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Geography (Hons)-Paper-CT14-6th Semester

Cyclone: Factors, vulnerability, consequences and management

Questions

1. Define cyclone. (Marks-2)
2. What are the factors of vulnerability for a cyclonic disaster? (Marks-2)
3. What are the main causes of morbidity and mortality due to cyclonic disaster? (Marks-5)
4. What precautionary measures to be followed before, during and after a cyclonic disaster? (Marks-5)
5. Mention the areas where care should be taken for post-cyclone recovering and reconstruction analyse the disastrous consequences of cyclone. (Marks-10)
6. Discuss about Cyclone Disaster management with special reference to India. (Marks-10)

Cyclone:

Cyclone is a circulatory wind system around a low pressure or along a front between warm and cold wind. It is of anticlockwise direction in the northern hemisphere and that of clockwise direction in the southern hemisphere. Depending on place of origin and other characteristics it is of two types-

- (i) Mid-latitude or temperate or extra-tropical cyclone, and
- (ii) Tropical cyclone.

Tropical cyclones are among the most destructive natural phenomena. The impact from cyclones extends over a wide area, with strong winds and heavy rains. However, the greatest damage to life and property is not from the wind, but from secondary events such as storm surges, flooding, landslides and tornadoes.

Factors of Vulnerability

Man made factors:

- (i) Settlement located in low lying coastal areas (direct impact);
- (ii) Poor building design, or construction;
- (iii) Insufficient lead time for warning and evacuation;
- (iv) Non compliance with evacuation procedures;
- (v) Inadequate shelter.

Main causes of Morbidity and Mortality

Direct Impact

Injuries, trauma, and asphyxiation due to entrapment are observed and result from building collapse and wind-strewn debris. Electrocutation or drowning happens while securing property such as television antennas or boats.

Short and long term mental health effects are observed.

Indirect Impact

The impact of tropical cyclones on the transmission of communicable diseases is limited. Outbreaks of communicable diseases are rarely observed. Nonetheless, the risk for water borne disease and vector transmitted disease can be exacerbated: human exposure to disease vectors can be increased due to changes in the physical environment.

The impact on the health infrastructures and all lifeline systems is massive and can result in food shortages and interruption of basic public health services (water, etc).

In case of floods and sea surges-

- risks of drowning and
- water borne and vector borne disease increase.

What precautionary measures to be followed before, during and after a cyclonic disaster?

Do's and Don's

Before the cyclone season

- Checking the house; securing loose tiles and carrying out repairs of doors and windows
- Removal dead branches or dying trees close to the house; anchoring of removable objects such as lumber piles, loose tin sheets, loose bricks, garbage cans, sign-boards etc. which can fly in strong winds
- Keeping some wooden boards ready so that glass windows can be boarded if needed
- Keeping a lantern filled with kerosene, battery operated torches and enough dry cells
- Demolishing condemned buildings
- Keeping some extra batteries for transistors
- Keeping some dry non-perishable food always ready for use in emergency

Necessary actions

The actions that need to be taken in the event of a cyclone threat can broadly be divided into :

- Immediately before the cyclone season
- When cyclone alerts and warnings are communicated
- When evacuations are advised
- When the cyclone has crossed the coast

When the Cyclone starts

- Listening to the radio (All India Radio stations give weather warnings).
- Keep monitoring the warnings. This will help one to prepare for a cyclone emergency.

- Passing the information to others.
- Rumours should be ignored and not to be spread; this will help to avoid panic situations.
- Believing the official information
- People of a cyclone alert area may continue normal working but should stay alert to the radio warnings.
- One should stay alert for the next 24 hours as a cyclone alert means that the danger is within 24 hours.

In area under cyclone warning people should get away from low-lying beaches or other low-lying areas close to the coast

- People should leave early before the high ground or shelter gets flooded
- not to be delayed and run the risk of being marooned
- If house is securely built on high ground then residents should take shelter in the safe part of the house. However, if asked to evacuate then they should not hesitate to leave the place.
- Glass windows to be boarded up or storm shutters should be put in place.
- Strong suitable support should be provided for outside doors.
- paper strips may be pasted on glasses to prevent splinters. However, this may not avoid breaking windows.
- Extra food to be procured, which can be eaten without cooking. extra drinking water to be stored in suitably covered vessels.
- At the time of evacuation valuable articles to be moved upper floors to minimize flood damage.
- People have to ensure hurricane lantern, torches or other emergency lights are in working condition and should be kept handy.
- Small and loose things, which can fly in strong winds, should be stored safely in a room.
- It is to be ensured that a window and door can be opened only on the side opposite to the one facing the wind.
- Making provision for children and adults requiring special diet.
- If the centre of the cyclone is passing directly over the area then there will be a lull in the wind and rain lasting for half an hour or so. During this time one should not go out; because immediately after that, very strong winds will blow from the opposite direction.
- Electrical mains of the house to be switched off.
- People should remain calm.

When Evacuation is instructed

- Essential items should be packed for at least a few days. These should include medicines, special food for babies and children or elders.
- Evacuees should head for shelter or evacuation points indicated for your area.
- At the shelter instructions of the person in charge should be followed.
- One should remain in the shelter until they are informed to leave

Post-cyclone measures

- People should remain in the shelter until informed that they can return to their home.
- People must get inoculated against diseases immediately.
- Any loose and dangling wires from lamp posts should strictly avoided.
- Special care should be taken for unavoidable driving
- Debris from premises should immediately be cleared .
- The correct losses should be reported to appropriate authorities.

Mention the areas where care should be taken for post-cyclone recovering and reconstruct:

After ‘All Clear’ is issued for back movement by ‘State’ attention should taken to the following:

- Whether ‘roads’ for reaching home is recommended by authorities
- Whether power lines are safe
- Whether transport arrangement is approved by authorities
- Pure drinking water is available
- Sewage lines are working
- Any epidemic spread in the area
- Safety of neighbor(s) assured

Analyse the disastrous consequences of cyclone.

(Marks-10)

The main effects of tropical cyclones include-

- heavy rain,
- strong wind, and
- large storm surges near landfall,

The destruction from a tropical cyclone depends mainly on its-

- intensity,
- its size, and
- its location.

Tropical cyclones act to remove forest canopy as well as change the landscape near coastal areas, by moving and reshaping sand dunes and causing extensive erosion along the coast. Even well inland, heavy rainfall can lead to mudslides and landslides in mountainous areas.

After the cyclone has passed, devastation often continues. Fallen trees can block roads and delay rescues, with medical supplies, or slow the repairs to electrical lines, telephone towers or water pipes, which could put other lives at risk for days or months. Standing water can cause the spread of disease, and transportation or communication infrastructure may have been destroyed, hampering clean-up and rescue efforts. Nearly two million people have died globally due to tropical cyclones.

PST-Hazards of cyclones:

PST is an acronym standing for-

- Primary,
 - Secondary and
 - Tertiary.
- A primary hazard involves destructive winds, debris and storm surge.
 - Secondary hazards include flooding and fires.
 - Tertiary hazards include hikes in prices of food and other necessities, as well as long term hazards like water-borne diseases.

At sea

A mature tropical cyclone can release heat at a rate upwards of 6×10^{14} watts. Tropical cyclones on the open sea cause large waves, heavy rain, and high winds, disrupting international shipping and, at times, causing shipwrecks.

Strong winds

Strong winds can damage or destroy vehicles, buildings, bridges, trees, personal property and other outside objects, turning loose debris into deadly flying projectiles. Tropical cyclones often knock out power to tens or hundreds of thousands of people, preventing vital communication and hampering rescue efforts. Tropical cyclones often destroy key bridges, overpasses, and roads, complicating efforts to transport food, clean water, and medicine to the areas that need it. Furthermore, the damage caused by tropical cyclones to buildings and dwellings can result in economic damage to a region, and to a diaspora of the population of the region.

Storm surge,

The storm surge, or the increase in sea level due to the cyclone, is typically the worst effect from landfalling tropical cyclones, resulting deaths. The relatively quick surge in sea level can move miles/kilometers inland, flooding homes and cutting off escape routes. The storm surges and winds of hurricanes may be destructive to human-made structures.

Intense Rainfall

The tropical cyclone produces intense rainfall, potentially resulting in flooding, mudslides, and landslides. Inland areas are particularly vulnerable to freshwater flooding, due to residents not preparing adequately. Heavy inland rainfall eventually flows into coastal estuaries, damaging marine life in coastal estuaries. The wet environment in the aftermath of a tropical cyclone, combined with the destruction of sanitation facilities and a warm tropical climate, can induce epidemics of disease which claim lives long after the storm passes. Infections of cuts and bruises can be greatly amplified by wading in sewage-polluted water. Large areas of standing water caused by flooding also contribute to mosquito-borne illnesses. Furthermore, crowded evacuees in shelters increase the risk of disease propagation.

Discuss about Cyclone Disaster management with special reference to India.

- ✓ According to the Home ministry, 8% of total area in **India** is prone to **cyclones**. Natural disasters cause a loss of **2% of GDP** every year in India.

- ✓ **Indian** Meteorological Department (IMD) is the nodal agency for early warning of **cyclones** and floods.
- ✓ Natural Disaster **Management** Authority is mandated to deal with the disaster **management in India**.

Cyclone Impact Mitigation:-

Although it is not possible to completely avoid cyclonic disasters but their effects can be minimised by taking some known long- and short term structural and non-structural mitigation measures such as-

- Developing **proper early warning systems**,
- Creating awareness at all levels in the concerned communities,
- Coastal afforestation,
- Construction of shelters, embankments, dykes,
- Coastal roads, bridges, canals, etc., through better preparedness, mitigation measures and improved response mechanisms.

Management of Cyclones

- **Structural Measures**

Construction of cyclone shelters, construction of cyclone resistant buildings, road links, bridges, canals, drains, saline embankments, communication and power transmission networks etc.

- **Non-Structural Measures**

a) Early warning dissemination systems, management of coastal zones, awareness generation and disaster risk management and capacity building of all the stakeholders involved.

b) These measures are being adopted and tackled on State to State basis under National Cyclone Risk Mitigation Project (NCRMP) being implemented through World Bank Assistance.

National Cyclone Risk Mitigation Project:

The National Cyclone Risk Mitigation Project (NCRMP), to be implemented with financial assistance from the World Bank, is envisaged to have four major components:

- ❖ Component A: Improvement of early warning dissemination system by strengthening the Last Mile Connectivity (LMC) of cyclone warnings and advisories.
- ❖ Component B: Cyclone risk mitigation investments.
- ❖ Component C: Technical assistance for hazard risk management and capacity building.
- ❖ Component D: Project management and institutional support.

Institutional Structure:

- **The Cabinet Committee on Management of Natural Calamities (CCMNC):**
- CCMNC has been constituted to oversee all aspects relating to the management of natural calamities, including **assessment of the situation** and **identification of measures** and programmes considered necessary to reduce its impact, monitor and suggest long-term measures for the prevention of such calamities formulate and **recommend programmes for public awareness** for building up society's resilience to them.
- At the district level, the **District Disaster Management Authorities (DDMAs)**, which constitute the very bedrock of the entire DM apparatus, will be in charge of DM and will control and coordinate all line departments, i.e., **police, fire services and any other form of support system as part of their response**. In the planning stage, the Collector/District Magistrate/Deputy Commissioner will head all planning and preparedness exercises pertaining to DM.

Measures to be taken

Pre Disaster

1. Provide cyclone forecasting, tracking and warning systems
2. Construction of cyclone shelters, cyclone resistant buildings, road links, bridges, canals, drains etc.
3. Establishing Early Warning Dissemination System (EWDS), and Capacity building for coastal communities.
4. Mock drills, and training of local population and police by NDRF and SDRF
5. Plantations of strong rooted trees, canopies, mangroves and proper vegetation cover which act as first line of defence.
6. Proper drainage system throughout the city to discharge the water as soon as possible to avoid flood like conditions
7. Use of NAVIC and RESOURCESAT-2 satellites for disseminating coastal information and helping in disaster management.
8. Implementation of National Cyclone Risk Mitigation Project

During Disaster

1. Cautionary advice put out on social platforms urging people to stay safe can reduce the number of casualties as seen in Chennai during recent cyclone Vardha.
2. Social media and the Internet, speedy official and community messages, creating online groups and sharing messages offering help and advice.
3. Perception of people decides the intensity of disaster. If people take necessary proactive steps to deal with disaster then even the severe disaster can be dealt with minimum damage.
4. Delivery of food and health care via mobile hospitals, with priorities to women child & elders.
5. Protection of the community and their evacuation and quicker response.

Post disaster

1. It is vital that the learning from each event is shared nationally, and the capacity of officials and communities to manage disasters built continuously.
2. Among the securities available to individuals in many countries is insurance against property losses. Viable policies should be made available in India too.
3. Providing alternative means of communication, energy and transport just after the disaster.

Over all Steps to be taken:

- (i) Establishing a state-of-the-art **cyclone EWS** involving observations, predictions, warnings and customised local-scale advice for decision-makers (national/state/district level) for managing the impact of cyclones
- (ii) Expanding the **warning dissemination outreach by using the services of Direct-To Home (DTH) transmission in remote and rural areas** (Panchayats) which cannot be otherwise covered, to introduce weather channel and broadcast cyclone warnings from high-power coastal radio stations including the use of satellite radio service like World Space, Ham radios, community radio and VHF network
- (iii) Establishing a comprehensive **Cyclone Disaster Management Information System (CDMIS)** covering all phases of DM to provide on-line services to the departments of Disaster Management in the states
- (iv) Structural safety of lifeline infrastructure in coastal areas
- (v) **Establishing a robust system of locating multi-purpose cyclone shelters and cattle mounds**
- (vi) Ensuring cyclone resistant design standards are incorporated in the rural/ urban housing schemes in coastal areas
- (vii) Regulating infrastructure and development activities in coastal zones
- (viii) **Mapping and delineation of coastal wetlands, patches of mangroves and shelter belts**
- (ix) Developing **Integrated Coastal Zone Management (ICZM) frameworks** for addressing the sustainability and optimal utilisation of coastal resources as also cyclone impact minimisation plans
- (x) **Implementing coastal flood zoning, flood plain development and flood inundation management**
- (xi) Evolving **eco-system restoration plans** for degraded ecological zones
- (xii) Developing integrated hazard mitigation framework taking into account cyclone and associated storm surge, wind hazard, rainfall-runoff, river flood.
- (xiii) To overcome the power cut it is important to have rooftop solar and battery storage systems as supplementary power sources for households and corporates.
- (xiv) Planting trees with strong root systems and pruning the canopy ahead of cyclone season could reduce uprooting.
- (xv) Government should restore infrastructure and provide priority relief to the families of those who lost their lives, and the worst-hit communities.
- (xvi) Efficient use of technology and implementation of the **Sendai framework** is the need to the hour

- (xvii) Collaboration with other countries in the region to strengthen the cooperation and efforts and to make a common fund for disaster management.
- (xviii) Construction of multipurpose cyclone shelters, access roads, saline embankments and underground.
- (xix) By taking long and short term mitigation measures, the loss of life and property can be minimized.
