

Ministry of Earth Sciences (MoES)

Summary of Important Developments – December, 2021

- 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 (Committee of Secretaries) 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 (Ministry of External Affairs), 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>

4. Cases of sanction for prosecution pending in the Ministry for more than three months: Nil

5. Particulars of cases in which there has been a departure from the Transaction of Business rules of established policy of the Government: Nil

6. Status of implementation of e-Governance: Being implemented

7. Status of Public grievances:

No. of Public Grievances redressed during the month	No. of Public Grievances pending at the end of the month
14	20

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 (Appointments Committee of Cabinets) have been updated on AVMS (ACC Vacancy Monitoring System):** 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 (Public Enterprise Selection Board) have been received but the proposals are yet to be submitted to the ACC Secretariat:** NIL

Important policy decision taken and major achievements:

- A Memorandum of Understanding (MoU) towards promoting scientific and technical cooperation in marine science and ecology was signed by Hon'ble Minister Dr JitendraSinghand Mr Tran Hong Ha, Minister of Natural Resources and Environment (MoNRE), Govt of Vietnam, on 17thDecember 2021.
- Six Ocean Observation System indigenous technologies successfully transferred to Larsen & Toubro by National Institute of Ocean Technology (NIOT).
- Indian National Centre for Ocean Information Services (INCOIS) was conferred with Confederation of Indian Industry (CII) Industrial Innovation Awards-2021 under the category "Top Innovative Research Institutions-2021 for its development of GEMINI (GAGAN (GPS (Global Positioning System) Aided Geo Augmented Navigation) Enabled Mariner's Instrument for Navigation and Information) System for dissemination of Ocean Information Services while out of mobile range.
- 46-members of 41stIndian scientific expedition to Antarcticacompleted their mandatory quarantine in Cape Town before reaching to Antarctica and 28 members of the overwinter team (40th Indian scientific expedition to Antarctica) were de-inducted from Antarctica during the month.

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 (Public Private Partnership) mode. Presently, about 28.78 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	Commissionedso far	Installations during the month	Data Reporting
Automatic Weather Station (AWS)	*350 (727-377)	--	350
Automatic Rain Gauge (ARG)	506** (1382-876)		506
Agro AWS	183		183
GPS Sonde based RS/RW (Radio Sonde/ Radio Wind) Stations	56	--	56
Doppler Weather Radar (DWR)	*** 29		28
Ozone (Ozone Sonde + Total Ozone)	04	--	04

Surface Ozone (Electrochemical Concentration Cell method)	07	--	07
Nephelometer	12	--	12
Sky Radiometer	20	--	13
Black Carbon Monitoring Systems (Aethalometer)	25	--	23
System of Air Quality Monitoring System (SAFAR)	10 (Delhi) 10 (Mumbai) 10 (Ahmedabad)	--	09(Delhi) NIL(Mumbai)***** 10 (Ahmedabad)
Hydromet (Indian Meteorological Department (IMD)& Extra-departmental excluding AWS &ARG)	---	--	3224
Aviation	79	--	79
Radiation Stations	46	---	46

*Out of Total 727, 377 are outlived.

** Out of total 1382, 876 are outlived.

***Including 2 Doppler Weather Radars of Indian Space Research Organization (ISRO).

***** Contract with the firm is not renewed.

Modelling

Under Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Centre for Weather and Climate (BCWC), National Centre for Medium Range Weather Forecasting (NCMRWF) have started sharing hourly surface temperature and precipitation forecast data from NCMRWF Unified Model (NCUM) global model over Bhutan on real time basis with National Center for Hydrology and Meteorology (NCHM), Bhutan.

During December, every week on Thursdays, NCMRWF coupled model based Extended Range Prediction (ERP) for four weeks for rainfall, surface temperature and winds (full fields and anomalies) were provided in real-time to (i) Long-range forecast and Agri-Met divisions of IMD, (ii) Indian Institute Of Tropical Meteorology (IITM) ERP group, (iii) Space Applications Centre (SAC), (iv) Snow and Avalanche Study Establishment (SASE), (v) Indian Air Force (IAF), (vi) Navy, (vii) Geological Survey of India (GSI), (viii) National Institute of Hydrology (NIH), (ix) All regional centres of IMD and (x) Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) countries Met Departments. Additionally, snow forecasts were provided to SASE/ DRDO an IAF for use at their end.

Monthly Weather Summary (December 2021)

a) Important Weather Events during the month

Low Pressure Systems: A Low Pressure Area formed over South Thailand & neighbourhood on 30th November. It concentrated into the Cyclonic Storm "JAWAD" over west central BoB on 3rd December. It caused heavy to extremely heavy rainfall over Odisha and Gangetic West Bengal. About seven Western disturbances (WD) and four induced cyclonic circulations affected Northwest India during the month. These caused scattered to fairly widespread rainfall/ snowfall/ thunderstorms/ Hail storm over Western Himalayan Region, Chhattisgarh, Jharkhand, Odisha,

Northwest India and adjoining plains of Punjab, Haryana, Madhya Pradesh and Rajasthan, over central and eastern India.

Dense to very dense fog occurred at isolated places over Punjab, Haryana, Rajasthan, East Uttar Pradesh, West Uttar Pradesh, Odisha, Saurashtra & Kutch, Himachal Pradesh, Uttarakhand and Madhya Pradesh.

Cold wave to severe cold wave conditions occurred at some places of Punjab, Haryana, Chandigarh, Rajasthan, Madhya Pradesh, Uttar Pradesh, Delhi, Jammu, Kashmir, Himachal Pradesh, Uttarakhand, Odisha, Jharkhand and Gangetic West Bengal.

b) Rainfall Scenario: The rainfall for the country as a whole, for the month of December-2021 has been recorded as 20.4 mm which is 117% of its Long Period Average (LPA) of 17.4 mm.

c) Heavy Rainfall Events:

Warning issued for	No. of Heavy/Very Heavy Rainfall Events (>64.4 mm): 31
	Percentage correct (in %) for Rainfall >64.4mm
Day1 / 24 Hours	97
Day2 / 48 Hours	97
Day3 / 72 Hours	97

d) Temperature Scenario: The mean temperature for the month of December-2021 for the country as a whole was 20.72°C which was above normal by 0.23°C. All India averaged temperature during the year 2021 was 25.93°C which was above normal by 0.43°C. The lowest minimum temperature of -2.6°C had been recorded at Churu (West Rajasthan) on 19th December 2021 over the plains of the country during the month.

e) Thunder squall & Hailstorm activity:Thunder squall & Hailstorm activity during the month (till 0830 IST of last date of the month) is given in the table below:

S. No.	State/ UT	Thunderstorm Events	Hail Events	Dust storms	Gusty Winds
1	Andaman & Nicobar	0	0	0	0
2	Andhra Pradesh	5	3	1	3
3	Arunachal Pradesh	0	0	0	0
4	Assam	0	0	0	0
5	Bihar	0	1	0	1
6	Chandigarh	0	0	0	0
7	Chhattisgarh	1	0	0	0
8	Dadar and Nagar Haveli	0	0	0	0
9	Delhi	0	0	0	1
10	Goa	0	0	0	0
11	Gujarat	1	0	0	3
12	Haryana	1	1	1	1
13	Himachal Pradesh	1	1	0	2
14	J & K	0	0	0	0
15	Jharkhand	1	0	0	0
16	Karnataka	1	0	0	2

S. No.	State/ UT	Thunderstorm Events	Hail Events	Dust storms	Gusty Winds
17	Kerala	1	0	0	1
18	Ladakh	0	0	0	0
19	Madhya Pradesh	2	3	0	2
20	Maharashtra	6	5	2	3
21	Manipur	0	0	0	0
22	Meghalaya	0	0	0	0
23	Nagaland	0	0	0	0
24	Odisha	3	1	0	4
25	Puducherry	0	0	0	0
26	Punjab	1	1	1	1
27	Rajasthan	1	2	1	2
28	Sikkim	0	0	0	0
29	Tamilnadu	1	1	1	1
30	Telangana	0	1	0	1
31	Tripura	0	0	0	0
32	Uttar Pradesh	4	1	1	3
33	Uttarakhand	0	0	0	1
34	West Bengal	4	1	1	4

Bulletins/Warnings/Press Releases Issued:

All India Weather Bulletins:-124, All India inference and severe weather warnings:-124, All India Weekly Weather Reports:-5, Mountain Met. Bulletins, Mountain weather bulletins issued for western and central Himalayan region:-62, All India Multi-hazard winter weather warnings bulletin issued for North India:-30, Current Temperature Status and Cold wave Warning Bulletin for next 24 hours issued for North India:- 20, Marine Weather Bulletins:-62, Nowcast Guidance Bulletins for severe weather:-31, Bulletins of the Severe Weather Forecast Programme (SWFP):-31, Tropical Weather Outlook to WMO/WSCAP Panel member countries for the north Indian Ocean:-31, Extended range outlook on Cyclogenesis (Weekly basis on every Thursday), Press Releases issued during the month:-12.

Publications & Operational Reports:

- i) El Niño-Southern Oscillation (ENSO) bulletin for the month of December 2021 and Seasonal Climate Outlook for South Asia for the period of December to March 2022 were issued.
(Quick Link: www.imdpune.gov.in/Clim_Pred_LRF_New/Products.html)
- ii) Monthly and cumulative Standardized Precipitation Index (SPI) maps were prepared for the month ending November 2021 for use in Climate Diagnostic Bulletin of India. The same have also been uploaded in IMD Pune website.
- iii) Computed gridded SPI & Standardized Precipitation Evapotranspiration Index (SPEI) at 0.5*0.5 degree resolution at 4 weekly, 1, 2, 3 & 4 monthly time scales. Uploaded the maps of the aforementioned timescales at weekly basis on IMD, Pune website.
- iv) Four weekly and cumulative Standardized Precipitation Index (SPI) maps were prepared for the weeks ending 01.12.2021, 08.12.2021, 15.12.2021, 22.12.2021 and 29.12.2021 and

supplied for use in Agromet Advisory Services Bulletin. The same have also been uploaded in IMD Pune website.

- v) Five weekly Aridity anomaly maps for the period 25 November to 01 December, 02 to 08, 09 to 15, 16 to 22 and 23 to 29 December 2021 have been prepared and uploaded on IMD Web-site.
- vi) Five weekly Aridity anomaly outlook maps for the period 02 to 08, 09 to 15, 16 to 22, 23 to 29 and 30 December to 05 January 2021 have been prepared and uploaded on IMD Web-site.
- vii) Five Biweekly Aridity Anomaly maps for the period 18 November to 01 December, 25 November to 08 December, 02 to 15, 09 to 22, 16 to 29 December 2021 have been prepared.
- viii) Five weekly Aridity anomaly maps for the period 25 November to 01 December, 02 to 08, 09 to 15, 16 to 22 and 23 to 29 December 2021 have been prepared and mailed to Agrimet for Agromet Advisory Services.
- ix) Monthly Aridity Anomaly Maps for the period November and October to November 2021 cumulative have been prepared and uploaded on IMD Web-site.

Seismological Observational Network

Observation Type	Target	Commissioned so far	Data reporting during the month
Seismic stations	115	152	137

Earthquake and Tsunami monitoring

Earthquake: 135 earthquakes were monitored in the Indian region out of which 2 events were greater than the 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 of all the events.

Ocean Observation System

Type of Platform	Target	Commissioned till November, 2021	Data received during December, 2021
Argo Floats *	200	374	83
Moored Buoys	16	19	12
Tide Gauges	36	36	29
High Frequency (HF) Radars	10	12	10
Acoustic Doppler Current Profiler (ADCP)	20	20	17
Tsunami Buoys	4	7	2
Wave Rider Buoy	23	16	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)	29
2.	Tuna Fishing Advisories	25
3.	Ocean State Forecast (OSF)-Wave, Wind, Currents, SST (Sea Surface Temperature), MLD (Mixed Layer Depth) and D20 forecasts	31
4.	Real time global ocean analysis (daily)	30

5.	Coral Bleaching Alert System	10
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Outreach and Awareness

- Indian Ocean Global Ocean Observing System (IOGOOS) in partnership with International Training Centre for Operational Oceanography (ITCOcean)/INCOIS organized a training course on “Basics of Ocean Modelling” in hybrid mode during 06-10 December 2021 as part of its project "Modelling of Ocean Forecasting & Process Studies (MOFPS)". Seventy participants including 45 foreign nationals have attended the course.
- ITCOcean/INCOIS organized Intergovernmental Oceanographic Commission Central Indian Ocean (IOCINDIO) workshop on “Coastal Vulnerability & Advances in Operational Oceanography Science & Technology” during 13-17 December 2021. The workshop was hosted online and attended by IOCINDIO representatives of Bangladesh, Iran, Kuwait, Maldives, Pakistan, Comoros, Myanmar, South Asia Co-operative Environment Programme (SACEP)& India.
- One day training course was organized by ITCOcean/INCOIS on 13 December 2021 to provide exposure to the Indian Naval officers and International Liaison Officers (ILOs) attached to the Indian Navy on various operational aspects of the Indian Ocean Tsunami Early System operating from INCOIS.
- ITCOcean/INCOIS organized a one-day national workshop on 16 December 2021 with experts from national institutes, universities, and industry participants to discuss the implementation plan of the “Development of Ocean Climate Change Advisory Services” initiative under the Government of India’s ambitious “Deep Ocean Mission” Programme.
- One week training course on “Ocean Observation System and Ocean Data Utilization” was organized by ITCOcean/INCOIS for the Students of M.Sc., and M.Tech., students from Indian Institutes of Technologies (IIT) and other universities from India during 23-27 December 2021. 52 Students have attended the course in virtual mode.
- INCOIS provided sea state warnings during the Jawad Cyclone during 2-6, December 2021 which affected the coasts of Andhra Pradesh, Odisha, and West Bengal. Twenty-six (26) high wave/swell surge alerts were issued.
- The recent faunistic expeditions to the Andaman Sea yielded the first zoogeographical record of the reef associated rock shrimp *Sicyonia vitulans* Kubo, which was collected from 56 m water depth in the Andaman Sea. *Sicyonia vitulans*, known previously from Japan, New Caledonia and Seychelles.
- National Training Workshop on Green House Gases (GHG-3): Observations and Inverse Modelling on Indian Regional Perspective: IITM conducted the Virtual Training Workshop during 14-17 December 2021. Total 52 candidates were shortlisted for the same and attended the Training workshop.
- Internship field work at COsmic-ray Soil Moisture Observing System (COSMOS)-IITM site was carried out along with Virtual lecture series (Cloud and Precipitation Physics and Dynamics) under Azadi Ka Amrit Mahotsav during 11-13 December 2021.
- International Workshop on Fires in South Asia: Current status and future challenges in modeling, predictions and mitigation was organized online by IITM on 3-4 December 2021.
- On 14 December 2021, IITM observed National Energy Conservation Day. The National level open online Quiz competition was organized and around 300 people participated in the competition.

- At IITM, National Pollution Control Day (NPCD) 2021 has been observed on every 2nd December, to commemorate the people who lost their lives in the unfortunate incident of Bhopal Gas Tragedy that occurred on this day in 1984.
- Director General of Meteorology (DGM), IMD addressed Press Conference regarding Seasonal Outlook for Winter Temperatures and Rainfall Forecast for December, 2021 on 1st December.
- IMD issued daily weather forecasting video of about 5 minutes duration in English & Hindi through YouTube, Facebook, Twitter and IMD website.
- Weekly Video on extended range forecast (upto two weeks) was issued every Thursday through website and social media (Facebook, Twitter, YouTube etc.).
- Daily interviewed was provided by the forecasters within the country.
- The forecast videos in regional language were issued by regional offices of IMD regularly.
- Bulletins and Warnings along with graphics were also communicated through Social Media including Facebook, Twitter, Instagram, YouTube and IMD Blog page.
- National Centre for Coastal Research (NCCR) has brought out a Special issue on ‘Advances in Coastal Research’ has been published in Journal of Earth System Sciences based upon AdCoRe IP-2019 international symposium organised by NCCR.
- Sixty Computer Science Engineering Students from Institute of Applied Medicines & Research visited the NCMRWF as a part of Industrial visit on 10-Dec-21. During their visit NCMRWF arranged two lecture on Numerical Weather Prediction and its applications and High Performance Computer at NCMRWF& its Support Infrastructure. Supercomputer Lab visit/tour was also organized.
- On 11th December Post-Graduate students from Climate Science, Environmental Sciences and Geo-informatics program of The Energy and Resources Institute (TERI) University, New Delhi visited NCMRWF under the scheme of "Azadi ka Amrut Mahotsav".

Publications

Subject	Publications			Ph.Ds		
	April, 2021 – November 2021	December, 2021	Total	April, 2021 – November 2021	December, 2021	Total
Atmospheric Sciences	164	14	178	5	1	6
Ocean Science and Technology	71	12	83	1	1	2
Polar Sciences	40	0	40	1	0	1
Geosciences and resources	81	9	90	2	0	2
Total	356	35	391	9	2	11

Patents: 1

Utilization of Ocean Research Vessels during the month

Vessel	Days at Sea / Utilization	Maintenance/ Inspection /Scientific Logistics / Cruise Preparation	No. of Cruise
Sagar Nidhi	16	15	1
Sagar Manjusha	0	31	0

Sagar Tara	0	31	0
Sagar Anveshika	2	29	1
Sagar Kanya	0	31	0
Sagar Sampada	0	31	0

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

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Dated, the 4th January, 2022.

CERTIFICATE

(FOR THE MONTH OF DECEMBER, 2021)

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 December, 2021. A summary of the status is given below:-

a. The total number of posts required to be entered on AVMS	- 13
b. Number of posts filled as on date	- 10
c. Number of posts totally vacant as on date	- 01
d. Number of posts under additional charge arrangement	- 02
e. Number of posts that would fall vacant during the next 6 months	- 01

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04/01/2022
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