



read

Natural Hazards

HIC Case Study

Japan Earthquake 2011



quiz



The Big Picture



Key Terms



Immediate responses - The reaction of people as the disaster happens and in the immediate aftermath.



Long-term responses - Later reactions that occur in the weeks, months and years after the event.



Primary effects - The initial impact of a natural event on people and property, caused directly by it.

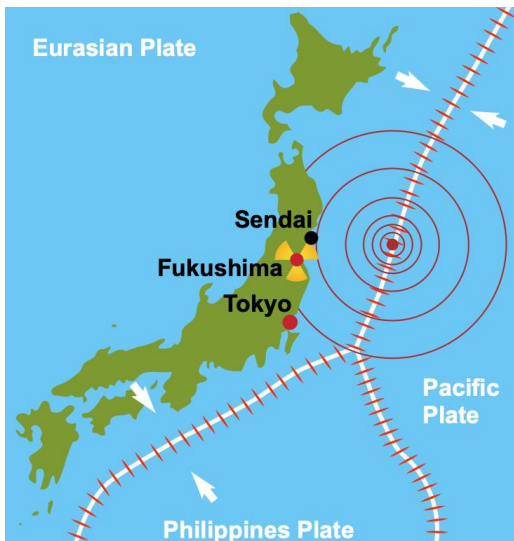


Secondary effects - The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale.



Overview

- 📅 Friday, March 11, 2011
- 🕒 2.46 pm
- 📍 Japan's northeast Pacific coast
- ⚙️ High income country
- 🌊 Magnitude 9.0
- 🏗️ Destructive margin – Eurasian and Pacific



Primary Effects

- 15,894 people died
- 26,152 people were injured.
- 130,927 people were displaced.
- 332,395 buildings were damaged or destroyed. 300 hospitals were damaged, and 11 destroyed.
- 2,126 roads, 56 bridges and 26 railways were destroyed or damaged.
- 4.4 million households were without power.



Secondary Effects

- Total damage estimated at US \$235 billion.
- Waves up to 40 m in high devastated entire coastal areas and resulted in the loss of thousands of lives.
- Seven reactors at the Fukushima nuclear power station experienced a meltdown. Radiation was over eight times the normal.



Immediate Responses

- The Japan Meteorological Agency issued tsunami warnings
- Rescue workers and around 100,000 members of the Japan Self-Defence Force supported search and rescue operations.
- A 20 km evacuation zone was established around the Fukushima nuclear plant.
- Japan received international help from the US military, rescue teams from NZ, India, South Korea, China and Australia.



Long-term Responses

- The central government established the Reconstruction Policy Council to develop a national recovery and reconstruction.
- The government approved a budget of 23 trillion yen (approx £190 billion) to be spent over ten years.
- A coastal protection policy was established to construct seawalls and breakwaters.
- By Nov 2011, 96% of the electricity supply was restored and 98% of water supplies.



read

Natural Hazards

LIC Case Study Haiti Earthquake 2010



quiz



The Big Picture



Key Terms



Immediate responses - The reaction of people as the disaster happens and in the immediate aftermath.



Long-term responses - Later reactions that occur in the weeks, months and years after the event.



Primary effects - The initial impact of a natural event on people and property, caused directly by it.

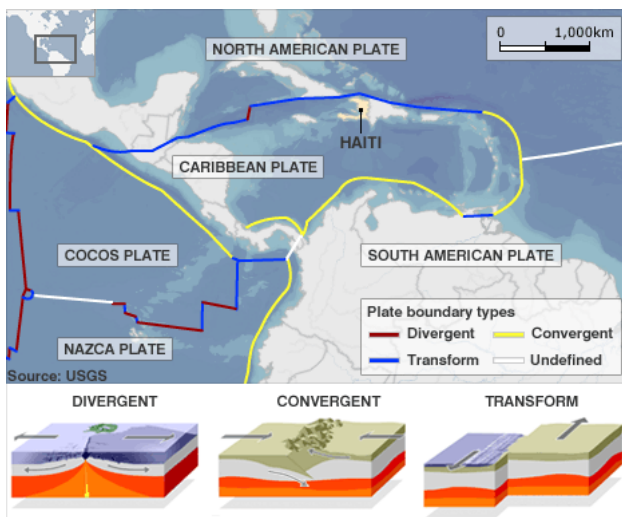


Secondary effects - The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale.



Overview

- 📅 January 12th 2010
- 🕒 16.53 am
- 📍 25 km west of Port-au-Prince
- ⚙️ Low income country
- 🌊 Magnitude 7.0
- 🏗️ Conservative margin North American plate and Caribbean plate



Primary Effects

- 316,000 people died.
- Over 300,000 people were injured.
- 3 million people were affected.
- 1.5 million people made homeless.
- 250,000 homes and 30,000 commercial buildings collapsed or were severely damaged.
- Electric and water supplies affected.
- Total damage estimated at US \$7.9 billion.



Secondary Effects

- Two million people were left without water and food.
- Regular power cuts occurred.
- Crime increased - looting became a problem and sexual violence escalated.
- People moved into temporary shelters.
- By November 2010 there were outbreaks of cholera.



Immediate Responses

- Due to the port being damaged, aid was slow to arrive.
- The USA sent rescue teams and 10,000 troops.
- Bottled water and purification tablets were provided.
- 235,000 people were moved away from Port-au-Prince to less-damaged cities.
- £20 million was donated by The UK government.



Long-term Responses

- As one of the poorest countries on Earth, Haiti relied on overseas aid.
- Although the response was slow, new homes were built to a higher standard. Over one million people were still lived in temporary shelters one year after the earthquake.
- The port needed rebuilding, which required a large amount of investment.



read

Natural Hazards

Hurricane Katrina Case Study



The Big Picture



Key Terms



Immediate responses - The reaction of people as the disaster happens and in the immediate aftermath.



Long-term responses - Later reactions that occur in the weeks, months and years after the event.



Primary effects - The initial impact of a natural event on people and property, caused directly by it.



Secondary effects - The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale.



Overview

August 29 th 2005	HIC
New Orleans, USA	145 MPH
	Category 3 (landfall)



Katrina initially formed about 200 miles (322 km) southeast of the Bahamas on Aug. 23, 2005, as a tropical depression, the storm was named Tropical Storm Katrina. But, once over the **very warm waters of the Gulf of Mexico**, Katrina re-intensified into a hurricane on Aug. 26, **and became a Category Five** storm on Aug. 28, with winds blowing at about 175 mph (280 kph). It is still the USA's most costliest natural disaster.



Primary Effects

- >1,800 people died
- 300,000 homes destroyed
- 80% of New Orleans were flooded
- Levees broken in 50 places
- 3m people left without electricity
- Some bridges collapsed
- Coastal habitats damaged
- Oil platforms damaged in the Gulf of Mexico
- Water supplies contaminated



Secondary Effects

- >1m people made homeless
- 230,000 jobs lost
- Huge amounts of dehydration due to tropical heat
- Looting of shops took place
- Total cost of damage >\$150bn
- Petrol prices rose
- Residents no longer able to get insurance against hurricanes



Immediate Responses

- 80% of New Orleans evacuated beforehand
- Government criticised for handling
- Poorest and most vulnerable left behind
- Took shelter in the Superdome
- State of emergency declared
- National Guard mobilised for search and rescue to save 50,000 people trapped
- Took 3 days for water supplies and evacuation after
- Charities collected and donated hot food



Long-term Responses

- US Government provided \$16bn for rebuilding homes and infrastructure
- \$14.5bn put aside for rebuilding and strengthening the flood defences
- Recommendations that homes and buildings are built on stilts, or not at all on low-lying land



Natural Hazards



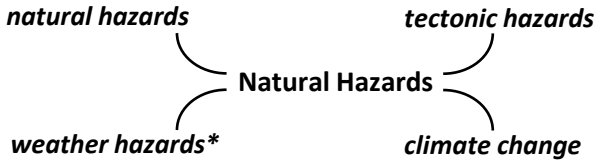
read

The Beast from the East

quiz

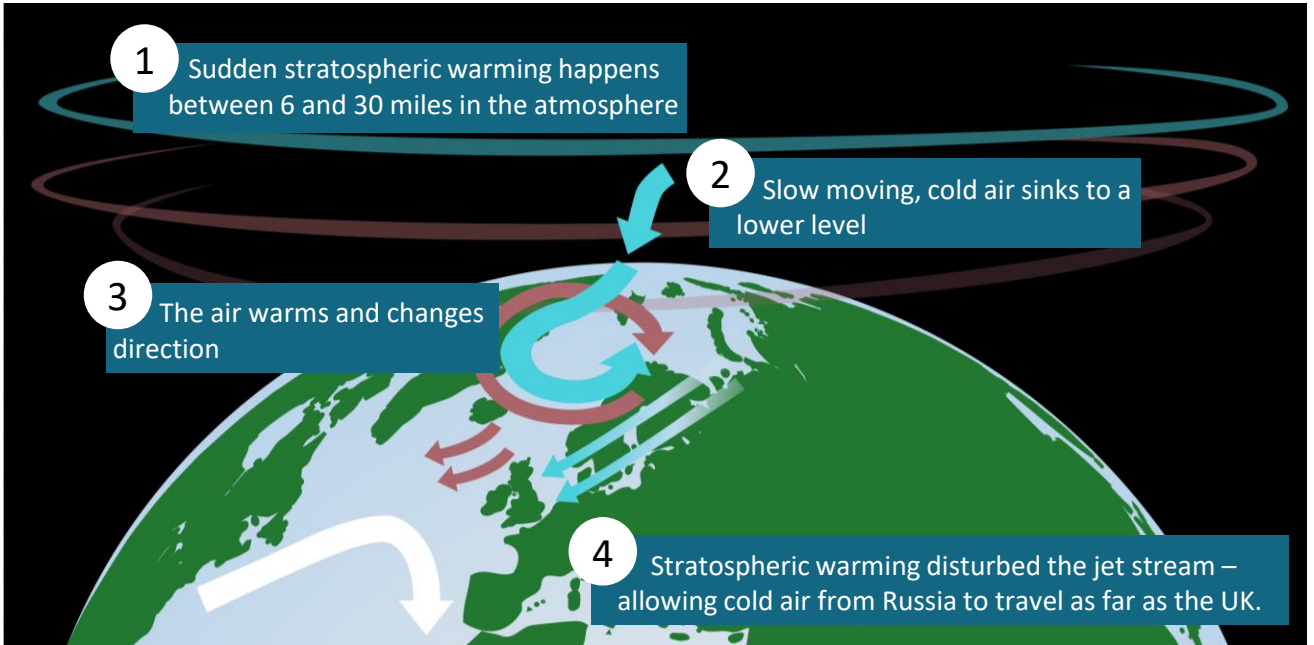


The Big Picture



Background

The Beast from the East was a prolonged cold snap, with heavy snow during the last week of February, 2018. It involved a polar vortex, from Siberia. It lasted for 10 days, and was compounded by the arrival of Storm Emma. Temperatures dropped to -10°C with a wind chill of -22°C .



Social Impacts

- 10 people died
- Thousands of homes were left without power
- Thousands of schools were closed
- Hundreds of motorists on the M80 near Glasgow were stuck for up to 13 hours
- The NHS cancelled non-urgent operations and clinics, affecting people's access to healthcare.



Environmental Impacts

- Extensive snowfall led to snow drifts, in South Wales 50cm caused 7m drifts
- The cold reduced the insect population, causing food shortages for birds & wildlife.
- Crop yields and growing seasons were reduced e.g. asparagus and potatoes.
- High Force (waterfall) froze for the first time since 1929.



Economic Impacts

- The Beast from the East cost the UK economy £1 billion/day
- Road closures cut supplies to supermarkets, reducing stock levels and profits
- Transport closures impacted tourism and trade
- £10 million of insurance claims from car accidents.



Management

- Red weather warning issued by the Met Office
- 4000 snow ploughs and gritters cleared roads
- Armed forces rescued drivers and drove NHS workers to work. In Edinburgh 200 critical care hospital workers were transported to their shifts at two hospitals in Edinburgh.
- High on the Pennines on the M62, the military provided support rescuing vehicles.



read

Natural Hazards

Managing Climate Change



quiz



The Big Picture



Key Terms



Climate Change Mitigation – Action taken to reduce or eliminate the long-term risk to human life and property from climate change.



Climate Change Adaptation – Actions taken to adjust to natural events such as climate change, to reduce potential damage, limit the impacts, take advantage of opportunities, or cope with the consequences.



Mitigation

Mitigation involves reducing the causes of climate change by reducing greenhouse gases in the atmosphere.



Alternative Energy Production

Developing renewable energy solutions such as wind, solar and tidal energy reduces our reliance on fossil fuel burning power stations. This helps reduce carbon dioxide emissions being released into the atmosphere.



Carbon Capture

Carbon capture involves reducing carbon dioxide emissions from fossil fuel-burning power stations. Carbon Dioxide is removed from waste gases. Once captured, the Carbon dioxide is then converted into a dense liquid that can be stored in safe locations



Planting Trees

Planting trees helps reduce the amount of carbon dioxide in the atmosphere as trees absorb it as part of photosynthesis.



International Agreements

International agreements encourage countries to take responsibility for reducing CO₂ emissions. Targets are more likely to be met if legally binding e.g. Paris 2015. However, financial support may be provided to LICs.



Adaptation

Adaption strategies do not aim to reduce the impact of climate change but respond to it by reducing its negative effects.



Changes in Agricultural Systems

Farmers respond to climate change by adapting their farming practices. This can include changing the type of crops they grow to those better suited to a warm climate, e.g. grapes.

Areas at risk of desertification will need to change approaches to farming. Low-technology solutions to this include the use of stone lines.



Managing Water Supply

There may be a greater need for developing water transfer schemes. This involves moving water from areas of surplus (more water than is used) to areas of water deficit (not enough water). This can be achieved by building water transfer pipelines. An example of this is the Kielder water transfer scheme in the north-east of England



Reducing the Risk of Rising Sea Levels

This involves developing coastal defences to protect areas at risk of coastal flooding. These aim to reduce the risk of further land being eroded away. It is estimated that sea levels will rise between 28 and 43cm by 2100, putting settlements and valuable agricultural land at risk.



read

THE LIVING WORLD

Malaysia Rainforest Case Study



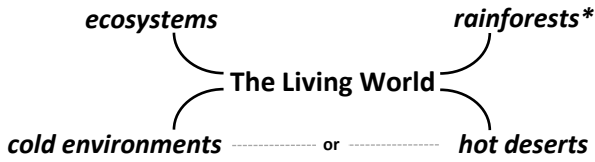
causes



effects

quizzes

The Big Picture



Background

- Malaysia is in southeast Asia.

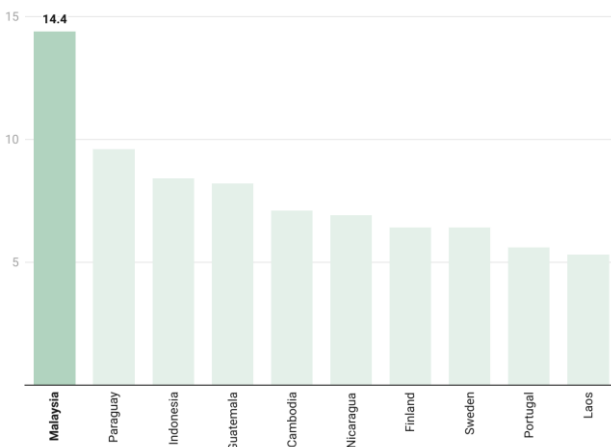


- At 192,838 km², the Malaysian rainforest is the 24th largest in the world.

Deforestation Rates

- Between 2000 and 2012 Malaysia had the highest deforestation rate in the world (by % area), losing 14.4% of its forest cover.

Percentage Forest Loss 2000 - 2012



- The rate of deforestation fluctuated between 2012 and 2015.
- It steadily declined between 2016 and 2020.
- Between 2001 and 2021 17% of rainforest cover was lost.

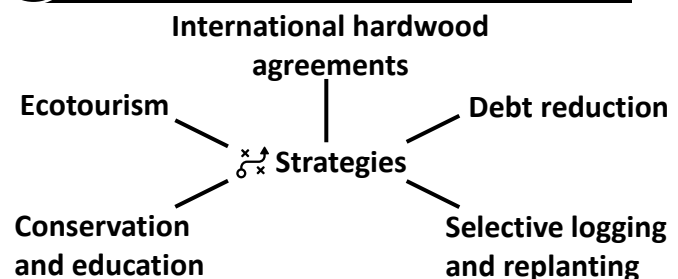
Causes of Deforestation

- Agriculture** – Malaysia is the second-largest producer of palm oil in the world.
- Logging** – Hard wood (mahogany & teak) valued for furniture. Small trees pulped/charcoal.
- Road building** – Increased accessibility encourages development e.g. in Sarawak.
- Mineral extraction** – Bauxite mined in Peninsular Malaysia. Oil and Gas in Borneo.
- Energy development** – High rainfall creates ideal conditions for HEP e.g. Bakun Dam, Sarawak.
- Settlement and population growth** – Transmigration Policy – 15000 ha rainforest cleared.

Impacts of Deforestation

- Economic Development**
 - Raw materials used by processing industries increasing the value of exported products.
 - Commercial farming and mining generate employment and tax income.
 - Cheap, renewable energy = development.
 - Loss of biodiversity affects tourism.
 - Long-term economic losses due to forests being destroyed and rivers polluted.
- Social Impacts**
 - Education, health care and social conditions are improved from tax revenue.
 - Decline in indigenous tribes e.g. Orang Asli.
- Environmental Impact**
 - Exposed land increases soil erosion
 - Decline in biodiversity
- Climate Change**
 - Local environment becomes hotter and drier.
 - Reduction in carbon sink due to deforestation.

Sustainable Management





read

THE LIVING WORLD

Sahara Desert

quiz



The Big Picture



Location




About

The Sahara desert is the largest hot desert on Earth. It stretches across many countries in north Africa including Egypt, Tunisia, Algeria and Morocco covering an area almost the size of the United States of America. The Sahara has one of the lowest population densities on Earth.



Opportunities

 **Mineral resources** – There are significant mineral resources in the Sahara including phosphate in Morocco, oil in Algeria, and gas in Egypt and Algeria.

 **Solar energy** – The Sahara provides ideal conditions for generating solar energy with 12 hrs of sunshine every day. The Noor solar farm in Morocco will be the world's largest.




Tourism – Many people are fascinated by holidaying in extreme environments. Sand-boarding, cross-desert treks and carting a popular attractions on the edge of the Sahara.




Farming – Commercial farming is limited to areas where there is enough irrigation water. The Aswan Dam provides water for Egyptian farmers.



Challenges

 **Water**– It is difficult to meet the growing demand for water for irrigation and industry. Extraction from boreholes is not sustainable as aquifers take 1000s of years to fill.

 **Inaccessibility** – The Sahara covers a vast area. Often, air has to be used to transport people and materials which is very expensive.



Temperature – High temperatures in the Sahara present a threat to human life. With daily temperatures often higher than 40°C exposure to this kind of heat leads to death or illness. In addition to this healthcare may be a long distance away. The hot season is too warm for tourists so tourism is seasonal.



Key Terms



Ecotourism – Travel that conserves the environment and benefits locals.



Inaccessibility – Very difficult to travel or impossible to travel to or reach.



Irrigation – Applying controlled amounts of water to crops.



Non-renewable energy – Energy from sources that will run out e.g. oil.



Population density – a measurement of the number of people in an area.



Renewable energy – Energy from sources that will eventually run out e.g. solar.



read

Coastal Landscapes

Withernsea – Coastal Management



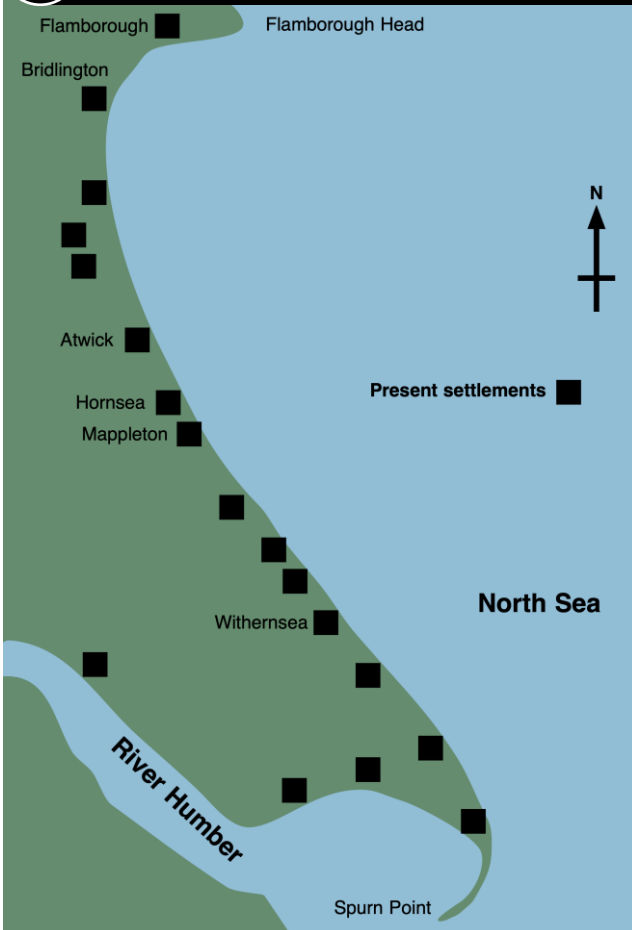
quiz



The Big Picture



Reason for Management



Withernsea is a seaside resort town on the Holderness Coast, situated 10 miles (16 km) north of Spurn Point and 17 miles south of Hornsea where the B1242 meets the A1033. The town requires coastal management because:

- It is a high-density urban development containing residential and various tourist related properties with a population of 6000.
- It lies on soft boulder clay which is susceptible to rapid erosion.
- Withernsea's local economy is dependent on tourism and recreation.



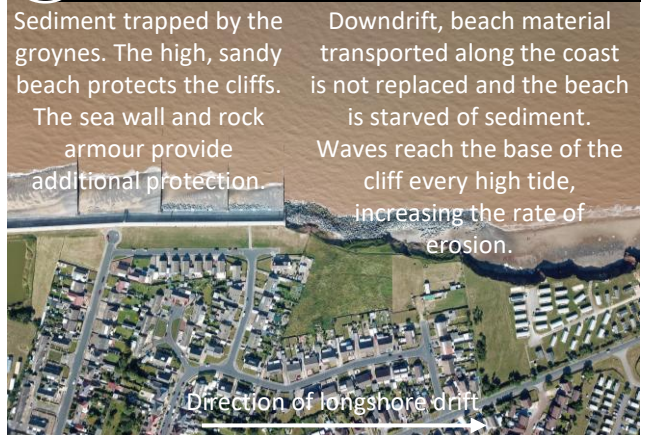
Management Strategy



Coastal defences were built at Withernsea during the 1870s. Nine extensions have followed. Timber groynes were replaced and the sea wall strengthened in 2017/18. Rock armour was extended 500m south of Withernsea in 2020. The current coastal management plan is to hold the line at Withernsea.



Effects and Conflicts



Coastal management has been effective in stopping erosion along the sea front at Withernsea. However, it has increased the rate of erosion downdrift of the defences.



Conflict

- The increased rate of erosion downdrift of the defences has led to the loss of caravan pitches.
- Increased erosion has led to the loss of farm land downdrift of the defences.



read

River Landscapes

Hydrographs



quiz



The Big Picture

river valleys and processes

river landforms

River Landscapes

river management*

case study



Flashy vs Flat Hydrograph

Flashy – rapid response hydrograph posing a high flood risk.

- Steep slopes
- Impermeable rock
- Heavy/prolonged rainfall
- Urbanisation
- Deforestation

Flat – slow response hydrograph posing a low flood risk.

- Gentle slopes
- Permeable rocks
- Drizzle
- Deep, dry soils
- Afforestation



Key Terms



Baseflow – The normal flow of a river when sustained by groundwater flow.



Bankfull discharge – Level of discharge above which a flood will occur.



Falling limb – The reduced discharge following the peak discharge.



Hydrograph – A graph showing river discharge, related to rainfall, over time.



Lag time – The time difference between peak rainfall and peak discharge.



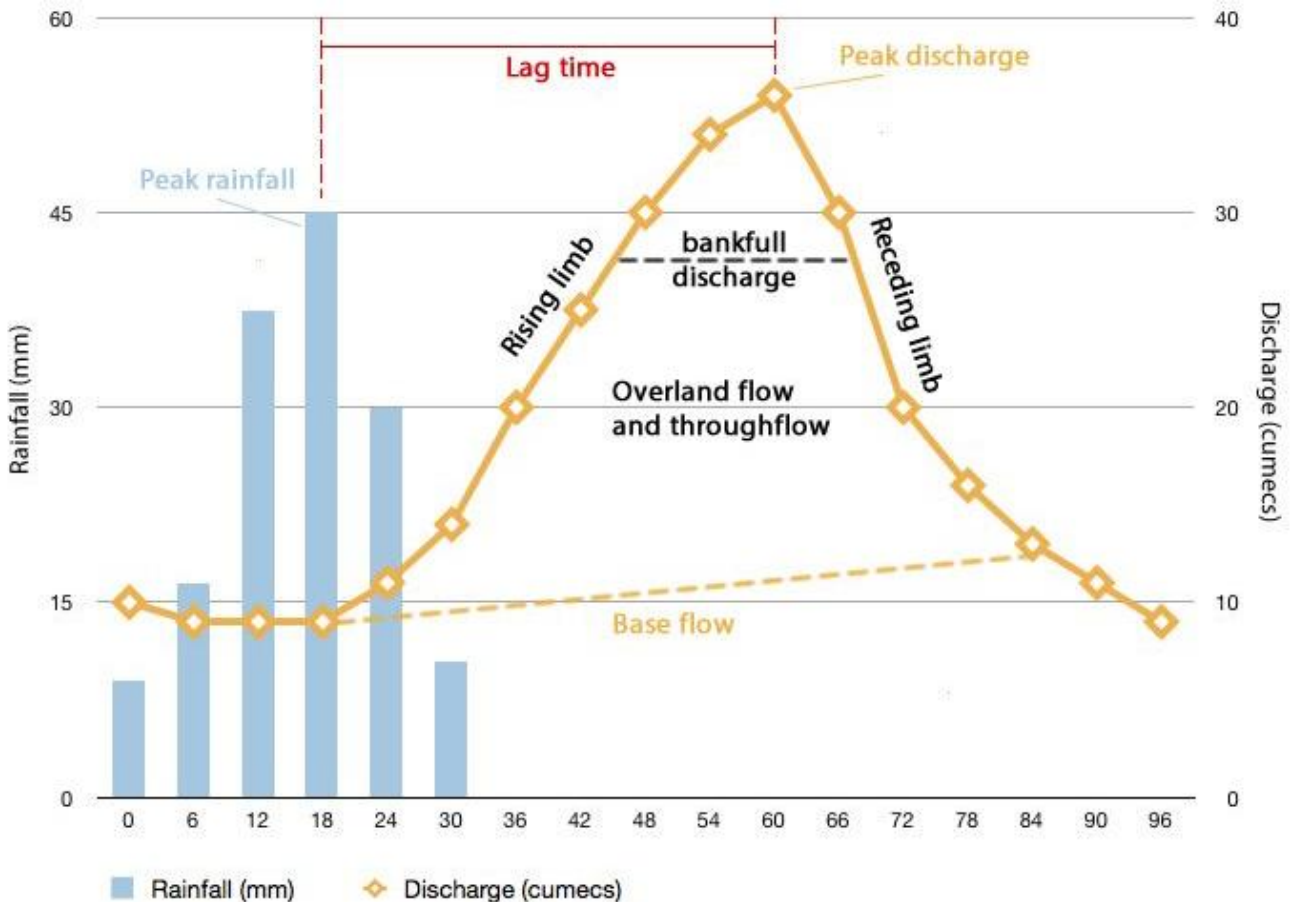
Peak discharge – The highest recorded discharge following a rainfall event.



Peak rainfall – The highest amount of rainfall per time unit (highest bar).



Characteristics of a Flood Hydrograph





read

River Landscapes

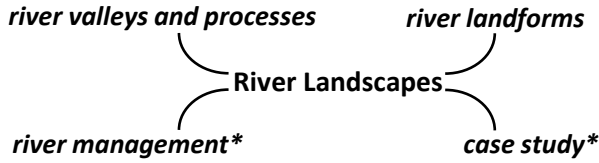
Boscastle Flood Management



quiz



The Big Picture



Management Scheme

On the 16th August 2004, a devastating flood swept through Boscastle. Very heavy rain, steep slopes that led to rapid run-off and Boscastle being at the confluence (where tributaries meet) of three rivers, caused the massive floods. Cars were swept out to sea and buildings were badly damaged. No one lost their lives, but millions of pounds worth of damage was caused by the flood.

In 2008 a flood management scheme for Boscastle was completed. The solution included both soft and hard engineering strategies.

The Environment Agency has made a considerable investment in flood defences in Boscastle to help prevent a similar flood happening in the future. Working with professional partners, more than £10 million of improvements were carried out. This included widening and deepening the Valency River, and installing a flood culvert to improve flow in the Jordan River.



Key Terms



Economic Issues – Factors relating to money e.g. will it make people rich/poor.



Environmental Issues – how the natural environment will be affected.



Culvert – a covered channel or pipe which allows water to flow



Social Issues – how a management method will affect people.



Social Issues

- The rebuilding projects and took several years which meant the lives of local people were disrupted for sometime.
- The risk of flooding has been reduced making Boscastle safer.
- The new bridge is not popular with local people as it is out of character compared to the rest of the building.



Environmental Issues

- Biodiversity has improved as have the river habitats.
- Vegetation in the area is now managed.



Economic Issues

- The risk of flooding has been reduced. Therefore, there is less risk of damage to property and businesses.
- The flood-defence scheme cost over £4 million. However, the scheme could have been significantly better, though some options were too expensive.