TOPIC: -
TROPICAL CYCLONES IN INDIA

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TROPICAL CYCLONES IN INDIA

Tropical cyclones are most frequently affecting natural disaster in India. The consequences of the tropical cyclones are storm surges, flood, high winds, inundation, and erosion etc. along with loss of life, causalities, and damages to the properties causing socio economic loss. India is mostly affected by the cyclones originating from Bay of Bengal. It is found that frequency of cyclones with various intensities originating in Bay of Bengal is very high and is four times that of originating in the Arabian Sea. West Bengal, Orissa and Andhra Pradesh, Andaman and Nicobar Islands are mostly affected states in India by the tropical cyclones. Gujarat, Lakshadweep are mostly affected with storms that are originating in the Arabian Sea. The main cyclone season in the South Indian Ocean observed is May-July and September-December with major occurrences of storms in April and August from the historical data.

Some of the deadliest tropical cyclone hits in the country are Ockhi (2017), Vardha (2016),Hudhud (2014), Phailin (2013), Nilam (2012), Thane (2011), Jal (2010), Nisha (2008), Fanoos (2005), Sidr (2007), Bhola (1970). Tropical cyclones have different names in different places according to the place of its origin. The name "hurricane" is given to systems that develop over the Atlantic or the eastern Pacific Oceans. In the western North Pacific and Philippines, these systems are called "typhoons" while in the Indian and South Pacific Ocean, they are called cyclones.

India is constantly at risk because of Tropical Cyclones, storm surges, tsunami, floods etc. India is surrounded by Indian Ocean in the south, Bay of Bengal on the southeast and Arabian Sea on the southwest. Tropical cyclones that hit India are originated mainly from the two basins namely Arabian Sea and Bay of Bengal during the spring and fall. The main cyclone season in the South Indian Ocean is May-July and September-December with significant occurrences of storms in April and August. Coastal areas are the most vulnerable to the cyclone hits and are followed by storm surges compared to the inland regions. The coastline of India is about 7516.6 km. There are 9 Districts share the coastline namely Gujarat, Maharashtra, Kerala, Goa, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal, 3 Union Territories namely Andaman and Nicobar Islands, Lakshadweep and Puducherry.

Four States (Andhra Pradesh, Odisha, Tamil Nadu and West Bengal) and one UT (Pondicherry) on the East Coast and One State (Gujarat) on the West Coast are more vulnerable to cyclone disasters. 40% of the total population lives within 100 km of coastline. Analysed data for the period 1980-2000 shows that on an average, annually 370 million people are exposed to cyclones in India. An analysis of the frequencies of cyclones on the East and West coasts of India during 1891-2000 show that nearly 308 cyclones (out of which 103 were severe) affected the East Coast. During the same period 48 tropical cyclones crossed the West Coast, of which 24 were severe cyclonic storms. Out of the cyclones that develop in the Bay of Bengal, over 58 percent approach and cross the East Coast in October and November. Only 25 % of the cyclones that develop over the Arabian Sea approach the West Coast. In the pre-monsoon season, corresponding figures are 25 percent over Arabian sea and 30 percent over Bay of Bengal.

Classification of Tropical Cyclones: The criteria followed by Meteorological Department of India (IMD) to classify the low pressure systems in the Bay of Bengal and in the Arabian Sea as adopted by World Meteorological Organisation (WMO) are as under:

Type of Disturbances	**Associated Wind Speed in the Circulation**
Low pressure Area	Less than17 knots (<31 kmph)
Depression	17 to 27 knots (31 to 49 kmph)
Deep Depression	28 to 33 knots (50 to 61 kmph)
Cyclonic Storm	34 to 47 knots (62 to 88 kmph)
Severe Cyclonic Storm	48 to 63 knots (89 to 118 kmph)
Very Severe Cyclonic Storm	64 to 119 knots (119 to 221 kmph)
Super Cyclonic Storm	119 knots and above (221 kmph and above)

Major Tropical Cyclones in Indian Sub-continent: The major Tropical cyclones which struck the coastal districts in India during the period 1891-2002 are as under:

WEST COAST			**EAST COAST**		
State	**Coastal Districts**	**No. of Cyclones.**	**State**	**Coastal Districts**	**No. of Cyclones.**
Kerala (3)	Malappuram	1	West Bengal (69)	24 Paragana (North and South).	35
	Kozikode	1		Midnapur	34
	Kannur	1			
Karnataka (2)	Dakshina Kannada	1	Odisha (98)	Balasore	32

	Uttar Kannada	1		Cuttack	32
				Puri	19
				Ganjam	15
Maharashtra (13)	Sindhudurg	3	Andhra Pradesh (79)	Srikakulam	14
	Ratnagiri	3		Vishakhapatnam	9
	Mumbai	3		East Godavari	8
	Thane	4		West Godavari	5
				Krishna	15
				Guntur	5
				Prakasam	7
				Nellore	16
Goa (2)	Goa	2	Tamil Nadu (54)	Chennai	18
				Cuddalore	7
				Southarcot	5
				Tanjavur	12
				Pudukkottal	5
				Ramnathpuram	3
				Tirunelveli	2
				Kanyakumari	2
Gujarat (28)	Surat	1		Pondicherry (UT)	8

	Kaira	1	Pondicherry (8)		
	Bhavnagar	4			
	Amereli	4			
	Junangarh	7			
	Jamnagar	6			
	Kachchh	5			

The Bay of Bengal has about five times as many tropical cyclones as the Arabian Sea. The high mountain ranges and low-lying coastal plains and river deltas of the Bay of Bengal combine to make this region extremely vulnerable to tropical cyclones.

There are six tropical cyclone Regional Specialized Meteorological Centres (RSMCs) together with five Tropical Cyclone Warning Centres (TCWCs) around the world. These centers have been designated as regional warning centers for tropical cyclones (including tropical depressions). Together, these centers cover all regions of the global tropics affected by tropical cyclones.

RSMC-tropical cyclones New Delhi

India Meteorological Department

Bay of Bengal and the Arabian Sea

It was Henry Piddington, President of the Marine Courts, Calcutta who pioneered scientific studies on tropical cyclones in the Indian seas, systematically collecting meteorological logs of ships plying in those waters. He published a series of memoirs in the Journal of the Asiatic Society of Bengal during 1838-1858 dealing with individual cyclones. He also wrote a book entitled The Sailor's Horn-Book for the Law of Storms, the fourth edition of which appeared in 1864.

One of the oldest recorded cyclonic storms that caused heavy casualties in India was the one that hit the mouth of the Ganges near Calcutta on October 7, 1737. It is reported to havekilled 3,00,000 people and destroyed 20,000 crafts of various descriptions, although there are some doubts about these figures. The river rose by 40 feet over its usual level. These details are taken from a catalogue of 112 recorded cyclones in the Bay of Bengal, up to the end of 1876, compiled by Henry F Blanford, Meteorological Reporter to the Government of India and published in the Journal of the Asiatic Society of Bengal.

Following a devastating cyclone that struck Calcutta in October 1864, the then Government of India established a cyclone-warning system for the port of Calcutta. The India Meteorological Department was born in 1875 and cyclone warning for ports, coastal areas and ships in the Indian seas became one of its routine activities. In 1969 the Government of India advised the

governments of all maritime states to set up 'Cyclone Distress Mitigation Committees' (CDMC) in their respective states to effect suitable measures for mitigating the attendant hazards. An efficient, full-fledged system of cyclone 'alerts' and 'warning' has since developed in the country to cope with this recurrent natural threat.

During the 100-year period 1891-1990, there have been 561 cyclones in the Indian seas with maximum winds of 34 knots or more. Cyclones over the Indian seas generally form between latitudes 5°N and 18°N during the pre-monsoon (April, May and early part of June) and post-monsoon (late September to December) seasons. During the monsoon period June to September, weaker systems (mostly depressions) form over the northern part of the Bay of Bengal (north of 18 ° N) and then move West-North-Westwards across North India shedding copious rainfall along their paths.