

Ministry of Earth Sciences (MoES)
Summary of Important Developments –June,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.	Dt 14/08/2014 PROPOSAL FOR KRILL FISHING 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 MoESwill study legislations enacted by other member countries before finalising the draft legislation as part of international convention obligations. 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.	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.	A proposal has been received for krill fishing which is under examination.

•**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
10	26

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:

Southwest monsoon advanced into some more parts of Rajasthan, Uttar Pradesh, Himachal Pradesh, Uttarakhand and Jammu & Kashmir and some parts of Punjab, Chandigarh and entire Delhi. For the country as a whole, cumulative rainfall during this year's southwest monsoon season up to 3rd July, 2019 is 138.3 mm and below Long Period Average by 28%.

India was elected as member of Executive Council of Intergovernmental Oceanographic Commission (IOC) and India's nominee, Dr. Satheesh Shenoi, Director, Indian National Centre for Ocean Information Services (INCOIS) was elected as Vice Chair of the IOC for a 2 year term.

India was re-elected as Member of Executive Council of the World Meteorological Organisation (WMO), UN for the 4 year term (2019-2023). India is a founder member of WMO.

Shallow water Remotely Operated Vehicle (ROV) was developed indigenously by National Institute of Ocean Technology (NIOT) for catering to the exploration of marine living resources, supported by scientific sensors and imageries. Training about its operation was also imparted to the scientists at Acoustic Test Facility (ATF), NIOT during 11-13 June, 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, 40.1 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	Installations during the month	Data Reporting
Automatic Weather Station (AWS)	#682+5	05	286
Automatic Rain Gauge (ARG)	1356	--	493
GPS Sonde based RS/RW Stations	43	--	37
Doppler Weather Radar (DWR)	25	--	23
Ozone (Ozone Sonde + Total Ozone)	05	--	*04

Surface Ozone (Electrochemical Concentration Cell method)	07	--	07
Nephelometer	12	--	12
Sky Radiometer	20	--	19
Black Carbon Monitoring Systems (Aethalometer)	25	--	23
Air Quality Monitoring System (SAFAR)	10(Delhi) 10(Mumbai) 10(Ahmedabad)	--	10(Delhi) 10(Mumbai) 09(Ahmedabad)
Hydromet. (IMD & Extra-departmental excluding AWS & ARG)	---	--	2521
Aviation	79	--	79

*One Ozone Sonde Station is temporarily suspended. # Temporary installation of 5 AWS for Amarnath Yatra.

Lightning Location Network sensors were installed at Ranchi, Nellore, Vellore and Bengaluru and integrated with the central processor at IITM Pune. Now, a total of 50 sensors are installed over the country.

Atmospheric Processes, Modelling and Services

Advance of the Southwest Monsoon-2019:

8th June: Southwest monsoon set in over Kerala with a delay of a week

10th June: South Arabian Sea & Lakshadweep area, most parts of Kerala, parts of Tamilnadu, southeast Bay of Bengal, most parts of southwest & east-central Bay of Bengal, parts of north-east Bay of Bengal, parts of west-central Bay of Bengal, most parts of Mizoram and parts of Manipur

14th June: Parts of central Arabian sea, Kerala, Karnataka, Tamilnadu, most parts of southwest Bay of Bengal, parts of central & North Bay of Bengal and parts of northeast India on;

20th June: Northwest Bay of Bengal, northeast India ; central Arabian Sea, remaining parts of Coastal Karnataka, south Konkan & Goa, south Madhya Maharashtra and Interior Karnataka, more parts of Bay of Bengal, remaining parts of northeastern states and more parts of West Bengal;

21st June: South Madhya Maharashtra, most parts of Karnataka, remaining parts of Tamilnadu, entire Andhra Pradesh, most parts of Telangana, south Chhattisgarh & Odisha, remaining parts of Bay of Bengal, most parts of West Bengal and some parts of Jharkhand and Bihar ;

22nd June: Parts of Madhya Maharashtra, parts of Marathwada, Vidarbha, remaining parts of Karnataka, Telangana, Odisha, Jharkhand, Gangetic West Bengal & Bihar, most parts of Chhattisgarh and parts of East Uttar Pradesh ;

23rd June: Parts of Madhya Maharashtra, most parts of Marathwada and parts of Vidarbha and East Uttar Pradesh ;

24th June: Parts of central Arabian Sea, Konkan, most parts of Madhya Maharashtra, remaining parts of Marathwada & Vidarbha, parts of Madhya Pradesh, parts of Chhattisgarh & Uttar Pradesh and parts of Uttarakhand;

25th June: Remaining parts of central Arabian Sea, Konkan & Madhya Maharashtra, parts of north Arabian Sea and south Gujarat and parts of Madhya Pradesh

29th & 30th June: Parts of north Arabian Sea, Gujarat & Madhya Pradesh on 28th June.

5th July, 2019: Parts of Rajasthan, remaining parts of Uttar Pradesh, Himachal Pradesh, Uttarakhand and Jammu & Kashmir and some parts of Punjab, Chandigarh and entire Delhi.

Very Severe Cyclonic Storm “VAYU” over Arabian Sea : Very Severe Cyclonic Storm (VSCS) “VAYU” originated from a low pressure area (LPA) formed over southeast Arabian Sea and adjoining Lakshadweep & eastcentral Arabian Sea (AS) in the morning (0830 IST) of 9th June. Under favourable environmental conditions, it concentrated into a Depression (D) over eastcentral & adjoining southeast AS in the morning (0530 IST) of 10th June. Moving north-northwestwards, intensified into a deep depression (DD) over the same region at 1130 IST and further into a cyclonic storm (CS) “VAYU” around midnight (2330 IST) of 10th June, 2019 over eastcentral & adjoining southeast AS. It then moved northwards and intensified into a severe cyclonic storm (SCS) in the evening (1730 hrs IST) of the 11th June and into very severe cyclonic storm (VSCS) in the same midnight (2330 hrs IST) over the eastcentral AS. It then moved north-northwestwards till 13th June and then westwards and weakened into an SCS in the early morning (0530 hrs IST) of 16th June, 2019

over northeast AS. It gradually started recurving northeastwards from evening (1730 hrs IST) of 16th June), and weakened into a CS in the same night (2030 hrs IST) over northeast AS. Thereafter, it moved east-northeastwards and weakened into a DD in the morning (0830 hrs IST) of 17th June and into a depression in the same afternoon (1430 hrs IST) over the northeast AS. It further moved east-northeastwards and weakened into a well marked low pressure area over northeast AS and adjoining Saurashtra & Kutch in the midnight (2330 hrs IST) of 18th June.

As the cyclone skirted Gujarat coast, the core maximum wind due to the cyclone occurred over the sea. However, the squally to gale wind speed from 45 kmph to 90 kmph occurred along & off Gujarat coast during 12th to 14th. Light to moderate rainfall at many places with isolated heavy to very heavy rainfall occurred over Saurashtra and Kutch on 13th & 14th and over Gujarat region on 14th. It also caused light to moderate rainfall at many places with isolated heavy to very heavy rainfall over Kerala, coastal Karnataka and Konkan & Goa during 10th -14th June.

India Meteorological Department (IMD) maintained round the clock watch in close association of Indian National Centre for Ocean Information Services (INCOIS), monitored and predicted the cyclone continuously from 6th June onwards and issued warnings.

A very high resolution (4km) regional ensemble prediction system (NEPS-R) of National Centre for Medium Range Weather Forecasting (NCMRWF) was employed for real time prediction of TC Vayu which is also running operationally for prediction of low pressure system over Bay of Bengal. Using the ensemble forecast based on GEFS and the deterministic GFS, accurate forecast has also been achieved by Indian Institute of Tropical Meteorology (IITM) with longer lead (5 to 6 days) for cyclogenesis, recurving track, intensification and landfall of very severe cyclone "VAYU".

Rainfall in June, 2019: Rainfall during the month of June, 2019 was large excess in 1, excess in 0, normal in 5, deficient in 28, large deficient in 2 and no rain in 0 of 36 meteorological sub-divisions. The percentage departures of rainfall statistics are given below.

Region	Actual	Normal	% Departure from Long Period Average
East & Northeast India	218.2	347.1	-37%
Northwest India	51.0	75.3	-32%
Central India	117.3	169.2	-31%
South Peninsular India	112.8	160.2	-30%
Country As A Whole	112.1	166.9	-33%

Heavy rainfall occurred at isolated places over Kerala on 11 days, Andaman & Nicobar Islands on 9 days, Odisha on 8 days, Tamilnadu and Telangana on 7 days each, Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, East Rajasthan and Konkan & Goa on 6 days each, Coastal Karnataka and Assam & Meghalaya on 5 days each, Bihar, Coastal Andhra Pradesh & Yanam and South Interior Karnataka on 4 days each, Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, Madhya Maharashtra, Gujarat Region, Chhattisgarh, North Interior Karnataka and Marathwada on 3 days each, Uttarakhand, Saurashtra & Kutch and Jharkhand on 2 days each and over Himachal Pradesh, Jammu & Kashmir, West Uttar Pradesh, Punjab, West Madhya Pradesh and Vidarbha on 1 day each during the month.

No. of Heavy rainfall events and (% correct) of spatial distribution of warnings during June 2019 is given below:

Lead Time	No. of Heavy Rainfall (Events): 252 (Heavy Rainfall events: 240, Very Heavy rainfall: 12) Overall (>64.4mm)
	24 Hour
48 Hour	79
72 Hour	78

Western Disturbances (WDs) and associated weather: During the month, about 6 (six) western disturbances affected

northwest India during 1st & 2nd June, 3rd – 8th June, 11th – 14th June, 13th – 17th June, 23rd – 27th June and 29th June – 2nd July 2019. Three WDs caused fairly widespread to widespread rainfall/thunderstorms over Western Himalayan Region and isolated to scattered rainfall/thunderstorm activity over adjoining plains.

Thundersquall & Hailstorm activity: Thundersquall & Hailstorm activity during the month is given in the table below:

S.No.	Region	TS Days	Maximum TS Activity	Hail	Squall
1.	South Peninsular India	30	06-06-19	Nil	Nil
2.	Northwest India	29	12-06-19	01(Batote on 03-06-19) 03(Pahalgam, Pantnagar, Mukteshwar on 06-06-19) 01(Shimla on 11-06-19) 03(Bhaderwah, Bhaderwah, Shimla on 12-06-19) 01(Pahalgam on 15-06-19) 01(Srinagar on 17-06-19) 01(Ludhiana on 20-06-19) 01(Gulmarg on 21-06-19)	04(Chandigarh, Ambala, Hissar, Dehradun on 12-06-19) 01(Dehradun on 17-06-19) 01(Amritsar on 26-06-19)
3.	Northeast India	29	14-06-19 & 21-06-19	Nil	01(Agartala on 01-06-19) 01(Agartala on 03-06-19)
4.	East India	29	02-06-19	01(Keonjhar on 12-06-19)	02(Port Blair, Port Blair on 10-06-19) 01(Port Blair on 11-06-19) 02(Alipore, Patna on 12-06-19) 01(Port Blair on 28-06-19) 03(Port Blair, Port Blair, Port Blair on 29-06-19)
5.	Central India	27	29-06-19	01(Raipur on 06-06-19)	01(Nagpur on 01-06-19) 02(Nagpur on 07-06-19) 01(Ambikapur on 16-06-19) 02(Nagpur 22-06-19)
6.	West India	17	23-06-19	Nil	Nil

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.

Heat wave, maximum temperature and mean temperature

During the first week of June 2019, Heat Wave to Severe Heat Wave conditions had been reported at most parts over West Rajasthan on one day; some parts over Madhya Maharashtra and West Rajasthan on one day each and at isolated places over south Uttar Pradesh one or two days; many parts with Severe heat wave conditions at isolated pockets had been reported over East Madhya Pradesh on 3 days and over Vidarbha on one day; at some parts with severe heat wave conditions at isolated pockets had been reported over West Rajasthan on 3 days, over East Uttar Pradesh on two days and over East Rajasthan on one day.

During the second week, severe heat wave conditions at isolated pockets was observed over Coastal Andhra Pradesh; some parts with severe heat wave conditions at isolated pockets over Bihar; isolated pockets over West Rajasthan on one day each; many parts over Vidarbha on three days and over Telengana, Coastal Andhra Pradesh on one day each; some parts over Vidarbha on three days, over Coastal Andhra Pradesh on two days and over Jharkhand and Bihar on one day each; isolated pockets over Telengana on five days; over West Madhya Pradesh, Chhattisgarh, Gangetic West

Bengal, Tamil Nadu on three to four days each and over West Rajasthan, Vidarbha, Coastal Andhra Pradesh, Odisha, Jharkhand, East Uttar Pradesh, Marathwada and Bihar on one or two days.

During the third week, heat wave to severe heat wave conditions were observed at isolated pockets over Coastal Andhra Pradesh, over Bihar, at isolated pockets over West Rajasthan on one day each, over Vidarbha on three days and over Telengana & Coastal Andhra Pradesh on one day each, some parts over Vidarbha on three days, over Coastal Andhra Pradesh on two days and over Jharkhand and Bihar on one day each. Heat wave conditions was observed at isolated places over Telengana on five days, over West Madhya Pradesh, Chhattisgarh, Gangetic West Bengal & Tamil Nadu on three to four days each and over West Rajasthan, Vidarbha, Coastal Andhra Pradesh, Odisha, Jharkhand, East Uttar Pradesh, Marathwada and Bihar on one or two days.

During the fourth week, Heat wave conditions in some parts with Severe Heat wave at isolated pockets occurred over Vidarbha on one day. Heat wave conditions at isolated pockets occurred over Vidarbha on two days and over Bihar on one day.

The highest maximum temperature of 50.8°C was recorded at Churu (West Rajasthan) on 1st June 2019 over the plains during the month.

Mean Temperature for the month for the country as a whole was 30.26°C; this was slightly above normal (+1.02°C).

Bulletins / Operational Reports/ Services

Bulletins/Warnings/Press Releases Issued: All India Weather Bulletins(120), All India inference and severe weather warnings (120), Press Releases Related to monsoon onset over Kerala and enhanced rainfall/thunderstorm activity over northeast India(2), Current weather status and outlook for next two weeks (4),All India Weekly Weather Reports (4), Mountain weather bulletins including severe weather warnings for western and central Himalayan region (60), Heat wave bulletins(60), FDP STORM Bulletins (30), Nowcast Guidance Bulletins for severe weather(30).

Publications & Operational Reports: Daily All India Weather Summary and Weekly Weather Reports, Enso bulletin for the month of June 2019 and Seasonal Climate Outlook for South Asia for the month of June to September 2019 (Quick Link : www.imdpune.gov.in/Clim_Pred_LRF_New/Products.html),

Climate Diagnostics Bulletin of India for May 2019 uploaded in IMD Pune website, Gridded Standardized Precipitation Index (SPI) & Standardized Precipitation Evapotranspiration Index (SPEI) at 0.5*0.5 degree resolution at 4 weekly 1, 2, 3 & 4 monthly time scales computed and maps of same timescales uploaded at weekly basis on IMD Pune website, four weekly and cumulative Standardized Precipitation Index (SPI) maps prepared for the weeks ending on 02, 09, 16, 23, and 30 June 2019 and uploaded in IMD Pune website.

Geoscience Research

Seismological Observational Network

Observation Type	Target	Commissioned so far	Data reporting during the month
Seismic stations	115	115	106
GPS stations	40	19#	17

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

Earthquake and Tsunami monitoring

Earthquake: 14 earthquakes were monitored in the Indian region out of which 3 events were greater than magnitude (M) of 5.0.

Tsunami: 3 seabed earthquakes (M> 6) with a potential to generate tsunami occurred. This information was provided within 12 minutes of occurrence for all the events.

Ocean Observation System

Type of Platform	Target	Commissioned till June, 2019	Data received during June, 2019
Argo Floats *	200	360	142
Drifters*	150	108	0
Moored Buoys	16	22	18
Tide Gauges	36	36	25
High Frequency(HF) Radars	10	10	7
Current Meter Array	10	11	2

Acoustic Doppler Current Profiler(ADCP)	20	20	17
Tsunami Buoys	7	9	5
Wave Rider Buoy	16	22	14

*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)	7
2	Tuna Fishing Advisories	3
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

Marine Living Resources Programme

Taxonomic studies of anomuran crabs collected from the Terrace of Trivandrum region off the southwest coast of India revealed 3 female specimens of the lithodid species *Paralomis ceres* Macpherson, 1989. This species is known only the Western Arabian Sea off Oman. The present observation constitutes the first known occurrence of this species outside its type locality, thereby indicating the first record from Indian EEZ.

Capacity Building and Outreach

Indo-UK Water Centre (IUKWC) at IITM, Pune organized four-day workshop on 'Safe and Sustainable Technologies and Strategies for Integrated Freshwater Resource Management' (as a part of IUKWC's 'Lead a workshop' initiative) at JSS Academy of Higher Education and Research (JSSAHER), Mysuru during 25–28 June, 2019. The workshop aimed to further the development of sustainable strategies urgently needed in India, which also have global long term impact on quality of drinking water and food production. Over 45 delegates from India and the UK presented their research and experiences, and explored innovative approaches and technologies for assessing, treating and managing water within the Water Food Energy Nexus.

Training course on "Marine Meteorology and Operational Ocean State Forecasting" was conducted by International Training Centre on Operational Oceanography (ITCOcean) during 17-21 June 2019. Twenty three (23) participants from various national institutes across India participated in this course.

5th International Yoga Day was observed at Ministry of Earth Sciences and its attached/subordinate officers/autonomous institutes on 21st June 2019. All officials, scientists, and staff participated in the Yoga session.

A 5-day training program for Indian Air Force (IAF) Officers was held at IITM during 17-21 June 2019. Total 10 IAF Met officers from the Directorate of Meteorology, New Delhi attended the program.

A one day Hindi workshop was organized on 25 June 2019 in Indian Institute of Tropical Meteorology(IITM) on the subject "Patrachar kr vividh roop". IITM employees participated in the workshop.

The Dehradun city forecast and Uttarakhand state weather forecast & warnings are being displayed in these Digital Display Boards installed at IOCL & HPCL petrol Pumps in 7 different places in Dehradun city for General Public.

Awareness workshop for Media Persons was conducted at Met Centre, Hyderabad on 24th June 2019 in which 26 media persons participated and at Mumbai on 7th June 2019 more than 100 media persons participated

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	10	2
Sagar Manjusha	19	11	2
Sagar Purvi	8	23(maintenance)	1
Sagar Kanya	12	18	1
Sagar Sampada	0	31(repair and maintenance)	-

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

Subject	Publications			Ph.Ds		
	April- May, 2019	June, 2019	Total	April- May, 2019	June, 2019	Total
Atmospheric Sciences	28	17	45	-	--	-
Ocean Science and Technology	12	3	15	-	-	-
Polar Sciences	4	2	6	-	-	-
Geosciences and resources	2	4	6	1	1	2
Total	46	26	72	1	1	2

Annex-II

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

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Dated, the 01st July, 2019

CERTIFICATE

(FOR THE MONTH OF JUNE, 2019)

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 June, 2019. 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 | - 01 |



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