

Ministry of Earth Sciences (MoES)
Summary of Important Developments –December,2017

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 MoESwill 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>There is no response from the private industries for a long time. Accordingly, it is proposed to close this item for monthly reporting. As and when the response is received, the same will be reported.</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
35	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:

(i) Cabinet approved the signing of agreement with UNESCO to establish International Training Centre on Operational Oceanography as United Nations Educational, Scientific and Cultural Organization (UNESCO) Category 2 Centre at the Indian National Centre for Ocean Information Services (INCOIS). UNESCO had approved the establishment of Centre at the 39th session of General Conference held at Paris on 30 November.

(ii) Bulletins containing the information/advisories on the prevailing high sea states along the coastline and beyond were issued by India Meteorological Department(IMD) and Indian National Centre for Ocean Information Services (INCOIS) through various dissemination modes like SMS, E-mail, website etc during Ockhi cyclone that affected Southern Tamil Nadu, Kerala and Lakshadweep during 28 November – 6 December, 2017. Total of 2,05,029 fisherfolks were served with forecasts/warnings through the mobile SMS in local languages

Minimum Government, Maximum Governance:

Dissemination of Agromet. Advisories to users community through SMS and IVR technology is being continued in the country through Kisan Portal and under PPP mode. Presently 21.69 Million farmers in the country getting advisories through SMS directly.

Adverse weather SMS warning are being sent through mobiles to State Govt. officials / Disaster related officials /Central Govt. Organization/Common men.

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.

First phase of Office Automation System (OAS) using SAP went live on 4th December 2017 at National Centre for Antarctic and Ocean Research(NCAOR), Goa.

Atmospheric Observation Systems Network

Observation Type	Commissioned so far	Data Reporting
Automatic Weather Station (AWS)	682	332

Automatic Rain Gauge (ARG)	1350	615
GPS Sonde based RS/RW Stations	43	30
Doppler Weather Radar (DWR)	22	20
Surface Ozone over Delhi (Electrochemical Concentration Cell)	07	07
Nephelometer	12	12
Sky Radiometer	12	08
Black Carbon Monitoring Systems (Aethalometer)	16	15
Hydromet. (IMD & Extra-departmental excluding AWS & ARG)	---	2357@
Aviation	74	74

@ Data received from various agencies viz. Air Force, Railways, Central Water Commission, State Agriculture, State Irrigation and India Meteorological Department (IMD)

Atmospheric Processes, Modeling and Services

Rainfall in December, 2017

Rainfall during the month of December, 2017 was large excess in 8, excess in 2, normal in 8, deficient in 3, large deficient in 11 and no rain in 4 of 36 meteorological sub- divisions. The rainfall for the country as a whole for the month has been recorded as 16.2 mm (-2%) against the Long Period Average of 16.6 mm.

Significant weather events:

Monthly Weather Summary (December 2017):

Very Severe Cyclonic Storm Ockhi over Arabian Sea: A fresh low pressure area formed over southwest Bay of Bengal and adjoining areas of south Sri Lanka & equatorial Indian Ocean in the forenoon (0830 IST) of 28th November became a well marked low pressure area in the early morning (0530 IST) of 29th over the same region. Under favourable environmental conditions, it concentrated into a Depression over southwest Bay of Bengal off southeast Sri Lanka coast in the forenoon (0830 IST) of 29th Nov. Moving westwards, it crossed Sri Lanka coast into Comorin area in the evening (1730 IST) of 29th and intensified into a Deep Depression (DD) in the early hours (0230 IST) of 30th and Cyclonic Storm (CS) in the forenoon (0830 IST) of 30th Nov. over the Comorin area. Moving west-north-westwards, it intensified further into a Severe Cyclonic Storm over Lakshadweep area in the morning of 1st December and into Very Severe Cyclonic Storm over southeast Arabian Sea to the west of Lakshadweep in the afternoon of 1st Dec. Moving Northwestwards it attained its peak intensity in the afternoon of 2nd Dec till the early morning of 3rd Dec. Moving North-north-eastwards, it weakened gradually and crossed South Gujarat coast between Surat & Dahanu as a well marked Low Pressure Area around the early morning of 6th December. It caused heavy rainfall over south Tamilnadu, south Kerala, north coastal Maharashtra and adjoining south coastal Gujarat and heavy to very heavy rainfall over Lakshadweep. It was a rare cyclone with rapid intensification in genesis stage with track length of 2538 km and life period of 6.75 days against long period average of 4.7 days for very severe cyclonic storm over north Indian Ocean. The track forecast error for 12, 24, 48 and 72 hrs lead period were 52.4, 77.2, 111.9 and 189.6 km respectively, which is significantly less than the average track forecast errors of 59.7, 97.2, 149.1 and 202.8 km during last five years (2012-16). The track forecast skill was about 45%, 61%, 76% and 69% for 12, 24, 48 and 72 hrs lead period respectively, which are higher than the long period average (LPA) during 2012-16 for 12 and 24 hrs lead period.

Deep Depression over southeast Bay of Bengal (06-10 December, 2017): A low pressure area (LPA) formed over Malay Peninsula and adjoining Andaman Sea in the morning of 30th November, 2017. It lay as a well marked low

pressure area (WML) over south Andaman Sea & adjoining Strait of Malacca on 1st December, over Sumatra coast and adjoining south Andaman Sea on 2nd, over southeast Bay of Bengal & adjoining south Andaman Sea and equatorial Indian Ocean on 3rd and 4th and over southeast Bay of Bengal (BoB) & neighbourhood on 5th. It concentrated into a Depression (D) over southeast BoB & neighbourhood in the morning of 6th December. It moved northwards till early hours of 8th, north-northwestwards thereafter. It intensified into a deep depression (DD) in the early morning of 8th over central BoB. It weakened into depression (D) during the night of same day over westcentral BoB. It started moving north-northeastwards from morning of 9th and weakened into a WML over northwest BoB in the evening of 9th December and into a LPA over north BoB & neighbourhood in the evening of 10th.

Under its influence, light to moderate rainfall at few places with isolated heavy falls occurred over Tamilnadu & Puducherry on 6th and 7th December. Light to moderate rainfall at many places with isolated heavy falls occurred over coastal Odisha and adjoining districts of interior Odisha on 8th. Light to moderate rainfall also occurred at many places over coastal districts of West Bengal, south Assam, Meghalaya, Mizoram and Tripura with isolated heavy falls over Tripura on 9th. Regular warnings for track, intensity, landfall and associated adverse weather were issued to concerned central and state disaster management agencies, fishermen, ports, ships, print & electronic media and general public.

Fog, Cold-wave & Minimum Temperature: Dense to very dense fog observed at many places over Punjab, Haryana, Chandigarh & Delhi, Uttar Pradesh, north Rajasthan, Assam & Meghalaya and Nagaland, Manipur, Mizoram & Tripura on many days during first half of the month and over Bihar during last week of the month. Moderate to dense fog observed at isolated places over West Bengal, Jharkhand and Odisha on one or two days during the month. Severe cold wave conditions were prevailed at isolated places over Punjab, Haryana, Chandigarh & Delhi, north Rajasthan on one or two days of the month. The minimum lowest temperature of 1.6° C was recorded at Churu (Rajasthan) on 17th over the plains of northwest India during the month; Severe cold day conditions were prevailed at isolated places over Punjab, Haryana, Chandigarh & Delhi, Rajasthan, Uttar Pradesh, Bihar and West Madhya Pradesh on one to two day during the month of December 2017. The lowest maximum temperature of 12.0° C was recorded at Karnal (Haryana) on 14th over the plains of northwest India during month of the December 2017.

Western Disturbance(WD): Ten (10) active western disturbances were observed out of which 2 caused significant precipitation activity over northwest India; scattered to fairly widespread rain/snowfall with isolated heavy falls observed over Jammu & Kashmir and Himachal Pradesh on one to two days and scattered rainfall over plains of northwest India during 11-13 December. Another western disturbance caused isolated to scattered rain/snow fall over western Himalayan region during 20-22 December 2017.

Rainfall during 1st December to 31st December 2017: The all India average rainfall was normal during the month. It was 16.2 mm (-02%) during the month against its Long Period Average (LPA) of 16.6 mm.

Climate forecast outlook for temperature and rainfall over South Asia for the 2017-18 winter season (DJF) was issued. Climate Diagnostics Bulletin of India for November 2017 was brought out.

National Centre for Medium Range Weather Forecasting (NCMRWF) started issuing daily model based weather and ocean forecast guidance for (i) Southern Ocean Scientific Expedition of India to cater to science planning and route optimization and(ii) ongoing 'Navika Sagar Parikrama – INSV TARINI' expedition through South Pacific and Southern Ocean stretch by all-women crew of Indian Navy.

Geoscience Research

Seismological Observational Network

Observation Type	Target for XII Plan	Commissioned so far	Data reporting during the month
Seismic stations	130	102	49

GPS stations	40	28	21
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Earthquake and Tsunami monitoring

Earthquake: 23 earthquakes were monitored in the Indian region out of which 5 events were greater than magnitude (M) of 5.0.

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

Ocean Observation System

Type of Platform	Target	Commissioned till December, 2017	Data received during December, 2017
Argo Floats *	200	305	145
Drifters*	150	108	7
Moored Buoys	16	19	19
Tide Gauges	36	34	26
High Frequency(HF) Radars	10	10	10
Current Meter Array	10	11	2
Acoustic Doppler Current Profiler(ADCP)	20	20	15
Tsunami Buoys	7	9	9
Wave Rider Buoy	16	17	12

*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)	30
2	Tuna Fishing Advisories	27
2	Ocean State Forecast(OSF)-Wave, Wind, Currents, SST, MLD and D20 forecasts	31
3.	Near Real time global ocean analysis (5-day averaged)	6
4.	Real time global ocean analysis (daily)	31
5.	Coral Bleaching Alert System	10

Ocean Technology

Installation of LiDAR based Offshore Wind Data Collection platform was completed at Gulf of Khambhat at about 15m water depth and Gulf of Kutch, Jakhau at about 10m water depth.

MoU was signed by National Institute of Ocean Technology with Puducherry Smart City Development Ltd. (PSCDL) for providing technical support for Construction of Southern Reef by Puducherry Government.

Polar Expeditions

37th Indian Scientific Expedition to Antarctica consisting of 27 members sailed off from Capetown on 31 December, 2017.

23 members and Leaders of the winter over team of Indian stations, Maitri and Bharati at Antarctica returned to India in two batches on 14 and 16 December 2016.

The 10th Indian Scientific Expedition to Southern Ocean/Antarctic Waters 2017-18 consisting of Forty two scientists was launched from Port Louis, Mauritius on 9th December 2017 with a view to understand the upper atmospheric structure, air-sea-ice interactions, hydrodynamics, ocean acidification, biogeochemistry of the ecosystem and studies to address the influence of the Southern Ocean ecosystem processes on the tropical climatic variability.

Topographic surveys of Exclusive Economic Zone:

Area covered during the month: 32,800 sq. km(approx.)

Capacity Building and Outreach:

INCOIS and Directorate of Disaster Management, Andaman & Nicobar Islands jointly organised a Tsunami Sensitization workshop and tabletop exercise for the Disaster Management Officers of Andaman & Nicobar islands at Port Blair on 13 December 2017. More than 80 participants from different organisations participated in the workshop.

The World Meteorological Organization's (WMO's) Tropical Cyclones Forecasters Training-2017 was conducted at India Meteorological Department (IMD), New Delhi during 11-22 December 2017. The training aimed at capacity building of the Tropical Cyclones (TCs) forecasters in the region by understanding the latest developments in observations, monitoring, modeling, prediction and warning-services of TCs over the region. Total 19 candidates from Myanmar, Oman, Sri Lanka and India participated in the training.

A Hindi workshop was conducted on 18th December 2017 on the subject 'कम्प्यूटर पर हिंदी और अन्य भारतीय भाषाओंका प्रयोग', at the Indian Institute of Tropical Meteorology, Pune. .

Utilization of Ocean Research Vessels during the month

Vessel	Days at Sea / Utilization	Maintenance/ Inspection /Scientific Logistics / Cruise Preparation	No. of Cruise	No. of Port Calls / Port Stay/ Statutory survey
Sagar Nidhi	24	7	2	-
Sagar Manjusha	11	20(7 days owing to Ockhi Cyclone)	1	-
Sagar Purvi	6	25(10 days owing to Ockhi Cyclone)	1	-
Sagar Kanya	25	6	2	-
Sagar Sampada	22	9	2	-

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

Subject	Publications			Ph.Ds		
	April – November, 2017	December, 2017	Total	April – November, 2017	December, 2017	Total
Atmospheric Sciences	93	16	109	6	2	8
Ocean Science and Technology	34	7	41	1	-	1
Polar Sciences	13	-	13	1	-	1
Geosciences and resources	13	-	13	1	-	1
Total	153	23	176	9	2	11

Ministry of Earth Sciences

CERTIFICATE

(For the month of December, 2017)

It is certified that the detailed status regarding all the posts pertaining to Ministry/Department of Earth Sciences have been updated on AVMS as on last day of the month of December, 2017. A summary of the status is given below :

- Total number of posts required to be entered on AVMS : 6
- Number of posts filled as on date : 5
- Number of posts totally vacant as on date : 1
- Number of posts under additional charge arrangement : 1
- Number of posts that would fall vacant during the next 06 months : 1

(Vipin Chandra)

Joint Secretary