

Causes and Effects of Cyclones in Coastal Areas in India

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Abstract: It is a well-known fact that India, due to its geographical location is prone to natural hazards especially the cyclones. Extensive research in this field has indicated that natural disasters like cyclones leads to an estimated 2% decline in the GDP of the country. Moreover, the share of revenue lost by the central government is around 12%. Tropical cyclones is the name given to cyclones that occur between Tropics of Cancer and Capricorn. The typical features of a tropical cyclone include wind speeds which equal or exceed gale force. This means minimum of 34 knot or 62 km/h speeds. India has around 7516 km of large coastline. This coastline is every year exposed to around ten percent of the tropical cyclones occurring in the world. The coastline of India comprises of around 13 states/union territories including around 84 districts. These regions are affected by cyclones each year. However, the most vulnerable states include Gujarat, West Bengal, Andhra Pradesh, Tamil Nadu, Orrisa etc. Around 40 percent of the population of country lives along 100 km of the coastline. The months of May-June and October-November are prime seasons for the occurrence of these cyclones. Also, studies have shown that an estimated of 370 million people are exposed to cyclones in the country.

Keywords: Cyclone, Tropical, Coastal, Storms, West Coast, East Coast, Arabian Sea, Bay of Bengal.

Introduction: To put things into perspective, a cyclone refers to any spinning storm that rotates around a low-pressure center. The center of a cyclone typically constitutes of a low pressure region known as the 'eye'. This region is comparatively calmer than the spinning 'arms' of the storm. The eastern coast in India is more vulnerable to cyclones as compared to the western one. A detailed study done on the frequency of cyclones in both the coasts during the period of 1891-2000 showed that nearly 308 cyclones out of which 103 were

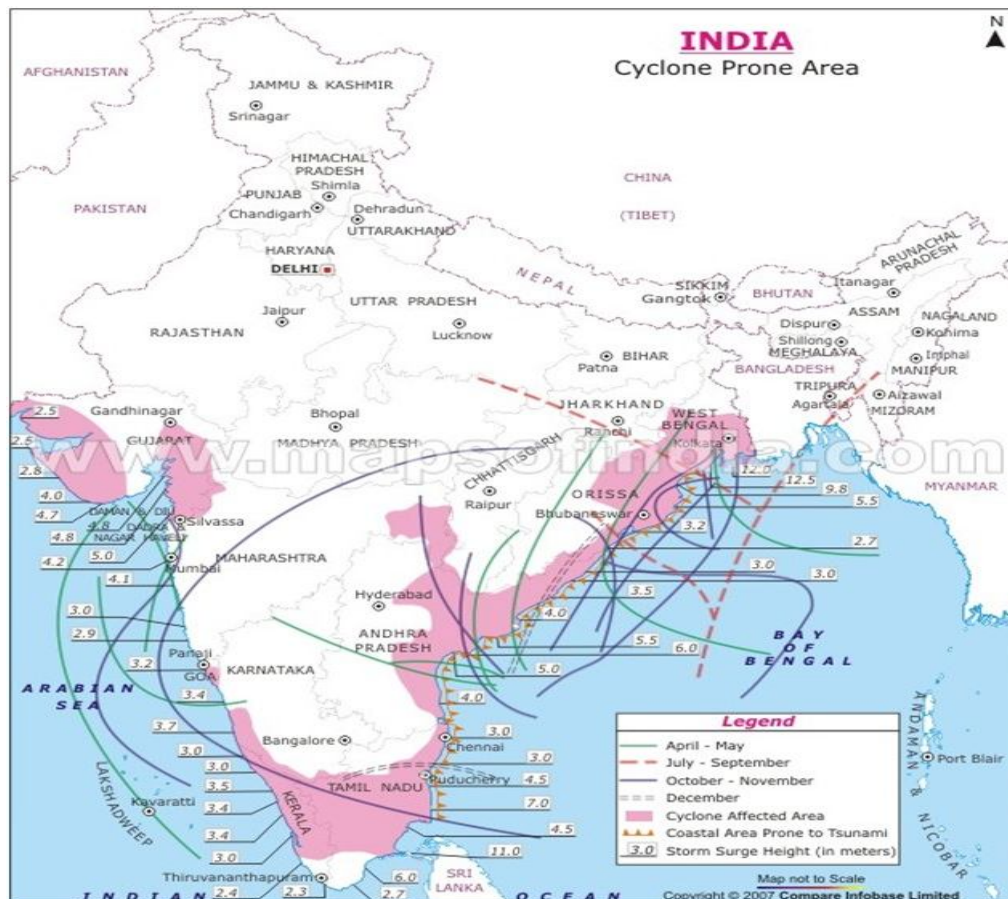
termed as severe affected the East Coast. During the same period 48 tropical cyclones crossed the West Coast, of which 24 were severe cyclonic storms. Out of the cyclones that develop in the Bay of Bengal, over 58 percent approach and cross the East Coast in October and November. Only 25 % of the cyclones 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. Recurring cyclones account for large number of deaths, loss of livelihood opportunities, loss of public and private property and severe damage to infrastructure, thus seriously reversing the developmental gains at regular intervals. Broad scale assessment of population at risk suggests that an estimated 32 crore people, which accounts for almost third of the country's total population, are vulnerable to cyclone related hazards. Moreover, other factors like climate change can result in an increased sea level which would threaten the people living in coastal regions.

Types of Cyclones: Actually, the term cyclone is a blanket term used to refer to multiple types of storms. Even the occurrence of these storm varies from land to water. However, the common characteristic of each one of these is that they are spinning storms rotating around that low-pressure center called 'eye'. Different types of such cyclones are:

- **Mesocyclone:** When part of a thunderstorm cloud begins to spin, eventually leading to a tornado, it is referred to as Mesocyclone. The term meso means 'middle', so this is the mid-point between one type of storm and the other. Tornadoes all come from thunderstorm clouds, but not all thunderstorm clouds make tornadoes. In order for a tornado to occur, part of that cloud has to spin. Although, it is not visible to the human eye, it is the intermediate, or 'meso' step from regular cloud to dangerous spinning cloud running along the ground.
- **Polar cyclones:** Polar Regions of the world also experience cyclones which are termed as polar cyclones. These cyclones occur in countries like Siberia, Antarctica and Greenland. Unlike tropical cyclones, polar cyclones are usually stronger in winter months. They also occur in areas that aren't very populated, so any damage they do is usually pretty minimal.

- Tropical Cyclones:** These are the most common cyclones which affect a large population of the world. As the name suggest, they occur in tropical regions. The different types of tropical cyclones are hurricanes and typhoons. However, the different names explain where that storm is occurring. Hurricanes are found in the Atlantic and Northeast Pacific, typhoons are found in the Northwest Pacific.
- Types of Cyclones Based of Wind Speed:** Further categorization of cyclones can also be done based on the wind speeds. They are labelled as category 1, 2, 3, 4 or 5, cyclones. The increase in number indicated an increased intensity and wind speed. So typically,a category 1 cyclone is the weakest, with wind speeds of 74-95 mph. A category 5 cyclone, on the other hand, is extremely dangerous and has the potential for major damage. Category 5 cyclones have alarming wind speeds of 155 mph and evenmore in some cases.

Figure 1: Cyclone Prone Areas of India



The following image shows a mapping of the cyclones in coastal areas in India. According to this image of some 96 districts of the country, about 12 of them stand to be affected most by cyclones. These districts have been labeled as 'very highly prone'. Also, almost all of them lie on the eastern coastal belt. These include Yanam district in Pondicherry, East Godavari, Krishna, and Nellore districts in Andhra Pradesh, Balasore, Bhadrak, Jagatsinghpur, and Kendrapara districts in Odisha, Medinipur, Kolkata, and North and South 24 Parganas in West Bengal. Apart from these there are about 41 districts which are classified as 'highly prone'. The rest 30 districts are 'moderately prone' and the remaining 13 are least prone to cyclones. Also, according to a study conducted by the India Meteorological Department, all 13 states and Union Territories that are located along the coast are vulnerable but Tamil Nadu, Pondicherry, Andhra Pradesh, Odisha, West Bengal, and Gujarat are most prone to damages from cyclone. Some of the most devastating cyclones of the country originate in the Arabian Sea and the Bay of Bengal. These constitute about 7 percent of the tropical cyclones in the world.

Worst Cyclones of Recent Times: Cyclone Phailin in 2013 and Cyclone Hudhud in 2014 were the two cyclones that caused extreme damage to life and property in India in recent times. Some other features of these cyclones were:

- Cyclone Phailin was one of the most intense and most destructive cyclones to make landfall in the country in recent times. The cyclone hit India in October 2013 and caused pronounced destruction to many villages in Odisha. It prompted one of the largest evacuations in the country in decades. Over 550,000 people were evacuated and moved to cyclone shelters. Over 30 lives were lost due to the cyclone.
- The next year in 2014, Cyclone Hudhud made landfall near Vishakhapatnam in the state of Andhra Pradesh and caused extensive damage to coastal regions. Total damages due to Hudhud were estimated to be about INR 21,908 crore. Some 124 deaths were also recorded due to the cyclone. Apart from India, Nepal was the other country which suffered avalanches in the country due to this cyclone.

Negative Impacts of Cyclones: Cyclones are known to cause havoc and destruction. There is a huge negative impact of cyclones on the human life. Some other such negative impacts are the following:

- **Storm Surge:** Abnormal rise of sea level near the coast caused by a severe tropical cyclone is classified as a storm surge. Due to this, sea water inundates low lying areas of coastal regions drowning human beings and life stock, causes eroding beaches and embankments, destroys vegetation and leads to reduction of soil fertility.
- **Strong Winds:** The typical characteristics of cyclones include very high speed winds. These are known to cause severe damage to infrastructure through high speed winds. Very strong winds which accompany a cyclonic storm damages installations, dwellings, communications systems, trees etc., resulting in loss of life and property. Gusts are short but rapid bursts in wind speed are the main cause for damage. Squalls on the other hand, are longer periods of increased wind speed and are generally associated with the bands of thunderstorms that make up the spiral bands around the cyclone.
- **Inland flooding:** Cyclones are known to cause torrential rainfall of about 30 cm/hour or even more. This is also a bigger cause of damage to the infrastructure. Unabated rain gives rise to unprecedented floods. Rain water on top of the storm surge may add to the fury of the storm. Rain is a serious problem for the people which become shelter less due to cyclone. Heavy rainfall from a cyclone is usually spread over wide area and cause large scale soil erosion and weakening of embankments.

Suggestions and Precautions: Taking a few steps can ensure the safety for us during a cyclone. The first thing is to evacuate out of the areas affected by cyclones. In coastal areas of the country, the fishermen are advised not to venture out in the ocean. However, if for some reasons, one is not able to evacuate, staying at home till the cyclone passes is the safest option. Make sure to unplug all your appliances to avoid electrocution hazards if water begins to enter your home. Turn off all electricity, gas and water. Keep emergency rations and an emergency kit at home. Also, make sure to keep that emergency kit close. Keep yourself and your family in the strongest part of the house, away from all windows and

doors. Keep the battery-powered radio going to listen for any updates on the situation and if your home or building begins to break up. Get under a strong bench or table to protect yourself from the elements and any falling debris that might collapse. Also, it is noteworthy here that the eye of the storm is calm. This may make people think that the storm has passed. However, it is dangerous to venture out till the passing of storm has been official announced. In case you wish to evacuate home due to the cyclone, before leaving ensure to lock the house. Moreover, ensure to turn off the electricity, water and gas supply in the house. Before leaving, make sure to carry an emergency kit along with you and remember to carry adequate rations. Plan a safe evacuation route for your family and carry adequate belongings with you.

Post Cyclone Precautions: When a cyclone is over, this doesn't necessarily avert the danger. There can be a number of hazards present in the surrounding even after a cyclone has passed on. One of the hazard is the falling debris. Falling debris from damaged buildings or downed power lines in the streets can lead to injury or even death. Moreover, if you wish to venture out to seek shelter or due to an evacuation, take only the recommended routes home. These are the routes which have either been inspected and the debris has been cleaned off them. These are often deemed as safe passages for the people. Also, if you are an adult make sure to check on your neighbors to make sure they are not hurt or in need of assistance, but avoid careless sightseeing. Also, avoid using wet appliances as they can give an electric shock. The cyclone would have polluted the water sources so, it is advised to boil or filter the water before drinking. It is also advised not to wade through the areas flooded due to cyclones. These areas can contain a wide number of hazards like power lines to sharp objects or sinkholes. Keep listening to the advisories issued by the official agencies and avoid any rumors. Through preparedness, evacuation and working together as a community, the locals can fight against such natural calamities.

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