

# Paper 1 Case Study Booklet



- This covers each **case study you have learnt**. This is not all the revision you do but is essential to add detail to the base knowledge from your knowledge organisers.
- Try and plan the **practise questions** as you go through the revision booklet

## Paper 1: Section A: The Challenge of Natural Hazards

### Contrasting case studies of a tectonic hazard in HICs (New Zealand 2016) and LICs (Nepal 2015): causes, primary and secondary effects, immediate and long-term responses

#### Basic Information

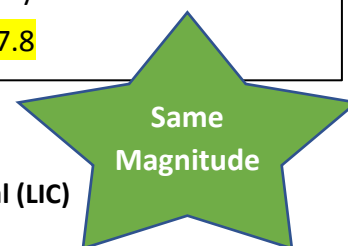
New Zealand (HIC) suffered a 7.8 magnitude earthquake in 2016

- Place: Kaikoura, New Zealand
- Date: 14th November 2016
- GDP per capita: US \$40,331
- Plate boundary: Destructive and conservative
- **Magnitude: 7.8**



Nepal (LIC) suffered a 7.8 magnitude earthquake in 2015

- Place: Gorkha, Nepal
- Date: 25th April 2015
- GDP per capita: US \$690
- Plate boundary: Destructive
- **Magnitude: 7.8**



#### Differences in development

##### New Zealand (HIC)

- Sparsely populated (18 people per Km<sup>2</sup>)
- High quality housing with excellent construction standards (Earthquake resistant buildings)
- More money to spend on evacuation and emergency services

##### Nepal (LIC)

- Densely populated (203 people per km<sup>2</sup>)
- Low quality housing with poor construction standards
- Less money to spend on emergency services and limited evacuation plans

#### New Zealand – Primary and Secondary Impacts

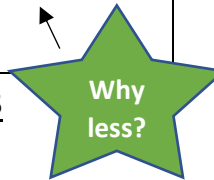
<b>Primary</b>	<b>2 people died</b> and 50 people were injured	<b>100,000 landslides</b> occurred which blocked 190km of roads and 200km of rail routes	<b>60 people needed emergency housing</b>
<b>Secondary</b>	The earthquake was responsible for a <b>\$16 million drop in tourism spending in the 3 weeks</b> immediately after the disaster	The total cost of the damage was <b>US \$8.5 billion</b>	A <b>tsunami was triggered</b> which flooded the land leaving debris up to 250m inland

**GCSE Practice Question: Assess the extent to which primary effects are more significant than secondary effects.' (9)**

## Nepal – Primary and Secondary Impacts

Primary	9000 people died and 22,000 people were injured	The <b>Kali Gandaki River was blocked by a landslide</b> ; this increased the risk of flooding in the area and led to further evacuations	<b>7000 schools, 50% shops, 3 million homeless</b> , roads destroyed making the rescue attempts more difficult
Secondary	Landslides were triggered on <b>Mount Everest, this killed 19 people</b>	The total cost of the damage was <b>US \$5 billion</b>	An outbreak of <b>typhus due to a lack of clean water killed 13 people</b>

### Responses



## New Zealand – Short term and long term

Short Term	A <b>tsunami warning was issued</b> and coastal residents evacuated to higher ground	<b>Hundreds of people were housed in emergency shelters and community centres</b>	<b>Power was restored</b> to most places within a few <b>hours</b> . Temporary water supplies were set up
Long Term	<b>\$5.3 million of funding</b> was provided by the government to help rebuild the water pipes and harbour.	Most road and railways were repaired and opened <b>within 2 years</b>	New water pipes were laid which are designed to move with an earthquake and not break

## Nepal - Short term and long term

Short Term	<b>Emergency services sent to Everest to look for survivors due to avalanches.</b> Local search and rescue in collapsed buildings and destruction	The Red Cross set up emergency shelters for 130,000 families made homeless and 500,000 tents provided for emergency accommodation in <b>Kathmandu – became known as ‘Tent City’</b>	<b>India and China provided \$1 billion in aid</b> to help set up field hospitals and help with the rescue efforts
Long Term	Roads cleared; 7000 schools rebuilt. After <b>2 years many roads were still damaged</b>	Over time the Asian development bank provided <b>\$3 million but the UK provided £73 million.</b>	Homelessness rehousing began but as of <b>2019, only 50% of people had been rehoused.</b>



Case study of a tropical storm (Typhoon Haiyan 2013): primary and secondary effects, immediate and long-term responses



read

# Natural Hazards

## Typhoon Haiyan Case Study



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

- 📅 November 8<sup>th</sup> 2013
- 🕒 04.40 am
- 📍 Philippines
- ⚙️ NEE
- 📊 190 MPH
- 🌀 Category 5



Typhoon Haiyan, a category five typhoon, struck the Philippines on 8th November 2013 at 4.40 am. The tropical storm originated in the northwest Pacific Ocean. It is one of the most powerful typhoons to affect the Philippines. Wind speeds of 314 kilometres per hour (195 miles per hour) were recorded.



### Primary Effects

- 6190 people died
- 4.1 million people were made homeless
- 14.1 million people affected
- The overall cost of damage was around \$12 billion
- 1.1 million tonnes of crops destroyed
- 1.1 million houses damaged
- 1 million farmers and 600,000 hectares of farmland affected



### Secondary Effects

- Shortages of food, water and shelter led to outbreaks of disease.
- Survivors fought for food and supplies. Eight people died in a stampede for food supplies.
- Seawater, chemicals and sewerage contaminated surface and groundwater.
- An oil tanker ran aground, causing an 800,000-litre oil leak that contaminated fishing waters.



### Immediate Responses

- Eight hundred thousand people were evacuated following government warning.
- The government provided essential equipment and medical supplies.
- A curfew was introduced two days after the typhoon to reduce looting.
- 1200 centres set up to help the homeless.
- International governments and aid agencies provided food aid, water and shelters.
- Over \$1.5 billion of foreign aid was pledged.



### Long-term Responses

- Build Back Better, the government's response to the typhoon was launched in 2014, to upgrade damaged buildings to protect them from future disasters.
- Aid agencies such as Oxfam provided replacement fishing boats.
- Thousands of homes built away from areas at risk of flooding.

**GCSE Practice Question:** Assess the extent to which tropical storms have effects on people and the environment using an example you have studied (9 marks)

Case study of UK extreme weather event (Storm Desmond 2015): causes, impacts (social, environmental, and economic), immediate and long-term responses

## Storm Desmond- Carlisle, Cumbria 5<sup>th</sup> – 6<sup>th</sup> Dec 2015

**CAUSES:** A tropical maritime air mass, driven by the jet stream, carried a lot of moisture across the Atlantic to the UK. As these warm, wet winds (atmospheric river) hit the Cumbrian Highlands, air was forced to rise. Air cooled and condensed to form clouds, releasing huge amounts of rain in one 24 hour period- **341.4mm** – a new record for the UK. This rain fell on already saturated soils and so water ran quickly into the river through surface runoff. Carlisle is at the confluence of the Rivers Caldew and Eden and the city is built on a floodplain, increasing the likelihood of homes and businesses being flooded. The intense low pressure also caused winds of over **100mph**



Glenridding village river channel blocked by boulders



Streets of Carlisle flooded

**EFFECTS:**

5,200 homes were flooded in Cumbria and Lancashire.

Many schools in Cumbria were closed because of flooding, power cuts and loss of water and heating.

61,000 homes in Lancaster lost power when the electrical substation was flooded.

The NHS in Lancashire declared a major incident after flooding caused power cuts and stopped doctors and nurses reaching hospitals.

The A591 between Keswick and Windermere was washed away along with 3 bridges.

£500 million of estimated flood damage.

Thousands of trees were ripped from river banks as well as millions of tons of sediment being transported by rivers and deposited on floodplains and in settlements.

Large amounts of the fragile upland soils were washed into rivers and lakes, affecting water quality and wildlife.

Flood waters did overtop some flood defences, BUT they did save 1000 properties from flooding!

Social

Environmental

Economic

Local / Regional management	National Management
Local community responses e.g. sandbags and emergency shelters in sports centres / schools	National emergency response: 200 military personnel deployed
Planting trees in the River Eden catchment area	Environment Agency issue flood warnings
Restoring 350 hectares of peatbog	£72 million government funding to improve flood defences

Key question	Answer
What date did Storm Desmond hit?	5 <sup>th</sup> and 6 <sup>th</sup> December 2015
What two rivers flow through Carlisle?	River Eden and River Caldew
Four places badly affected by the flood?	Carlisle, Keswick, Cockermouth and Glenridding
What caused Storm Desmond?	An extratropical cyclone brought UK record for the most rain to fall in a single 24 hour period, 341.4mm fell on the Lake District. (Cyclone + relief rainfall) Ground already saturated so rain couldn't soak in. Carlisle is on flat land at a confluence.
How was the flood disaster managed?	Management can be local and linked to a specific catchment area or national and more strategic linked to planning, funding and preparation for future events.

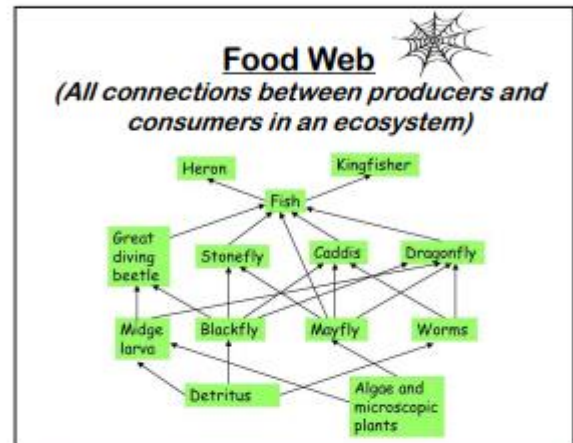
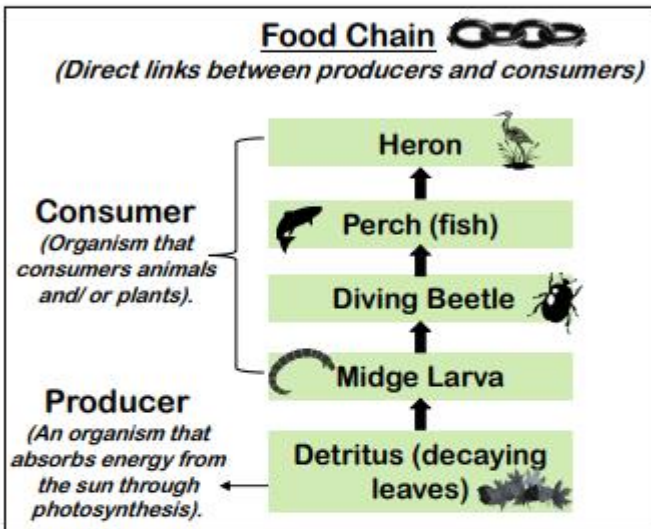
**GCSE Practise Question:** Using an example of a recent extreme weather event in the UK, assess whether the socio-economic effects were more severe than the environmental effects (9 marks)

# A Freshwater Pond Ecosystem



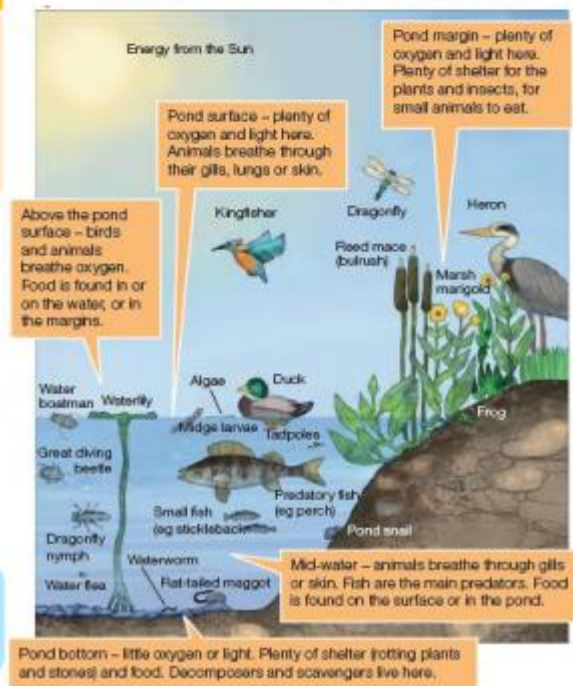
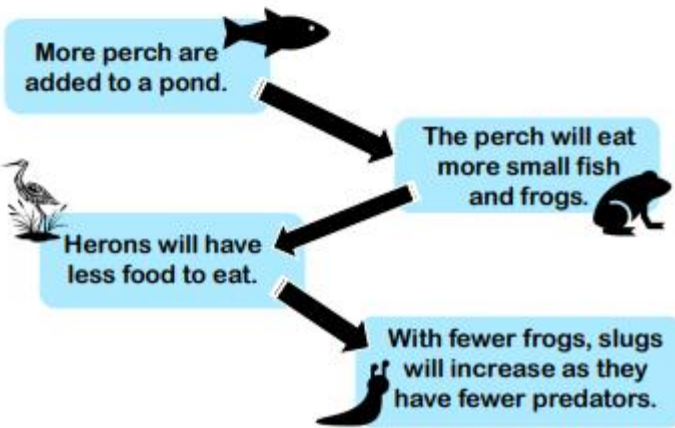
Your Example of a Small-scale ecosystem

Freshwater ponds provide a variety of habitats for plants and animals. There are big variations in the amount of light, water and oxygen available in different parts of a pond.



**Interdependence** - All organisms in an ecosystem depend upon each other. If the population of one organism rises or falls, then this can affect the rest of the ecosystem.

Natural Change	Human Change
A drought could dry out the pond in places so that plants dry out and die. Fish may then be starved of oxygen and die too.	Agricultural fertilisers can lead to eutrophication. Algae will grow out of control and deplete the oxygen – fish may die due to lack of oxygen.



**GCSE Practise Question:** For a small scale ecosystem you have studied, name one producer and one consumer (2)

Case study of a tropical rainforest (Sumatra Rainforest, Indonesia): causes and impacts of deforestation, management (international agreements, ecotourism, selective logging)

## Sumatran Rainforest

### Background

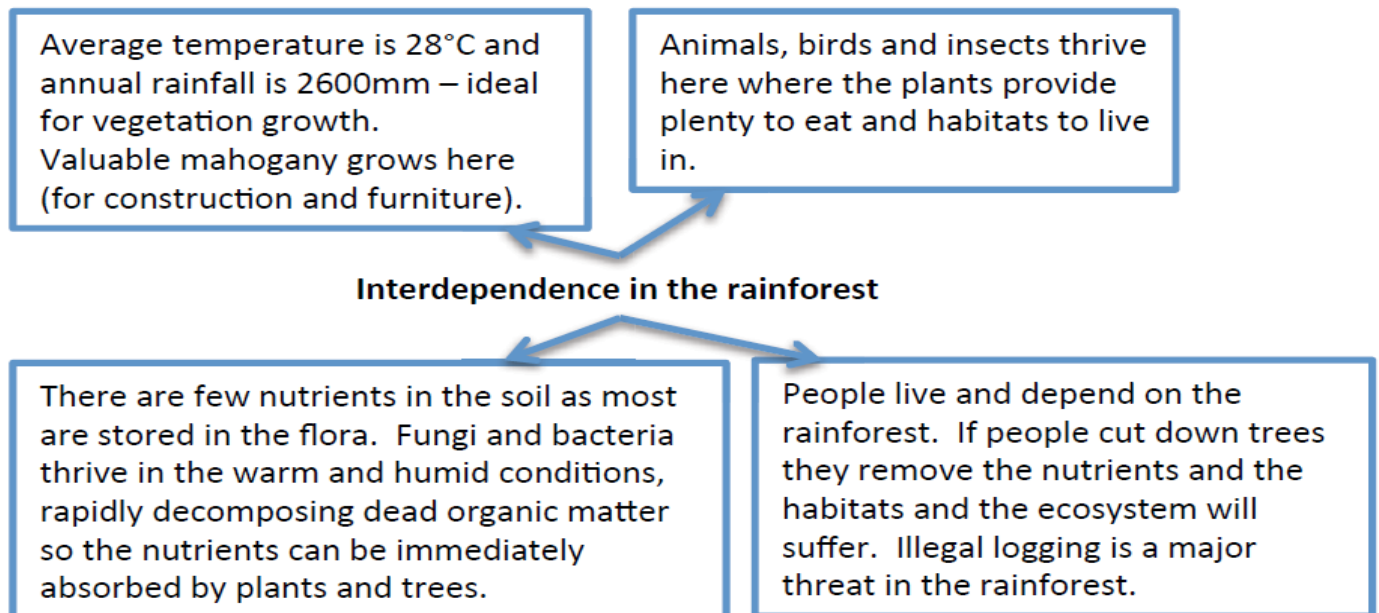
- Continent/Region: South East Asia
- Country: Indonesia
- Island: Sumatra
- Biome: Tropical Rainforest
- Climate: Hot, wet and humid (Temp - 20°C - 28°C) (Rainfall –over 3000 mm per year)
- Importance: **Gunung Leuser National Park** UNESCO World Heritage Site – last remaining wilderness in Indonesia



Deforestation	
<ul style="list-style-type: none"> <li>fastest rate of deforestation in the world</li> <li>50% of rainforest lost in 22 years – 12 million hectares lost</li> </ul>	
Causes of Deforestation	
<b>Logging (chopping down for wood)</b>	<ul style="list-style-type: none"> <li>2 million hectares lost per year from logging (same size as Massachusetts)</li> <li>50% of logging is done illegally so number could be higher!</li> </ul>
<b>Agriculture – Palm Oil</b>	<ul style="list-style-type: none"> <li><b>10.8 million hectares (size of Iceland)</b> of rainforest cut down to make way for Palm oil</li> <li>Destroys the natural ecosystem, releases CO2 and creates a <b>monoculture – reduces biodiversity.</b></li> <li><b>54%</b> of palm oil used globally is from Indonesia making it extremely <b>important for the country's exports and GDP.</b></li> </ul>
<b>Highways</b>	<ul style="list-style-type: none"> <li>Highways – new highways built in <b>1982</b> goes through the centre of the rainforest</li> <li>Allowed easier access into the previously remote parts of the rainforest.</li> <li>led to an increase in illegal logging and palm oil plantations.</li> </ul>
<b>Mining for Minerals and Coal</b>	<ul style="list-style-type: none"> <li><b>3<sup>rd</sup> largest coal exporter</b> in the world</li> <li><b>Illegal gold mining</b> largest cause of <b>deforestation in west Sumatra</b></li> <li>Throughout <b>2021, at least 7000 hectares</b> of forest were found in West Sumatra damaged by illegal gold mining.</li> </ul>
Impacts of Deforestation	
<ul style="list-style-type: none"> <li>Loss of habitat and food sources causes decline in animal population (Sumatran orangutans - 80% drop).</li> <li>Only 50 Sumatran rhinos and <b>less than 400 Sumatran Tigers left in Sumatra</b></li> <li>In <b>2022 Indonesia made \$30 million dollars from Palm oil exports and a signal hard wood tree can be worth \$7000</b></li> <li>2015 land owners burning forest for farming <b>released so much CO2 they were the highest polluter</b> in the world that year!</li> <li>Illegal slash and burn of Sumatran rainforest have led to ground clearing and soil erosion</li> <li>Tribal land replaced by palm oil plantations - <b>11 tribes of Orang Rimba forced out of home</b> - Conflict grows with locals and palm oil farmers – 22 deaths from a clash between tribe and farmers</li> </ul>	
Value of the Sumatran Rainforest	
<b>Biodiversity</b>	<ul style="list-style-type: none"> <li>170 species of mammals +380 species of birds</li> <li>core ecoregion = critical for preservation of global biodiversity</li> <li>Last habitat where Sumatran tigers, Sumatran rhinos (50 left), elephants and orangutans live in the same forest.</li> </ul>
<b>Environment</b>	<ul style="list-style-type: none"> <li>Huge carbon sink – absorb some of the excess CO2 in the atmosphere.</li> <li><b>Produce 20% of worlds oxygen</b></li> <li>More than half the world's water stored here</li> </ul>

<b>Home for Indigenous People</b>	<ul style="list-style-type: none"> <li>• <b>50 million people living in rainforests globally</b></li> <li>• The Orang Rimba is a tribe made of 3000 people. They have inhabited the jungles of Sumatra for centuries</li> </ul>
<b>Medicine</b>	<ul style="list-style-type: none"> <li>• <b>25% of all medicinal drugs are derived from rainforest plants</b></li> <li>• 2/3 of drugs to treat cancer come from rainforest plants</li> <li>• Extracts from <b>Lianas used to treat Parkinson's</b></li> <li>• Vampire bat saliva helps prevent heart attacks</li> </ul>
<b>Mitigation - Ways to reduce the impact of deforestation</b>	
<ul style="list-style-type: none"> <li>• <b>Ecotourism: This provides locals with jobs in a range of activities such as; tour guides, working in eco-lodges, selling souvenirs, etc.</b> As tourists are attracted to the park specifically for the wildlife and biodiversity, this will therefore encourage locals to help with conservation to protect their income in the future. <b>30,000 visitors to Sumatra</b>, on average spending <b>&gt;\$1,100 per person</b>. This money can benefit both locals and the government. Tourists who enter the <b>GLNP have to pay £8.50</b> which can then be used to manage the park.</li> <li>• <b>Reforestation: Since 2008 the Orangutan Information Centre (OIC) has also been restoring damaged forests in the Leuser Ecosystem and have planted more than 1.5 million trees.</b> These trees should be as close to the natural forest tree ecosystem as possible</li> <li>• <b>Law Enforcement: ensuring illegal activities are 'clamped down' on through fining and prosecuting illegal logging and illegal palm oil plantations.</b> In 2015 the government prosecuted a major palm oil company for illegal plantations, issuing a fine of over \$26 million and a prison sentence for the company director.</li> <li>• <b>Part of the Sumatran rainforest became the Gunung Leuser National Park – It is a UNESCO world heritage site in 2004</b> and has National Park status: help protect the rainforest from development and make logging illegal across the park. It gives the park legal status.</li> <li>• <b>Selective logging of mature and commercially viable trees over a 40-year cycle</b> to ensure that trees had time to re-establish themselves. This is known as a <b>Selective Management System</b>.</li> </ul>	

### How all the Rainforest is connected together – Interdependence



**GCSE Practise Question: 'Some economic activities in tropical rainforests have major environmental impacts.' Do you agree? (9 marks)**

**GCSE Practise Question: discuss strategies adopted to manage tropical rainforest sustainably. (9 marks)**





# THE LIVING WORLD

## Sahara Desert



read

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.

**GCSE Practise Question:** Using a case study, to what extent have opportunities for economic activity been developed in your chosen environment?' (9 marks)

## Causes of desertification

### Climate Change

- 5) **Rainfall** - climate change is expected to reduce rainfall in areas that are already dry. Less rain = less water for plant growth. If the plants die, the soil is easily eroded.
- 6) **Temperatures** - Global temperatures are expected to increase. Higher temperatures mean that more water evaporates from the land and from plants. This makes soils drier and means that plants die (so their roots no longer bind the soil together)

### Human Activities

- 1) **Removal of fuel wood** - many people in arid (dry) areas rely on wood for fuel or cooking. Removal leaves the soil exposed = erosion
- 2) **Overgrazing** - too many cattle eat the plants faster than they can re-grow. This leads to soil erosion as no plants left to bind the soil.
- 3) **Over-cultivation** - if crops are planted in the same area continually, all the nutrients in the soil get used up. This means that plants can no longer grow in this areas.
- 4) **Population Growth** - This puts pressure on the land, leading to more deforestation, more over-grazing and more over-cultivation.

## Solutions to desertification

### Afforestation

- Planting more trees - the **roots of trees hold the soil together** and help to reduce soil erosion from wind and rain. Growing trees amongst crops (agroforestry) helps protect the soil, as well as providing shade for the crops

### Water Management

- Water management - water can be stored in **earth dams** in the wet season and used to irrigate crops during the dry season. This is an example of using appropriate technology to manage water supplies in the desert environment. You can also **grow crops that don't need much water** (olives) which can reduce water use.

### Soil Management

- Improving the quality of the soil - this can be managed by encouraging people **to reduce the number of grazing animals** they have and grow crops instead. The animal manure can be used to fertilise the crops grown. Growing crops in this way can improve the quality of the soil as it is held together by the roots of plants and protected from erosion. This type of farming is more sustainable.
- **Rotating crops** that use different nutrients from the soil means the same nutrients don't keep getting used

### Appropriate technology e.g. Stone Lines (Bunds)

- Local farmers are encouraged to use the bunds to prevent soil erosion.
- **Magic stones (or bunds)** are circles or walls of stones placed on the ground to hold water on the soil rather than letting it run quickly over the surface. The picture to the right shows a **Bund Wall**.
- **Solar cookers** can also be used, these use the sun's energy to cook food rather than fuel wood and are cheap and easy to use.



**GCSE Practise Question:** 'Assess the importance of management strategies used to reduce the risk of environmental damage caused by desertification.' (9 Marks)

## Section C: UK Physical Landscapes

### Case study of a UK coastline (North Wales Coast, Wales): landforms, management

#### North Wales Coast



**Geomorphic Processes:** The North Wales coast has been shaped by erosion, longshore drift and deposition

Landform	Location and geology	Geomorphic processes and influence of climate
Headland and bay	<p><b>Great Orme</b>- headland made out of hard limestone which is resistant to erosion</p> <p><b>Colwyn Bay</b>- bay made out of soft sandstone and siltstone</p>	Waves erode the coastline via processes such as hydraulic action and abrasion. The area of Great Orme has taken longer to erode due to the rock type and so it is left jutting out into the Irish sea. In contrast Colwyn bay has been formed as the sandstone is less resistant to erosion and therefore the land has eroded at a faster rate creating the bay. In the future Great Orme may erode further resulting in the formation of stacks.
Spit and sand dunes	<b>Talacre</b> - made up of sands which have been deposited, making it vulnerable to erosion.	Prevailing winds along the coast from Prestatyn to Talacre cause waves to hit the beach at an angle. This means sediment is transported eastwards along the coast via longshore drift. When this reaches the Dee Estuary the sediment is deposited as the waves lose energy; this has built up over time to form the spit and sand dunes at Talacre.
Beach	<b>Colwyn Bay</b>	This area is sheltered by Little Orme to the north west, meaning waves have less energy. Constructive waves have a stronger swash and a weak backwash, therefore sand is deposited building a beach up over time.

#### Management of the coastline

##### At Colwyn Bay (Hard Engineering):

- Old sea wall protected land but reflected wave energy caused sediment to be lost on the beach (10 – 20mm per year)
- £35 million coastal defence scheme - Sea wall, groynes and beach nourishment
- £14 million on beach nourishment and 3 rock fishtail groynes – increase beach height by 5m
- 630m Sea wall
- 9000 Interlocking tetrapods defend the coast east of Colwyn Bay. They are all numbered and photographed so their movement can be mapped to see any future issues.

##### At Talacre (Soft Engineering)

- Marram grass planting + fencing to prevent excessive foot path erosion and allow grass to trap sand
- Christmas tree recycling scheme – plant trees along sand dunes to trap windblown sand and build up dunes + spit

**GCSE Practise Question: Explain the formation of a spit (4 marks)**

**GCSE Practise Question: 'Coastal management schemes are effective in protecting the coastline from physical processes.' Do you agree? Using an example, explain your answer (9 marks)**

## Case study of a UK river (Afon Ogwen, North Wales): landforms

Key term	Definition
<b>Corrie</b>	An armchair shaped hollow, high on a mountain with steep back and side walls
<b>Glacial trough</b>	A valley shaped by glaciers with steep sides and a flat valley bottom formed by a combination of plucking on the valley sides and abrasion on the valley floor
<b>Riffles</b>	Shallow areas of fast flowing water- good habitats for fish and insects

### The Afon Ogwen (River Ogwen) – NW Wales

- Just a few hundred metres from the source, the Afon Ogwen flows into a corrie tarn called **Ffynnon Loer**.
- Having fallen 450m in just 2km, the river enters **Llyn Ogwen**, a glacial ribbon lake at the end of the Ogwen valley.
- Leaving Llyn Ogwen the river plunges 100m down the **Ogwen Falls**, a series of cascades descending into the **Nant Ffrancon** valley.
- Leaving the Nant Ffrancon, the Afon Ogwen flows past the slate wastes of the **Penrhyn Quarry** into the village of **Bethesda**.
- On leaving Bethesda, the river flows north, until making a sharp turn west through dense woodland after the **Halfway Bridge**.
- Finally, after 20km the river reaches its mouth where, at low tide, it flows out across the **Bangor Flats**, towards the Irish Sea.



fig.69 Ffynnon Loer



fig.70 Llyn Ogwen



fig.71 Ogwen Falls



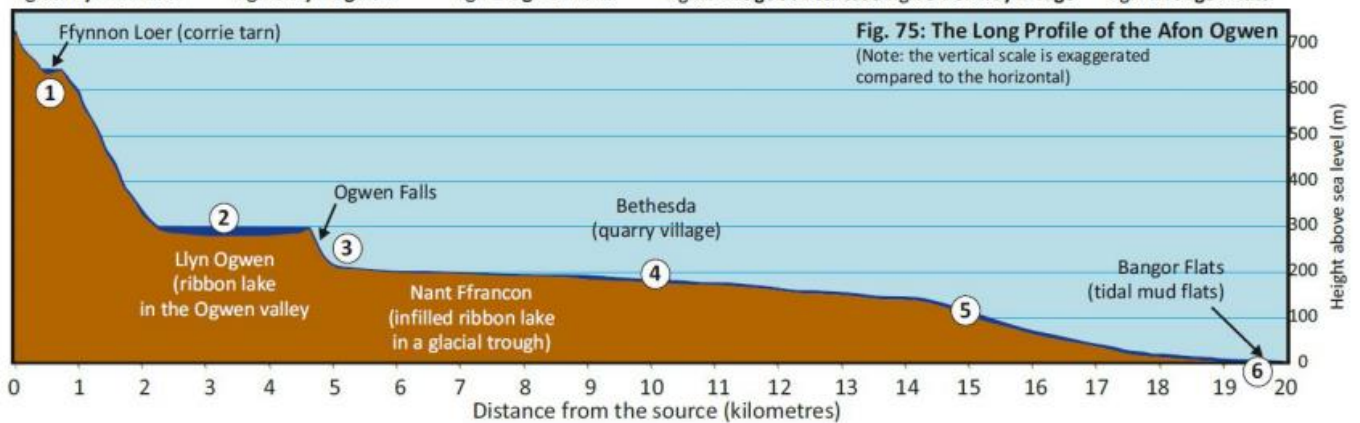
fig.72 Bridge at Bethesda



fig.73 Halfway Bridge



fig.74 Bangor Flats



**Geomorphic Processes:** The Afon Ogwen basin has largely been shaped by glacial erosion

Upper course- igneous rock	Middle Course - sedimentary	Lower Course- sedimentary
Igneous rock makes this part of the river basin very resistant to erosion. However, glaciers during the last ice age have carved out corries such as Ffynnon Loer through plucking and abrasion. More recently, a combination of river erosion and mass movement has created v-shaped valleys. Rates of weathering can be high here due to the high rainfall and low temperatures in winter.	Glacial erosion through plucking of the side walls and abrasion of the valley floor has created the Nant Ffrancon which is a glacial trough.	Flooding in the lower course, north of Bethesda, has caused deposition and created floodplains. Deposition has also helped create the Bangor Flats, as the river slows when it meets the sea, it deposits fine alluvium, making it a perfect habitat for birds.

### How Human Activity Impacts the Landscape:

Positives	Negatives
1990s- The Environment Agency helped to <b>restore the river to recreate the meanders, pools and riffles</b> to allow the river to re-gain its original form and diversity of wildlife. Salmon numbers have since seen a rise. Snowdonia is a <b>National Park</b> – this limits the negative impacts of humans upon the landscape as new buildings and developments are strictly regulated and land use is monitored carefully.	1960s- Part of the river flowing through the Nant Ffrancon was <b>dredged and straightened</b> to help drain farmland. However, this increased river velocity and removed the gravel from the river bed, meaning salmon numbers dropped significantly. Footpath erosion- tourists visit to view the beautiful river basin but damage the landscape as a result.

**GCSE Practise Question:** Using a named example, which river features are found in the middle and lower course (6)

**Flood Management – How a community responds to a flooding event (we use Storm Desmond again)**

## RIVERS – Hard & Soft Engineering

The UK can receive heavy amounts of rainfall and this has caused many floods to different areas. Whilst we obviously cannot stop the rain, many strategies have been implemented to try and prevent floods from occurring or limiting the impacts of them. *The 2 main types of preventing flooding are called Hard and Soft Engineering strategies.*

**Hard Engineering** involves using man-made structures to prevent or control natural processes from taking place. This form of flood management is usually very expensive.

**Soft Engineering** does not involve building artificial structures, but takes a more sustainable and natural approach to managing the potential for river flooding.

Method	What is it	Advantages	Disadvantages
<b><u>Dams and reservoirs</u></b>	The dam traps water, which builds up behind it, forming a reservoir. Water can be released in a controlled way.	<ul style="list-style-type: none"> <li>• Can be used to produce electricity by passing the water through a turbine within the dam.</li> <li>• Reservoirs can attract tourists.</li> </ul>	<ul style="list-style-type: none"> <li>• Very expensive.</li> <li>• Dams trap sediment which means the reservoir can hold less water.</li> <li>• Habitats are flooded often leading to rotting vegetation. This releases methane which is a greenhouse gas.</li> <li>• Settlements are lost leading to the displacement of people.</li> </ul>
<b><u>River straightening and dredging</u></b>	Straightening the river speeds up the water so high volumes of water can pass through an area quickly. Dredging makes the river deeper so it can hold more water.	<ul style="list-style-type: none"> <li>• More water can be held in the channel.</li> <li>• It can be used to reduce flood risk in built-up areas.</li> </ul>	<ul style="list-style-type: none"> <li>• Dredging needs to be done frequently.</li> <li>• Speeding up the river increases flood risk downstream.</li> </ul>
<b><u>Embankments</u></b>	Raising the banks of a river means that it can hold more water.	<ul style="list-style-type: none"> <li>• Cheap with a one-off cost</li> <li>• Allows for flood water to be contained within the river.</li> </ul>	<ul style="list-style-type: none"> <li>• Looks unnatural.</li> <li>• Water speeds up and can increase flood risk downstream.</li> </ul>
<b><u>Flood relief channels</u></b>	The floodwater flows into the relief channel and is taken either to an area where it can be absorbed, or re-enters the river further down its course.	<ul style="list-style-type: none"> <li>• Removes excess water from the river channel to reduce flooding.</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive to build.</li> <li>• If water levels continue to rise, the relief channel may also flood.</li> </ul>
<b><u>Floodplain zoning</u></b>	Allowing only certain land uses on the floodplain reduces the risk of flooding to houses and important buildings.	<ul style="list-style-type: none"> <li>• More expensive buildings and land uses are further away from the river, so have a reduced flood risk.</li> <li>• Less damage is caused, leading to fewer insurance claims.</li> </ul>	<ul style="list-style-type: none"> <li>• Not always possible to change existing land uses.</li> <li>• Planners have to decide what type of flood to plan for.</li> </ul>
<b><u>Flood Warnings</u></b>	The Environment Agency warns people in advance	<ul style="list-style-type: none"> <li>• Warnings give people time to evacuate</li> </ul>	<ul style="list-style-type: none"> <li>• Warnings don't stop a flood from happening.</li> </ul>

# Storm Desmond- Carlisle, Cumbria 5<sup>th</sup> – 6<sup>th</sup> Dec 2015

**CAUSES:** A tropical maritime air mass, driven by the jet stream, carried a lot of moisture across the Atlantic to the UK. As these warm, wet winds (atmospheric river) hit the Cumbrian Highlands, air was forced to rise. Air cooled and condensed to form clouds, releasing huge amounts of rain in one 24 hour period- **341.4mm** – a new record for the UK. This rain fell on already saturated soils and so water ran quickly into the river through surface runoff. Carlisle is at the confluence of the Rivers Caldew and Eden and the city is built on a floodplain, increasing the likelihood of homes and businesses being flooded. The intense low pressure also caused winds of over **100mph**



Glenridding village river channel blocked by boulders



Streets of Carlisle flooded

## EFFECTS:

5,200 homes were flooded in Cumbria and Lancashire.

Many schools in Cumbria were closed because of flooding, power cuts and loss of water and heating.

61,000 homes in Lancaster lost power when the electrical substation was flooded.

The NHS in Lancashire declared a major incident after flooding caused power cuts and stopped doctors and nurses reaching hospitals.

The A591 between Keswick and Windermere was washed away along with 3 bridges.

£500 million of estimated flood damage.

Thousands of trees were ripped from river banks as well as millions of tons of sediment being transported by rivers and deposited on floodplains and in settlements.

Large amounts of the fragile upland soils were washed into rivers and lakes, affecting water quality and wildlife.

Flood waters did overtop some flood defences, BUT they did save 1000 properties from flooding!

Social

Economic

Environmental

Short Term Responses	Long term responses – Flood management
Local community responses (e.g. sandbags and emergency shelters in sports centres / schools)	£72 million of government funding –for new flood defences (at least 4,300 Cumbrian homes better protected)
Environment agency issued flood warnings	Restoring 350 hectares of peatland to hold water upstream, as well as working with United Utilities to manage local reservoirs to provide more storage.
National emergency response: 200 military deployed plus 50 water pumps	Planting over 200,000 trees in the river Eden catchment to intercept more rain and slow the lag time
£400,000 was donated within 48 hours by the public after a £1m appeal was launched to help people affected by flooding caused by Storm Desmond.	6.3km of raised river embankment and 5km of flood wall built and maintained to allow the river to hold more water.
	Adding meanders back into the river and connecting the river back to floodplains to slow the flow into the town.

**GCSE Practise Question:** 'Use a case study to describe responses to river flooding. (6)

## Exam Skills

### Command Words

**Describe** - state what something (graph, map, diagram...) looks like and how it works. DO NOT explain or give reasons

**Explain** - give as many detailed reasons as you can

**Analyse** - Break down the topic into parts and give an in-depth account. Comment.

**Evaluate** - identify the positives and negatives OR strengths and weaknesses... this is an evaluative question requiring you to weigh up the importance of the subject. This means there are a number of possible explanations - give both sides and comment on the relative strength or importance of each side.

**State** or **identify** or **name** - require a short answer to a simple task, usually a sentence not just a word

**Annotate** - add detailed labels

**Assess** - see evaluate

**Compare** - identify similarities and differences

**Contrast** - Point out the differences only between two or more items

**Define** - explain the meaning of...

**Discuss** - Give both sides of an argument (for and against) and come to a conclusion

**Examine** - look closely, investigate in detail, often offering evidence for and against

**Interpret** - explain the meaning of something

**Justify** - give reasons for your answer (often a decision or course of action)

**Illustrate** - Use an example to show how a concept or processes works

**Suggest** - give possible reasons or ideas

**With reference to specific examples/cases...** You must refer to a specific place, preferably a case study you know in some detail.

### How to Develop

- Think 'So What' every time you finish a point. Try and keep going until you have done two extra bits of development
- This means that ....
- Because....
- Therefore
- So...