for Delhi city and surrounding regions for major pollutants, developed by the scientists of IITM.
3. The Beach restoration project in Puducherry has been successfully completed. Demonstration of submerged reef at Puducherry has resulted in formation of wide beach. A workshop on beach restoration was organised on 11th October 2018 at Puducherry. Dr. Kiran Bedi, Hon'ble Lt. Governor of Puducherry unveiled the video on Puducherry beach restoration project, and Shri V. Narayanasamy, Hon'ble Chief Minister of Puducherry released a brochure about the project. The work carried out has been appreciated by the Government of Puducherry, media and public.
4. Hon'ble Minister laid the foundation stone for the new facility of National Centre for Coastal Research (NCCR) at Visakahapatnam on 2nd November, 2018. This facility will host research in marine pollution and coastal erosion. It will also host a new training centre jointly by IMD and NCCR.

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	327
Automatic Rain Gauge (ARG)	1350	508
GPS Sonde based RS/RW Stations	43	43
Doppler Weather Radar (DWR)	25	24
Ozone (Ozone Sonde + Total Ozone)	05	05
Surface Ozone over Delhi (Electrochemical Concentration Cell)	07	07
Nephelometer	12	12
Sky Radiometer	20	16
Black Carbon Monitoring Systems (Aethalometer)	16	15
Air Quality Monitoring System (SAFAR-Delhi)	10	10
Hydromet. (IMD & Extra-departmental excluding AWS & ARG)	---	2465@
Aviation	76	76

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

New Aviation Met Station has been made operational at Naini Saini Airport Pithoragarh with installation of current weather Met Equipments and Preparation of Visibility Polar Diagram with effect from 8th Oct 2018 and at Pakyong (Sikkim) with effect from 1st October 2018.

Ceilmeter (to determine the height of cloud ceiling or cloud base) was installed at MWO Kolkata and is in operation with effect from 8th Oct 2018 .

Atmospheric Processes, Modelling and Services

Significant weather events:

Withdrawal of Southwest Monsoon: The southwest monsoon further withdrew from most parts of northwest India and adjoining central India on 2nd October .The withdrawal has been completed from major parts of central and east India on 5th October and some parts of northern peninsular India on 6th October.

Severe Weather Systems: In a rarest of rare occurrence, two very severe cyclonic storms (VSCS), one each in Bay of Bengal (8-13 Oct.) and Arabian Sea (06-14 Oct.) developed simultaneously during October 2018. World Meteorological

Organisation (WMO) appreciated the services of IMD as Regional Specialised Meteorological Centre-Tropical Cyclones, New Delhi.

A. Very Severe Cyclonic Storm "Titli" over eastcentral Bay of Bengal (08-13 Oct.)

Very Severe Cyclonic Storm (VSCS) Titli originated from a low pressure area (LPA) which formed over southeast Bay of Bengal (BoB) and adjoining north Andaman Sea in the morning (0830 IST) of 7th October and further developed into a cyclonic storm (CS) on 9th and into very severe cyclonic storm (VSCS) on 10th. It crossed north Andhra Pradesh and south Odisha coasts near Palasa (18.8°N/84.5°E) to the southwest of Gopalpur during 0430-0530 IST of 11th as a VSCS with the wind speed of 140-150 gusting to 165 kmph. Moving further west-northwestwards, it weakened into an SCS around noon (1130 IST) of 11th and to a CS in the same evening (1730 IST) and finally into an LPA over the same region in the morning (0830 IST) of 13th.

Under the influence of the system, heavy to very heavy rainfall occurred at a few places over coastal Odisha and extremely heavy rainfall at isolated places over south coastal Odisha, isolated heavy to very heavy rainfall over coastal districts Gangetic West Bengal, heavy to extremely heavy rainfall occurred at a few places over Srikakulam district of coastal Andhra Pradesh and moderate rainfall upto 5 cm occurred at many places over Assam, Meghalaya, Mizoram and Tripura. Gopalpur reported maximum wind speed of 126 kmph at 0430 hrs IST of 11th. The estimated wind speed at the time of landfall was 140-150 kmph gusting to 165 kmph. Gopalpur Port (Odisha) reported tide height of 0.85m on 11th and Palasa (Andhra Pradesh) reported tide height of about 1.0 m at the time of landfall.

IMD issued regular bulletins to WMO/ESCAP Panel member countries including Bangladesh and Myanmar, National & State Disaster Management Agencies of Tamil Nadu, Andhra Pradesh, Odisha, West Bengal, Assam & Meghalaya, Manipur, Mizoram & Tripura, general public and media. Regular Bulletins (every six hourly) were issued since formation of depression. In addition, RSMC New Delhi also issued Press Release and SMS to registered users.

B. Very Severe Cyclonic Storm "Luban" over southeast and adjoining eastcentral Arabian Sea (06-15 October 2018)

Very Severe Cyclonic Storm (VSCS) Luban originated from a low pressure area (LPA) which formed over southeast Arabian Sea (AS) and neighbourhood in the morning (0830 IST/0300 UTC) of 5th October. It lay as a well marked low pressure area (WML) of 6th, depression (D) on 6th, intensified into a deep depression (DD) of 7th. It further intensified into a cyclonic storm (CS) "Luban" in the early morning (0530 IST/0000 UTC) of 8th October over westcentral and adjoining south & eastcentral AS; it intensified into a severe cyclonic storm (SCS) on 9th over westcentral AS and into a very severe cyclonic storm (VSCS) on 10th over westcentral AS. It attained its peak intensity of 75 kts around noon (1130 IST/0600 UTC) of 10th. It weakened into an SCS in the morning (0830 IST/0300 UTC) of 12th and into a CS in the same midnight (2330 IST/1800 UTC). It crossed Yemen and adjoining south Oman coasts near 15.80N and 52.20E during 1100-1130 hrs IST (0530 to 0600 UTC) of 14th as a CS with the wind speed of 70-80 gusting to 90 kmph. After landfall, it weakened quickly into a DD in the afternoon (1430 IST/0900 UTC) of 14th, into a D in the same midnight (2330 hrs IST/1800 UTC) and into a WML over Yemen and adjoining Saudi Arabia in the morning (0830 IST/0300 UTC of 15th).

First information about formation of low pressure area (LPA) over southeast AS around 5th was issued in Tropical weather outlook dated the 3rd October at 1130 IST (about 45 hours in advance of formation of LPA). The LPA formed over southeast AS & neighbourhood at 0300 UTC of 5th October. In the same bulletin, it was also forecasted that the LPA would concentrate into a depression by 7th October (about 69 hours in advance of formation of D). Depression formed over southeast & adjoining eastcentral AS in the afternoon (1430 IST) of 6th October. First information that the system would cross Yemen and adjoining Oman coasts around 1730 IST of 13th near 15.20N/51.40E was issued in the Tropical Cyclone Advisory issued at 2130 IST of 8th (about 5 days and 15 hours prior to landfall). The system crossed coast near 15.80N/52.20E between 0530-0600 UTC of 14th.

Rainfall in October 2018: Rainfall during the month of October, 2018 was large excess in 0, excess in 0, normal in 5, deficient in 7, and large deficient in 24 and no rain in 0 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month of October – 2018 has been recorded as 35.6 mm which is 56% of its Long Period Average (LPA) of 80.9 mm.

Heavy Rainfall Activity: Extremely heavy rainfall was observed at isolated places in Odisha and Bihar on one day; heavy to very heavy falls at isolated places over Tamilnadu & Puducherry and Kerala on a few days; over Haryana, Chandigarh & Delhi, Jharkhand, Gangetic West Bengal, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Coastal Andhra Pradesh, Marathwada, Karnataka, Telangana and Rayalaseema on one or two days during the month of October, 2018.

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

Lead Time	No. of heavy Rainfall (Events): 80 (Heavy rainfall events: 64, very heavy rainfall: 16)
	Overall (>64.4mm)
24 Hour	93%
48 Hour	93%
72 Hour	93%

Temperature Scenario: Maximum temperatures prevailed above normal by 2-4°C over some parts of west and adjoining northwest and peninsular India during a few days of the month and near normal over rest of the country during most days of the month. The highest maximum temperature of 42.4 °C had been recorded at Bhuj (Gujarat) on 7th October and the lowest minimum temperature of 9.8 °C had been recorded at Pantnagar (Uttarakhand) on 22nd over the plains of the country during the month of October, 2018.

Western Disturbances (WDs) and associated weather:

During the period, there were ten (10) Western Disturbances affected western Himalayan region i.e. 1-5, 4-8, 7-10, 9-12, 12-13, 14-20, 18-22, 22-24, 24-27 and during 29-31, October 2018. Out of these 10 WDs, only one WD caused fairly widespread to widespread rainfall activity over western Himalayan region and adjoining plains. Other WDs caused isolated to scattered rainfall activity over western Himalayan region and isolated over adjoining plains.

Thundersquall & Hailstorm activity during the month (till 0830 IST of 31-10-2018) is given in the table below:

S.No.	Region	TS Days	Maximum TS Activity	Hail	Squall
1.	South Peninsular India	23	16-10-18	Nil	Nil
2.	Northwest India	18	11-10-18	03 (Pahalgam on Oct .09 & 11) (Tehri on 10-10-18)	01(Amritsar on 11-10-18)
3.	Northeast India	14	08-10-18	01(Barapani on 25-10-18)	Nil
4.	East India	09	12-10-18	Nil	Nil
5.	Central India	06	21-10-18	Nil	Nil
6.	West India	02	05-10-18 & 16-10-18	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.

Bulletins / Operational Reports/ Services

All India Weather Bulletins, all India inference and severe weather warnings, 124 each were issued; 13 number of Press Releases were issued for enhanced rainfall activity, low pressure systems, withdrawal of southwest monsoon and outlook of rainfall related to northeast monsoon 2018; Current weather outlook and forecast for next two weeks (4). All India weekly weather reports (4) each 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 September 2018 was brought out.

ENSO bulletin for October 2018 and Seasonal Climate Outlook for South Asia for the months of October 2018 to January 2019 were issued. (www.imdpune.gov.in/Clim_Pred_LRF_New/Products.html).

Geoscience Research

Seismological Observational Network

Observation Type	Target	Commissioned so far	Data reporting during the month
Seismic stations	116	115	105
GPS stations	40	30	27

Earthquake and Tsunami monitoring

Earthquake: 21 earthquakes were monitored in the Indian region out of which 4 events were greater than magnitude (M) of 5.0.

Tsunami: 5 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 events.

Ocean Observation System

Type of Platform	Target	Commissioned till October, 2018	Data received during October, 2018
Argo Floats *	200	323	139
Drifters*	150	108	2
Moored Buoys	16	22	19
Tide Gauges	36	35	25
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	5
Wave Rider Buoy	16	19	8

*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	Tuna Fishing Advisories	22
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

Capacity Building and Outreach

A science and training workshop on the theme "Climate Change over the High Mountains of Asia (HMA)" was held at the Indian Institute of Tropical Meteorology (IITM), Pune during 8-12 October 2018. This workshop was jointly organized by the Centre for Climate Change Research (CCCR), IITM, the Ministry of Earth Sciences (MoES), New Delhi, Divecha Centre for Climate Change (DCCC), Indian Institute of Science, Bengaluru and the Monsoon Asia Integrated Research

for Sustainability - Future Earth (MAIRS-FE) at DCCC. The overarching goal of this workshop was envisaged towards integrating the regional climate downscaling activities, facilitating cross-fertilization of scientific expertise and engaging the community of Asian scientists for further capacity building pertaining to the HMA. There were 48 Participants including 8 International participants from Nepal, Sri Lanka, Cambodia, Laos, Thailand and Spain and 40 National participants. 28 Scientific Experts including 5 International experts from Nepal, Japan, South Africa, UK and USA participated alongwith 23 National Faculties including experts from IITM. (<http://cccr.tropmet.res.in/home/workshop/oct2018/index.jsp>)

International Training Centre on Operational Oceanography of Indian National Centre for Ocean Information Services(INCOIS), an autonomous institute under Ministry of Earth Sciences organized the training course on "Fish-catch Time-Series Forecasting with R" during 24 - 28 September, 2018 . This training course was focused on forecasting fisheries catch time series and documentation with R statistical software, creating codes to enable the participants to create their own products. Twenty eight (28) Indians, one each from Bangladesh and Kenya participated in the course. Dr. Elizabeth Holmes from National Oceanic and Atmospheric Administration (NOAA), USA was the main tutor for this training program with faculties from Centre for Marine Living Resources and Ecology, Kochi and INCOIS.

ENVIS Center of IITM, Pune has successfully completed two training programs in 2018 i.e. "Emission Inventory" & "Pollution Monitoring (Air & Water Pollution)" under Government of India's Priority Project, "Green Skill Development Program (GSDP)" as a part of Nationwide initiative taken by ENVIS secretariat, MoEF& CC. Both the programs started on 20th August, 2018. Total 46 candidates attended regularly the expert's lecture & practical sessions. Field visits were also arranged. Candidates also actively participated in activities such as public awareness rally, cleanliness drive under "Swatch hi Seva" Campaign at Pashan Lake. The Emission Inventory training program was concluded on 25th September 2018, whereas training program on Pollution Monitoring (Air & Water Pollution) was completed on 12th October, 2018.

At the request of National Maritime Search and Rescue Board (NMSRB), Indian National Centre for Ocean Information Services(INCOIS) trained the officers of Indian Coast Guard and other agencies on the Search and Rescue Aid Tool (SAR) and impact-based ocean state forecast, advisory and information services. The training was arranged as part of the 'Maritime search and rescue workshop' conducted by the Coast Guard-Maritime Rescue Co-ordination Centre (MRCC)-Port Blair on 8 October 2018. Fifty (50) trainers from the coast guard, fisheries department and other departments attended the training.

A two day training was conducted for the NGO Trainers (catering mainly to the fishermen community) in collaboration with MS Swaminathan Research Foundation (MSSRF) on the Ocean State Forecast products and PFZ advisories during October 4-5, 2018 at INCOIS, Hyderabad.

Training on Utilization of Service from INCOIS was organized at INCOIS for the Indian Air Force Trainee Officers on 10 October 2018. Five Met-trainee officers along with their Trainer from Air Force Academy, Dundigal and two Sri Lankan Air Force personnel attended the training.

One day training/ refresher course in Aeronautical Meteorology organized by IMD on 26-10-2018 for all Airlines Operators, Flight Dispatchers.

Met Centre, Ahmadabad office organised one day media workshop at Ahmadabad on 26th Oct 2018.

NCMRWF and Vigyan Prasar jointly organized 'Hindi Sangoshti' on 4th Oct 2018 at NCMRWF, Noida. The theme was "Samanya Janjeevan par Jal-vayuewam Mausamka Prabav".

Vigilance Awareness Week was observed from 29 October to 03 November, 2018 in Ministry of Earth Sciences, its attached offices, subordinate office and autonomous institutes. On this occasion, integrity pledge was administered to the employees and various debates, quiz, slogan writing competitions were organised.

Utilization of Ocean Research Vessels during the month

Vessel	Days at Sea / Utilization	Maintenance/ Inspection /Scientific Logistics / Cruise Preparation	No. of Cruise
Sagar Nidhi	20	11	1
Sagar Manjusha	10	21(bad weather, maintenance)	2
Sagar Purvi	0	31(maintenance)	1
Sagar Kanya	20	11	2
Sagar Sampada	6	25(dry dock)	2

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

Subject	Publications			Ph.Ds		
	April - September, 2018	October, 2018	Total	April - September, 2018	October, 2018	Total
Atmospheric Sciences	92	13	105	1	2	3
Ocean Science and Technology	25	10	35	1	-	1
Polar Sciences	12	2	14	-	-	-
Geosciences and resources	3	-	3	-	-	-
Total	132	25	157	2	2	4

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

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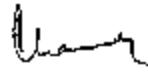
Dated, the November, 2018

CERTIFICATE

(FOR THE MONTH OF OCTOBER, 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 October, 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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