

Ministry of Earth Sciences (MoES)
Summary of Important Developments –May,2020

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 mooted through NITI Aayog for collaboration with Norway for krill fishing.</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
4	2

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. **Second stage Monsoon Forecast** of India Meteorological Department issued on 1 June 2020 indicates that quantitatively, monsoon season rainfall for the country as a whole is likely to be 102% of the Long Period Average(LPA) with a model error of $\pm 4\%$. Region wise, the season rainfall is likely to be 107% of LPA over North-West India, 103% of LPA over Central India, 102% of LPA over South Peninsula and 96% of LPA over North-East India, all with a model error of $\pm 8\%$. The monthly rainfall over the country as whole is likely to be 103% of its LPA during July and 97% of LPA during August, both with a model error of $\pm 9\%$.
2. As per the IMD prediction, the southwest monsoon was set in over Kerala on 1st June, 2020.
3. **Mobile App-UMANG** (Unified Mobile Application for New-age Governance) incorporating current weather, nowcast, city forecast, tourism forecast, rainfall information, warnings and cyclones was relaunched. (The App is available at Web: <https://web.umang.gov.in/web/#/>., Android:<https://play.google.com/store/apps/details>iOS: <https://apps.apple.com/in/app/umang/id1236448>).
4. **Super Cyclonic Storm "AMPHAN" developed over southeast Bay of Bengal during 16th-21st May, 2020:** IMD provided uninterrupted tropical cyclones forecasting services including observations, modeling, forecasting, and communication to various stake holders, disaster managers, media and general public in the current scenario due to COVID-19.
5. During the lockdown due to Covid-19, all **weather, climate, ocean, seismology observations and essential services** including the critical services like disaster management, agriculture, air quality and aviation services are continued. Relative Humidity and Temperature (Maximum & Minimum) data and forecast are being supplied to various agencies viz. NDMA, PMO, PSA in connection with the management of COVID-19.
6. **All instructions / guidelines regarding lockdown due to COVID-19** issued by the government are strictly adhered.

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. **Agromet Advisory** has been sent for 2878069 farmers in the state of Andhra Pradesh, Orissa, West Bengal, Assam, Meghalaya during period of occurrence of Super Cyclone Amphan from 16-22 May, 2020.
- 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)	*305 (705-400)		231
Automatic Rain Gauge (ARG)	1356	--	332
GPS Sonde based RS/RW Stations	56	--	20
Doppler Weather Radar (DWR)	** 25	--	22
Ozone (Ozone Sonde + Total Ozone)	04	--	04
Surface Ozone (<u>Electrochemical Concentration Cell</u> method)	07	--	07
Nephelometer	12	--	12
Sky Radiometer	20	--	17
Black Carbon Monitoring Systems (Aethalometer)	25	--	23
Air Quality Monitoring System (SAFAR)	10 (Delhi) 10 (Mumbai) 10 (Ahmedabad)	--	09 (Delhi) 10 (Mumbai) 10 (Ahmedabad)
Hydromet. (IMD & Extra-departmental excluding AWS & ARG)	---	--	2737
Aviation	79	--	79
Radiation Stations	46	---	46

* Out of Total 705, 400 are outlived. ** In addition there are 2 Doppler Weather Radar of ISRO.

Due to short supply of consumables e.g. balloons/instruments etc due to close down .

Monthly Weather Summary (May 2020)

- a) **Temperature Scenario:** The Mean Temp for the month for the country as a whole was 29.09°C; this was near normal (+0.15°C above normal).

Prevailing strong and dry northwesterly winds have caused heat wave to severe heat wave conditions over **plains of northwest India and central India and over parts of east and west India** mainly during the second half of the month. The **highest maximum temperature of 50.0°C** had been recorded at **Churu (West Rajasthan)** on **26th May 2020**, over the plains of the country during the month. **The National Capital Region (NCR)** also recorded maximum temperature of the order of more than 45.0 °C on many days during the month with the highest maximum temperature recorded over Safdurjang and Palam during the month being 46.0 °C and 47.6 °C respectively on 26th May 2020.

- b) **Super Cyclonic Storm 'AMPHAN' over Bay of Bengal:** The Super Cyclonic Storm (SuCS) "AMPHAN" originated as a low pressure area (LPA) formed over southeast BoB and adjoining south Andaman Sea in the morning (0830 IST) of 13th May. Under favourable environmental conditions, it concentrated into a depression (D) over southeast BoB in the early morning (0530 IST) of 16th May and further intensified into a deep depression (DD) in the afternoon (1430 IST) of the same day. It moved north- northwestwards and intensified into the cyclonic storm "AMPHAN"

(pronounced as UM-PUN) over southeast BoB in the evening (1730 IST) of 16th May, 2020. Moving nearly northwards, it further intensified into a severe cyclonic storm (SCS) over southeast BoB in the morning (0830 IST) of 17th May. It underwent rapid intensification during subsequent twenty four hours and accordingly intensified into a very severe cyclonic storm (VSCS) by the afternoon (1430 IST) of 17th, extremely severe cyclonic storm (ESCS) in the early hours of 18th (0230 IST) and into a super cyclonic storm (SuCS) around noon (1130 IST) of 18th May, 2020. It maintained the intensity of SuCS over westcentralBoB for nearly 24 hours (during 1130 IST of 18th-19th), before weakening into an ESCS over westcentralBoB around noon (1130 IST) of 19th May.

Thereafter, it weakened slightly and crossed West Bengal – Bangladesh coasts as a VSCS, across Sundarbans, near latitude 21.65°N and longitude 88.3°E during 1530-1730 hrs IST of 20th May, with maximum sustained wind speed of 155 – 165 kmph gusting to 185 kmph. It lay over West Bengal as a VSCS, gradually moving north-northeastwards during late evening to night (1730 – 2030 IST) of 20th May. Moving further north-northeastwards, it weakened into an SCS over Bangladesh & adjoining West Bengal around mid-night (2330 IST) of 20th May, weakened further into a CS over Bangladesh in the early hours (0230 IST) of 21st May, into DD over Bangladesh around noon of 21st May and into a D over north Bangladesh in the evening (1730 IST) of the same day. It further weakened and lay as a well marked low pressure area over north Bangladesh and neighbourhood around mid night (2330 IST) of 21st May. The system caused heavy to very heavy rainfall at a few places over coastal Odisha & Gangetic West Bengal on 20th May, heavy rainfall at isolated places over Gangetic West Bengal & adjoining Bangladesh and Assam, Meghalaya & Arunachal Pradesh on 21st May and heavy rainfall at isolated places over Assam, Meghalaya, Arunachal Pradesh, Sikkim, Nagaland, Manipur & Mizoram on 22nd May. Kolkata (Dum Dum) reported 130 kmph at 1855 hrs IST and Kolkata (Alipore) 112 kmph at 1752 hrs IST of 20th May. Also Paradip reported 106 kmph at 0630 hrs IST, Chandbali, 80 kmph at 0830 hrs IST and Balasore 91 kmph during 1330 – 1430 hrs. IST of 20th May. As per the post cyclone landfall survey conducted by ACWC Kolkata, tidal waves of 15 feet height inundated low lying areas of the coastal Districts of West Bengal.

The landfall point forecast errors were almost Zero for 24 & 48 hours lead periods as they were 5.5 & 11 km respectively. It was also reported that 72 hours lead period forecast error being 39.0 km against the 109.3 km during 2015-19 respectively. The landfall time forecast errors for 24, 48 and 72 hrs lead period were 0.5, 0, and 2.0 hours respectively. The cyclone intensity of 155-165 kmph gusting 185 kmph at the time of land fall over West Bengal was also predicted 72 hours in advance. In addition, all the three types of weather like heavy rainfall, gale wind and storm surge were well predicted. A total of 48 national bulletins were issued including 3 informatory messages.

It was the second super cyclonic storm over Bay of Bengal after the 1999 Orissa Super Cyclone. IMD earned worldwide appreciation for accurate monitoring and prediction of genesis, intensification, and landfall and associated adverse weather that helped in effective mitigation of disaster in the COVID era. IMD provided uninterrupted tropical cyclones forecasting services including observations, modeling, forecasting, and communication to various stake holders, disaster managers, media and general public in the current scenario due to COVID-19.

c) **Cyclone Nisarga** : A low pressure area formed over southeast & adjoining eastcentral Arabian Sea and Lakshadweep area in the early morning (0530 hrs IST) of 31st May 2020. Under favourable environmental conditions, it concentrated into a depression over eastcentral and adjoining southeast Arabian Sea in the early morning (0530 hrs IST) of 1st June 2020. It intensified into deep depression over eastcentral Arabian Sea in the early morning (0530 hrs IST) and into cyclonic storm “NISARGA” in the noon (1130 hrs IST) of 2nd June. It moved northwards till evening (1730 hrs IST of 2nd June). Thereafter, it gradually recurved northeastwards and intensified into a severe cyclonic storm in the early morning (0530 hrs IST) of 3rd June 2020. Further moving northeastwards, it crossed Maharashtra coast close to south of Alibagh as a severe cyclonic storm with a maximum sustained wind speed of 100-110 kmph gusting to 120 kmph during 1230-1430 hrs IST of 03rd June. Continuing to move northeastwards after landfall, it weakened into a cyclonic storm in the evening (1730 hrs IST) over north Madhya Maharashtra and into a deep depression in the midnight (2330 hrs IST) of 3rd June 2020 over the same region. It further weakened into a depression over western parts of Vidarbha and neighbourhood in the early morning (0530 hrs IST) and into a well marked low pressure area in the evening (1730 hrs IST) of 4th June over central parts of Madhya Pradesh. It lay as a low pressure area over southeast Uttar Pradesh and adjoining Bihar in the afternoon (1430 hrs IST) of today, the 5th June

d) Depression over West central Arabian Sea:

A depression formed over south coastal Oman and adjoining Yemen in the evening (1430 hrs IST) of 29th May, 2020. It moved northwestwards till morning (0830 hrs IST) of 30th May. Thereafter, it moved southwestwards and weakened into a well marked low pressure area over south coastal Oman and adjoining Yemen in the early morning of 1st June 2020. The genesis, intensification, track and associated adverse weather were well predicted by IMD. A total of 11 National bulletins and 11 special tropical weather outlooks were issued in association with this system. Advance advisory were also provided to Oman And Yemen.

e) Advancement of Southwest Monsoon: South West Monsoon advances in some parts of south Bay of Bengal, Nicobar Islands & Andaman Sea. On 17th& 18th May some more parts of South Bay of Bengal, Arabian sea and the most parts of Andaman Sea and Andaman & Nicobar Islands on 27th May 2020. It further advanced into some parts of Maldives-Comorin area and Southwest and some more parts of South Bay of Bengal remaining parts of Andaman Sea and Andaman & Nicobar Island on 28th May-2020. South West Monsoon onset is over Kerala on 1st June -2020.

f) Western Disturbances and severe weather: Six numbers of Western Disturbances (WDs) have affected the Northwest India during the month. Movement of these WDs have caused scattered to fairly widespread rainfall/thunderstorm activity over Western Himalayan Region and isolated to scattered rainfall/thunderstorm activity over the adjoining plains of northwest India and northern parts of Central India during the month. Thunderstorm accompanied with strong gusty winds, dust storm and hail storm had been reported from parts of these regions, associated with the movement of the systems.

g) Thundersquall& Hailstorm activity:Thundersquall& Hailstorm activity during the month (till 0830 IST of 31-05-2020) is recorded as under:

S. No.	Region	TS Days	Date of Maximum TS Activity	Hail Events	Squall Events
1.	South Peninsular India	29	02-05-20	Nil	01(Bengaluru city on 26-05-20)
2.	Northwest India	28	10-05-20	01(Kanpur City on 01-05-20) 02(Pilani, Dehradun on 03-05-20) 01(Mt. Abu on 04-05-20) 04(Kupwara, Karnal, Kheri, Hamirpur on 05-05-20) 01(Kupwara on 09-05-20) 01(Bhaderwah on 13-05-20) 01(Kukernag on 19-05-20) 02(Bhaderwah, Mukteswar on 29-05-20) 01(Ajmer 31-05-20)	02(Ambala, Safdarjung 10-05-20) 02(Ambala, Safdarjung 14-05-20) 02(Jodhpur, Jaisalmer on 31-05-20)
3.	Northeast India	29	13-05-20	Nil	01(Agartala on 07-05-20) 01(Guwahati on 26-05-20) 01(Agartala on 27-05-20)
4.	East India	27	01-05-20	01(Gaya on 05-05-20) 01(Sriniketan 14-05-20)	04(Alipur, Dum Dum, Gaya, Daltonganj on 05-05-20) 02(Malda, Sriniketan 07-05-20)

					02(Asansol, Gaya on 10-05-20) 01(Sriniketan 14-05-20) 01(Dum Dum 20-05-20) 01(Bhubaneswa 29-05-20) 01 (Alipore on 31-05-20) 02(Port Blair 12-05-20 & 13-05-20)
5.	Central India	23	16-05-20	Nil	04(Nagpur 01-05-20, 10-05-20, 13-05-20, 30-05-20) 03(Satna on 10-05-20, 27 05-20, 28-05-20)
6.	West India	10	14-05-20	Media Report: Osmanabad, Nashik, Dindori 13-05-20 Media Report: Aurangabad 14-05-20	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. In addition to that, nowcasts were also given by corresponding RMCs/MCs with respect to these events

h) Rainfall Scenario:

The rainfall for the country as a whole for the month of May 2020 has recorded as 70.9mm which is 14% higher than its Long Period Average (LPA) of 62.0mm.

- **Heavy to very heavy rainfall with extremely heavy falls** at isolated places had been reported over Assam & Meghalaya on seven days and over Gangetic West Bengal, Odisha and Kerala on one day each during the month.
- **Heavy to very heavy rainfall** had been reported over Arunachal Pradesh, Nagaland, Manipur, Mizoram & Tripura, Tamilnadu, Puducherry & Karaikkal on three days each; over Sub Himalayan West Bengal & Sikkim and Kerala and Mahe on two days each; over Odisha, South Interior Karnataka and Jharkhand on one day each during the month.
- **Heavy rainfall** had been reported at isolated places over Sub Himalayan West Bengal & Sikkim on ten days; over Kerala & Mahe on eight days; over Tamilnadu, Puducherry & Karaikkal on six days; over Gangetic West Bengal on five days; over Odisha on four days; over Andaman & Nicobar Islands, Assam and Meghalaya, Coastal Karnataka, North Interior Karnataka and Arunachal Pradesh on three days each; over Bihar, Telangana, Rayalaseema, Nagaland, Manipur, Mizoram & Tripura on two days each; over Haryana, Chandigarh & Delhi, East Uttar Pradesh, Uttarakhand, Himachal Pradesh, Chhattisgarh, West Madhya Pradesh, South Interior Karnataka, and Lakshdeep on one day each during the month.
- **Heavy / Very Heavy Rainfall Warning Skill:** No. of Heavy/Very Heavy Rainfall Events (>64.4 mm) and Warning Skill (correctness in %) of spatial distribution in issued warnings during the month is given below:

warning issued for	No. of days with Heavy/Very Heavy Rainfall Events (>64.4 mm): 98
	Percentage correct (in %) for Rainfall >64.4mm
Day1 / 24 Hours	89%
Day2 / 48 Hours	89%
Day3 / 72 Hours	89%

Under BIMSTEC activity Meteograms and EPSgrams for 20 locations over Bhutan (new stations) are generated daily.

Bulletins/Warnings/Press Releases Issued: All India Weather Bulletins(124), All India inference and severe weather warnings(124), Press Releases related to (a)Low Pressure Area/Depression/Tropical Cyclones(16),(b) advance of SW Monsoon 2020(02), (c) revised normal dates of advance & withdrawal of SW Monsoon(02),(d)severe weather activity over North, East & Northeast India(04), (e) heat wave(02), and (f)launching of mobile App, 'UMANG(02),Nowcast Guidance Bulletins for severe weather (31), All India Weekly Weather Reports (5), Mountain weather bulletins including severe weather warnings for western and central Himalayan region(62), FDP Storm Bulletins (31).

Publications & Operational Reports issued: Daily All India Weather Summary and Weekly Weather Reports, ENSO and Indian Ocean Dipole (IOD) bulletin for the month of May 2020 and Seasonal Climate Outlook for South Asia for the months of May to August 2020 were issued (www.imdpune.gov.in/Clim_Pred_LRF_New/Products.html), Gridded Standardized Precipitation Index (SPI) & Standardized Precipitation Evapotranspiration Index (SPEI) at 0.5*0.5 degree resolution at 5 weekly 1,2,3 & 4 monthly time scales computed and maps of same timescales are being uploaded at weekly basis on IMD Pune website, CRS Research Report No. 001/2020 entitled "Development of a New (1.0° x 1.0°) Monthly Gridded Rainfall data set over South Asian Region (1981--2019)" Climate Diagnostics Bulletin of India for February 2020, Winter Season (January – February) 2020 and Annual Climate Summary 2019 brought out and uploaded on IMD Pune website.

Geoscience Research

Seismological Observational Network

Observation Type	Target	Commissioned so far	Data reporting during the month
Seismic stations	115	115	100
GPS stations	40	20#	18

20 out of 40 are connected with VSAT, remaining 20 are operating in stand-alone mode.

Earthquake and Tsunami monitoring

Earthquake: 29 earthquakes were monitored in the Indian region out of which noevent wasgreater than magnitude (M) of 5.0.

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

Ocean Observation System

Type of Platform	Target	Commissioned till May, 2020	Data received during May, 2020
Argo Floats *	200	374	150
Moored Buoys	16	22	16
Tide Gauges	36	36	29
High Frequency (HF) Radars	10	12	9
Acoustic Doppler Current Profiler (ADCP)	20	20	18
Tsunami Buoys	7	9	3
Wave Rider Buoy	16	28	11

*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)	23
2	Tuna Fishing Advisories	23
2	Ocean State Forecast (OSF)-Wave, Wind, Currents, SST, MLD and D20 forecasts	31

4.	Real time global ocean analysis (daily)	30
5.	Coral Bleaching Alert System	10

Polar Expedition

Summer Expedition Team returned to India from Antarctica through Cape Town upon completion of mandatory quarantine period.

Topographic survey of Exclusive Economic Zone (EEZ)

Area covered: 24000 sq.

Outreach and Awareness

As an initiative by the Ministry of Earth Sciences (MoES), IITM Pune (MoES) has organized "Earth Sciences Popular Lectures" webinar series in coordination with MoES & its Institutions. Total 7 talks were delivered in the month of May by MoES institutes.

Publications

Subject	Publications			Ph.Ds		
	April, 2020	May, 2020	Total	April, 2020	May, 2020	Total
Atmospheric Sciences	20	18	48	-	-	-
Ocean Science and Technology	6	14	20	-	-	-
Polar Sciences	2	4	6	-	-	-
Geosciences and resources	-	-	-	-	-	-
Total	28	36	74	-	-	-

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	28	3	2
Sagar Tara	12	19(bad weather and defect rectification)	1
Sagar Anveshika	23	8	2
Sagar Kanya	25	6	1
Sagar Sampada	0	31(Corona Lockdown)	-

Annex II

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

'Prithvi Bhavan', Lodhi Road
New Delhi-110003.

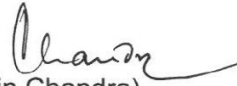
Dated, the 6 May, 2020

CERTIFICATE

(FOR THE MONTH OF APRIL, 2020)

It is certified that the detailed status regarding all the posts pertaining to Ministry of Earth Sciences have been uploaded on AVMS as on last day of the month of April, 2020. A summary of the status is given below:-

- | | |
|---|------|
| (a) Total number of posts required to be entered on AVMS | - 13 |
| (b) Number of posts filled as on date | - 12 |
| (c) Number of posts totally vacant as on date | - 01 |
| (d) Number of posts under additional charge arrangement | - 00 |
| (e) Number of posts that would fall vacant during the next 6 months | - 03 |


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