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CURRENT AFFAIRS

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CYCLONES

This article covers "Daily Current Affairs" and the topic details "Cyclones". The topic "Cyclones" has relevance in the Geography and Disaster Management section of the UPSC CSE exam.

Relevance:

For Prelims:

- What are Cyclones?
- Conditions for Formation and Dissipation of Cyclones?

For mains:

- GS 1&3 : Geography and Disaster Management.
- Major vulnerable areas?
- Cyclone Management in India?

Why in the news?

Cyclone Biparjoy to intensify in next 36 hours, informed the IMD.

What are Cyclones?

A cyclone is a powerful and destructive weather phenomenon characterized by a low-pressure center and strong rotating winds. It typically forms over warm ocean surfaces, where the air rises and creates an area of low pressure. As the air spirals inward towards the center, it begins to rotate, generating a cyclonic circulation. Cyclones are known for their intense thunderstorms, heavy rainfall, and high wind speeds. They can cause significant damage to infrastructure, homes, and landscapes, as well as pose threats to human lives. Proper monitoring, early warning systems, and preparedness measures are crucial in managing and mitigating the impacts of cyclones.

Conditions for Formation and Dissipation of Cyclones?

Formation of a Cyclone:

- **Warm Ocean Surface:** Cyclones form over warm ocean surfaces where the sea surface temperature exceeds 26.5 degrees Celsius (79.7 degrees Fahrenheit). The warm ocean provides the necessary energy for the cyclone's development.
- **Low-Pressure System:** A disturbance, such as a tropical wave or an area of low pressure, initiates the cyclone formation. As the warm and moist air rises, it creates an area of low pressure at the surface.

- **Coriolis Effect:** The Coriolis effect, caused by the Earth's rotation, deflects the moving air to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. This effect is essential for the cyclone's rotation.
- **Cyclonic Circulation:** The rotating winds around the low-pressure center start to organize, forming a cyclonic circulation. Air spirals inward toward the center in a counterclockwise direction in the Northern Hemisphere and in a clockwise direction in the Southern Hemisphere.
- **Eyewall and Eyewall Replacement Cycle:** The cyclone develops an eyewall, which is a ring of intense thunderstorms surrounding the center. This eyewall is where the strongest winds and heaviest rainfall occur. In mature cyclones, an eyewall replacement cycle may occur, where a new eyewall forms outside the original eyewall. This process temporarily weakens the cyclone but may lead to a larger and stronger storm later.

Dissipation of a Cyclone:

- **Land Interaction:** When a cyclone moves over land, it loses its primary energy source, the warm ocean surface. Land interaction disrupts the cyclone's circulation and leads to gradual weakening.
- **Cooler Sea Surface:** If a cyclone moves over cooler ocean waters with temperatures below 26.5 degrees Celsius (79.7 degrees Fahrenheit), it lacks the necessary warmth and energy to sustain itself. The cooler sea surface causes the cyclone to weaken and eventually dissipate.
- **Wind Shear:** Strong wind shear, the change in wind direction and speed with height, can disrupt the vertical structure of a cyclone. High wind shear causes the storm to tilt and separates the upper-level and lower-level circulation, inhibiting further intensification or leading to weakening and dissipation.
- **Loss of Moisture:** As a cyclone moves away from its moisture source, such as an ocean or a tropical region, it gradually loses its moisture supply. The absence of moisture reduces the storm's ability to maintain convective activity and sustain itself.

Major vulnerable areas?

In India, cyclone-prone areas are classified into different categories based on their vulnerability to cyclonic disturbances. The classification is primarily based on historical data and the frequency of cyclone occurrences in specific regions. The cyclone-prone areas in India are classified as follows:

- **Very High-Risk Zone:** This zone includes the coastal areas along the Bay of Bengal, primarily the states of Odisha and Andhra Pradesh. These regions are highly vulnerable to cyclones, with a higher frequency of severe cyclonic storms and intense impacts.
- **High-Risk Zone:** The high-risk zone comprises the coastal regions of West Bengal, Tamil Nadu, and Puducherry. These areas experience a relatively high frequency of cyclonic disturbances, with a potential for severe impacts.
- **Moderate-Risk Zone:** This zone covers the coastal areas of Gujarat and Maharashtra, including Mumbai. While these regions have a lower frequency of cyclonic disturbances compared to the very high and high-risk zones, they still experience moderate cyclonic activity and associated impacts.
- **Low-Risk Zone:** The low-risk zone includes the remaining coastal areas of India, such as Kerala, Karnataka, Goa, and parts of Gujarat. These regions have a relatively lower vulnerability to cyclones, with a lesser frequency of cyclonic disturbances and milder impacts.

Cyclone Management in India?

The management of cyclones in India involves a comprehensive approach that includes preparedness, early warning systems, evacuation plans, disaster response, and post-disaster recovery. Here are the key components of cyclone management in India:

- **Early Warning Systems:** The India Meteorological Department (IMD) plays a crucial role in monitoring and forecasting cyclones. It uses sophisticated weather prediction models, satellite imagery, and data from weather stations to issue timely cyclone alerts, warnings, and forecasts. These warnings are disseminated through various communication channels to authorities, media, and the general public.
- **Cyclone Preparedness:** Cyclone-prone states and coastal communities have developed cyclone preparedness plans that include identifying vulnerable areas, establishing cyclone shelters, pre-positioning relief materials, and training emergency response teams. Preparedness measures also involve creating awareness among the public about cyclone safety protocols and evacuation procedures.
- **Evacuation and Shelter Management:** Timely evacuation of coastal communities from high-risk areas is a critical aspect of cyclone management. State authorities, along with the National Disaster Response Force (NDRF) and local administrations, coordinate evacuation efforts, mobilize transportation, and designate cyclone shelters for people to seek refuge during cyclone events.
- **Coordination and Response:** Various agencies, including state governments, disaster management authorities, defense forces, and relief organizations, work together to coordinate response efforts during cyclones. They ensure the availability of essential supplies, medical aid, and search and rescue operations. The NDRF plays a significant role in deploying specialized teams for rescue and relief operations.
- **Post-Disaster Recovery:** After a cyclone strikes, the focus shifts to post-disaster recovery and rehabilitation. It involves assessing damages, restoring infrastructure, providing relief to affected communities, and facilitating the return of evacuated populations. Efforts are made to restore electricity, communication networks, and essential services to cyclone-affected areas.
- **Research and Development:** Continuous research and development in meteorology, disaster management, and infrastructure resilience are essential for improving cyclone management strategies. This includes enhancing forecasting models, studying climate change impacts on cyclone patterns, and implementing measures to strengthen infrastructure against cyclonic forces.
- **International Cooperation:** India actively participates in international collaborations and shares best practices in cyclone management. It collaborates with regional and international organizations such as the World Meteorological Organization (WMO) and Indian Ocean Rim Association (IORA) to enhance cyclone forecasting, data sharing, and capacity-building initiatives.

Source:

<https://indianexpress.com/article/india/cyclone-biparjoy-intensify-imd-live-updates-8653649/>

Q.1 Which of the following factors are essential for the formation of a cyclone?

1. Low-pressure system
2. High-pressure system

3. Warm ocean surface
4. Cold ocean surface

Select the correct option:

- (a) 1 and 3
- (b) 2 and 4
- (c) 1, 2, and 3
- (d) 1, 3, and 4

Answer: (a)

Q.2 Which of the following factors can contribute to the dissipation of a cyclone?

1. Landfall on a coastal area
2. Interaction with cooler sea surface temperatures
3. Intensification of convective activity
4. Presence of low wind shear

Select the correct option:

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 4 only
- (d) 2 and 4 only

Answer: (a)

Q.3 “Discuss the impact of cyclones on coastal regions and the measures taken by India for cyclone management. Examine the challenges faced in effective cyclone management and suggest strategies for enhancing preparedness and resilience.”

Rishabh

