Hazardous Earth: The USA and Bangladesh

Tropical Cyclones in a Developing Country: Bangladesh

Cyclone Aila was a severe tropical cyclone that struck Bangladesh on the **25th May 2009**.

The cyclone's **intense rainfall** (120mm of rain in a few hours), **very strong winds** (270km/h) and **large storm surge** caused **widespread flooding** and **devastation** across Bangladesh.

Bangladesh was particularly at risk as it is a very **low-lying country**, with **80%** of the land **less than 10m above sea level** and many large rivers that can **overflow onto the floodplains** during periods of high rainfall.

(Source: REUTERS/Andrew Biraj)

Cyclone Aila had devastating socioeconomic impacts on Bangladesh, including:

- 190 **deaths**.
- 750,000 made **homeless**.
- 3.5 million **affected overall**.
- Nearly 60,000 **animals killed**.
- **Flooding** caused by a **large storm surge** which raised the sea level by 3 metres.
- Over half of **flooding embankments destroyed** in Southern Bangladesh.

Villagers working to repair an embankment.
(Source:AP Photo/Pavel Rahman)

Preparation and Response in Bangladesh

Bangladesh's **response and preparedness** helped to limit the effects of the cyclone.

Weather Forecasting and Satellite Technology

The Bangladesh Meteorological Department (BMD) uses **forecasting technology** to **predict and track** tropical cyclones, allowing communities to prepare for them making landfall.

There are **weather radars** across the country to track weather patterns, and **satellite imagery is purchased from the US, China and Japan**.

The BMD's headquarters.

In 2018, Bangladesh's first satellite, **Bangabandhu Satellite-1**, was sent into the Earth's orbit. This **$280million project** has made **satellite imagery** more accessible to Bangladesh, which may support the country's **preparedness** to future tropical cyclones.

In order to increase **community preparedness** in Bangladesh, the BMD communicates their forecasts to multiple sectors, including **television and radio stations**, **airports**, the **prime minister** and the **air force**. In doing so, the information is spread across Bangladesh and people can prepare.

Warning and Evacuation Strategies

There are many **communities in Bangladesh** that have **little to no access to television, the internet or radio**. Outside the capital of Dhaka, remote communities have historically been left **extremely vulnerable to tropical cyclones** as they do not receive weather **forecasts** and **warnings**.

Bangladesh's government has developed an **early warning system** which targets vulnerable coastal communities through awareness campaigns.

45,000 cyclone warning volunteers now work in threatened areas around Bangladesh.

Furthermore, **3,500 cyclone shelters** have been constructed in Bangladesh following the devastating Cyclone Bhola in 1970.

Many of these cyclone shelters function as **schools and other public buildings** so they are not left empty for the majority of the year.

A trainee community volunteer.
(Source: news.bbc.co.uk/1/hi/8118720.stm)

A primary school which doubles as a shelter.
(Source: Julian Spector)

Storm Surge Defences

Embankments have been built to protect some areas from flooding, though this is usually **limited to main roads** and areas that need to be protected.

Bangladesh has needed financial aid with some of their flood defences. For example, **the World Bank provided $400 million** to upgrade Bangladesh's embankment defence system.

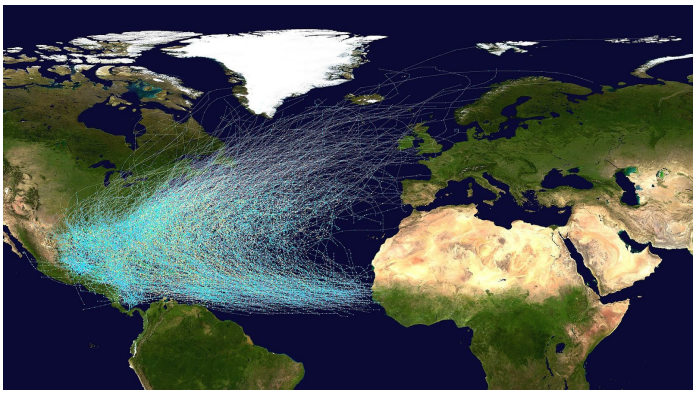
Man-made embankments next to a river.
(Source:progressbangladesh.com)

Tropical Cyclones in a Developed Country: The USA

On the **eastern coast of the US**, tropical cyclones (called **'hurricanes'** in the US) are a **very frequent** hazard.

Between **July and October** every year, **hurricane season** hits. Tropical cyclones travel over the Atlantic and make landfall in eastern coastal areas surrounding the Gulf of Mexico and the Atlantic Ocean.

States such as **Florida, Texas and North Carolina** are commonly hit by tropical cyclones. Florida has a **22%** chance of a hurricane making landfall every year!



Tracks of all Atlantic tropical cyclones from 1851-2012.

Preparation and Response in The USA

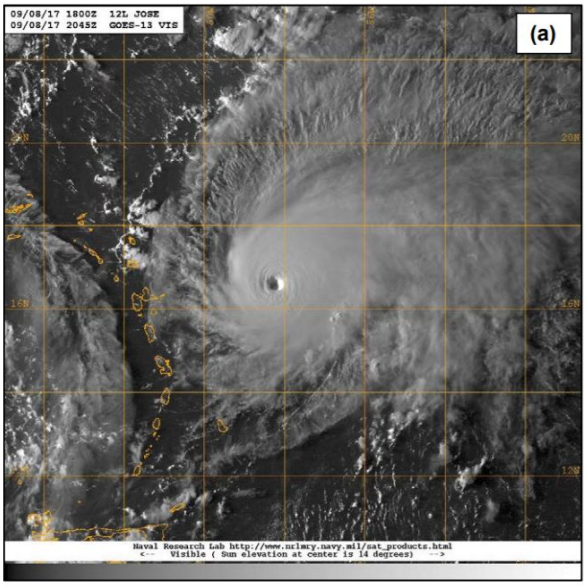
The USA invests a lot into **hurricane preparedness and response** as the cost of damage is usually so high, especially when hitting cities.

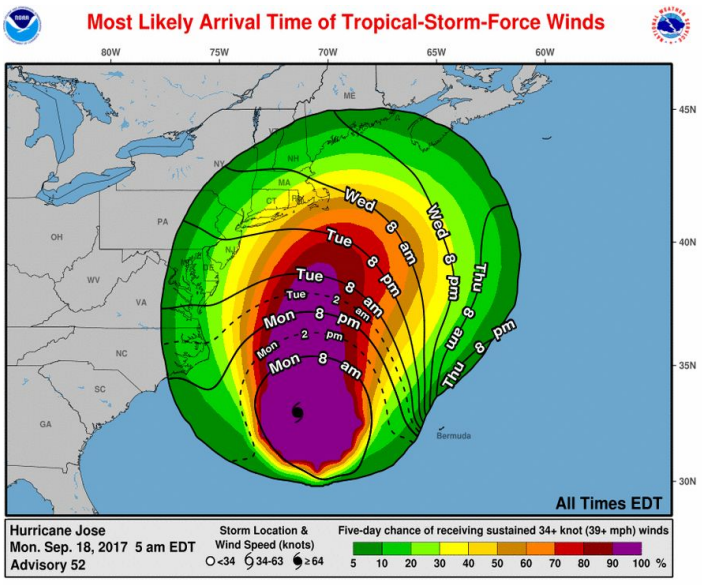
Weather Forecasting and Satellite Technology

The USA's weather forecasting system is usually very effective at **tracking the formation** and **movement** of tropical cyclones. Over **20 weather satellites** operate every day over the US and Atlantic Ocean, gathering information about the **location and intensity** of any potential tropical cyclone activity.

Using information from **satellite technology**, meteorologists in the US can predict **wind speeds**, **storm surge heights** and the likely **track of the cyclone** before it makes landfall, and these predictions are usually accurate.

Hurricanes are closely monitored in the US by organisations like the **National Hurricane Center**, and **regular forecasts** are given on the television, the radio and online.





Warning and Evacuation Strategies

The US has developed **effective warning systems** and **evacuation strategies** to ensure those at risk are prepared for the storm.

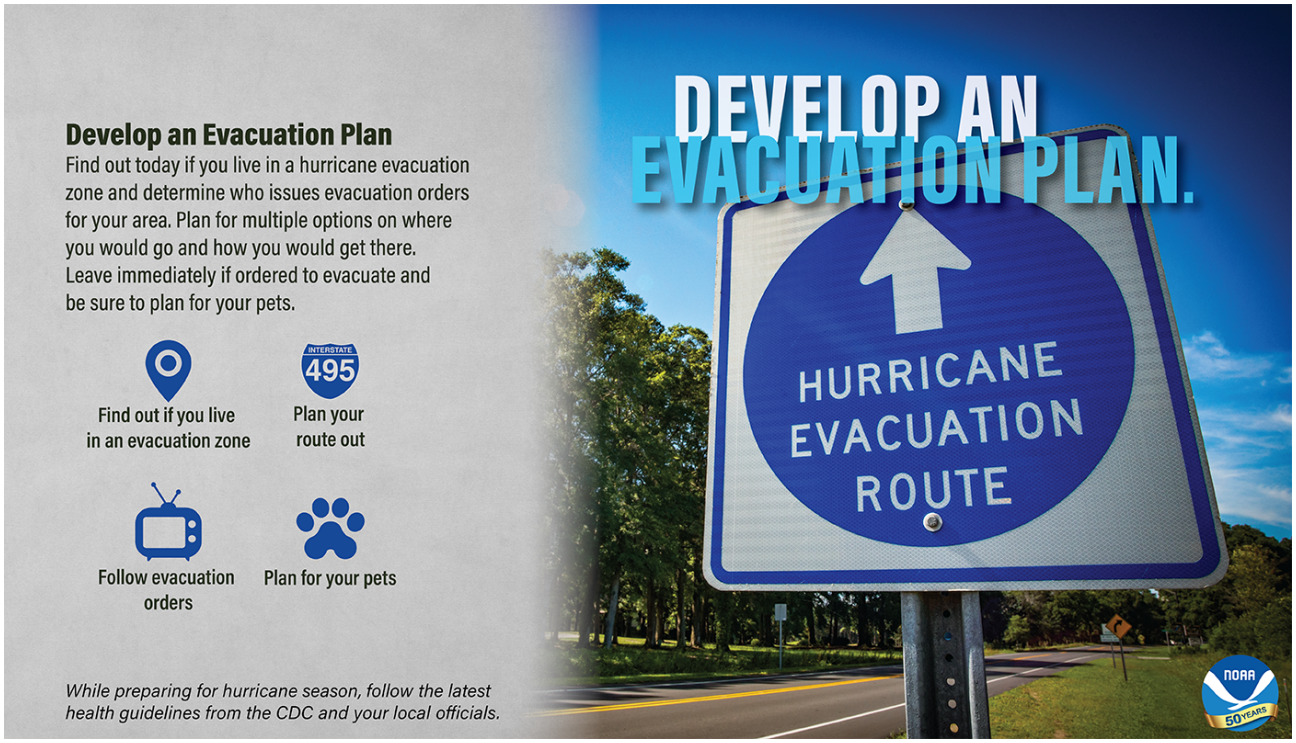
Hurricane warnings are widely broadcasted on major news channels, and some areas even have **hurricane sirens** that sound when there is a high risk of a hurricane.

Local authorities play a major part in the **evacuation** of civilians from areas of high risk. **Evacuation orders** are issued in areas where it is likely people will be severely affected if they stay at home, and law enforcement visit homes spreading this information (as well as it being broadcast on tv, the radio and online).

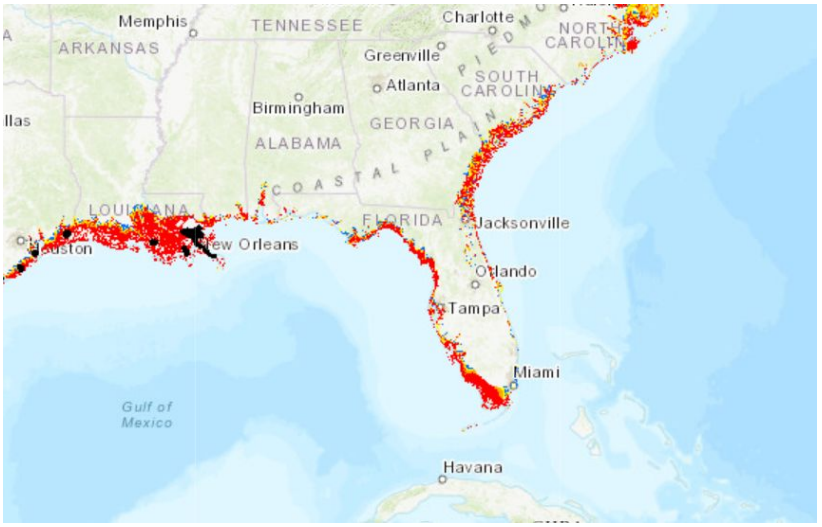
Hurricane evacuation routes are established in areas that are often hit by tropical cyclones. The sign to the right is in New Orleans; **floodwater marks** from Hurricane Katrina can actually be seen on the sign!

Another key aspect of tropical cyclone preparedness in the US is **education** of the public concerning their personal risk.

Every year, the National Hurricane Center runs **National Hurricane Preparedness Week**, which aims to spread awareness about people's risks and tell them how they can be best prepared for a hurricane. All of this is funded by the US Government.



The USA also manages risk through **hazard mapping**, which identifies areas that are particularly vulnerable to tropical cyclone hazards. For example, below is a map of the risk around the Gulf of Mexico and eastern coast if a **Category 4** storm was hit. The National Oceanic and Atmospheric Administration analyses and provides this data and it is **free to the public**, increasing public awareness about areas of high risk.



(Source:noaa.maps.arcgis.com/apps/MapSeries/index.html?appid=d9ed7904dbec441a9c4dd7b277935fad&entry=1)

Storm Surge Defences

The US invests a lot of money into storm surge defences, such as **levees** (embankments) and **storm surge barriers**.

However, the US has been criticised heavily for having **poor quality storm surge defences**, and these defences have been breached on multiple occasions. After Hurricane Katrina, man-made levees failed and **flooded 80% of the city of New Orleans,** and 1,577 died in the state of Louisiana (where New Orleans is located).

A failed levee in New Orleans after Hurricane Katrina. (Source:www.nytimes.com)

Some areas that are extremely prone to hurricanes have taken precautions to lower the risk to property from storm surges.

This house is an example of a 'hurricane-proof' home. It is built on **stilts** to ensure it is high up and resistant to flooding from **storm surges**. The building is made out of **concrete** which is resistant to very strong winds. Windows and doors can also be **reinforced** to be resistant to heavy winds, and resistant to **breaking** if they are hit with flying debris.

(Source: jorgefontan.com/hurricane-proof-house-design/)