

## Myanmar Tropical Cyclone

### Specification topic: Storms: forms and causes 3.1.5.5

#### Case study: Cyclone Nargis

This cyclone struck Myanmar (Burma) in May 2008. Myanmar lies between the Tropic of Cancer and the Equator. It's in the monsoon region of Asia, with its coastal regions receiving over 5,000 mm (196.9 in) of rain annually.

Its situation adjacent to the Bay of Bengal means it experiences both warm and moist air that ascends into the lower atmosphere forming tropical storms and which, under the right conditions, can escalate into powerful cyclones.

#### *Timeline of the cyclone's formation:*

The formation of the cyclone started in the last week of April 2008 in the Bay of Bengal. Initially a low pressure system, the Indian Meteorological Department (IMD) stated that it had strengthened to become a tropical depression on April 27<sup>th</sup>. At this time the depression was moving north-west at approximately 8mph.

By the 28<sup>th</sup> April the depression was situated 547 km (340 miles) east of Chennai (Madras) on east coast of India and the IMD upgraded it to a cyclone; equivalent of a category 1 hurricane.

On the morning of April 29<sup>th</sup> the cyclone's energy had increased and had wind speeds of 100mph, making it a category 2 hurricane. On April 30<sup>th</sup> its strength reduced but then it intensified once more on May 1<sup>st</sup> and started to move eastwards.

On the 2<sup>nd</sup> May Cyclone Nargis, now a category 4 hurricane with wind speeds of 135mph hit land in the south western town of Wagon. At this time the storm system was centred about 210km west of Haing Gyi Island at the mouth of the Irrawaddy River and about 430km south-west of Yangon. Haing Gyi Island begun being inundated by a storm surge that reached 3 to 3.5 metres (10-12 feet). Nargis gained further strength and begun exhibiting erratic behaviour as it started to cross the Irrawaddy river delta coast at about 6:00pm (local time) on Friday, May 2. Instead of moving inland as cyclones usually do, it created a path along the coast, meaning that the cyclone didn't weaken as quickly as normal. The cyclone finally subsided on the 3<sup>rd</sup> May.

#### *Factors which made the storm more severe:*

- Bay of Bengal – warm upper ocean waters extended much deeper than usual, allowing the cyclone to increase in energy. The availability of warm water enabled Cyclone Nargis to grow from a category 1 storm to a category 4 over a 24-hour period. This made it difficult for authorities to successfully warn and evacuate people in its path.

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- The Irrawaddy delta in Myanmar was the worst hit area. The delta contains 7 million of the country's 53 million people due to the fertile soils here and this meant that when the cyclone travelled along this coastal region, the death toll was high.
- Nearly 2 million people living along this coastline were living on land that was less than 5m above sea level and the coastline has a population density of 100/km<sup>2</sup>. Dense housing led to an increased risk of death. Equally, low lying land was affected by large storm surges which resulted in 10,000 people being killed.
- The storm surge which hit the low lying coastal region was made worse due to the angle of approach which the cyclone took. The cyclone headed in a north easterly direction and the winds had a counterclockwise rotation just off the coast on the shallow continental shelf area. These counterclockwise winds stayed in this region for several hours and drove water onto the coast to build up. When the cyclone then continued on its path, the resulting storm surge was huge and in some areas measured as 4 metres in height. The area where the storm surge hit land was the lowest part of the coastline which further intensified the impact.
- A major human factor impacting upon this cyclone's severity was the level of development of the country. Limited mitigation and organisation after the event meant more people died than would have done had the rescue effort started immediately. Another problem linked to this was the government refused to allow international aid and despite the UN's best efforts to negotiate, it took 3 weeks for the first international rescue effort to arrive in the country. This also contributed to a higher death rate from secondary consequences of disease and dehydration.

### Exam style questions:

1. Outline the characteristics of one hazard associated with tropical storms (3 marks)
2. 'The impact of tropical storms is influenced by the level of development of the place affected.' To what extent do you agree with this view? (20 marks)

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## 1. Outline the characteristics of one hazard associated with tropical storms (3 marks)

Point marked response with additional points for developed ideas:

- Storm surges/heavy precipitation/lightning/violent winds occur as a result of a tropical storm.
- Strong winds cause the build-up of water.
- Fast moving storms cause high surges along open coast and lower surges in sheltered bays and estuaries.
- Slow moving storms usually result in greater flooding inside bays and estuaries, with smaller values along the open coast.
- The slope of the near-shore seabed will affect the level of surge in a particular area. Areas with shallow continental shelf slopes will allow a greater storm surge, but have smaller waves.
- Areas with deep water just offshore experience large waves, but little storm surge.

## 2. 'The impact of tropical storms is influenced by the level of development of the place affected.' To what extent do you agree with this view? (20 marks)

There is a need to have knowledge of a developed and less developed tropical storm event so that a comparative assessment can be made regarding the impacts and whether the impacts are as a result of the nature of the event or as a result of development levels.

Cyclone Nargis is a useful developing country tropical storm and would be compared well with Hurricane Katrina in 2005.

The answer should take the following structure:

- An overview of what the question requires – an outline of the impacts of a tropical storm (winds, storm surges, coastal flooding etc.).
- Discussion surrounding Cyclone Nargis – what happened, what damage it did etc. Mention that the country is developing and has a reliance on agriculture. The fertile delta is densely populated as a result of the farming opportunities and led to many deaths as the Cyclone hit the delta head on and travelled along it, along Myanmar's coastline. Poor infrastructure meant that many people were crushed in buildings and the high storm surge led to deaths from drowning. Crucially, the nature of the storm (its rapid growth over a 24-hour period) and the lack of government preparation meant that people weren't given warning – hence the high death toll.
- Discussion surrounding a tropical storm in a developed country – Hurricane Katrina is an ideal comparative case study. It has many similarities – low lying coastal location and densely populated. The difference is that they had warnings due to complex satellite tracking systems so the death toll was significantly lower than in Myanmar. However – it could be argued that despite the advanced nature of the USA that large numbers were still affected and that whilst development has an impact, the natural power of a tropical storm is still devastating.
- A comparison of the scale and nature of destruction of human infrastructure and loss of life. A distinction between immediate primary causes of fatalities and medium term secondary causes after the storm has subsided.
- A conclusion outlining whether development is an integral factor in the impacts caused by tropical storms.