Storm events: impacts and human response
3.1.5.5 Hazards

What you need to know
How tropical storms cause a range of hazards
How tropical storms cause a range of impacts
How tropical storm impacts are reduced by different human response techniques

How tropical storms cause a range of hazards:

Heavy precipitation:
This is a key hazard as it can lead to many of the other hazards occurring. Increased rainfall can rapidly increase river discharge, leading to flash floods, which can overwhelm communities. Also, the added volume of water which can soak into raised relief can lead to landslides taking place which are hazardous to life and can be costly in terms of repairing an area following such an event.

High winds:
In some cases, these can exceed 150mph. Not only can they destroy property, but they can also lift objects into the air which then become flying projectiles, making the situation even more dangerous. They also drive coastal waves forward, contributing to a destructive storm surge at the coast that can create devastation a considerable way inland.

Storm surges:
The high storm surge that accompanies tropical storms can sweep over lowland areas, destroying property and killing and injuring people in its path. These occur as the strong winds push the water forwards in advance of the storm. It is compounded by the general rising of the normal sea level under the extremely low-pressure atmospheric conditions of the storm. With little descending air, the level of the sea is raised and this, combined with the build-up of storm waves along coasts as the shoreline becomes shallower, can result in considerable inundation of the coastal strip.

Coastal flooding:
Storm surges can flood entire coastal areas. This is particularly problematic in countries where large populations living along the coast as the human death toll and economic cost can be immense. The salt water may contaminate fresh water reservoirs, causing water shortages in the period immediately after the storm, together with agricultural land, ruining existing crops and making it unsuitable for food production for months afterwards.

River flooding:
As mentioned before, intense precipitation can cause fresh water flooding. Also, storm surges can flow up river channels causing flash floods further inland than the storm surge affects directly.

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Landslides:
As well as material being weakened and made heavier by heavy precipitation, flooding can cause material on slopes to be loosened via undercutting and this can result in substantial mass movement down onto often inhabited land below.

Impacts:

Impacts can be categorised according to whether they are primary or secondary and whether they are a social, environmental, economic or political impact, as well as other classification choices.

Primary impacts are the effects that occur immediately during and after the storm hits and can be directly attributed to elements of the storm, whereas **secondary effects** are the indirect consequences of primary impacts:

Primary	**Secondary**
Freshwater floods	Shortages of food and water
Saltwater floods	Power blackouts
Lightning strikes	Homelessness
Devastating winds	Refugees
Coastal storm surge	Transport disruption etc.

Storm impacts may also be classified by scale (local scale, coastal zone scale, regional scale and national scale) and by impact (mild and easily rectified, through to catastrophic and with multiple serious impacts). A further classification is by thematic impact:

Category	Illustration
Social	• Death toll and loss of income-earners • Residential properties destroyed • Ongoing stress / depression resulting from the event
Environmental	• Storm surge flooding land • Crops destroyed • Habitats affected • Saltwater contamination
Economic	• Cost of damage • Tourism decreased • Trade interrupted • Loss of economic production • Cost of building coastal defences • Insurance costs rising
Political	• Loss of faith in government to take effective action • Migration from the affected area into neighbouring regions • Escalating social and economic tensions as demands for action increase beyond government capacity to satisfy.

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Human response techniques:

Human response can be categorised into short and long term response. **Short term** response refers to the days and weeks following the storm. Short-term responses are centred around preserving life. Search and rescue, recovery of bodies and the provision of supplies (food, water, shelter & medicines) fall under this category. Depending upon the level of development of the country affected response may take several days to first arrive. Both government (own and allies) and non-governmental organisations (NGOs) may help with this.
Long term response refers to the months and years following the storm. This type of response is concerned with rebuilding and preparing for future events.

Long term response strategies can be further categorised into the following:

- **Mitigation** – the action of reducing the severity of a future event. This can involve "storm proof" buildings, coastal defences, improved satellite monitoring.
- **Prevention** – the action of stopping the event from happening to a place. Land use zoning to prevent construction on coastal plains would be an example of this.
- **Adaptation** – the action of being able to react in a more organised and knowledgeable way. An example would include having an evacuation plan or first aid kits made available in the home.