

1.1 What is a tropical storm and how do they form?

A tropical storm is a very powerful low-pressure weather system which results in strong winds (over 120 km/h) and heavy rainfall (up to 250 mm in one day)

How do they form?

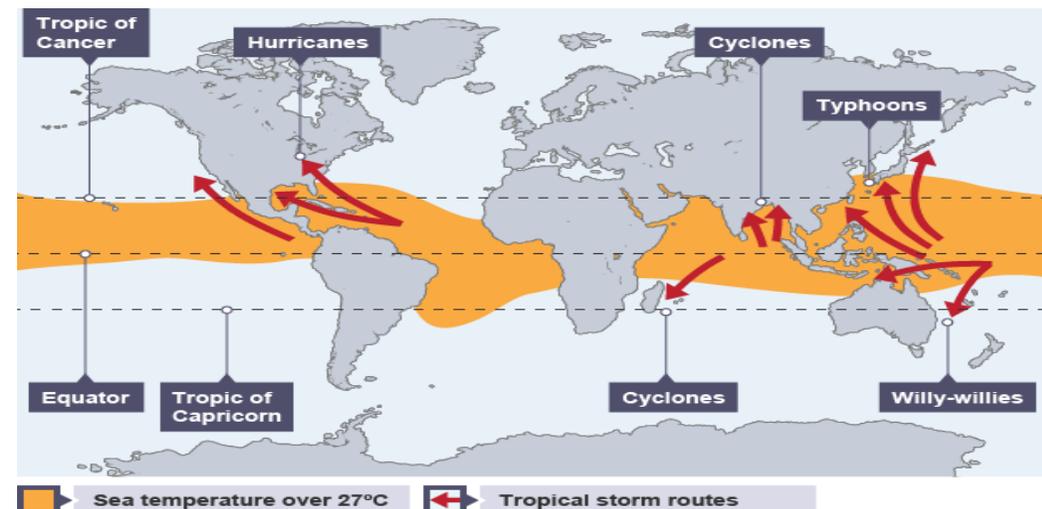
- ✓ Tropical storms form between approximately 5° and 30° latitude. Because of winds blowing from the east, they initially move westward.
- ✓ The air above the warm ocean is heated. Once the ocean water reaches at least 27°C, the warm air rises quickly, causing an area of very low pressure.
- ✓ As the air continues to rise quickly it draws more warm moist air up from above the ocean leading to strong winds.
- ✓ The rapidly rising warm air spirals upwards, cools, condenses and large clouds form.
- ✓ These clouds form the eye wall of the storm and produce heavy rainfall.
- ✓ In the centre of the storm, cold air sinks forming the eye of the storm - here, conditions are calm and dry.

1.3 Can we predict tropical storms?

- ✓ Satellite images are used to track the movement of tropical storms.
- ✓ When it looks like a storm will hit an area on the coast, warnings are given.
- ✓ Warnings give people enough time to prepare. These are normally sent over TV and radio
- ✓ People in coastal locations are normally asked to move away. This sometimes mean moving over 1 million people in the USA
- ✓ Aircraft also fly through storms to collect data on wind speed

1.2 Why do tropical storms die?

When tropical storms reach a land surface, they begin to lose their energy and die out. This is because they are no longer receiving heat energy and moisture from the ocean, which is needed to drive the storm.



1.4 LIC Case Study- Haiyan

Effects

- ✓ Six million workers lost their sources of income
- ✓ Major rice, corn and sugar-producing areas for the Philippines were destroyed affecting the country's international trade and farmers' incomes
- ✓ 7,000 people were killed
- ✓ There were outbreaks of disease due to the lack of sanitation, food, water, shelter, and medication. Widespread floods
- ✓ Flooding knocked over Power Barge 103 causing an oil spill affecting **mangrove** ecosystem

Responses

- ✓ Warnings were given by PAGASA- this meant 750,000 evacuated
- ✓ The UK provided shelter, clear water, medicine.
- ✓ Charities are helping people to rebuild their lives- for example repairing fishing boats and give people rice seeds

1.5 HIC Case study- Sandy

Effects

- ✓ More than 18,000 flights were cancelled leading to disruptions in business, tourism and trade
- ✓ Crops were lost resulting in loss of earnings for farmers.
- ✓ At least 286 people were killed
- ✓ Makeshift shanty towns in Haiti were washed away.
- ✓ Approximately 10 metres of beach was lost in some parts of New Jersey, (making it narrower) exposing the coast to further erosion and impacting wildlife

Responses

- ✓ In places like Haiti, there were insufficient prediction planning and protection, but in the USA it was much better.
- ✓ Evacuation of coastal areas
- ✓ Schools and transport shut down
- ✓ Evacuation centres created in schools and community centres.
- ✓ Flood walls have built.

1.6 Is the UK's weather becoming more extreme?

The UK's weather is becoming more extreme. Some examples of extreme weather in the UK include:

- ✓ Floods - Cumbria in 2009
- ✓ heavy snowfall- Beast from the East 2018
- ✓ heat wave- Kent hit 38.5 in 2003
- ✓ Drought

Climate change can increase the frequency and intensity of extreme weather events.

1.7 Beast from the East Case study – Extreme Weather Case study

What caused it?

The Beast from the East (25 February) was caused by a change to the jet stream, which twisted its direction unexpectedly, drawing in cold air to the UK from the east.

Effects:

- ✓ A man died after falling in a frozen lake in London- three other reported deaths
- ✓ 50cm of snow in some areas
- ✓ British airways cancelled flights
- ✓ Schools were closed
- ✓ Hundreds of people were trapped in their vehicles for hours
- ✓ Over 8,260 accidents, costing over £10 million



Responses

- ✓ Stranded drivers given foil blankets
- ✓ Army called in to help rescue people
- ✓ Red warnings were given to those areas most at risk
- ✓ Nurses and doctors were driven round in 4x4's to check if poorly/elderly were ok

1.8 Evidence of global warming

Glaciers melting: The increase in global temperatures is causing glaciers to disappear and is increasing the melting of sea ice in the Arctic

Ice cores:

Scientists often use ice cores to detect changes in temperatures. When snow falls it traps air into the ice. When scientists take a sample of ice it reveals the atmospheric gas concentrations at the time the snow fell

Rising sea levels

Sea levels have risen by 0.91m- areas like the Maldives may end up flooding



1.9 What are the human causes?

Burning fossil fuels, eg coal, gas and oil - these release carbon dioxide into the atmosphere.

Deforestation - trees absorb carbon dioxide during photosynthesis. If they are cut down, there will be higher amounts of carbon dioxide in the atmosphere.

Dumping waste in landfill - when the waste decomposes it produces methane.

Agriculture - agricultural practices lead to the release of nitrogen oxides into the atmosphere.

1.10 What are the natural causes?

Orbital changes - the Earth has natural warming and cooling periods caused by Milankovitch cycles or variations in the tilt and/or orbit of the Earth around the Sun (Wobble, roll and stretch theory).

Volcanic activity - during a volcanic eruption carbon dioxide is released into the atmosphere.

Solar output - there can be fluctuations in the amount of radiation from the sun. If there is high amount emitted there will be an increase in Earth's temperatures

1.11 Dealing with Climate Change

Mitigation means to reduce or prevent the effects of something from happening. Mitigation strategies include:

Alternative energy - using alternative energy such as solar, wind or tidal can reduce the use of fossil fuels. This will reduce the amount of carbon dioxide released into the atmosphere.

Planting trees - encouraging afforestation, means that there will be more trees to absorb the carbon dioxide in the atmosphere during the process of photosynthesis.

1.12 Dealing with climate change

Adaptation strategies

Do not aim to reduce or stop global warming. Instead they aim to respond to climate change by limiting its negative effects. Strategies include:

Agriculture - farmers will have to adapt as some crops may not be able to grow in a warmer climate. However, other crops (eg oranges and grapes) will be able to be planted.

Water supply - water transfer schemes could be used. This is where water is transferred from an area of water surplus to an area of water shortage.

Reducing risk from sea level rise - areas at risk from sea level rise may use sea defences to protect the land from being eroded away.