Disaster Management for Cyclones - Mitigation, Preparedness Measures & Government Initiatives!

UPSC Notes

Disaster Management for Cyclones refers to preparedness and mitigation strategies taken by the government of India. India is most vulnerable to cyclones. On average India experiences 6-7 cyclones every year. Therefore, a proper preparedness, development, and mitigation plan is an essential part of Disaster Management for Cyclones.

Disaster Management for Cyclones is one of the most important topics for the UPSC IAS exam. It covers a significant part of the Disaster Management subject in the General Studies Paper-3 syllabus.

In this article, we shall study the mitigation and preparedness measures for cyclone disaster management UPSC.

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Cyclones: An Overview

The name "Cyclone" comes from the Greek word "cyclos," which means a snake's coils. Henry Paddington came up with the term because tropical storms in the Arabian Sea and the Bay of Bengal resemble coiled sea serpents. Cyclones are generated by rapid and frequently damaging air circulation in low-pressure areas. Storms and unfavorable weather are frequently present during cyclones. In the Northern hemisphere, the air moves counterclockwise, whereas, in the Southern hemisphere, it moves clockwise. There are two categories of cyclones: Extratropical cyclones, sometimes known as temperate cyclones, and Tropical cyclones.

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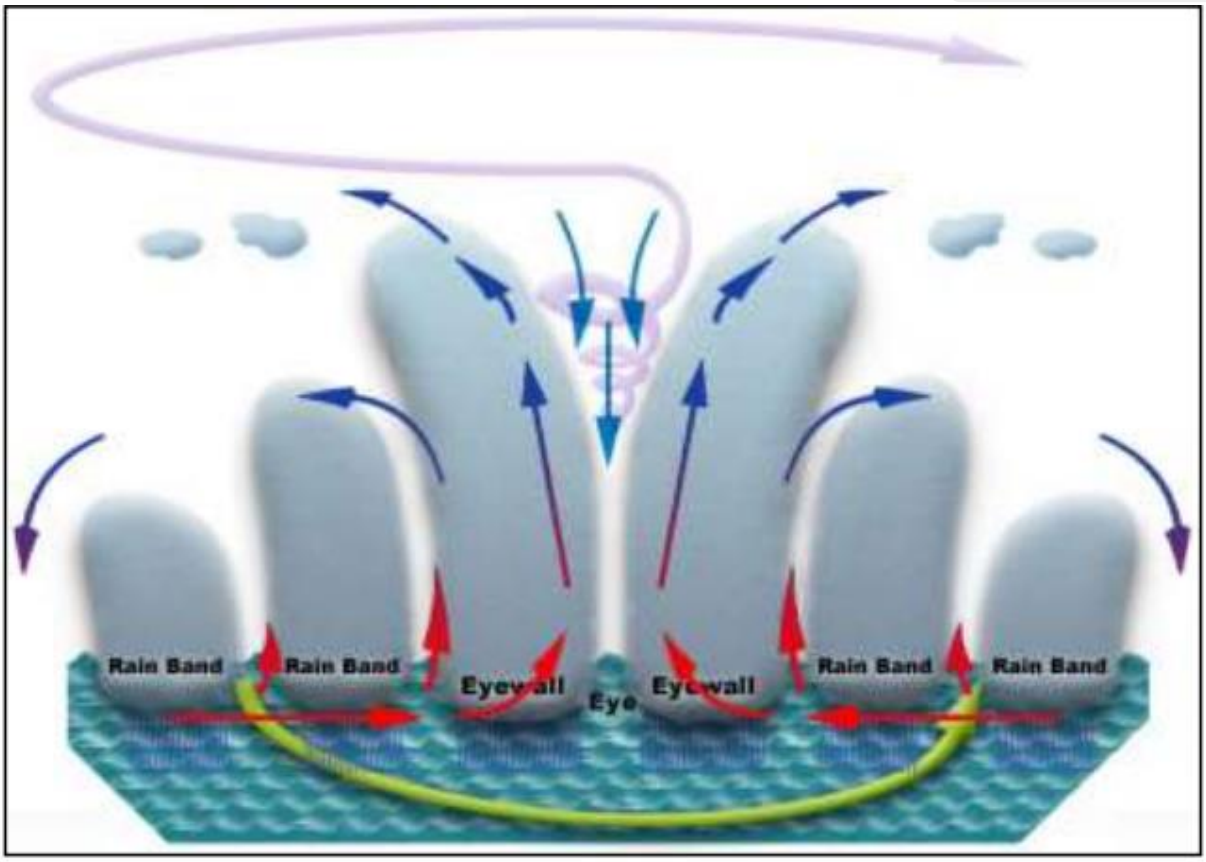

Image: Schematic Diagram of a Cyclone
Image Source: IMD

How is a Cyclone Disastrous?

Tropical Cyclones are the most disastrous cyclones. Even in the early phases of their formation, tropical cyclones pose one of the greatest risks to property and human life. They comprise a variety of dangers, such as storm surges, flooding, extremely strong winds, tornadoes, and lightning, each of which can potentially have a severe negative impact on life and property. Together, these risks combine and significantly raise the possibility of fatalities and property damage.
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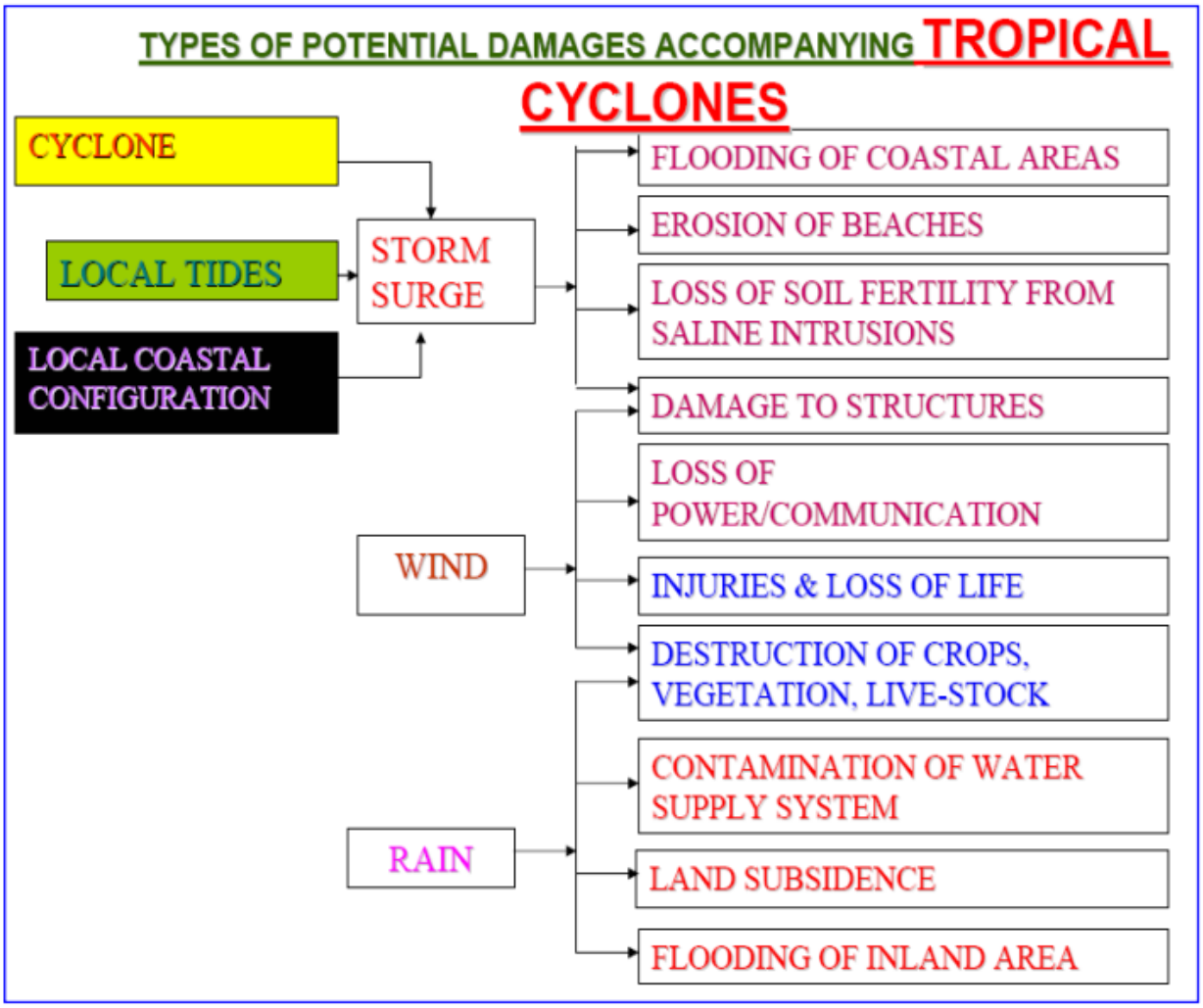

Image Source: IMD

Mitigation and Preparedness Measures for Cyclone Disaster Management

In India, the Natural Disaster Management Authority (NDMA) is in charge of disaster management. National Guidelines on the Management of Cyclones have been prepared by it. The Home Ministry started the National Cyclone Risk Mitigation Project (NCRMP) to improve cyclone forecasting, tracking, and warnings in states.

Land Use Planning

- Planning for land use should take cyclones into account consistently such that low-importance activities are located in vulnerable Mitigation and Preparedness Measures for Cyclones areas.
- Settlements in flood plains should be avoided at all costs. Key facility locations must be noted in the land use.
- Land use and building code enforcement should be governed by policies. Instead of being used for habitation, vulnerable regions should be preserved for parks, grazing areas, or flood diversion.

Hazard Mapping

- A map that displays the frequency/probability of occurrences of different intensities or durations of cyclones is known as a hazard map for cyclones.
- It is impossible to predict cyclones' days in advance however the pattern of occurrence for specific wind speeds can be determined using historical records and pathways. An area's vulnerability to a cyclone, along with any accompanying storm surge and flooding, will be shown on a hazard map.
- Estimating the cyclone's power and potential damage intensities in the area will be beneficial.
- Data from historical climatological records, wind speed history, frequency of flooding, etc. are used to generate the map.

Cyclones Early Warning System

On October 12, 2020, the Indian Meteorological Department and the Ministry of Earth Sciences introduced the new Impact-Based Cyclone Warning System. Its ultimate goal is to reduce the amount of money lost and property destroyed as a result of the storms that hit the Indian coasts every year. This approach takes into account all the crucial factors, including the local population, settlements, usage of the land, and location warning mechanisms.

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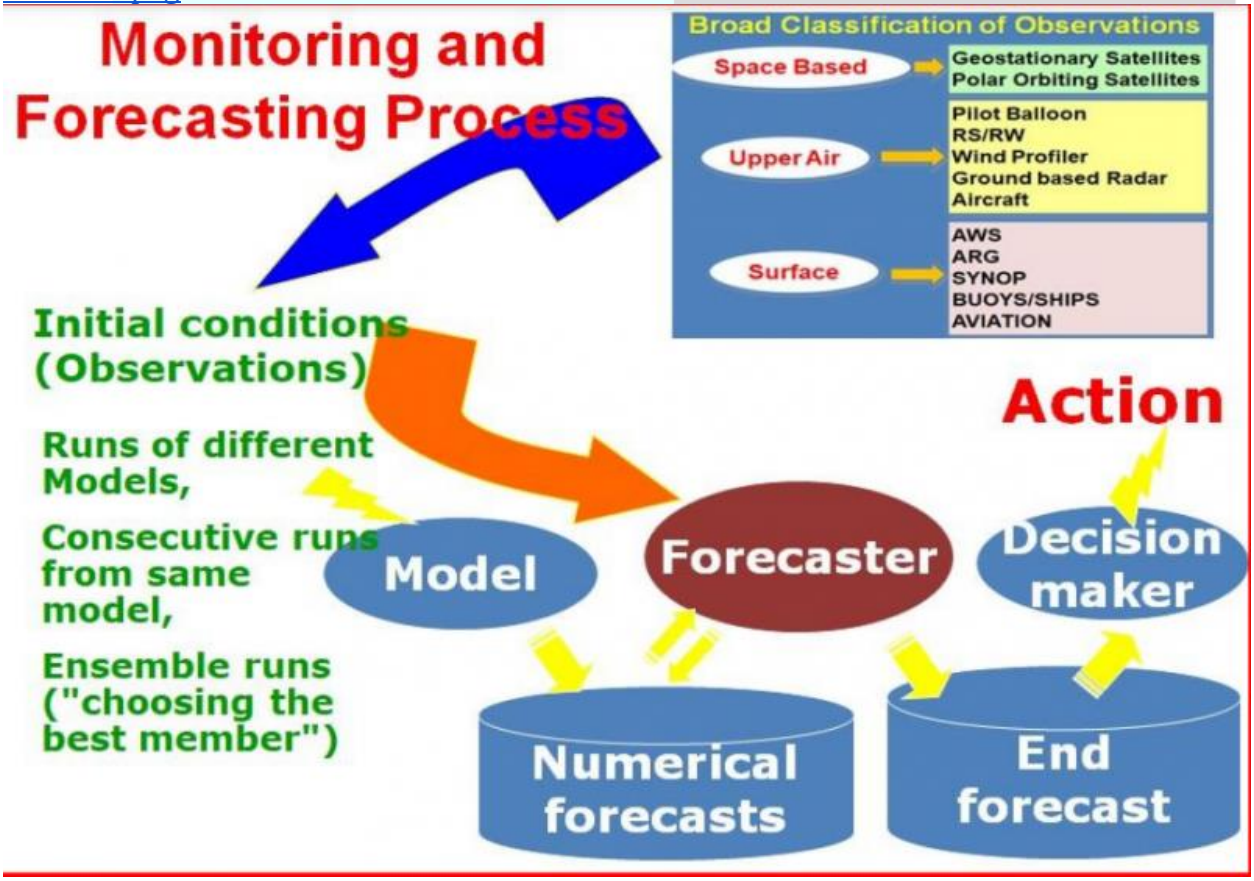

Image Source: IMD

Cyclone Shelters

- Cyclone Areas that are susceptible to recurring cyclones must have shelters. Since cyclone shelter building requires significant funding, it is frequently dependent on assistance from the government or outside contributors.
- Additionally, it includes technical and engineering elements that are typically outside the scope of the community.
- To ensure that people can quickly access the shelters during emergencies, the location of the cyclone shelter should have road connections to major thoroughfares and to the nearby rural areas.

Engineered Structures

- Buildings must be constructed to withstand wind pressure. The choice of a good site is also crucial.
- Engineering-designed structures should be used for public infrastructures, such as hospitals, schools, rural healthcare facilities, communication towers, and community centres.
- Additionally, it should be promoted for the population to build designed structures as their homes.
- Government intervention is required to provide building regulations and other regulatory frameworks for these interventions.

Flood Management

- Flood management is essential because a cyclonic storm will result in flooding. Coastal areas will be inundated by storm surges.
- Flash floods will result in heavy rain. Water may be kept away from the flood plains by sea walls and embankments along rivers.
- By building reservoirs, check dams, and alternative drainage channels and/or routes, water flow can be controlled.

Mangrove Plantation

- Mangroves protect the coastal region from cyclone-related storm surges and wind. The water's flow is slowed down by the branch tangle.
- The community should take part in the mangrove planting project, which might be run by the local government, an NGO, or even the community itself.
- Mangroves also support coastal preservation and prevention of coastal erosion.

Public Awareness and Community Participation

- Comprehensive cyclone preparedness and response strategies are crucially needed at all levels to improve readiness to preserve lives and livelihoods.
- A specific emphasis needs to be placed on community-based disaster preparedness and successful response through active community participation because the community is the first responder to any disaster.
- In order to construct community plans, it is necessary to identify vulnerable groups and populations, evaluate the community's hazards, map its resources, and identify specialized teams for swift reaction.

Retrofitting Non-engineered Structures

Non-engineered settlements should make sure they are aware of how resistant their homes are to the wind or other dangerous weather conditions. UN-HABITAT provided the following examples of retrofitting non-engineered structures:

- Constructing a steep-slope roof to reduce the chance of being blown off.
- Anchoring strong poles to the ground with firm footings.
- To assist in reducing wind forces, Plantations of trees should be placed safely away from the house.
- Early repair of the shelters

Study in detail about Bomb Cyclone for UPSC preparation!

Governmental Initiatives for Cyclone Disaster Management in India

Some of the Governmental Initiatives for Cyclone Disaster Management in India are discussed below.

Integrated Coastal Zone Management (ICZM) Project

- **Origin**: The idea of Integrated Coastal Zone Management was conceptualized in 1992 during the Earth Summit of Rio de Janeiro. Chapter 17 of Agenda 21's summit proceedings contains the policy addressing ICZM.
- **Objective**: The Integrated Coastal Zone Management (ICZM) Project's goal is to help the Government of India (GoI) develop the national capability needed to implement a comprehensive coastal management strategy across the nation while also testing the strategy in the states of Gujarat, Orissa, and West Bengal.
- **Features**: The project consists of four parts.
    1. National ICZM Capacity Building: Mapping, delineation, and demarcation of the hazard lines, and delineation of coastal sediment cells.
    2. Piloting ICZM Approaches in Gujarat: Support capacity building of the state-level agencies and institutions.
    3. Piloting ICZM Approaches in Orissa: Capacity building of the state-level agencies and institutions (Paradip-Dhamra and Gopalpur-Chilika).
    4. Piloting ICZM Approaches in West Bengal.

National Cyclone Risk Mitigation Project

Origin: The National Cyclone Risk Mitigation Project (NCRMP) is a flagship initiative supported by the World Bank and executed by NDMA in eight coastal states at risk of cyclones in two phases, including the following elements.

Components of National Cyclone Risk Mitigation Project	
Component A	Early Warning Dissemination System (EWDS)
Component B	Cyclone Risk Mitigation Infrastructure (CRMI)
Component C	Technical Assistance for Capacity Building on Disaster Risk Management

Component D	Project Management and Monitoring

Objective: The objective is to lessen the vulnerability of coastal populations in Project States to cyclones and other hydro-meteorological hazards and to strengthen the ability of State agencies to effectively prepare for and respond to disasters.

Features: **NCRMP Phase-I** was started in 2011 covering the Indian states of Andhra Pradesh and Odisha. Phase I was completed in December 2018.

NCRMP Phase-II has implemented in 6 Coastal States namely Goa, Gujarat, Karnataka, Kerala, Maharashtra, and West Bengal, and was completed in September 2022. As far no update is mentioned further.

Coastal Regulation Zones (CRZ)

Origin: The Ministry of Environment and Forests (MoEF) issued a notification in February 1991 under the Environmental Protection Act of 1986 to regulate operations in the coastal area.
Objective: Coastal Regulation Zone (CRZ) policies aim to conserve the coastal ecosystem by limiting human, economic, and industrial activity close to the beach or shoreline area.
Features: The Coastal Regulation Zone is defined by the notification as the coastal area up to 500 metres from the High Tide Line (HTL) and a stage of 100 metres along the banks of creeks, estuaries, backwaters, and rivers vulnerable to tidal fluctuations (CRZ).

Color Coding of Cyclones

The Indian Meteorological Department (IMD) issues warnings for areas that will suffer significant cyclone damage. IMD has its own color-coding scheme for cyclone warnings and information. The department uses color codes to denote the seriousness of the situation and the accompanying warning. It has developed four color codes: red, orange, yellow, and green. The primary goal of the color codes is to warn people about dangerous weather conditions that could endanger lives and property.
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Color Coding of Cyclones		
Colour	**Meaning**	**Action**
Green	No Warning	No severe weather expected and no advisories issued

Yellow	Be Updated	Severely bad weather spanning across several days
Orange/Amber	Be Prepared	It serves as a warning for very harsh weather that could cause power outages, road, and train closures, and other commuting disruptions
Red	Take Action	Be extra cautious, be ready for drastic measures, and follow any orders given by the government

Also check out the article on Disaster Management Act 2005 with this link!

Example: Disaster Management of Cyclone Fani

Since Cyclone Phailin in 2013, the Severe Cyclonic Storm Fani was the most powerful tropical cyclone to hit the Indian state of Odisha. Cyclone Fani originated from a tropical depression on April 26, 2019, from the west of Sumatra in the Indian Ocean.
Some of the preparedness and mitigation strategies followed for Disaster Management for Cyclones Fani are listed below.

- The operation made use of all available resources, including communication and response tools and supplies.
- In the impacted parts of Andhra Pradesh, Odisha, and West Bengal, teams cut down or removed damaged or uprooted trees in order to clean the roadways and railroad tracks.
- 50 NDRF teams helped the state of Odisha's officials in the large-scale evacuation of more than 14.7 lakh people to safer locations prior to the landfall.
- Following the evacuation effort, NDRF teams worked with other state agencies to restore vital services on a war footing, including power supply, communication setup, and road clearance by removing uprooted and fallen trees and poles, debris that is scattered on the highways.

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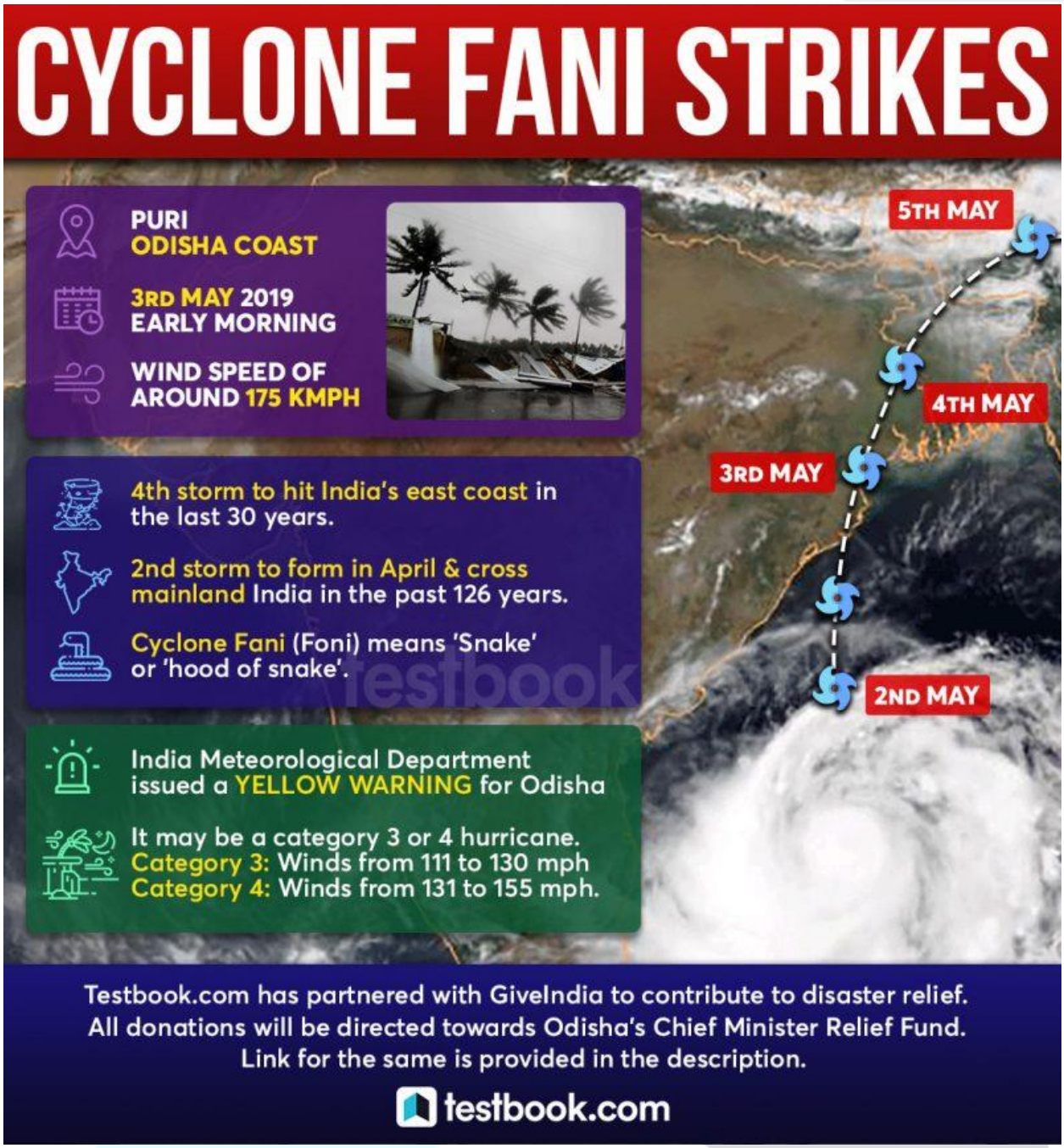

Also check out the article on Tropical Cyclone Nivar with this link!

Conclusion

Disaster Management for Cyclones is an important mitigation strategy to overcome the destruction caused by tropical cyclones. The warnings given by IMD are also beneficial to create awareness among the people living in vulnerable areas. The government of India is doing remarkable work in cyclone preparedness however, there is still a need for community awareness and effective mitigation measures.

UPSC Previous Year Questions on Disaster Management for Cyclones

Q. Discuss the recent measures initiated in disaster management by the Government of India departing from the earlier reactive approach. **(UPSC 2020)**