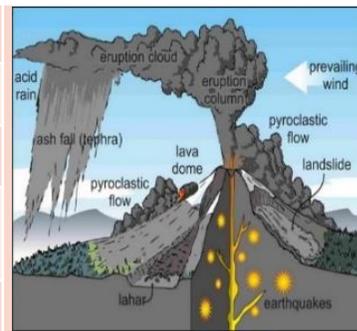


Year 9

Autumn Term

| The structure of the Earth      |   |
|---------------------------------|---|
| <b>The Crust</b>                | Varies in thickness (5-10km) beneath the ocean. Made up of several large plates.  |
| <b>The Mantle</b>               | Widest layer (2900km thick). The heat and pressure means the rock is in a liquid state that is in a state of convection.                              |
| <b>The Inner and outer Core</b> | Hottest section (5000 degrees). Mostly made of iron and nickel and is 4x denser than the crust. Inner section is solid whereas outer layer is liquid. |

| Volcanic Hazards        |   |
|-------------------------|---|
| <b>Ash cloud</b>        | Small pieces of pulverised rock and gnd glass which are thrown into the atmosphere. |
| <b>Gas</b>              | Sulphur dioxide, water vapour and carbon dioxide come out of the volcano.           |
| <b>Lahar</b>            | A volcanic mudflow which usually runs down a valley side on the volcano.            |
| <b>Pyroclastic flow</b> | A fast moving current of super-heated gas and ash (1000°C). They travel at 450mph.  |
| <b>Volcanic bomb</b>    | A thick (viscous) lava fragment that is ejected from the volcano.                   |



| Managing Volcanic Eruptions                                     |  |
|---|--|
| <b>Warning signs</b>  | <b>Monitoring techniques</b>   |
| Small earthquakes are caused as magma rises up.                 | Seismometers are used to detect earthquakes.                                       |
| Temperatures around the volcano rise as activity increases.     | Thermal imaging and satellite cameras can be used to detect heat around a volcano. |
| When a volcano is close to erupting it starts to release gases. | Gas samples may be taken and chemical sensors used to measure sulphur levels.      |

| Preparation  |   |
|--|---|
| Creating an exclusion zone around the volcano.               | Being ready and able to evacuate residents.                 |
| Having an emergency supply of basic provisions, such as food | Trained emergency services and a good communication system. |

| Convection Currents   |   |
|---|---|
| <b>The crust is divided into tectonic plates which are moving due to convection currents in the mantle.</b> |   |
| 1   | Radioactive decay of some of the elements in the core and mantle generate a lot of heat.                          |
| 2   | When lower parts of the mantle molten rock (Magma) heat up they become <b>less dense</b> and <b>slowly rise</b> . |
| 3   | As they move towards the top they cool down, become <b>more dense</b> and <b>slowly sink</b> .                    |
| 4   | These <b>circular movements</b> of semi-molten rock are <b>convection currents</b>                                |
| 5   | Convection currents create <b>drag</b> on the base of the tectonic plates and this causes them to move.           |

| LIC-CS: Haiti Earthquake 2010   |  |
|---|--|
| <b>Causes</b><br>On a <b>conservative plate margin</b> , involving the Caribbean & North American plates. The <b>magnitude 7.0 earthquake</b> was only <b>15 miles</b> from the capital Port au Prince. With a very <b>shallow focus of 13km deep</b> . |  |
| <b>Effects</b><br><b>230,000 people</b> died and 3 million affected. Many <b>emotionally affected</b> . <b>250,000 homes</b> collapsed or were damaged. <b>Millions homeless</b> . Rubble blocked roads and shut down ports.                            | <b>Management</b><br>Individuals tried to recover people. Many countries <b>responded with appeals or rescue teams</b> . Heavily relied on <b>international aid</b> , e.g. <b>\$330 million</b> from the EU. <b>98% of rubble</b> remained after <b>6 months</b> . |

| Earthquake Management   |  |
|---|--|
| <b>PREDICTING</b>   |  |
| <b>Methods include:</b>   |  |
| <ul style="list-style-type: none"> <li>Satellite surveying (tracks changes in the earth's surface)</li> <li>Laser reflector (surveys movement across fault lines)</li> <li>Radon gas sensor (radon gas is released when plates move so this finds that)</li> <li>Seismometer</li> <li>Water table level (water levels fluctuate before an earthquake).</li> <li>Scientists also use seismic records to predict when the next event will occur.</li> </ul> |  |

| Types of Plate Margins  |  |
|---|--|
| <b>Destructive Plate Margin</b>   |  |
| When the denser plate subducts beneath the other, friction causes it to <b>melt and become molten magma</b> . The magma forces its ways up to the surface to form a volcano. This margin is also responsible for <b>devastating earthquakes</b> .         |  |
| <b>Constructive Plate Margin</b>  |  |
| Here two plates are <b>moving apart</b> causing new magma to reach the surface through the gap. Volcanoes formed along this crack cause a submarine mountain range such as those in the <b>Mid Atlantic Ridge</b> .                                       |  |
| <b>Conservative Plate Margin</b>  |  |
| A conservative plate boundary occurs where plates <b>slide past each other</b> in opposite directions, or in the same direction but at different speeds. This is responsible for earthquakes such as the ones happening along the San Andreas Fault, USA. |  |

| Unit 1a  |  |
|--|--|
| <b>The Challenges of Natural Hazards</b>   |  |
| <b>What is a Natural Hazard</b>  |  |
| A natural hazard is a natural process which could cause death, injury or disruption to humans, property and possessions. |  |
| <b>Geological Hazard</b>   | <b>Meteorological Hazard</b>                     |
| These are hazards caused by land and tectonic processes.   | These are hazards caused by weather and climate. |

| Causes of Earthquakes   |  |
|---|--|
| Earthquakes are caused when two plates become <b>locked</b> causing <b>friction</b> to build up. From this <b>stress</b> , the <b>pressure</b> will eventually be released, triggering the plates to move into a new position. This movement causes energy in the form of <b>seismic waves</b> , to travel from the <b>focus</b> towards the <b>epicentre</b> . As a result, the crust vibrates triggering an earthquake. |  |
| The point directly above the focus, where the seismic waves reach first, is called the <b>EPICENTRE</b> .   |  |
| <b>SEISMIC WAVES</b> (energy waves) travel out from the focus.  |  |
| The point at which pressure is released is called the <b>FOCUS</b> .  |  |

| PROTECTION  |  |
|---|--|
| <b>You can't stop earthquakes</b> , so earthquake-prone regions follow these three methods to reduce potential damage:  |  |
| <ul style="list-style-type: none"> <li>Building earthquake-resistant buildings</li> <li>Raising public awareness</li> <li>Improving earthquake prediction</li> </ul>  |  |
| HIC - CS: Eyjafjallajökull (E15) Eruption, Iceland 2010   |  |
| <b>Causes</b><br>The North-American and Eurasian plates move apart on a <b>constructive plates</b> . The <b>disruption caused by Eyjafjallajökull</b> was the result of a series of <b>small volcanic eruptions from March to October</b> . |  |

|  |   |
|--|---|
| <b>Effects</b><br>The <b>thick ice cap</b> melted which caused major flooding. <b>No reported deaths</b> . Airspace closed across Europe, with at least <b>17,000 flights</b> cancelled. Costed insurers <b>£65m</b> to cancelled flights. | <b>Management</b><br>Iceland had a good warning system with <b>texts being sent</b> to residents within <b>30 minutes</b> . Large sections of <b>European airspace</b> were closed down due ash spread over the continent. Airlines developed <b>ash monitoring equipment</b> . |
|--|---|

## Global pattern of air circulation

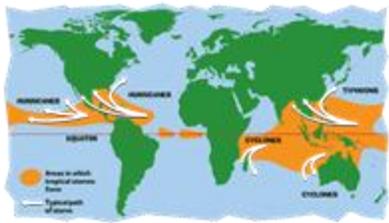
Atmospheric circulation is the large-scale movement of air by which heat is distributed on the surface of the Earth.

|                    |   |
|--------------------|---|
| <b>Hadley cell</b> | Largest cell which extends from the <b>Equator</b> to between <b>30° to 40° north &amp; south</b> . |
| <b>Ferrel cell</b> | Middle cell where air flows <b>poleward</b> between <b>60° &amp; 70°</b> latitude.                  |
| <b>Polar cell</b>  | <b>Smallest &amp; weakness</b> cell that occurs from the poles to the Ferrel cell.                  |



### Distribution of Tropical Storms.

They are known by many names, including **hurricanes** (North America), **cyclones** (India) and **typhoons** (Japan and East Asia). They all occur in a band that lies roughly **5-15°** either side of the Equator.



### High and Low Pressure

| Low Pressure   | High Pressure  |
|--|--|
| Caused by <b>hot air rising</b> . Causes stormy, cloudy weather. | Caused by <b>cold air sinking</b> . Causes clear and calm weather. |



### Formation of Tropical Storms

|   |  |
|---|--|
| 1 | The sun's rays heats large areas of ocean in the summer and autumn. This causes <b>warm, moist air</b> to rise over the particular spots   |
| 2 | Once the <b>temperature is 27°</b> , the rising warm moist air leads to a <b>low pressure</b> . This eventually turns into a thunderstorm. This causes air to be sucked in from the <b>trade winds</b> . |
| 3 | With trade winds blowing in the opposite direction and the rotation of earth involved (Coriolis effect), the thunderstorm will eventually start to <b>spin</b> .   |
| 4 | When the storm begins to <b>spin faster than 74mph</b> , a tropical storm (such as a hurricane) is officially born.  |
| 5 | With the tropical storm growing in power, <b>more cool air sinks</b> in the centre of the storm, creating calm, clear condition called the <b>eye of the storm</b> .                                     |
| 6 | When the tropical storm hits land, it <b>loses its energy source</b> (the warm ocean) and it begins to lose strength. Eventually it will 'blow itself out'.  |

## Changing pattern of Tropical Storms

Scientists believe that **global warming is having an impact on the frequency and strength of tropical storms**. This may be due to an **increase in ocean temperatures**.

### Management of Tropical Storms

|  |   |
|--|---|
| <b>Protection</b><br>Preparing for a tropical storm may involve construction projects that will improve protection.      | <b>Aid</b><br>Aid involves assisting after the storm, commonly in LIDs.                               |
| <b>Development</b><br>The scale of the impacts depends on the whether the country has the resources cope with the storm. | <b>Planning</b><br>Involves getting people and the emergency services ready to deal with the impacts. |
| <b>Prediction</b><br>Constant monitoring can help to give advanced warning of a tropical storm                           | <b>Education</b><br>Teaching people about what to do in a tropical storm.                             |



### Primary Effects of Tropical Storms

- The intense winds of tropical storms can destroy whole **communities, buildings and communication networks**.
- As well as their own destructive energy, the winds can generate abnormally high waves called **storm surges**.
- Sometimes the most destructive elements of a storm are these subsequent **high seas and flooding** they cause to coastal areas.

### Secondary Effects of Tropical Storms

- People are **left homeless**, which can cause distress, poverty and ill health due to lack of shelter.
- Shortage of clean water and lack of proper sanitation** makes it easier for diseases to spread.
- Businesses are damaged** or destroyed causing employment.
- Shortage of food as **crops are damaged**.

### Case Study: Typhoon Haiyan 2013

#### Causes

Started as a tropical depression on **2<sup>nd</sup> November 2013** and gained strength. Became a Category 5 "**super typhoon**" and made landfall on the Pacific islands of the Philippines.

#### Effects

- Almost **6,500 deaths**.
- 130,000 homes destroyed**.
- Water and sewage systems destroyed had caused **diseases**.
- Emotional grief** for dead.

#### Management

- The UN raised **£190m in aid**.
- USA & UK sent **helicopter carrier ships** deliver aid remote areas.
- Education** on typhoon preparedness.

## Case Study: UK Heat Wave 2003



### Causes

The heat wave was caused by an anticyclone (areas of high pressure) that stayed in the area for most of August. This blocked any low pressure systems that normally brings cooler and rainier conditions.

### Effect

- People suffered from heat strokes and dehydration.
- 2000 people died from causes linked to heatwave.
- Rail network disrupted and crop yields were low.

### Management

- The NHS and media gave guidance to the public.
- Limitations placed on water use (hose pipe ban).
- Speed limits imposed on trains and government created 'heatwave plan'.

### What is Climate Change?

Climate change is a **large-scale, long-term shift in the planet's weather patterns or average temperatures**. Earth has had tropical climates and ice ages many times in its 4.5 billion years.

### Recent Evidence for climate change.

|                                  |  |
|----------------------------------|--|
| <b>Global temperature</b>        | Average global temperatures have increased by more than <b>0.6°C since 1950</b> .  |
| <b>Ice sheets &amp; glaciers</b> | Many of the world's glaciers and ice sheets are melting. E.g. the Arctic sea ice has declined by <b>10% in 30 years</b> .                        |
| <b>Sea Level Change</b>          | Average global sea level has risen by <b>10-20cms</b> in the past 100 years. This is due to the additional water from ice and thermal expansion. |

### Enhanced Greenhouse Effect

Recently there has been an increase in **humans burning fossil fuels** for energy. These fuels (gas, coal and oil) emit **greenhouse gases**. This is making the Earth's atmosphere thicker, therefore trapping more solar radiation and causing **less to be reflected**. As a result, the Earth is becoming warmer.

### Evidence of natural change

|                           |   |
|---------------------------|---|
| <b>Orbital Changes</b>    | Some argue that climate change is linked to how the Earth orbits the Sun, and the way it wobbles and tilts as it does it.             |
| <b>Sun Spots</b>          | Dark spots on the Sun are called Sun spots. They increase the <b>amount of energy Earth receives</b> from the Sun.                    |
| <b>Volcanic Eruptions</b> | Volcanoes release large amounts of <b>dust containing gases</b> . These can <b>block sunlight</b> and results in cooler temperatures. |

### Managing Climate Change

|  |  |
|--|--|
| <b>Carbon Capture</b><br>This involves new technology designed to reduce climate change.                                 | <b>Planting Trees</b><br>Planting trees increase the amount of carbon is absorbed from atmosphere.   |
| <b>International Agreements</b><br>Countries aim to cut emissions by signing international deals and by setting targets. | <b>Renewable Energy</b><br>Replacing fossil fuels based energy with clean/natural sources of energy. |

Year 9

Spring Term

## Resource Challenges

Resources are things that humans require for life or to make our lives easier. Humans are becoming increasingly dependent on exploiting these resources, and as a result they are in high demand.

### Significance of Water

Resources such as food, energy and water are what is needed for basic human development.

#### FOOD

Without enough nutritious food, people can become **malnourished**. This can make them ill. This can prevent people working or receiving education.

#### WATER

People need a supply of **clean and safe water** for drinking, cooking and washing. Water is also needed for food, clothes and other products.

#### ENERGY

A good supply of energy is needed for a basic standard of living. People need **light and heat** for cooking or to stay warm. It is also needed for industry.

### Demand outstripping supply

The demand for resources like food, water and energy is rising so quickly that supply cannot always keep up. Importantly, access to these resources vary dramatically in different locations

#### 1. Population Growth

- Currently the global population is **7.3 billion**.
- Global population has risen **exponentially** this century.
- Global population is expected to reach **9 billion by 2050**.
- With more people, the **demand** for food, water, energy, jobs and space **will increase**.

#### 2. Economic Development

- As **LICs** and **NEEs** develop further, they require **more energy** for industry.
- LICs** and **NEEs** want similar lifestyles to **HICs**, therefore they will need to **consume more resources**.
- Development means **more water is required** for food production as diets improve.

#### Resource Reliance Graph

**Consumption** – The act of using up resources or purchasing goods and produce.  
**Carry Capacity** – A maximum number of species that can be supported.

**Resource consumption exceeds Earth's ability to provide!**

#### 3. Changing Technology and Employment

- The demand for resources has driven the **need for new technology** to reach or gain more resources.
- More people in the **secondary and tertiary industry** has increased the **demand for resources** required for electronics and robotics.

## Food in the UK

### Growing Demand

- The UK imports about 40% of its food. This increases people's **carbon footprint**.
- There is growing demand for greater choice of **exotic foods** needed all year round.
- Foods from abroad are more affordable.
- Many food types are unsuitable to be grown in the UK.

### Agribusiness

**Farming is being treated like a large industrial business. This is increasing food production.**  
 + Intensive farming maximises the amount of food produced.  
 + Using machinery which increases the farms efficiency.  
 - Only employs a small number of workers.  
 - Chemicals used on farms damages the habitats and wildlife.

### Impact of Demand

**Foods can travel long distances (food miles). Importing food adds to our carbon footprint.**  
 + Supports workers with an income  
 + Supports families in LICs.  
 + Taxes from farmers' incomes contribute to local services.  
 - Less land for locals to grow their own food.  
 - Farmers exposed to chemicals.

### Sustainable Foods

**Organic foods that have little impact on the environment and are healthier have been rising. Local food sourcing is also rising in popularity.**  
 • Reduces emissions by only eating food from the UK.  
 • Buying locally sourced food supports local shops and farms.  
 • A third of people grow their own food.

## Water in the UK

### Growing Demand

**The average water used per household has risen by 70%. This growing demand is predicted to increase by 5% by 2020.**  
 This is due to:  
 • A growing UK population.  
 • Water-intensive appliances.  
 • Showers and baths taken.  
 • Industrial and leisure use.  
 • Watering greenhouses.

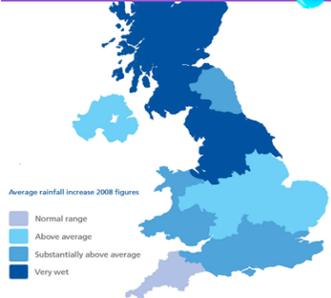
### Pollution and Quality

**Cause and effects include:**  
 • Chemical run-off from farmland can destroy habitats and kills animals.  
 • Oil from boats and ships poisons wildlife.  
 • Untreated waste from industries creates unsafe drinking water.  
 • Sewage containing bacteria spreads infectious diseases.

### Deficit and Surplus

The north and west have a **water surplus** (more water than is required).  
 The south and east have a **water deficit** (more water needed than is actually available).  
 More than half of England is experiencing **water stress** (where demand exceeds supply).

### Water stress in the UK



## Unit 2c



# The Challenge of Resource Management

## Energy in the UK

### Growing Demand

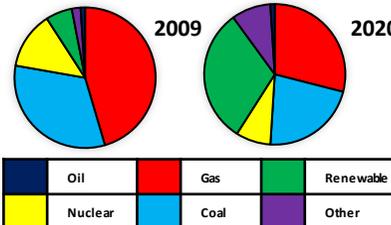
The UK **consumes less energy** than compared to the 1970s despite a smaller population. This is due to the **decline of industry**.

### Changes in Energy Mix

- 75% of the UK's oil and gas has been used up.
- Coal consumption has declined.
- UK has become too dependent on imported energy.

### Energy Mix

The majority of UK's energy mix comes from **fossil fuels**. By 2020, the UK aims for 15% of its energy to come from **renewable sources**. These renewable sources do not contribute to **climate change**.



### Management

UK has **strict laws** that limits the amount of discharge from factories and farms. **Education campaigns** to inform what can be disposed of safely. **Waste water treatment plants** remove dangerous elements to then be used for safe drinking. Pollution traps catch and filter pollutants.

### Water Transfer

Water transfer involves moving water through pipes from areas of surplus (Wales) to areas of deficit (London).  
**Opposition includes:**  
 • Effects on **land and wildlife**.  
 • High maintenance **costs**.  
 • The **amount of energy** required to move water over long distances.

## Energy in the UK (continued)

### Significance of Renewables

+ The UK government is investing more into low carbon alternatives.  
 + UK government aims to meet targets for reducing emissions.  
 + Renewable sources include wind, solar and tidal energy.  
 - Although infinite, renewables are still expensive to install.  
 - Shale gas deposits may be exploited in the near future

### Exploitation

**Nuclear**  
 New plants provide job opportunities.  
 Problems with safety and possible harm to wildlife.  
 Nuclear plants are expensive.

**Wind Farm**  
 Locals have low energy bills.  
 Reduces carbon footprint.  
 Construction cost is high.  
 Visual impacts on landscape.  
 Noise from wind turbines.

## Option 1: FOOD



Food Security is when people at all times need to have physical & economic access to food to meet their dietary needs for an active & healthy life. This is the opposite to Food Insecurity which is when someone is unsure when they might next eat.

### Human



- **Poverty** prevents people affording food and buying equipment.
- **Conflict** disrupts farming and prevents supplies.
- **Food waste** due to poor transport and storage.
- **Climate Change** is affecting rainfall patterns making food production difficult.

### Physical



- The **quality of soil** is important to ensure crops have key nutrients.
- **Water supply** needs to be reliable to allow food to grow.
- **Pest, diseases and parasites** can destroy vast amounts of crops that are necessary to populations.
- **Extreme weather** events can damage crops (i.e. floods).

### Daily Calorie Intake



This map shows how many **calories per person** that are consumed on average for each country. This can indicate the global distribution of **available food** and **food inequality**.

### Food Supply



This map shows the amount of **food produced** in different countries. Whilst Asia and **North America** have **high** production outputs, **Africa** and **Central America** have **low** production outputs.

### Increasing Food Supply



- **Hydroponics** - A method of growing plants without soil. Instead they use nutrient solution.
- **New Green Revolution** - Aims to improve yields in a more sustainable way. Involves using both GM varieties and traditional and organic farming.
- **Biotechnology** - Genetically modified (GM) crops changes the DNA of foods to enhance productivity and properties.
- **Irrigation** - Artificially watering the land so crops can grow. Useful in dry areas to make crops more productive.

### Sustainable Food Supply



This ensures that **fertile soil, water and environmental resources** are available for **future generations**.

- **Organic Farming** - The banned use of chemicals and ensuring animals are raised naturally.
- **Permaculture** - People growing their own food and changing eating habits. Fewer resources are required.
- **Urban Farming** - Planting crops in urban areas. i.e. roundabouts.
- **Managed Fishing** - Includes setting catch limits, banning trawling and promoting pole and line methods.

### C.S. Thanet Earth

- Located in **Kent**, the site involves four **huge greenhouses** using **hydroponics**.
- **Advantages**
  - Supports more than 500 jobs.
  - Produces food all year round.
  - Provides UK with food security.

### Disadvantages

- **Money generated mostly goes to large companies** not community.
- **Requires a lot of energy.**
- **Causes visual & light pollution.**

### C.S. NEE- Indus Basin Irrigation System

Largest irrigation scheme in the world. Involves large and small dams. Thousands of channels provides water to supports Pakistan's rich farmlands.

### Advantages

- **Improves food security** by adding 40% more land for farming.
- **Increased yield & range of foods.**

### Disadvantages

- **Few take an unfair share of water**
- **Water is wasted and demand is rising** due to population growth.
- **High cost to maintain reservoirs.**

## Option 2: WATER



Water security is when people have good access to enough clean water to sustain well-being and good health. Water insecurity is when areas are without sufficient water supplies. Water Stress is when less than 1700m<sup>3</sup> is available per person.

### Human



- **Pollution** caused from human and industrial waste being dumped into peoples water sources.
- **Poverty** prevents low income families affording water.
- **Limited infrastructure** such as a lack of water pipes and sewers.
- **Over-abstraction** is when more water is taken than is replaced.

### Physical



- **Climate** needs to provide enough rainfall to feed lakes and rivers. Droughts affect supply if water.
- **Geology** can affect accessibility to water. Permeable rock means sourcing water from difficult aquifers, whereas impermeable allows water to run-off into easily collected basins.

### Impact of Water Insecurity



#### Food production

The less water available for irrigating crops the less food that will be produced. This could lead to starvation.

#### Industrial output

Manufacturing industries depend heavily on water. A severe lack of water can impact economic output.

#### Disease and Water Pollution

Inadequate sanitation systems pollutes drinking water causing diseases such as cholera and typhoid.

#### Water conflict

Water sources that cross national borders can create tensions and even war between countries.

### Increasing Water Supply



- **Water diversion** - Involves diverting water to be stored for longer periods. Often water is pumped underground to prevent evaporation.
- **Dams and Reservoirs** - Dams control flow and storage of water. Water is released during times of water deficit.
- **Water transfer** - includes schemes to move water from areas of surplus to areas of deficit.
- **Desalination** - Involves the extraction of salt from sea water to produce fresh drinking water.

### Sustainable Water Supply



Ensures water supplies don't cause **damage to the environment** whilst also supporting the local economy.

- **Water conservation** - Aims to reduce the amount of water wasted.
- **Groundwater Management** - Involves the monitoring of extracting groundwater. Laws can be introduced.
- **Recycling and 'Grey' Water** - Means taking water that has already been used and using it again rather than returning it to a river or the sea. This includes water taken from bathrooms and washing machines.

### C.S. NEE - The Waken River Basin

A project in India that aims to improve water use by encouraging greater use of **rainwater harvesting techniques**.

#### How does the project work?

- Provides 'taankas' that store water underground.
- Small dams called 'johed' interrupt water flow and encourages infiltration.
- Villages take turns to irrigate their fields so water is not overused.
- Maintained by farmers so it is entirely sustainable.
- Greater education for awareness.

## Option 3: ENERGY



Energy security means having a reliable, uninterrupted and affordable supply of energy available. Energy insecurity can be experienced by countries with both a high and low energy consumption. Technology is increasing energy consumption.

### Physical



- **Geology** determines the availability of fossil fuels.
- **Climate variations** will affect the potential use of renewable energy.
- **Natural disasters** can damage energy infrastructure.

### Economic



- **Cost** of extracting fossil fuels is becoming costly and difficult.
- **Price of fossil fuels** are volatile to potential political changes.
- **Infrastructure** for energy is costly, especially for LICs.

### Technology



- **New technology** is making once difficult energy sources now reachable/exploitable.

### Political



- **Conflict** and turmoil in energy rich countries can affect exports.
- **Stricter regulations** over Nuclear.

### Impact of Energy Insecurity



#### Sensitive environments

Exploration of energy resources threatens to harm sensitive areas such as the oil drilling in Alaska, USA.

#### Food production

Food production depends on the energy needed to power machinery and transport goods to different markets.

#### Energy conflict

Shortages of energy resources can lead to tensions and violence. Conflict can be caused by fear of energy insecurity.

#### Industry

Countries can suffer from shortfalls in energy leading to a decline in manufacturing and services.

### Increasing Energy Supply

- **Non-renewables**
  - **Fossil Fuels** - Conventional power stations can be made more efficient with carbon capture overcoming the environmental impacts.
  - **Nuclear** - Once a nuclear plant is built it can provide a cheap and long-term dependable source of energy.
- **Renewables**
  - **Wind, Solar, Biomass** - These are examples of environmentally friendly renewable sources that can't run out but cost a lot to install.

### Sustainable Energy Supply

This involves **balancing supply & demand**. It also includes **reducing waste & supporting the environment**.

- **Home design** - Building homes to conserve energy. i.e. roof insulation.
- **Reduce demand** - Changing attitudes towards energy used to save energy.
- **Efficient technology** - Making cars more efficient by improving engine design and weight. i.e. Hybrid engines.
- **Transport** - Using public buses & bikes.

### C.S. UK Fracking

**Fracking** is used to extract natural gas trapped in underground shale rock. It is a method considered by the UK.

#### Advantages

- **Estimated to create 64,000 jobs.**
- **UK has large shale gas reserves.**
- **Is far cheaper than natural gas.**

#### Disadvantages

- **May cause groundwater pollution**
- **Is a non-renewable resource.**
- **May trigger minor earthquakes.**

### C.S. NEE - Chambamontera

Chambamontera is an isolated community in the Andes of Peru. It introduced a micro-hydro to exploit water power as an energy source.

#### Benefits to the community

- **Provides renewable energy.**
- **Low maintenance & running costs**
- **Has little environmental impacts.**
- **Using local labour and materials.**
- **Businesses are developing.**
- **Less wood is needed to be burnt.**

Year 9

Summer Term

## Coastal Defences

| Hard Engineering Defences |   |  |
|---------------------------|---|--|
| <b>Groynes</b>            | Wood barriers prevent longshore drift, so the beach can build up.                   | <ul style="list-style-type: none"> <li>✓ Beach still accessible.</li> <li>✗ No deposition further down coast = erodes faster.</li> </ul>                           |
| <b>Sea Walls</b>          | Concrete walls break up the energy of the wave. Has a lip to stop waves going over. | <ul style="list-style-type: none"> <li>✓ Long life span</li> <li>✓ Protects from flooding</li> <li>✗ Curved shape encourages erosion of beach deposits.</li> </ul> |
| <b>Gabions or Rip Rap</b> | Cages of rocks/boulders absorb the waves energy, protecting the cliff behind.       | <ul style="list-style-type: none"> <li>✓ Cheap</li> <li>✓ Local material can be used to look less strange.</li> <li>✗ Will need replacing.</li> </ul>              |

## Soft Engineering Defences

|                          |  |   |
|--------------------------|--|---|
| <b>Beach Nourishment</b> | Beaches built up with sand, so waves have to travel further before eroding cliffs. | <ul style="list-style-type: none"> <li>✓ Cheap</li> <li>✓ Beach for tourists.</li> <li>✗ Storms = need replacing.</li> <li>✗ Offshore dredging damages seabed.</li> </ul> |
| <b>Managed Retreat</b>   | Low value areas of the coast are left to flood & erode.                            | <ul style="list-style-type: none"> <li>✓ Reduce flood risk</li> <li>✓ Creates wildlife habitats.</li> <li>✗ Compensation for land.</li> </ul>                             |

## Case Study: Hunstanton Coast

**Location and Background**  
 Located on the North-West coast of Norfolk. The town is a popular sea resort for tourists to visit all year round. In 2013, the town suffered damage from a storm surge. The Sea Life Centre was flooded and closed for a number of months.

**Geomorphic Processes**  
 - Old Hunstanton is dominated by dunes that are formed when sand is trapped and built up behind objects.  
 -Hunstanton Cliffs are made from three different bands of rock (sandstone, red chalk and white chalk).  
 -Hunstanton Cliff are exposed to cliff retreat. This is when a wave-cut notch develops enough for the cliff face to become unstable and eventually collapses.  
 -Longshore drift travels from Sheringham in the north to the Wash in the south.

**Management**  
 -Hunstanton is protected by a number of groynes. These trap sand to build up the beach for better protection.  
 -The town is also protected by large sea walls to prevent flooding and deflect the waves energy.  
 -\$15 million has been spent on beach nourishment to add sediment to beach for increased protection against flooding.

## Water Cycle Key Terms

|                       |   |
|-----------------------|---|
| <b>Precipitation</b>  | Moisture falling from clouds as rain, snow or hail. |
| <b>Interception</b>   | Vegetation prevent water reaching the ground.       |
| <b>Surface Runoff</b> | Water flowing over surface of the land into rivers  |
| <b>Infiltration</b>   | Water absorbed into the soil from the ground.       |
| <b>Transpiration</b>  | Water lost through leaves of plants.                |

## Physical and Human Causes of Flooding.

|   |  |
|---|--|
| <b>Physical: Prolong &amp; heavy rainfall</b><br>Long periods of rain causes soil to become saturated leading runoff. | <b>Physical: Geology</b><br>Impermeable rocks causes surface runoff to increase river discharge.                   |
| <b>Physical: Relief</b><br>Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.  | <b>Human: Land Use</b><br>Tarmac and concrete are impermeable. This prevents infiltration & causes surface runoff. |

## Upper Course of a River

Near the source, the river flows over steep gradient from the hill/mountains. This gives the river a lot of energy, so it will erode the riverbed vertically to form narrow valleys.

## Formation of a Waterfall

- 1) River flows over alternative types of rocks.
- 2) River erodes soft rock faster creating a step.
- 3) Further hydraulic action and abrasion form a plunge pool beneath.
- 4) Hard rock above is undercut leaving cap rock which collapses providing more material for erosion.
- 5) Waterfall retreats leaving steep sided gorge.

## Middle Course of a River

Here the gradient get gentler, so the water has less energy and moves more slowly. The river will begin to erode laterally making the river wider.

## Formation of Ox-bow Lakes

| Step 1  | Step 2  |
|---|---|
| <p>Erosion of outer bank forms river cliff. Deposition inner bank forms slip off slope.</p> | <p>Further hydraulic action and abrasion of outer banks, neck gets smaller.</p> |
| Step 3  | Step 4  |
| <p>Erosion breaks through neck, so river takes the fastest route, redirecting flow</p>      | <p>Evaporation and deposition cuts off main channel leaving an oxbow lake.</p>  |

## Lower Course of a River

Near the river's mouth, the river widens further and becomes flatter. Material transported is deposited.

## Formation of Floodplains and levees

When a river floods, fine silt/alluvium is deposited on the valley floor. Closer to the river's banks, the heavier materials build up to form natural levees.

- ✓ Nutrient rich soil makes it ideal for farming.
- ✓ Flat land for building houses.

## River Management Schemes

| Soft Engineering  | Hard Engineering   |
|---|--|
| <p><b>Afforestation</b> – plant trees to soak up rainwater, reduces flood risk.</p> <p><b>Demountable Flood Barriers</b> put in place when warning raised.</p> <p><b>Managed Flooding</b> – naturally let areas flood, protect settlements.</p> | <p><b>Straightening Channel</b> – increases velocity to remove flood water.</p> <p><b>Artificial Levees</b> – heightens river so flood water is contained.</p> <p><b>Deepening or widening river</b> to increase capacity for a flood.</p> |

## Hydrographs and River Discharge

River discharge is the volume of water that flows in a river. Hydrographs who discharge at a certain point in a river changes over time in relation to rainfall

1. **Peak discharge** is the discharge in a period of time.
2. **Lag time** is the delay between peak rainfall and peak discharge.
3. **Rising limb** is the increase in river discharge.
4. **Falling limb** is the decrease in river discharge to normal level.

## Case Study: The River Tees

**Location and Background**  
 Located in the North of England and flows 137km from the Pennines to the North Sea at Red Car.

**Geomorphic Processes**  
**Upper** – Features include V-Shaped valley, rapids and waterfalls. High Force waterfall drops 21m and is made from harder Whinstone and softer limestone rocks. Gradually a gorge has been formed.  
**Middle** – Features include meanders and ox-bow lakes. The meander near Yarm encloses the town.  
**Lower** – Greater lateral erosion creates features such as floodplains & levees. Mudflats at the river's estuary.

**Management**  
 -Towns such as Yarm and Middlesbrough are economically and socially important due to houses and jobs that are located there.  
 -Dams and reservoirs in the upper course, controls river's flow during high & low rainfall.  
 - Better flood warning systems, more flood zoning and river dredging reduces flooding.



| Location and Background  |
|--|
| <p>Sheffield is a city in South Yorkshire in the North of England. The population of the city is 575,000, making it the fifth largest in the UK. The city grew during the industrial revolution.</p>  |

| City's Importance   |
|---|
| <ul style="list-style-type: none"> <li>The city enjoys a large sporting heritage with famous athletes and football clubs.</li> <li>Sheffield is famous for being described as the greenest city in Europe.</li> <li>Sheffield has a thriving community of international students.</li> <li>Sheffield has two major UK universities popular with young students.</li> <li>Fastest growing city outside of London.</li> </ul> |

| Location and Background  |
|--|
| <p>Rio is a coastal city situated in the South East region of Brazil within the continent of South America. It is the second most populated city in the country (6.5 million) after Sao Paulo.</p>  |

| City's Importance   |
|---|
| <ul style="list-style-type: none"> <li>Has the second largest GDP in Brazil It is headquarters to many of Brazil's main companies, particularly with Oil and Gas.</li> <li>Sugar Loaf mountain is world heritage site</li> <li>One of the most visited places in the Southern Hemisphere.</li> <li>Hosted the 2014 World Cup and 2016 Summer Olympics.</li> <li>Christ the Redeemer is a new 7 wonder.</li> </ul> |

| Migration to Sheffield  |
|---|
| <p>During the industrial revolution, the population dramatically increased with people migrating from nearby rural communities.</p>  |
| <p>With the attraction of working in the large steelworks or mines, international migrants from Ireland, Pakistan and the Caribbean came to work in Sheffield from 1900-1960.</p>                                     |
| <p>More recently, refugees have arrived from Syria and Iraq. Also Sheffield has attracted thousands of students from the UK &amp; abroad.</p>   |

| City's Opportunities  |
|---|
| <p><b>Social:</b> Sheffield has various cultural attractions such as the Crucible Theatre &amp; museums. Also Meadowhall is very popular with shoppers.</p>   |
| <p><b>Economic:</b> The retail sectors contribute to thousands of jobs. The Universities and advanced manufacturing contributes to the city's economy.</p>  |
| <p><b>Environmental:</b> Sheffield is described as being the greenest city in Europe. It's close to the Peak District and has various open spaces (i.e. the Peace Garden) for residents to enjoy.</p> |

| Migration to Rio De Janeiro   |
|---|
| <p>The city began when Portuguese settlers with slaves arrived in 1502. Since then, Rio has become home to various ethnic groups.</p>  |
| <p>However, more recently, millions of people have migrated from rural areas that have suffered from drought, lack of services and unemployment to Rio. People do this to search for a better quality of life.</p>        |
| <p>This expanding population has resulted in the rapid urbanisation of Rio de Janeiro.</p>  |

| City's Opportunities  |
|---|
| <p><b>Social:</b> Standards of living are gradually improving. The Rio Carnival is an important cultural event for traditional dancing and music.</p>                   |
| <p><b>Economic:</b> Rio has one of the highest incomes per person in the country. The city has various types of employment including oil, retail and manufacturing.</p> |
| <p><b>Environmental:</b> The hosting of the major sporting events encouraged more investment in sewage works and public transport systems.</p>                          |

| City Challenges   |
|---|
| <p><b>Social:</b> House prices have increased along with greater house shortages. A third of households live in the 10% of the most deprived wards in the UK.</p>                 |
| <p><b>Economic:</b> Closure of the steelworks and factories caused large scale unemployment. Poor transport connections to large economic hubs such as London and Manchester.</p> |
| <p><b>Environmental:</b> Urban sprawl has led to increased pressure and decline of greenfield sites around the city.</p>  |

| Sheffield City Centre Regeneration Projects  |
|--|
| <p>Aims: Sheffield wanted to attract investment in more businesses and job opportunities. Also the projects aim to improve public spaces with more green urban environments.</p>   |
| <p>Main features: Brownfield sites and derelict buildings pulled down, £50 million invested on its train station to improve connections, £120 million on green open spaces with the construction of the Winter Gardens and Peace Gardens, £430m to improve the retail quarter and attract shoppers away from Meadowhall.</p> |

| City Challenges   |
|---|
| <p><b>Social:</b> There is a severe shortage of housing, schools and healthcare centres available. Large scale social inequality, is creating tensions between the rich and poor.</p> |
| <p><b>Economic:</b> The rise of informal jobs with low pay and no tax contributions. There is high employment in shanty towns called Favelas</p>                                      |
| <p><b>Environmental:</b> Shanty towns called Favelas are established around the city, typically on unfavourable land, such as hills.</p>  |

| Self-help schemes - Rocinha, Bairro Project  |
|--|
| <ul style="list-style-type: none"> <li>The authorities have provided basic materials to improve peoples homes with safe electricity and sewage pipes.</li> <li>Government has demolished houses and created new estates.</li> <li>Community policing has been established, along with a tougher stance on gangs with military backed police.</li> <li>Greater investment in new road and rail network to reduce pollution and increase connections between rich and poor areas.</li> </ul> |

