

Ministry of Earth Sciences (MoES)
Summary of Important Developments –February, 2019

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
14	33

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:

Dr. Harsh Vardhan, Hon'ble Minister of Science and Technology, Earth Sciences, Environment and Climate Change dedicated the Atal Bhavan, the new campus of the Centre for Marine Living Resources and Ecology (CMLRE) on 23.02.2019 at Puthuvype, Cochin to the nation. On this occasion, a book on 'Taxonomic Discoveries from Northern Indian Ocean', a treatise showcasing the research outputs of CMLRE, 'Our strides into deep biosphere', a booklet portraying the significant research and diverse activities of the CMLRE, Special Post cover and stamp portraying the new campus were also released. The center is involved in organizing, co-coordinating and promoting ocean development activities in the country which inter-alia would include mapping of the living resources and developing country's ecosystem based management strategies relating to the seas by understanding the scientific activities with regard to Marine Living Resources.

Dr. Harsh Vardhan, Hon'ble Minister of Science and Technology, Earth Sciences, Environment and Climate Change inaugurated North Karnataka Agro Meteorological Forecasting Centre (NKAFC) of the India Meteorological Department(IMD) established at the University of Agriculture , Dharwad(Karnataka) on 14.02.2019.

There was no matter pending before the Cabinet requiring decision/approval.

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	250 #

Automatic Rain Gauge (ARG)	1350	510
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)	25	25
Air Quality Monitoring System (SAFAR-Delhi)	10	10
Hydromet. (IMD & Extra-departmental excluding AWS & ARG)	---	2640@
Aviation	79	79

The decrease in number of AWS reporting data is due to the temporary problem in GPS time synchronisation by Data Loggers. The action is being taken by Surface Instrument Division at IMD, Pune.

@ 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

Rainfall in February,2019: Rainfall during the month of February, 2019 was large excess in 11, excess in 3, normal in 7, deficient in 4, large deficient in 9 and no rain in 2 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month of February, 2019 has been recorded as 32.9 mm which is 48% above its Long Period Average (LPA) of 22.2 mm.

Significant Weather Conditions:

(a) Heavy Rainfall Activity: Very heavy rainfall had been observed at isolated places over Jammu & Kashmir, Himachal Pradesh, Punjab, Odisha& Kerala and heavy rainfall at isolated places over Uttarakhand, Jharkhand, Gangetic West Bengal, South Interior Karnataka and Lakshadweep and Tripura on one or two days of the month.

No. of Heavy rainfall events and (percentage correct) of warnings issued by IMD during February 2019 are given below:

Lead Time	No. of Heavy Rainfall (Events): 25 (>64.4mm)
24 Hour	98%
48 Hour	97%
72 Hour	97%

(b) Western Disturbances and associated weather: Ten (10) Western Disturbances(WDs) affected Western Himalayan region during the month. Out of these 10 WDs, 3 active WDs with their induced cyclonic circulations caused widespread rain / snow over the western Himalayan region and adjoining plains of northwest India with isolated heavy precipitation and hailstorm over northwest India. The WD during 12th-16th February,2019, in its eastwards movement, caused scattered to fairly widespread rain/thundershowers and isolated hailstorm activity over east and northeastern states and snowfall over the higher reaches of Sikkim and Arunachal Pradesh. Rest 7 WDs caused isolated to fairly widespread precipitation over western Himalayan region and isolated to scattered rainfall over plains of northwest India during their movement.

(c) Thundersquall& Hailstorm activity: Thundersquall& Hailstorm activity during the month (till 0830 IST of 28-02-2019) is given in the table below:

S.No.	Region	TS Days	Maximum TS Activity	Hail	Squall
1.	Northwest India	19	7 February	07-02-19: Tehri, Katra, Shimla, Chandigarh, Ganganagar Media Reports: Nainital, Mussorie, Patiala, Anandpur, Nuh, Faridabad, Palwal,, CharkhiDadri (Haryana), Bharatpur, Ganganagar, Saharanpur, Noida & Delhi; 08-02-19: Basti; 14-02-19: Pahalgam (Media Reports), Ayanagar(Delhi), Kota, Mathura, Ballabhgarh, Rohtak; 15-02-19: Tehri, Dehradun & Mukteshwar; 18-02-19: Pahalgam; 21-02-19: Shimla, Sundernagar; 24-02-19: Kukernag; 27-02-19: Lucknow;	08-02-19: Mukteshwar
2.	Northeast India	7	27-28 Feb	26-02-19: Passighat	--
3.	East India	10	27 February	14-02-19: Ranchi, Jamshedpur(Media Report); 24-02-19: Jamshedpur; 25-02-19: Kolkata(Media reports); 27-02-19: Champaran, Muzzafarpur (Media Reports).	25-02-19: Alipore, Dumdum
4.	Central India	6	15 February	14-02-19: Ujjain (Media Report); 15-02-2019: Brahampuri Media Reports: North Satna/Chitrakoot, Bhopal, Tikamgarh, Ashoknagar, Vidisha(Ganjabsoda), Chhattarpur, Rewa, Jabalpur, Balaghat& Raipur 21-02-2019: Satna (Media Report)	--

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.

(d) Cold wave: Cold wave to severe cold wave conditions were observed at many places over Odisha, East Madhya Pradesh, northern parts of Telangana; at some parts of Vidarbha, West Madhya Pradesh and at isolated places over Chhattisgarh, Jharkhand, Bihar, Gangetic West Bengal, East Rajasthan, Saurashtra & Kutch and Madhya Maharashtra on one or two days. The lowest minimum temperature of 1.4°C had been recorded at Churu (West Rajasthan) on 9th February 2019, over the plains of the country during the week.

(e) Fog: Dense to very dense fog observed at a few places over Punjab, Haryana, Chandigarh & Delhi and West Uttar Pradesh on a few days and over Jammu & Kashmir, Himachal Pradesh, Uttarakhand, East Uttar Pradesh, north Rajasthan, Madhya Pradesh, West Bengal & Sikkim, Odisha, Assam & Meghalaya and Tripura on one or two days during the month.

Modelling and Research

National Centre for Medium Range Weather Forecasting(NCMRWF), an attached office of MoES, made operational the Regional high resolution (4km) 4DVar Data Assimilation(DA) and NCMRWF Unified Model with explicit rain process (NCUM_R)forecast runs. The model forecasts show improved results compared to cold start in 4D-Var assimilation system. These model runs are useful for severe weather forecasting. The new forecast products from NCUM-R (4km) now include total number of lightning flashes, maximum wind gust and mean surface dust concentration per day as well as the diurnal variation of these products and rainfall as 3 hourly spatial snapshots.

Following a request from the Maldives, NCMRWF has implemented generation of ensemble model EPSgrams for 30 locations in Maldives. This product is a part of WMO's Severe Weather Forecast Demonstration Project (SWFDP). The

EPS Meteogram (*EPSgram*) is a probabilistic interpretation of the forecasts from the Ensemble Prediction System (EPS) for a given location.

The extended range prediction products for research/scientific use based on 20th February 2019 initial condition have been made available at <http://www.tropmet.res.in/erpas/>. Rainfall, Maximum & Minimum temperatures, MJO forecast, soil moisture (0-10cm), Relative humidity, Cyclogenesis predictions are also made available at the same link. The MME forecasts are prepared using CFS (T126 & T382) and GFS (T126 & T382). Each resolution of CFS and GFS is having 4 ensemble members. The IMD operational products are made available at http://nwp.imd.gov.in/erf_outlook.php

A report on Strategies to Improve the Prediction of Extreme Weather Events on Extended Range brought out by Indian Institute of Tropical Meteorology(IITM), an autonomous institute under MoES indicates that bias-corrected downscaled ERP is more efficient in predicting extreme weather with 10-12 days lead time.

Proton-Transfer Reaction Time-of-flight Mass spectrometer (PTR-ToF-MS) was commissioned by IITM at High Altitude Cloud Physics Laboratory (HACPL), Mahabaleshwar. This will provide information on Volatile Organic Compounds and its variability over the Western Ghats. Data sets will be helpful in the estimation of secondary organic aerosol formation potential and its role in cloud condensation. A compact combined weather sensor which consists of sensors for measurements of Wind speed and direction, air temperature, humidity, pressure and rainfall has also been installed at the Sanjay Ghodawat University, Kolhapur.

Bulletins / Operational Reports/ Services during the month

All India Weather Bulletins, all India inference and severe weather warnings (112 each); 04 number of Press Releases related to enhanced rainfall/ thunderstorm activity over northern India, 1 related to International Symposium on 'Advances in Agromet. for Managing Climate Risks of Farmers' during 11-13 February at New Delhi were issued. Current weather outlook and forecast for next two weeks (4); All India Weekly Weather Reports (4) each were also issued. Fifty Six (56) mountain weather bulletins including severe weather warnings for western and central Himalayan region were issued.

A total of 28 Nowcast Guidance Bulletins for severe weather were issued (daily once).

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

Climate Diagnostics Bulletin of India for January 2019 was brought out and uploaded in IMD Pune website.

ENSO and IOD bulletin for February 2019 were issued.

Geoscience Research

Seismological Observational Network

Observation Type	Target	Commissioned so far	Data reporting during the month
Seismic stations	115	115	108
GPS stations	40	20#	17

#10 VSATS (6) have been dismantled to shift them to new locations.

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Earthquake and Tsunami monitoring

Earthquake: 38 earthquakes were monitored in the Indian region out of which 4 events were greater than magnitude (M) of 5.0.

Tsunami: 2 seabed earthquakes (M> 6) with a potential to generate tsunami occurred. This information was provided within 12 minutes of occurrence.

Ocean Observation System

Type of Platform	Target	Commissioned till February, 2019	Data received during February, 2019
Argo Floats *	200	328	138
Drifters*	150	108	2
Moored Buoys	16	22	18
Tide Gauges	36	36	27
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)	28
2	Tuna Fishing Advisories	28
2	Ocean State Forecast(OSF)-Wave, Wind, Currents, SST, MLD and D20 forecasts	28
3.	Near Real time global ocean analysis (5-day averaged)	6
4.	Real time global ocean analysis (daily)	27
5.	Coral Bleaching Alert System	9

Perigeon Spring Tide Alert issued for the coastline of India for the period during February 19-24, 2019.

Polar expedition

Expedition vessel MV Vasily Golovnin along with 28 members and two helicopters reached Indian research station, Bharati in Antarctica on 7th February, 2109 and sailed for station, Maitri, India Bay in Antarctica on 25th February 2019 with 27 members and two helicopters.

Topographic survey of Exclusive Economic Zone(EEZ)

Area surveyed during the month: 3,400 sq. km.

Ocean Technology

A mobile app "MarPlastS" for marine plastic study to be jointly carried out by National Institute of Ocean Technology(NIOT) and National Centre for Coastal Research(NCCR) was developed and released.

Visit of Committee on papers- Rajya Sabha

Rajya Sabha Committee on Papers laid on the table, undertook a study visit in Chennai on February 24, to discuss 'Constraints being faced by organizations/institutions in laying their Annual Report /Audited Accounts timely'. NIOT

presented the technological activities and achievements and timely submission of Annual report/audited accounts. The committee appreciated the achievements as well as timeliness of NIOT.

Capacity Building and Outreach

The India-UK Water Centre (IUKWC) at IITM hosted the IUKWC Grassroots Field Exposure Session (GFES) and User Engagement Initiative (UEI) during “Water Resources Management (WRM) and Supply In Central India” held at IISER, Bhopal from 25 February - 2 March, 2019 and addressed topics viz. Water resource and supply management for agriculture, Water resource and supply management for domestic and industrial uses and Water resource and supply management for Energy.

INCOIS hosted a two day workshop jointly organised by Ministry of Earth Sciences (MoES), Government of India, National Oceanographic Atmospheric Administration (NOAA), USA, Office of Naval Research (ONR), USA during 25-26 February 2019 at Hyderabad, India. The discussions in workshop was focused on implementing a joint oceanographic observational campaign in the Arabian Sea and the scientific issues to be addressed to understand the ocean circulation and air-sea interaction process that influences the Asian Monsoon.

A 2--day refresher course on ‘Met. Aviation Services’ was organised at Met Watch Office, Mumbai during 27-28 Feb 2019 for Aeronautical Meteorological Stations (AMS) in the region as per the requirements of the inspection guidelines.

Indian Institute of Tropical Meteorology (IITM) won First Prize in theme based Wall painting / beautification competition, organized by Pune Municipal Corporation (PMC), under event “Swachha Servekshan Abhiyan 2019”.

INCOIS Operational Services Training to Indian Navy Officers (SNOM - Advanced Oceanography Course) was conducted during 21- 23 February, 2019 to provide exposure to Indian Navy officers on various products and services provided by INCOIS for operational requirements.

Utilization of Ocean Research Vessels during the month

Vessel	Days at Sea / Utilization	Maintenance/ Inspection /Scientific Logistics / Cruise Preparation	No. of Cruise
Sagar Nidhi	25	3(maintenance)	2
Sagar Manjusha	17	11(maintenance)	2
Sagar Purvi	10	18(maintenance, bad weather)	1
Sagar Kanya	17	11	2
Sagar Sampada	21	7	3

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

Subject	Publications			Ph.Ds		
	April - January, 2019	February, 2019	Total	April - January, 2019	February, 2019	Total
Atmospheric Sciences	167	16	183	4	2	6
Ocean Science and Technology	55	14	69	2	-	2
Polar Sciences	20	3	23	-	-	-
Geosciences and resources	7	-	7	-	1	1
Total	249	33	282	6	3	9