

Ministry of Earth Sciences (MoES)
Summary of Important Developments –July,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
29	31

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. Foundation Day of Ministry of Earth Sciences (MoES) was celebrated on 27th July 2019 at the Vigyan Bhavan, New Delhi with Dr. Harsh Vardhan, Hon. Minister for Science, & Technology, Earth Sciences and Health & Family Welfare as Chief Guest. The Foundation Day lecture was delivered by Dr. Peter Molnar, Distinguished Professor, Geological Sciences, University of Colorado, USA. The Life Time Excellence Award was awarded to Professor J. Srinivasan for his significant contribution in the field of Indian monsoon and Climate Change. The National Awards for Ocean Science & Technology, Atmospheric Science & Technology and Geoscience & Technology were presented to Dr. Doraiswamy Shankar; Prof. S.K. Satheesh and Prof. GVR Prasad respectively. National Award for Woman Scientist was presented to Prof. C. Manikyamba, NGRI. The young researcher awards were given to 3 young scientists. In addition, certificates of merit were presented to the scientists from the Ministry. School children from different age groups were awarded for Drawing Competition of Earth Day Celebration along with the winner of 12th International Earth Science Olympiad 2018. On this occasion, IMD's new website entitled MAUSAM was launched along with a mobile application for farmers named MEGHDOOT for agrometeorological Advisory Services.
2. A Memorandum of Understanding was signed on 26th July, 2019 between National Institute of Ocean Technology (NIOT) and Krylov State Research Centre, Russia on technologies pertaining to deep sea mining and habitable capsule for submersible.
3. Agreements were signed for technology transfer to 5 Indian industries on 26th July 2019. These include the technologies developed by National Institute of Ocean Technology pertaining to Wave powered Navigational Buoy and Multiplex PCR detection kit for detecting virulent genes of Enterococcus faecal in water and seafood.
4. A soil moisture assimilation system is developed for operational NCUM regional model of 4 km resolution for the Indian domain by National Centre for Medium Range Weather Forecasting (NCMRWF). This assimilation system produces soil moisture analysis at 4 soil levels covering entire root zone.
5. NCMRWF provided real-time weather forecasts during the period 1-22 July 2019, for the ISRO Lunar Mission Chandrayaan-2 Launch and also to India Army for its Uttarakhand Expedition during 27 July to 6 August 2019.
6. India organized a side event during the 25th session of International Seabed Authority at Kingston, Jamaica and projected the work carried out pertaining to exploration of deep sea minerals in last 4 decades.

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)	562 # (688-125)	01 (Amarnath Ji)	203
Automatic Rain Gauge (ARG)	1356	--	411
GPS Sonde based RS/RW Stations	43+4	04	47
Doppler Weather Radar (DWR)	* 25	--	22
Ozone (Ozone Sonde + Total Ozone)	04	--	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)	---	--	2887
Aviation	79	--	79

125 AWS (Sutron -make 9210 AWS (100) and Astra- make AWS (old-25) have worked for 13 years and outlived its life and its receiving PRBS ERS at IMD Pashan has also outlived its life . These 125 AWS are under replacement process with GPRS based AWS.

* Includes 2 Doppler Weather Radar of ISRO.

One Hundred Sixty Six (166) more stations were added on Nowcast Warning Page of newly launched IMD website for issue of three hourly nowcast warnings for severe weather, thereby increasing the total number of three hourly nowcast stations to 607.

Atmospheric Processes, Modelling and Services

Major Weather Systems during the Month: In addition to the continuation of last month's low pressure area as a well marked low pressure area over the northern plains during the 1st week of July, another well marked low formed over Bihar and adjoining Uttar Pradesh in quick succession. These two systems aided in maintaining active monsoon conditions over central India, northern Plains and south Peninsula during the initial 2 weeks. Subsequently two more low pressure areas formed during the last week of July, enhancing the rainfall activity over central and adjoining interior Peninsula, during the period.

Western Disturbances and associated weather: Apart from the monsoon low pressure systems, about 5 (five) western disturbances also affected northwest India during 29th June – 2nd July, 4th – 5th July, June, 7th – 9th July, 12th – 18th July, 25th – 30th July 2019. Out of these western disturbances, three of them caused fairly widespread to widespread rainfall/thunderstorms over Western Himalayan Region upon their interaction with the monsoon flow.

Advance of the Southwest Monsoon-2019:

9th July, 2019: East Rajasthan, most parts of Haryana and some more parts of West Rajasthan & Punjab

15th July: most parts of Haryana and Punjab

17th July: remaining parts of Punjab and Haryana and some more parts of West Rajasthan

It further advanced into the remaining parts of West Rajasthan and thus Southwest Monsoon covered the entire country on 19th July 2019.

Rainfall Scenario: The rainfall for the country as a whole for the month of July 2019 has been recorded as 298.3 mm which is 5% above to its Long Period Average (LPA) i.e. 285.3 mm. For the current Monsoon Season i.e. from 01/06/2019 to 31/08/2019 recorded rainfall is 410.5mm which is 9% below to its Long Period Average i.e. 452.2.

Rainfall statistics (% departures of area weighted rainfall from LPA):

Region	Period- 01.07.2019 to 31.07.2019			Period- 01.06.2019 to 31.07.2019		
	Actual	Normal	% Departure from Long Period Average	Actual	Normal	% Departure from Long Period Average
EAST & NORTHEAST INDIA	479.0	432.0	+11	697.2	779.1	-11
NORTHWEST INDIA	214.7	212.2	+1	265.7	287.5	-8
CENTRAL INDIA	350.4	322.8	+9	467.7	492.0	-5
SOUTH PENINSULAR INDIA	193.9	216.7	-11	306.7	376.9	-19
COUNTRY AS A WHOLE	298.4	285.4	+5	410.5	452.2	-9

Heavy to very heavy rainfall with extremely heavy rainfall at isolated places occurred over Konkan & Goa on 13 days, Assam & Meghalaya on 9 days, Sub-Himalayan West Bengal & Sikkim and Gujarat Region on 7 days each, Madhya Maharashtra on 6 days, Bihar on 5 days, East Uttar Pradesh on 4 days, Kerala on 3 days, Coastal Karnataka and West Madhya Pradesh on 2 days each and over Telangana, Vidarbha, Saurashtra & Kutch, East Rajasthan, West Rajasthan, Jammu & Kashmir, West Uttar Pradesh and Nagaland, Manipur, Mizoram & Tripura on one day each during the month. **1464.8 mm rainfall was received in Mumbai in July 2019 which was second highest since year 1959.**

Heavy to very heavy rainfall at isolated places occurred over: Assam & Meghalaya on 12 days, Coastal Karnataka on 11 days, South Interior Karnataka on 9 days, Chhattisgarh on 8 days, Konkan & Goa and East Rajasthan on 7 days each, East Uttar Pradesh and Madhya Maharashtra on 6 days each, Sub-Himalayan West Bengal & Sikkim, Odisha and Gujarat Region on 5 days each, Nagaland, Manipur, Mizoram & Tripura, Haryana, Chandigarh & Delhi, Punjab, Uttarakhand and Himachal Pradesh on 4 days each, Arunachal Pradesh, West Uttar Pradesh East Madhya Pradesh, Telangana and Kerala on 3 days each, Gangetic West Bengal, Bihar, West Rajasthan and Vidarbha on 2 days each and over Saurashtra & Kutch, Marathwada, Coastal Andhra Pradesh, North Interior Karnataka and Lakshadweep on 1 day each during the month.

Heavy rainfall at isolated places occurred over: Nagaland, Manipur, Mizoram & Tripura and Coastal Andhra Pradesh on 15 days each, Jharkhand and Coastal Karnataka on 14 days each, Odisha on 12 days, Arunachal Pradesh, Bihar and North Interior Karnataka on 11 days, West Uttar Pradesh and Konkan & Goa on 10 days each, East Uttar Pradesh, Haryana, Chandigarh & Delhi and Tamil Nadu on 9 days each, Assam & Meghalaya, Uttarakhand, West Madhya Pradesh, East Madhya Pradesh, Telangana and Kerala on 8 days each, Vidarbha and Chhattisgarh on 7 days each, Gangetic West Bengal, Himachal Pradesh, East Rajasthan and South Interior Karnataka on 6 days each, Andaman & Nicobar Islands, Sub-Himalayan West Bengal & Sikkim and Saurashtra & Kutch on 5 days each, Punjab, West Rajasthan, Gujarat Region, Rayalaseema and Lakshadweep on 4 days each and over Jammu & Kashmir and Marathwada on 3 days during the month.

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

Lead Time	No. of Heavy Rainfall Events (>64.4 mm): 514 Heavy Rainfall (115.6mm>64.4mm): 299 Very Heavy rainfall (>or=115.6mm): 215
	Overall (>64.4mm)
24 Hour	74%
48 Hour	74%
72 Hour	73%

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	25	15-July	Nil	Nil
2	Northwest India	30	24-July	Nil	Nil
3	Northeast India	29	5-July	Nil	Nil
4	East India	27	1-July	Nil	Gaya (1 st July)
5	Central India	25	2-July	Nil	Nil
6	West India	Nil	Nil	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.

Heat wave and maximum temperature: During the first week, Heat Wave Conditions were observed in some parts over West Uttar Pradesh and in isolated pockets over Bihar, East Uttar Pradesh, Haryana, Chandigarh & Delhi, Jammu & Kashmir, West Rajasthan and East Madhya Pradesh.

Temperature Scenerio: The Mean Temp for the month for the country as a whole was 28.65°C; this was slightly above normal (+0.67°C).

The MoU between SASE (DRDO) and NCMRWF (MoES) was renewed for another three years till June 2022. Under this MoU, operational weather forecasting for Himalayan region for defence applications have been undertaken and jointly developed.

Bulletins / Operational Reports/ Services

Bulletins/Warnings/Press Releases Issued: All India Weather Bulletins(124), All India inference and severe weather warnings (124), Press Releases Related to monsoon onset over Kerala and enhanced rainfall/thunderstorm activity over northeast India(4), 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 (62), Heat wave bulletins(62), FDP STORM Bulletins (30), Nowcast Guidance Bulletins for severe weather(30).

Publications & Operational Reports: Report on cyclonic disturbances over north Indian Ocean during 2018 published online (<http://www.rsmcnewdelhi.imd.gov.in/images/pdf/publications/annual-rsmc-report/rsmc-2018.pdf>) and circulated to all stake holders in July, 2019. Daily All India Weather Summary and Weekly Weather Reports, Enso bulletin for the month of July 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 June, 2019 and Pre-monsoon (March-May, 2019) were brought out and has been 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 was computed and maps of same timescales uploaded at weekly basis on IMD Pune website. Four weekly and cumulative Standardized Precipitation Index (SPI) maps were prepared

for the weeks ending on 02, 09, 16, 23, and 30 June 2019 and uploaded in IMD Pune website. Report on cyclonic disturbances over north Indian Ocean during 2018 was published online and circulated to all stake holders in July, 2019.

Geoscience Research

Seismological Observational Network

Observation Type	Target	Commissioned so far	Data reporting during the month
Seismic stations	115	115	107
GPS stations	40	20#	19

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

Earthquake and Tsunami monitoring

Earthquake: 33 earthquakes were monitored in the Indian region out of which 2 events were 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 for all the events.

Ocean Observation System

Type of Platform	Target	Commissioned till July, 2019	Data received during July, 2019
Argo Floats *	200	360	142
Drifters*	150	108	5
Moored Buoys	16	22	18
Tide Gauges	36	36	28
High Frequency(HF) Radars	10	12	11
Current Meter Array	10	11	2
Acoustic Doppler Current Profiler(ADCP)	20	20	17
Tsunami Buoys	7	9	4
Wave Rider Buoy	16	22	10

*The remaining floats/drifters have completed their life time and as such no data can be received from them.

The independently moored autonomous ambient noise system was retrieved successfully in the Kongsfjorden, Arctic that was deployed in July 2018 and continuous data was obtained.

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)	20
2	Tuna Fishing Advisories	16
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

Indian National Centre for Ocean Information Services (INCOIS) issued daily forecasts for requested platform locations of Oil and Natural Gas Corporation (ONGC), KG-Basin Kakkina. INCOIS sent daily forecasts to Maharashtra Maritime Board in four locations for facilitating vessel movements off Maharashtra.

Topographic Survey of Exclusive Economic Zone

Area covered during the month: About 27000 sq. km

Marine Living Resources Programme

Homolodromiarajeevania new species of deep-water sponge crab has been described from the Northern Indian Ocean (Arabian Sea, 957 m, and Bay of Bengal, 231–514 m). This is the first discovery of the genus from this region.

Capacity Building and Outreach

Indo-US Science workshop on Moored buoy Data Analysis was conducted at NIOT during July 2-5, 2019. Fifteen mentors from premier institutions in India and Abroad and thirty students from fifteen institutions participated in the workshop. The participants also visited the US research vessel R/V Sally Ride on 5th July 2019 and attended the practical demonstration of advanced measurement techniques such as FCTD, Wirewalker, glider.

Swachhta Pakhwada was held during July 1-15, 2019 and cleanliness campaign inside and outside the campus were conducted.

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
SagarManjusha	16	15	2
SagarPurvi	10	21(maintenance)	2
SagarKanya	7	24	1
SagarSampada	24	7	2

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

Subject	Publications			Ph.Ds		
	April- June, 2019	July, 2019	Total	April- June, 2019	July, 2019	Total
Atmospheric Sciences	45	16	61	-	--	-
Ocean Science and Technology	15	8	23	-	-	-
Polar Sciences	6	2	8	-	-	-
Geosciences and resources	6	-	6	2	-	2
Total	72	26	98	2	-	2