

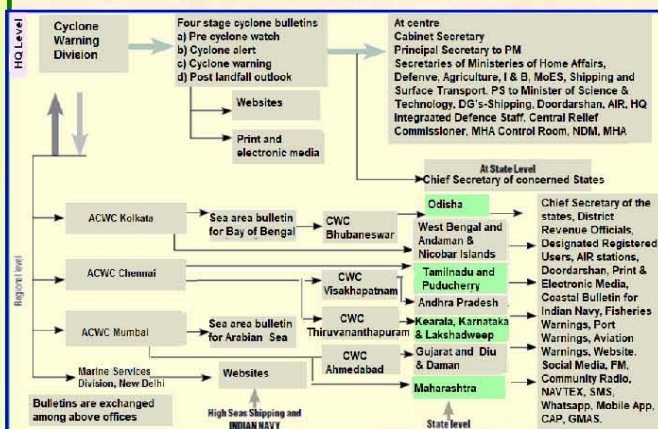


IMD in the service of Nation since 1875

Cyclone Warning Services

IMD is nodal agency to provide cyclone warning services in the country. It has a 3-tier network with Cyclone Warning Division at Delhi, 3 Area Cyclone Warning Centres at Mumbai, Chennai & Kolkata and 4 Cyclone Warning Centres at Bhubaneswar, Visakhapatnam, Ahmedabad & Tiruvananthapuram.

It also acts as Regional Specialised Meteorological Centre and Tropical Cyclone Advisory Centre, New Delhi.



Mandate

- Round the clock watch over the North Indian Ocean
- Running Numerical Models for Cyclone Track & Intensity Prediction and Storm Surge models
- Tropical Cyclone Vitals to NWP modeling groups
- Tropical Weather Outlook/Tropical Cyclone Advisories to Panel countries (Bangladesh, Maldives, Myanmar, Pakistan, Sri Lanka, Oman, Yemen, Thailand, Iran, Saudi Arabia, Qatar and UAE)
- Storm Surge advisories for member countries.
- Collection, Processing & archival of TC data over the NIO and their exchange with Panel member countries
- Preparation of Annual Review, RSMC Reports and Tropical Cyclone Operational Plan
- Research on cyclones & associated adverse weather and conduct Trainings/conferences/seminars for forecasters from WMO/ESCAP Panel countries.

IMD's Cyclone Warning Network and Services



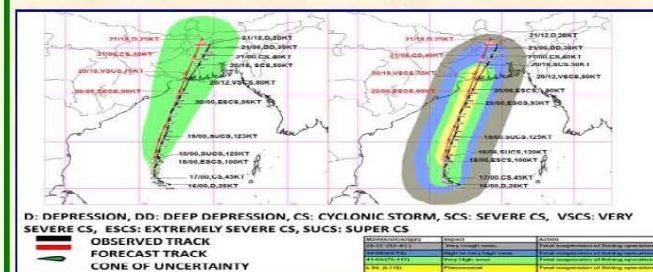
Bulletins issued by Cyclone Warning Division, New Delhi

- Tropical Weather Outlook (daily)
- Tropical Cyclone Advisory (3 hourly)
- National Bulletin (3 hourly)
- TCAC Bulletin for Civil Aviation (6 hourly)
- TC Vital bulletin for modeling group (6 hourly)
- Bulletin from Director General of Meteorology (Daily)
- Press Release (Daily)
- SMS/Facebook/tweet/whatsapp/CAP (4 times daily)
- Warning graphics of observed & forecast track alongwith cone of uncertainty and wind distribution both png and on GIS platform
- Warning graphics on heavy rainfall and storm surge

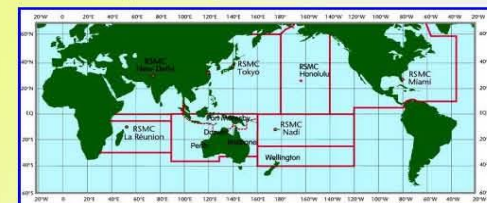
Bulletins and Products issued by ACWCs and CWCs

- Four stage cyclone warnings
- Sea area bulletin and Coastal weather bulletin
- Bulletins for Indian Navy
- Warnings for fishermen and fishery officials
- Port warnings and Aviation warning
- Bulletins for AIR/ Doordarshan/ Press
- Cyclone Warning Dissemination System bulletin
- Warnings for registered/ designated users.

Observed and forecast track along with cone of uncertainty and quadrant wind distribution based on 1130hrs IST of 17th May (84 hrs prior to landfall) of SuCS AMPHAN indicating accuracy in landfall, track & intensity predictions



Regional Specialised Meteorological Centre, Tropical Cyclones, New Delhi



RSMCs in the World:

- RSMC New Delhi
- RSMC La Réunion
- RSMC Miami
- RSMC Nadi
- RSMC New Delhi
- RSMC Honolulu

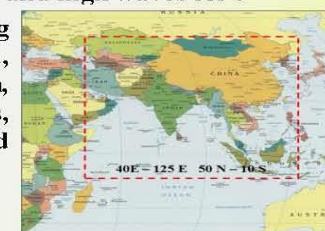
IMD acts as RSMC, New Delhi to provide tropical cyclones and storm surge guidance to 13 member countries under WMO/ESCAP Panel including Bangladesh, India, Iran, Maldives, Myanmar, Oman, Pakistan, Qatar, Saudi Arabia, Sri Lanka, Thailand, United Arab Emirates and Yemen.

Severe Weather Forecasting Programme (SWFP)

Southeast Asia:

IMD is leading WMO's Severe Weather Forecasting Programme for southeast Asia to predict the severe weather from tropical cyclones, severe thunderstorms and monsoon namely heavy rain, strong wind, storm surge and high waves for 9

countries including Bangladesh, India, Nepal, Bhutan, Pakistan, Sri Lanka, Maldives, Myanmar and Thailand since May, 2016



Tropical Cyclone Advisory Centre, New Delhi

Major TCAC centres in the world:

- New Delhi (India) (25th August, 2003)
- Miami (United States),
- Darwin (Australia),
- Honolulu (United States),
- Nadi (Fiji),
- Reunion (France)
- Tokyo (Japan)

IMD acts as Tropical Cyclone Aviation Centre (TCAC) to provide cyclone advisories to Asia Pacific and Middle East countries for civil aviation. These bulletins are issued to Met Watch Offices (MWO) for preparation of SIGMET messages.

Milestones

- 1865: 1st storm warning system from Kolkata Port.
- 1886: Early warning system of cyclones extended to cover all Indian ports.
- 1908: Meteorological Atlas of the Indian Seas and the North Indian Ocean published
- 1970: First cyclone detection radar was set up at Visakhapatnam in 1970
- 1974: Classification of cyclones into cyclonic storms, severe cyclonic storms and severe cyclonic storms with core of hurricane winds
- 1973: Regional Meteorological Centre (RMC) for Tropical Cyclones, New Delhi came into existence with the formation of WMO/ESCAP Panel
- 1988: Regional Meteorological Centre (RMC) New Delhi redesignated as Regional Specialized Meteorological Centre (RSMC) Tropical Cyclones, New Delhi
- 1990: Cyclone Warning Directorate established at New Delhi to co-ordinate cyclone warning work in the country and act as RSMC-Tropical Cyclones, New Delhi for regional guidance.
- 2003: Cyclone Warning Division to act as Tropical Cyclone Advisory Centre (TCAC), New Delhi as per ICAO requirements
- 2004: Introduction of naming of cyclones over north Indian Ocean
- 2005: Introduction of bi-weekly training for cyclone forecasters from WMO/ESCAP member Countries
- 2012: Verification of Track, Intensity & Landfall forecast errors from 2003 onwards
- 2013: Extension of forecast upto a lead period of 120 hours from cyclone 'VIYARU'
- 2014: Launching of a dedicated website for RSMC, New Delhi (www.rsmcnewdelhi.imd.gov.in)
- 2014: Digitisation of Annual RSMC Report since 1990
- 2016: Introduction of severe weather forecasting project for north Indian Ocean
- 2018: Introduction of Extended range outlook for next two weeks
- 2020: Introduction of cyclone track on GIS platform
- 2020: New list of names of cyclones released with representation from 13 Panel member countries

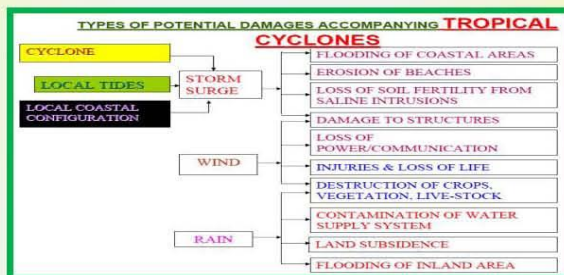
Tropical Cyclones

As per WMO's definition, Tropical Cyclones (Hurricanes, Typhoons) are low pressure system with winds rotating anticlockwise (clockwise) in northern (southern) hemisphere having minimum sustained wind speed of 34 knots. These are synoptic scale system (≥ 100 km) over tropical or subtropical oceanic regions,

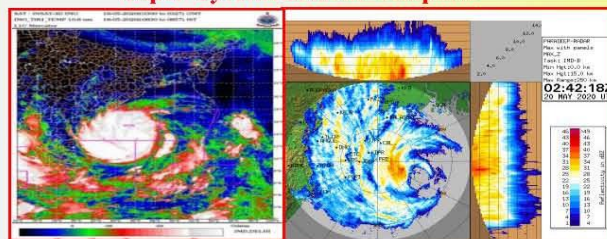
Basin	Cyclone Name
WESTERN PACIFIC	TYPHOONS
AUSTRALIA	WILLY-WILLIES
MEXICO	CORDONAZO
PHILIPPINES	BAGIOUS
INDIAN SEAS	CYCLONES
ATLANTIC & EASTERN PACIFIC	HURRICANES

Climatology of tropical cyclones over north Indian Ocean

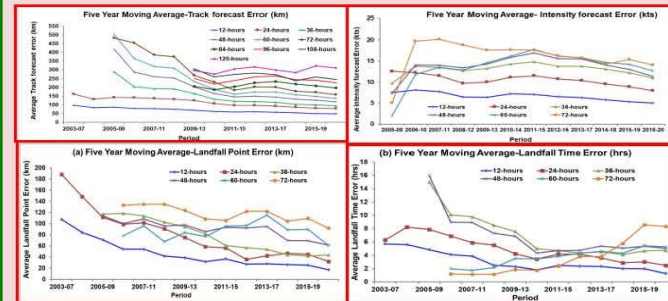
- ❖ 11 cyclonic disturbances develop over NIO annually (9 over BoB & 2 over AS).
- ❖ 5 intensify into TC (4 over BOB and 1 over AS), 3 into severe TC (2 over the BOB and 1 over the AS) and 1-2 into very severe TC.
- ❖ BoB TCs more often strike Odisha-West Bengal coast in October, Andhra coast in November and the Tamil Nadu coast in December
- ❖ About 20% of TCs forming over BoB and 68% of TCs over AS dissipate over sea.



Satellite & DWR Paradeep imagery during Super Cyclonic Storm "Amphan"



Track, Intensity and Landfall Forecast Performance



Appreciations Earned



Hon'ble PM Sh. Narendra Modi's appreciation for Hudhud, 2014:

In this cyclone, India Meteorological Department made excellent utilization of technology and from 6th October itself, this cyclone was predicted. The actual wind speed due to cyclone was same as the predicted wind speed. The track was same as predicted. Time of landfall was same as predicted IMD.



FANI, 2019

Our expertise in accurate weather forecast has improved. This was evidenced during the recent #CycloneFani that struck the eastern coast of the country. Due to accurate information and timely preparation, large scale destruction to life and property was averted #PresidentKovind

12:55 PM - Jun 20, 2019 - Twitter Web Client

232 Retweets 11K Likes



News18

19 mins · 3

UN agency for disaster reduction has commended the Indian Meteorological Department's "almost pinpoint accuracy" of early warnings that helped authorities conduct a well-targeted evacuation plan and minimise the loss of life.



NEWS18 · 3 MIN READ
UN Praises Met Dept for 'Pinpoint Accuracy' on Cyclone Fani That Minimised Loss of Life

Annual Publications

1. Preliminary reports on cyclonic disturbances
2. RSMC Report on cyclonic disturbances
3. Annual Review on tropical cyclones
4. Tropical Cyclone Operational Plan (TCP-21)
5. Forecast Demonstration Project Report

List of data base available on RSMC website

- ❖ Best track data of all cyclonic disturbances since 1982
- ❖ Cyclone e-Atlas having track/frequency data since 1891
- ❖ Annual reports on cyclonic disturbances since 1990
- ❖ Climatological data on TC characteristics
- ❖ Bulletins of TCs since 2011
- ❖ List of names of TCs
- ❖ Various Publications by Cyclone Warning Division
- ❖ Track, intensity & landfall verification data since 2003

Website address: www.rsmcnewdelhi.imd.gov.in