GCSE AQA Geography

Y9 Summer Reading

Paper 1: Physical Environment

Case Studies

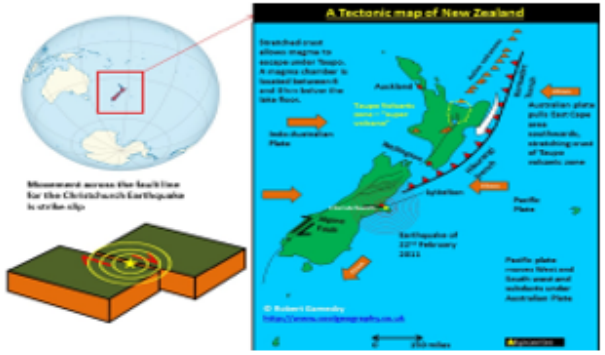
Topic	Case Study	QR code Topic Golden Knowledge
Tectonic Hazards	HIC - New Zealand Earthquake 2011 p.g. 2	
	LIC - Nepal Earthquake 2015 p.g. 3	
Weather Hazards	Typhoon Haiyan 2013 p.g. 4	
Living World: Tropical Rainforests	Amazon Rainforest, Brazil p.g. 7	
Living World: Cold Environments	Iceland Tundra p.g. 8-9	
Physical Landscapes UK: Rivers	River Tees Basin, NE England p.g. 11-12	
Physical landscapes UK: Coasts	Holderness Coast, East Yorkshire p.g. 13-14	

Christchurch, NZ (HIC) Background and Context:

- Located in the south Pacific Ocean South East of Australia.
- It is made up of over 600 islands
- Capital City = Wellington
- Population = 4.6 million
- Average Life Expectancy = 82
- GNI per capita = $45,440
- Receive 3 million tourists per year.

Causes of Christchurch Earthquake 2011

The earthquake occurred on New Zealand's South Island, 10km west of Christchurch, at 12.51 pm on 22nd February 2011 and lasted just 10 seconds. Measuring 6.3 on the Richter Scale and, at 4.99 km deep, the earthquake was very shallow. The earthquake occurred along a conservative margin between the Pacific Plate and the Australasian Plate.



Primary Effects – Immediate

- 185 people died
- 3,129 injured and requiring medical treatment.
- 10,000 buildings were demolished
- Liquefication destroyed roads and buildings
- Water and sewage pipes were damaged

Secondary Effects – Weeks, Months and Years

- Schools were closed for 2 weeks
- $28 Billion (USD) of damage was caused
- 5 rugby world cup matches were cancelled
- 1/5 of the population migrated from the city
- Economists have suggested it will take 50-100 years for New Zealand's economy to recover

Primary Responses

- Around $6-7 million of international Aid was provide to be used to help
- The red Cross and other international charities supplied aid works, water and food to help survivors.
- Rescue crews from all over the world including the UK, USA, Taiwan and Australia provided support in finding and helping survivors.
- More than 300 Australian police officers flew into Christchurch three days after the earthquake. They were sworn in with New Zealand officers enforcing law and order and reassuring the people of Christchurch.

Secondary Responses

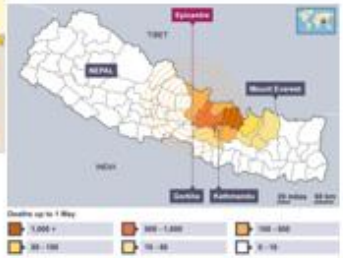
- 10,000 affordable homes were constructed for those who lost their homes.
- Sanitation systems including clean water and sewage systems were restored by August 2011
- The New Zealand government provided temporary homes to those who's had been damaged or destroyed in the quake.
- The Canterbury Earthquake Recovery Authority was created to organise the rebuilding of the region. It was given special powers to change planning laws and regulations to speed up the recovery.

Nepal (LIC) Background and Context:

- Located between China and India along the Himalayan Mountain range.
- Capital City = Kathmandu
- Population = 27million
- 50% of the population live on $1 or less per day
- Average Life Expectancy = 59
- GNI per capita = $1,340
- Approx. 800 people attempt to climb Everest each year.

Causes of the Nepal Earthquake 2015

On 25 April 2015 a 7.8 magnitude earthquake struck Nepal in Asia. The earthquake occurred on a **collision plate boundary** between the Indian and Eurasian plates. Both plates are moving towards each other. Due to them both being continental crust, as they collide, the land is pushed upwards forming fold mountains. Earthquakes are common at these boundaries due to the pressure built as plates collide. The focus was only eight kilometres deep and the epicentre was just 60 kilometres north-west from the capital Kathmandu.



Primary Effects – Immediate

- 8632 people died
- 19,000 injured and requiring medical treatment.
- Avalanche on Mt Everest killed 20 climbers, and flattened the town of Langtang killing 250 villagers (Netflix Series – Aftershock)
- Landslides damaged towns and habitats
- Culturally significant buildings e.g. Changu Narayan Temple were destroyed.

Secondary Effects – Weeks, Months and Years

- Farmer harvests were reduced or lost for the following year/ years
- $7.1 billion in economic damage/ loss.
- Reduction in tourism revenue (less people visiting the capital/ climbing Mt Everest).
- 3.5 million left homeless e.g. surviving residents of Langtang Valley.

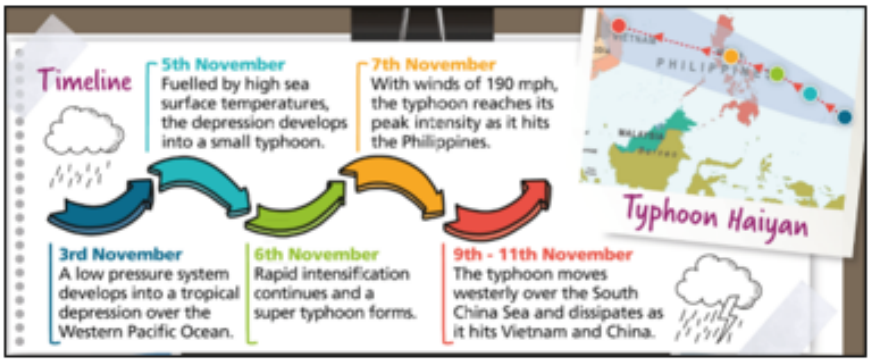
Primary Responses

- 100 search and rescue teams dispatched from the UK including 3 Chinook helicopters for hard-to-reach areas.
- Red Cross Charity offered food, water and shelter on the ground for those made homeless.
- Temporary housing was set up in Kathmandu ('Tent City')
- GIS 'crisis mapping' tool was used to help coordinate search and rescue.

Secondary Responses

- Asian Development Bank sent $200 million to help with the rebuilding
- Restoration work began on the Changu Narayan Temple in 2021.
- A new government task force was created to strategise for future earthquake events – particularly strengthening buildings.
- The UK alone sent £73 million

Typhoon Haiyan 2013 Case Study



Typhoon Haiyan was One of the Most Powerful Storms Ever Recorded

1) Typhoon Haiyan made landfall in the Philippines on 8th November 2013.
2) Tacloban and Cebu were among the worst affected areas, with up to 280 mm of rain and winds reaching a maximum of 314 km/hour.
3) A storm surge with waves of up to 2.3 m, combined with a high tide, meant that Tacloban was hit by waves of up to 5 m.

A storm surge is a temporary rise in water level caused by wind pushing waves onshore.

Primary Effects

1) 8000 people were killed.
2) Over 1 million homes were severely damaged or destroyed.
3) 1.9 million people were made homeless.
4) Strong winds damaged electricity lines, and water supplies were contaminated by salt water from the storm surge.
5) The heavy rain and storm surges flooded 600 000 hectares of farmland.
6) The cost of damage was estimated at approximately US $13 million.

Secondary Effects

1) Flooding triggered several landslides, which blocked roads and delayed the arrival of aid.
2) 5.6 million workers lost their jobs after businesses and agricultural land were destroyed.
3) The lack of clean water caused outbreaks of diseases such as dysentery.

The Philippines and the Wider World Responded Quickly

Immediate Responses

1) PAGASA (the Philippines' meteorological agency) broadcast warnings about Typhoon Haiyan two days before it made landfall. This led to the evacuation of 800 000 residents before the storm. Unfortunately, some of these people died when evacuation centres flooded.
2) Fishermen were warned not to go to sea.
3) The Philippines declared a state of emergency, which led to many charities offering aid in the form of food, shelter and clean water.
4) Plan International constructed pit latrines for 100 000 people to help prevent the spread of disease.

Long-Term Responses

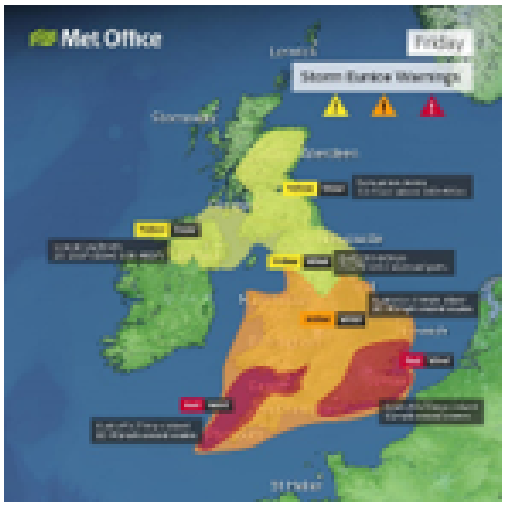
1) The UN appealed for over $300 million to help fund rebuilding and relief.
2) Charities built new storm-resistant houses for those who lost their homes.
3) The Philippines' tourism board encouraged people to visit the country after the storm by emphasising that most areas were unaffected and that money from tourism would help with the rebuilding process.

Many homes needed rebuilding after Typhoon Haiyan

UK Weather Hazard Example: Storm Eunice 2022

Causes: How was the Hazard Caused?

Storm Eunice reached the UK on 8 February 2022 following a period of extremely wet weather. A winter jet stream (fast atmospheric winds) blowing from Canada and the US is the main cause of the storm. When this air mixed with warmer, low-pressure air moving up from the equator, a series of storms were created. Eunice being the biggest and most impactful. The UK felt winds of up to 122MPH in places.



Effects: How were people, the economy and the environment impacted?

Social:

- 4 people died from falling trees and debris
- Thousands of people were left without power
- Many schools shut for a few days in the worst hit areas.

Economic:

- The roof of the Millennium Dome in London was blown off.
- Many trains were cancelled, and people couldn't get to work.
- Clean up cost could be around £350 million

Environmental:

- Widespread flooding of agricultural land damaged crops
- Litter was picked up from bins and landfill sites and spread over large areas of land, rivers and lakes causing pollution.

Responses: How did people manage the storm?

- Road and Highway teams were sent into clear debris off roads and allow people to travel easier.
- Monitoring of the storm and warning signals were sent to locals through social media and the news to allow the public to be prepared.
- Flood defenses have been reviewed, and improvements being made for future storm events.

Storms in the UK are becoming more frequent due to global warming and climate change. Weather conditions are more extreme and so the UK need to respond and prepare for their frequency to continue rising.

Impact 1: Rising Sea Levels

One of the most significant consequences of climate change is the rise in sea levels. This occurs due to two main factors: thermal expansion of the oceans as they warm and the melting of land-based ice, such as glaciers and ice sheets.

Coastal Flooding

Higher sea levels lead to more frequent and severe coastal flooding, threatening low-lying areas and islands.

Erosion

Increased water levels accelerate coastal erosion, damaging ecosystems and human settlements.

Saltwater Intrusion

Rising seas can contaminate freshwater sources with saltwater, affecting agriculture and drinking water supplies.

Example: The Maldives - This low-lying island nation in the Indian Ocean is at risk of becoming uninhabitable. With an average ground level of just 1.5 meters above sea level, a rise of 1 meter could submerge 77% of its land area by 2100, according to UN estimates.

Impact 2: Increased Drought

Climate change is altering precipitation patterns and increasing evaporation rates, leading to more frequent and severe droughts in many regions. This has devastating consequences for ecosystems, agriculture, and human populations.

Water Scarcity

Prolonged dry periods reduce water availability for drinking, irrigation, and industrial use, impacting communities and economies.

Ecosystem Damage

Drought can lead to vegetation loss, wildlife habitat destruction, increased wildfire risk, and long-term ecological damage.

Economic Impact

Agriculture, tourism, and other water-dependent industries suffer during drought periods, resulting in economic losses and job displacement.

Example: California, USA - From 2012 to 2016, California experienced its most severe drought in 1,200 years. This led to $2.7 billion in agricultural losses in 2015 alone and the death of over 129 million trees, dramatically altering the state's landscape and economy.

Impact 3: Effects on Agriculture and Food Production

Climate change poses significant challenges to global agriculture and food production. Shifting weather patterns, extreme events, and changes in temperature and precipitation affect crop yields, livestock health, and overall food security.

Changing Growing Seasons

Altered temperature patterns affect planting and harvesting times, potentially reducing crop yields.

Pest and Disease Proliferation

Warmer temperatures can lead to increased pest populations and new crop diseases.

Water Stress

Droughts and changing rainfall patterns affect irrigation and crop growth, particularly in rain-fed agriculture regions.

Livestock Impacts

Heat stress affects animal health and productivity, while changes in grasslands affect grazing patterns.

Example: Sub-Saharan Africa - The region is particularly vulnerable to climate change impacts on agriculture. A World Bank study projects that crop yields in Sub-Saharan Africa could decrease by up to 20% by 2050 due to climate change, affecting millions of smallholder farmers and threatening food security in the region.

Impact 4: Increased Extreme and Unpredictable Weather

Climate change is intensifying the global water cycle, leading to more frequent and severe extreme weather events. These include hurricanes, heatwaves, floods, and winter storms, which can have devastating impacts on communities and ecosystems.

Hurricanes

Warmer ocean temperatures fuel more powerful and frequent hurricanes, causing extensive damage to coastal areas.

Heatwaves

Longer and more intense heatwaves lead to increased mortality rates, especially among vulnerable populations.

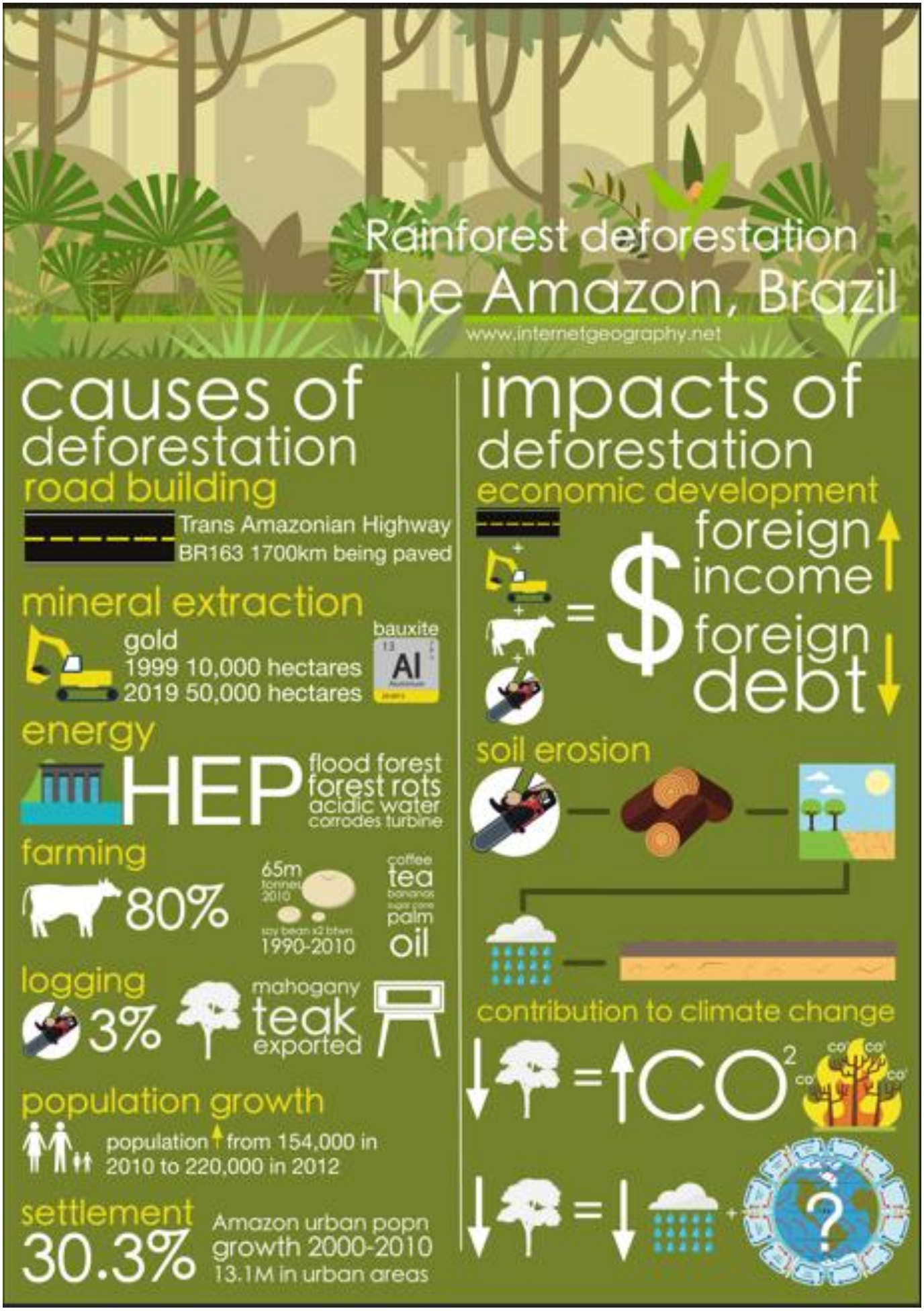
Floods

Increased precipitation and storm surges result in more frequent and severe flooding events.

Winter Storms

Climate change can lead to more intense winter storms and polar vortex events in some regions.

Example: Hurricane Harvey, Texas, USA (2017) - This Category 4 hurricane was intensified by warmer-than-average Gulf of Mexico waters. It caused catastrophic flooding in Houston, with over 100 deaths and $125 billion in damage. Studies suggest climate change made the rainfall from Harvey about 15% more intense.


Rainforest deforestation
The Amazon, Brazil
www.internetgeography.net
causes of deforestation
road building
Trans Amazonian Highway
BR163 1700km being paved
mineral extraction
gold
1999 10,000 hectares
2019 50,000 hectares
bauxite
Al
energy
HEP
flood forest
forest rots
acidic water
corrodes turbine
farming
80%
65m tonnes 2010
soy bean x2 btwn 1990-2010
coffee
tea
bananas
sugar cane
palm oil
logging
3%
mahogany
teak
exported
population growth
population ↑ from 154,000 in 2010 to 220,000 in 2012
settlement
30.3%
Amazon urban popn growth 2000-2010
13.1M in urban areas
impacts of deforestation
economic development
foreign income ↑
foreign debt ↓
soil erosion
contribution to climate change
↓ = ↑ CO2
↓ = ↓
?

Iceland Case Study Tundra Ecosystem

Development Opportunities

1. Mineral Extraction

There are many resources trapped under the ice which could be extracted and traded. Aluminium is Iceland's leading mineral commodity. Countries like Canada invested $400 million in the mining and smelting of aluminium ores in Iceland. Aluminium is then sold to other countries where supply is low and demand is high. Aluminium is important in the manufacturing of cars and aeroplanes.

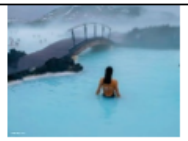
2. Energy

Renewable energy makes up 99.9% of all energy mix in Iceland (Mostly hydroelectric and geothermal). There is a total of 6 large geothermal power stations which harness the heat from the mantle by pouring water down pipes. The steam produced, turns a turbine which produces electricity. This means electricity in Iceland is extremely cheap and they do not rely on importing resources like coal, oil and gas from other countries.

3. Fishing

The **Fishing** industry is one of the key industries in **Iceland**, and directly employs around **9000** people. The Atlantic Cod and Haddock are two populous fish in the area and are used in many traditional dishes across Iceland as an important food source. This fish is often exported to other countries for profit.

4. Tourism: Tourism contributed to 10% of Iceland's GDP (economy). Visitors create a multiplier effect in Iceland, generating large amounts of tax from businesses and employees working in the hospitality industry. Approximately 10% of the working population in Iceland are hired in jobs related to tourism. This is approximately 30,000 people. These include _____ and _____.



Taking a dip in the Blue Lagoon

Whale watching – Reykjavik

See the Northern Lights

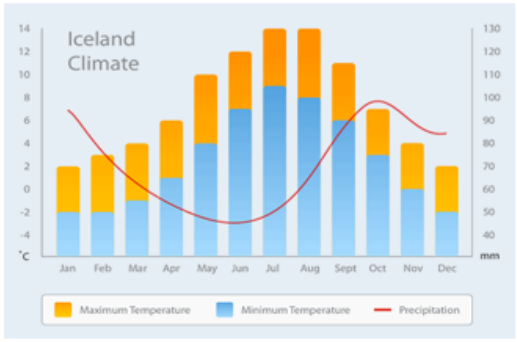
Development Challenges

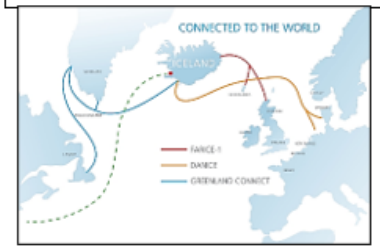
A. Extreme Temperature/ Climate:

Iceland has a cold climate. Its temperature ranges between -2 degrees to a maximum of 14 degrees in summer. Icey cold winds travelling from the arctic can also create harsh conditions for the vegetation and people living there. This means that not many things can grow. The winter storms also shut roads down leaving people without connection.

B. Inaccessibility

Much of Iceland is sparsely populated. Only larger towns and cities host the largest populations (capital city – Reykjavik). This means that much of Iceland is deserted and baron. This is because the landscape consists of mountains and rocky terrain, which is rather infertile. Only some lowland areas are suitable for human settlement. Those living in rural Iceland are also most effected by harsh snow storms, in which they can be cut off from basic needs.





Small settlement with one road in and out.

C. Buildings and Infrastructure

Iceland is a HIC. It can afford to invest a great deal of money in its infrastructure e.g. telecommunications, road networks and air connections. However, it has been a challenge to get these up and running in Iceland. For example, Iceland is connected to the USA, UK and France via a series of fiberoptic submarines which cost over £31bn to install. This allows communication with ease, but strained the economy. Road building also proved challenging as they had to not only connect the different Icelandic settlements (mostly near coasts), planners also had to take into consideration the inaccessibility of the landscape, making detours around large mountains and lakes. Finally, permafrost thaws in the summer months, which is problematic for setting building foundations and burying pipes and cables in the ground.

Key word Glossary:

Conservation – protection of natural environments

Densely populated – High density of people living in a small area

Economic development – improvements to an economy (money)

Extraction – To remove

Geothermal energy – Energy created from tectonic activity

Glacier – Large, moving ice sheet

Inaccessibility – unable to be reached

Inaccessibility - unable to be reached.

Infrastructure – man-made structures/ facilities that aid in human survival (Roads, buildings, street lights…)

International agreements – laws and treaties signed by countries to protect specific areas.

Mineral – A naturally occurring substance.

Permafrost – Permanently frozen ground.

Sparsely Populated – Low density of people living in a vast area.

Telecommunications (Tel – ie – com-mune-ic-a- shuns) – communicating via transmitted signal (Phone networks/ television/ radio)

Specification content
The physical characteristics of a cold environment. The interdependence of climate, permafrost, soils, plants, animals and people. How plants and animals adapt to the physical conditions. Issues related to biodiversity.
A **case study** of a cold environment to illustrate: • development opportunities in cold environments: mineral extraction, energy, fishing and tourism • challenges of developing cold environments: extreme temperature, inaccessibility, provision of buildings and infrastructure.
The value of cold environments as wilderness areas and why these fragile environments should be protected. Strategies used to balance the needs of economic development and conservation in cold environments – use of technology, role of governments, international agreements and conservation groups.

Sustainable Management Strategies for Cold Environments:

International Agreements

Agreements and treaties can be signed in order to protect cold environments from human damage. For example, in 1986 commercial whaling was banned in countries like Japan, Norway and Iceland after a treaty was signed by over 15 countries. Additionally, Iceland is a member of the Arctic Council, an intergovernmental forum promoting cooperation among Arctic states. Through this platform, Iceland collaborates on various projects focused on environmental protection and sustainable development in the Arctic region.

Conservation Groups

Organisations such as 'Green Peace' and 'World Wide Fund for Nature (UN program)' pressure governments to protect the natural. Cold environment. These groups often protest the human driven exploitation of these areas and encourage governmental level change.

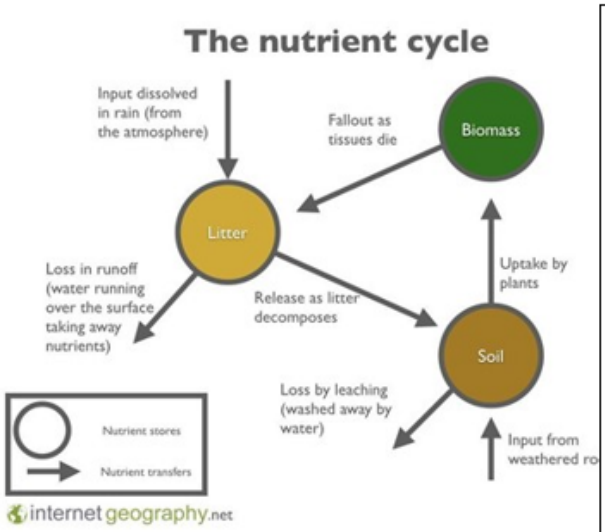
E.g. **Vatnajökull (Vat-Na-Yo-Kull) National Park**: Covering approximately 13,950 km^2, it is the largest national park in Iceland and one of the largest in Europe.

Technology and Research

Technology and research can help people invent new ways of living in cold environments, without the impact on the natural environment. For example, underground pipelines carrying heated water can melt the permafrost and cause landslides and flooding. These can be elevated above the ground so that the ground remains frozen. Furthermore, the Marine and Freshwater Research Institute (MFRI) conducts research on marine and freshwater habitats, providing scientific advice on sustainable use and protection.

The role of the government

Governments have the power to protect the wilderness by setting up areas for conservation e.g. national parks. New laws can also be created to protect the natural environment. For example in Iceland, The Conservation of Nature Act was created in 1971 in order to conserve parts of the Icelandic landscape at risk from human exploitation.



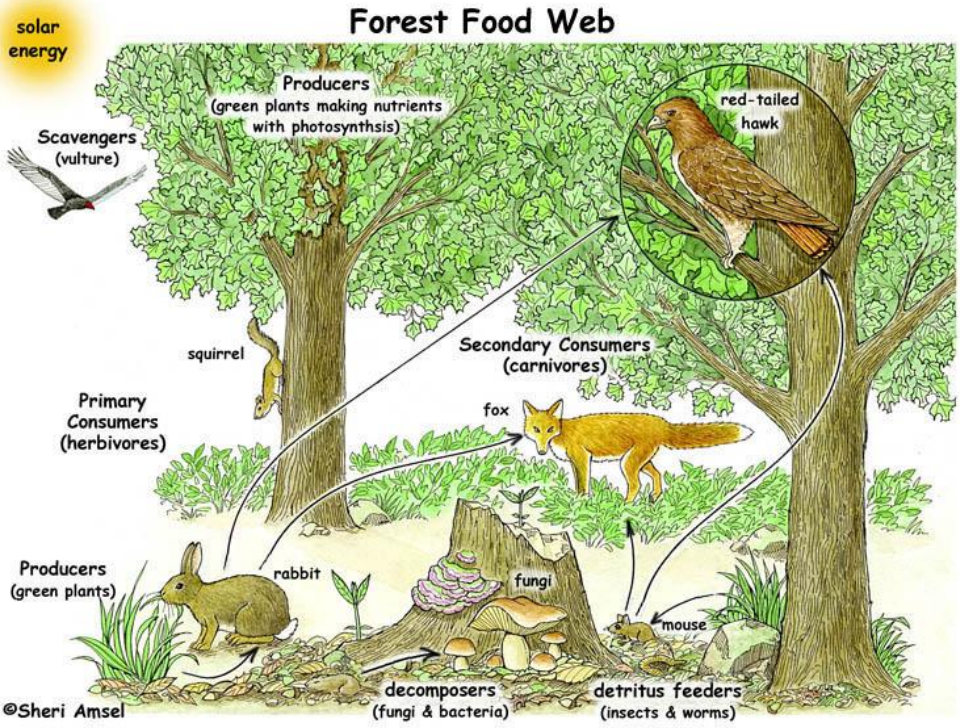
Small Scale UK Ecosystem: Sherwood Forest, Nottingham

Located in Nottinghamshire, Sherwood Forest has been at the heart of the county for hundreds of years. The legend of Robin Hood and his Merry Men derives from this mystery of Sherwood Forest.

Today, Sherwood Forest is a great place for people to visit and enjoy. Various outdoor activities and sports including tree top ziplining, archery, hot tub stays and walks.

Although used by people, its protected nature allows it to be a home to many species of plant and animal native to the UK. Many decomposers like worms, beetles and spiders roam the forest floor breaking down decaying organic matter. Consumers such as rabbits, mice and hedgehogs gain their energy from eating producers (plants and nuts) and decomposers (insects). Secondary consumers and predators at the top of the food chain, hunt for primary consumers on both the ground (foxes) and the air (Hawks).

If elements of the food web were removed, it would have an impact on the rest of the food chains, and the effectiveness of the nutrient cycle. The most common element being removed or damaged is the trees themselves. Luckily Sherwood Forest is a protected area and trees cannot be removed. But this is not the same for all forests in the UK.



The River Tees

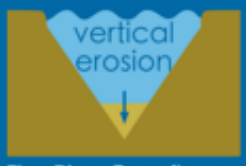
www.internetgeography.net

Landforms of Erosion and Deposition

The River Tees is located in the north of England. It flows east from its source in the Pennines to its mouth, on the North Sea coast.

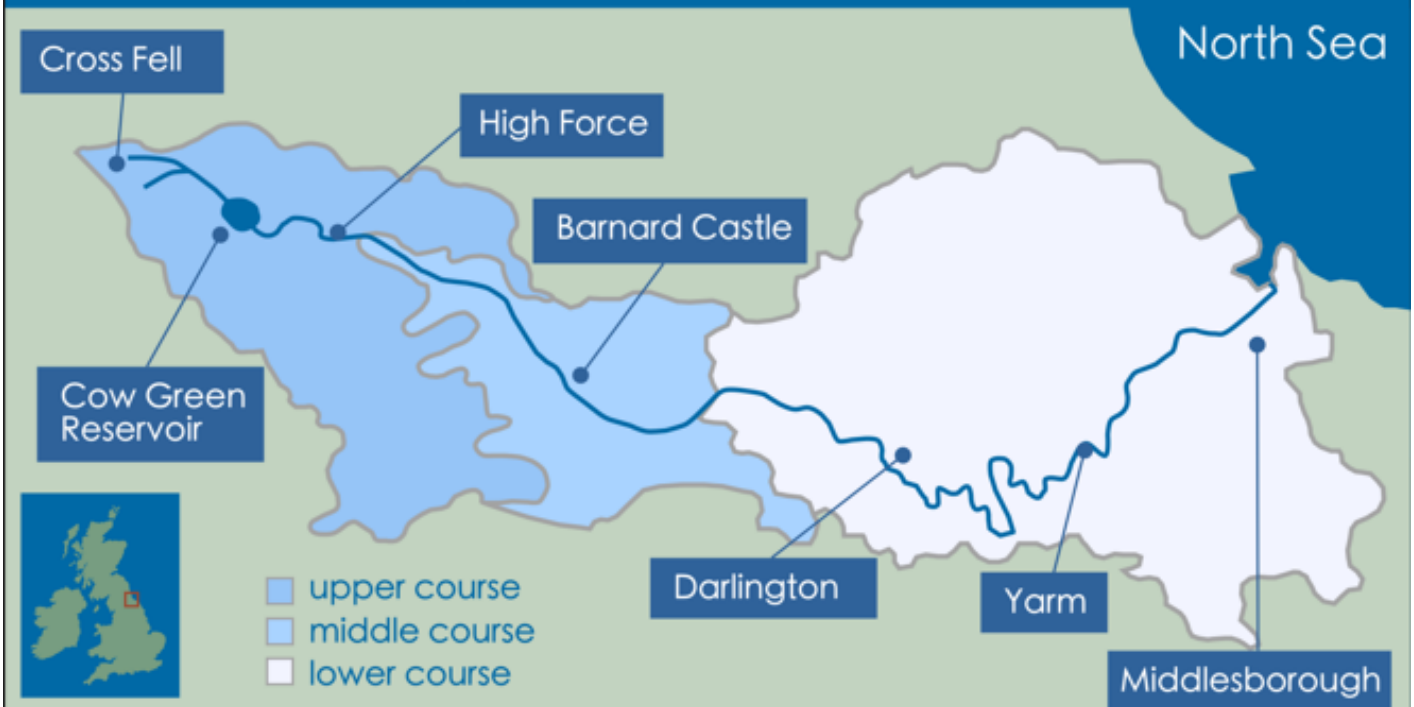
Upper course

The source of the River Tees is Cross Fell in the Pennines.



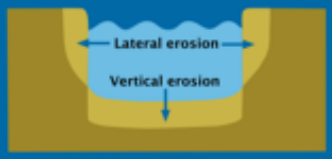
The River Tees flows over impermeable rock. Vertical erosion has formed classic V-shaped valleys.

The UK's largest waterfall, High Force, is located in the upper course of the River Tees. An area of hard rock, called Whin Sill (or Whinstone), is located above a layer of soft rocks (sandstone and shale) and together they create the waterfall.

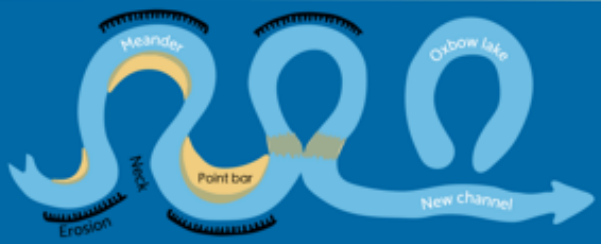


Middle course

The middle course of the River Tees meanders through the County of Durham.



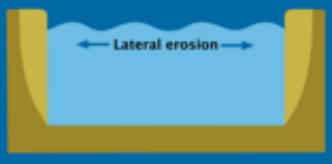
The middle course is typified by the valley becoming wider. This is due to the increase in lateral erosion. Flood plains are common.



As the River Tees reaches its middle course lateral erosion overtakes vertical erosion and is evidenced by winding meanders.

Lower course

The lower course of the River Tees includes its mouth at Middlesborough.



The River Tees becomes very wide due to increased lateral erosion.

The River Tees carries a large amount of sediment in the lower course. Repeated flooding has formed natural levées.

Towards its mouth The River Tees is a large tidal estuary with mudflats and sandbanks. Large scale deposition occurs here due to the reduced competence of a river.

The Tees Times

Cow Green Reservoirs Triumphs and Tribulations against flood risk.

Cow Green Reservoir is a hard engineering strategy used to reduce flood risk along the River Tees. It was completed in 1971 to a sum of £2.2 million, which today equates to around £35 million. Located in the North Pennines, the 2-mile-long reservoir stores and controls water levels for towns located downstream. These include: Yarm, Stockton and Middlesbrough.

Throughout the middle and lower courses there are large floodplains which can flood very easily if not managed. The river has been a very important industrial resource in the past with towns such as Stockton-on-Tees being founded along its banks. For this reason, humans have tried to control the flooding of the Tees and protect the high value, industrial areas.

Yarm is a great example of a town in a vulnerable position along the river. It is built on a flood plain inside a meander of the Tees. Yarm has had problems with severe flooding as early as the 18th Century (1700's). On the night of 16/17th November 1771 the North East of England suffered some of the worst and most destructive flooding on record. The river Tees burst its banks in a number of places with Yarm being one of the areas worst affected. The flood was caused by rapid ice and snow melt in the Pennines. At the height of the deluge some stretches of the High Street were submerged in 20 feet of water. Yarm and other towns continued to flood, until the local government decided to comprise several flood relief strategies in the mid-1900's.

Image: Yarm Highstreet flood in 1968.

Cow Green Reservoir reduces flooding by storing and controlling river discharge. During periods of heavy rainfall, less water is released by the reservoir, reducing discharge in areas downstream. There is also a hydroelectric dam attached to the reservoir creating clean, renewable energy. Many people are attracted to the area on weekends and during holidays for relaxation, leisure and walking. This has boosted the local towns economy through the multiplier effect. As a result of the construction of the dam, many new employment opportunities were created in engineering, hospitality and environmental conservation.

However, various challenges developed concerning the environmental impact of its construction. A large area of land had to be flooded to create the reservoir. This meant a loss of habitat for wildlife, including the reduction in rare species like the Teesside Violet flower. In addition, sediment trapped by the dam wall has meant an increase in erosion downstream. Although some animal and plant species suffered, others thrived. Numbers of brown trout have increased in the reservoir with expansion of breeding grounds, which has attracted more fishing in the area.

Unfortunately, the livelihood of farmers was heavily impacted by the construction as many had to be relocated from their land. Although compensated, many still felt let down with the decision to flood the valley. With famer compensation, and the construction costs, the scheme became very costly. Some argue that the decline in industries in Teesside, and lowering populations have meant the reservoir is no longer cost effective. However, the boost to local economies from tourism has created positive economic impacts for those living around Cow Green Reservoir.

Although the scheme was vital in reducing flood risk, it has not been fully effective in preventing floods. Other flood management schemes have also been implemented in and around Yarm, Stockton and Middlesbrough to alleviate the risk. Examples include embankments and afforestation.

UK Coastal Landscapes

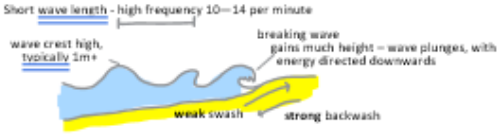
1. Waves

waves Ripples in the sea caused by the transfer of energy from the wind blowing over the surface of the sea.

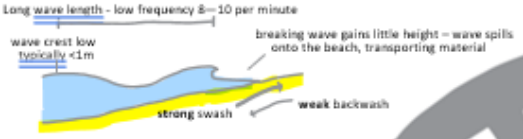
Wave size depends on:
- fetch
- wind speed
- wind duration

fetch The distance of open water the wind blows over.

destructive waves High, steep waves; weak swash, strong backwash; erode the coast (remove beach material).



constructive waves Low, long waves; strong swash, weak backwash; deposit material (build beaches).



2. Processes

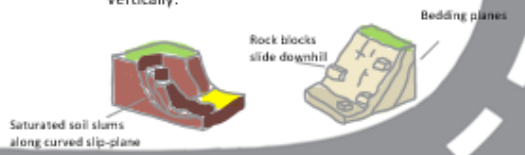
Weathering
The process of breaking up or dissolving rocks in situ.

Mechanical:
- Freeze–thaw weathering (water expands on freezing in cracks).
- Salt weathering (salt crystals grow, widening cracks).

Chemical:
- Carbonation (weak acids in rainwater dissolve limestone/chalk).

Mass movement
Definition

Sliding: Material shifts in a straight line.
Slumping: Material rotates along a concave slip plane.
Rock falls: Material breaks up and falls vertically.



2. Processes

Erosion
Wearing away of land by the sea.

Abrasion: transported sediment wears away the base of a cliff or wave-cut platform.
Attrition: rocks and pebbles collide, becoming smaller and rounder.
Hydraulic action (power): Force of waves compressing air in cracks, causing rock to break.
Solution: Certain rock minerals dissolve in seawater..

Transportation
The process by which the sea carries its load.

Traction: large boulders rolled along the riverbed.
Saltation: smaller pebbles "bounced" along.
Suspension: fine sediment carried in the water column.

Solution: dissolved materials carried invisibly in water.

Longshore drift: waves approach the shore at an angle (swash), then retreat perpendicular to the shoreline (backwash), transporting sediment along the coast.

Deposition
The process by which the sea drops its load.

Occurs when waves lose energy (constructive waves, sheltered areas, shallow water).
Leads to accumulation of sediment, forming depositional landforms (e.g., beaches, spits).

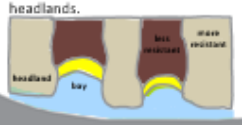
3. Geology & Rock Type

Rock Type (hard vs soft): Influences erosion rates (e.g., chalk erodes slowly, boulder clay rapidly).
Concordant & Discordant Coastlines:
- **Concordant:** Rock layers run parallel to the coastline; features like coves may form where a harder outer layer is breached and softer rock behind is eroded (e.g. Lulworth Cove).
- **Discordant:** Rock layers run perpendicular to the coastline, creating alternating bands of hard and soft rock, leading to headlands and bays.

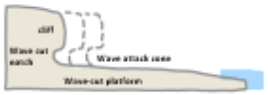
Structure: Arrangement of bedding planes, faults, and joints can create weaknesses (more rapid erosion) or resistance (headlands).

4. Landforms of erosion

Headlands and bays
Found on discordant coastlines where softer rock erodes to form bays, leaving harder rock as headlands.



Wave-cut platforms
Waves undercut a cliff (wave-cut notch) by abrasion and hydraulic action; cliff collapses and retreats, leaving a rocky platform.



Erosion of a headland
Weaknesses in headlands erode (hydraulic action & abrasion)to form caves. Cave erodes through to form an arch. Arch collapses, leaving a stack, which can further erode into a stump.

5. Depositional Landforms

Beaches: Formed by constructive waves depositing sand/shingle between high and low tide marks.

Spits: Longshore drift extends beach material out into the sea, often curving if wind/wave direction changes.

Sand Dunes: Sand is blown inland and trapped by obstacles; vegetation (e.g. marram grass) stabilises dunes.

Bars: A spit grows across a bay, sealing off water behind it to form a lagoon.

internet geography

Notes
Quizzes

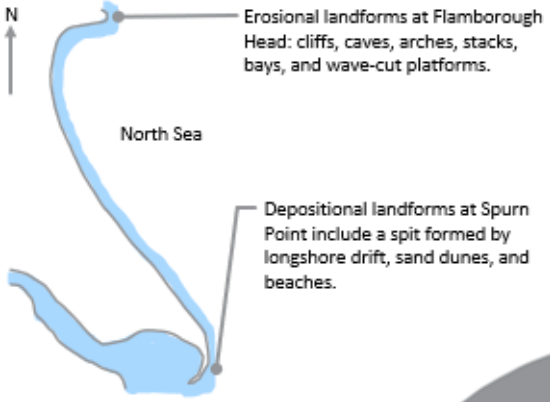
UK Coastal Landscapes

6. UK Coastline

Holderness

East Yorkshire | 61 km – Flamborough to Spurn Point

Chalk at Flamborough – boulder clay to the south



7. Hard Engineering

Hard engineering Hard Engineering refers to the use of large, man-made structures to directly control and defend against coastal erosion and flooding.

Strategies	Advantages	Disadvantages
Sea walls	Effective, long-lasting, reflect wave energy.	Very expensive, can cause scouring at base, visually intrusive.
Rock armour	Absorbs wave energy, relatively cheap.	Rocks can shift in storms, may be unattractive.
Gabions	Cheap, absorb wave energy well.	Shorter lifespan; can become unsightly if damaged.
Groynes	Builds up a wider beach by stopping longshore drift; can boost tourism.	Starves downdrift beaches; can look unnatural.

8. Soft Engineering

Soft engineering A more natural, sustainable approach to coastal management that works with natural processes to reduce erosion and flood risk with minimal environmental impact.

Beach nourishment: Adding sand or shingle (often brought from elsewhere) to widen and build up the existing beach.

✓ Creates wider beaches that dissipate wave energy, can enhance tourism.

✗ Needs frequent maintenance; can be expensive over time.

Beach reprofiling: Reshaping and redistributing sediment on a beach (e.g., bulldozing the upper beach to create a gentler slope).

✓ Helps absorb wave energy, reduces the rate of erosion.

✗ Can be disruptive to beach users; regular upkeep may be required.

Dune regeneration: Replanting and stabilising sand dunes (e.g., using marram grass) to form a natural buffer.

✓ Creates wildlife habitats, more sustainable and visually attractive.

✗ Easily damaged by human activity; not suitable for all coastlines.

9. Managed Retreat

Process: Letting low-value coastal land flood naturally, forming salt marshes that act as a buffer.
Pros: Creates habitats; more sustainable in the long run.
Cons: Loss of farmland or properties; compensation costs.
Examples: Examples of managed retreat in the UK include Donna Nook on the Lincolnshire Coast, Wallasea Island in the Thames Estuary and the Medmerry flood defence in Sussex.

10. Coastal Management

Mappleton: Holderness Coast; village population 342; 50 properties; B1242 coastal road.

Reasons for Management:

- Rapid cliff erosion (boulder clay) threatened the B1242 coastal road and local properties.
- Mappleton is a small village but strategically important due to the road link.

Management strategy:

- Hard engineering: Two rock groynes and rock armour (large granite boulders) along the base of the cliff.
- Soft engineering: cliff reprofiling.
- Cost: Approx. £2 million (installed in the 1990s).

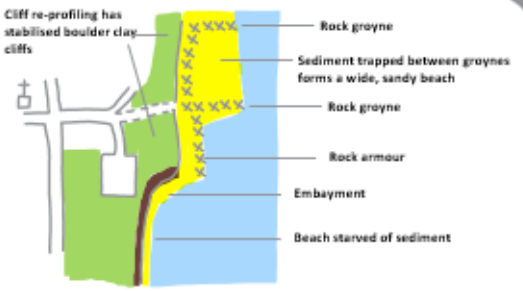
Effects and conflicts:

Positive:

- The groynes have built up the beach at Mappleton, protecting the village and road.
- Reduced erosion rates immediately behind the defences.

Negative:

- Down-drift areas (e.g., Cowden Farm) experience higher erosion due to sediment starvation.
- Some landowners south of Mappleton argue their land is being lost faster because of the defences.



Notes

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