

# Sustainability is the key principle throughout the GCSE course.

- It can be in relation to tourism, rural or urban areas, transport, water, recycling, buildings or climate change.
- It is to do with living in a way that does as little damage to our environment as possible and ensures that the local economy and culture benefits.
- Examples include: Sustainable management of Snowdonia National Park, ecotourism in Costa Rica, sustainable solutions to flood

management, sustainable water use and sustainable rural and urban living. It is also relevant when looking at sustainable living – climate change, carbon & ecological footprints and food miles.

# Unit 1 - Year 10 work (3 themes)

# <u>Core Topic</u>

# Theme 1 - Landscape Processes (GREEN)

**Distinctive landscapes in Wales**: Wales has highland and lowland areas and a wide variety of natural environments:

MountainsLakesRiversBeachesIslandsValleysForestsWaterfallsCavesCliffsManagement of Snowdonia National Park (large protected area of countryside)It is a 'Tourist Honeypot' (popular tourist site) with a 'carrying capacity'

(limit to how many people it can take, before it's damaged.

If managed well tourism here can be **sustainable**.

- \* Varied local economy
- \* Spreading visits through the year

\* Guides/rangers to help visitors

- \* Re-investing money (positive multiplier)
- \* Variety of sites/attractions\* Environmental protection
- \* Protect local culture











#### River/Coastal Processes and Landforms - River and wave erosion:

- 1) **HYDRAULIC ACTION** the power of the water wears away rocks.
- 2) **ABRASION** Rocks carried rub and scrape against the bed, banks or cliff.
- 3) **SOLUTION** The water in the river dissolves certain rocks it flows over.
- 4) **ATTRITION** Rocks and stones bump and bang against each other.



Weathering - rocks are also broken down by changes around them - Freeze-thaw, chemical.

# Deposition - when energy is lost sediment/rocks are dropped.



## Coastal landforms

A-Hydraulic action will attack the weakness and enlarge it forming a cave.

B-The cave will get larger on both sides of the headland and they will eventually meet to form an arch.

C-The arch will grow until the roof collapses to leave a stack on its own out at sea.

Waves come in at

an angle carrying



as sea loses

# **River Flooding and Management**



## Factors affecting landform development

Landforms will develop at different speeds depending on:

- 1) Geology harder rocks erode faster than softer ones.
- 2) Climate stormy conditions will increase waves and river discharge causing erosional landforms to develop more quickly.
- 3) Human activity people building structures (hard engineering) can affect the landform.

# Core Topic Theme 2 - Rural-Urban Links (YELLOW)

## Rural and Urban change in Wales

Rural - countryside areas with some small towns and villages e.g. Mid Wales, Pembrokeshire, Snowdonia Urban - built up areas such as large towns and cities e.g. Cardiff, London, Mumbai

Urban-rural continuum - today there is a gradual change between urban and rural areas as cities have expanded out into the surrounding countryside.

Sphere of Influence - every town or city has an area around it that it influences or affects. It will pull in **commuters**, shoppers,

students, patients from these areas. Cardiff has the largest sphere of influence in Wales.

Counterurbanisation - In recent years more and more people in the UK are choosing to live in rural areas. They choose to leave the cities as the result of **push factors** (air pollution, crime, traffic) and are attracted by the **pull factors** (quiet lifestyle, open space). This is the opposite of many poorer countries (LICs - Low Income Countries) such as India where urbanisation is still happening.

<u>Creating a sustainable rural community (Pwllglas)</u> - village in north Wales was once in decline but now has a rising population. What was done?

- \* Installed broadband
- \* Created Siop Pwllglas
- \* Reopened village pub
- Managing traffic issues in cities (Cardiff) Many ideas suggested to improve traffic congestion problems in Cardiff, including:
  - \* Trams (Metro system)
  - \* Park and ride schemes \* Improved bus services
    - 5



\* Converted school to gym

\* Bus services restarted

- \* Created local jobs
- - \* Congestion charging

# **Population Change**

## Population change:

- 1) Birth rate Death rate
- 2) Migration (people moving in or out)

The UK and other HICs (High Income countries) tend to have low rates of natural change but large increases in migrants from other areas of the world. They also have an **ageing population**.

# Population challenges in UK



Ageing population	Housing shortage
+ Older people could work for longer (pay	<ul> <li>Make more land available to build on</li> </ul>
tax, not receive pension)	<ul> <li>Build on 'recycled' Brownfield sites</li> </ul>
+ Can help to care for grandchildren	<ul> <li>Build more affordable housing in</li> </ul>
+ Older people help to train younger people	popular areas such as London
	<ul> <li>Ensure there is enough social housing</li> </ul>
- Cost of pensions is rising	for people on lower incomes
- More strain on NHS	<ul> <li>Ensure all new houses are eco-friendly</li> </ul>
- Less tax being paid to government	and sustainable

# Challenges Facing Modern Cities

<u>Cardiff Bay redevelopment/regeneration</u> Upgrading and improving a **brownfield** former industrial area. Improvements to the local economy, environment and housing. Not all is sustainable and many locals form old areas have been forced out.

## Retailing in cities

- CBD city centre shops
- Shopping parades
- Out of town stores
- Online retailing

Traditional towns struggling to cope with increased competition. Need to find ways to fightback - improve environment, events, free parking etc.



# **Global Cities**

**Global cities** are cities with a global reach and influence due to their trade, tourism, culture, history, infrastructure or transport.

## <u>Urban Issues in Mumbai</u>

\*Transport - Mumbai has over 7 million daily commuters and under developed roads and railways leading to huge overcrowding and congestion.

\* Employment - Many people in India work in **informal** jobs such as street vendors or recyclers.



## <u>Bhendi Bazaar redevelopment</u>



An area of chawls redeveloped into modern flats for families with up to date facilities and a mix of shops and open space. All have toilets, showers and are solar powered.



# Urban Issues in Cardiff

- Ethnic minorities in Cardiff **ethnic minority** groups tend to be found in the inner city areas such as Grangetown and Canton.
- Wealth vs Poverty in Cardiff Cardiff is divided into areas with wealthier people such as Pontcanna and Radyr and areas with high levels of **deprivation** such as Butetown and Ely. To try to improve these deprived areas many such as Cardiff Bay have been redeveloped e.g. Cardiff Bay (see previous page).





#### Plate movement

**Convection currents** in the partially melted **mantle** of the earth drive the movement of the crustal plates on the surface. Denser ocean plates are dragged down by the process of **slabpull**.



#### Types of Plate Boundary/Margin

The type of plate margin controls the types of hazards and landforms.

- a) <u>Constructive (divergent)</u> Can be under the sea (Mid-Atlantic ridge) or on land (Iceland). Plates forced apart to produce a **rift valley**. Runny lava produces wide, low **shield volcanoes**. Very few large earthquakes produced.
- b) <u>Destructive (convergent)</u> where tectonic plates meet. Either:
- Continental meets oceanic denser oceanic plate subducted under the less dense continental one. Melting of subducted plate creates magma which rises to create steep stratovolcanoes. These can be steep and tall and can explosively erupt, often collapsing afterwards to create a caldera. Lots of friction creates earthquakes. Continental plate is often pushed up to create Fold Mountains.

- Oceanic meets oceanic one of the two ocean plates will be subducted. This produces a chain of volcanic islands known as an island arc.
- c) <u>Volcanic hotspots</u> Strong convection currents can push magma through the ocean crust to produce shield volcanoes (e.g. Hawaii).



Other volcanic features:

Geyser - hot water vent near a volcano

Cinder cones - small volcanoes made of ash and rock

Lava tubes - a tunnel created from lava flowing underground

## Tectonic hazards and management

To reduce the impact of hazards people must **reduce the vulnerability** of the people and **build their capacity** to cope.

1) Earthquake hazards - Primary: Ground shaking (Richter scale)

Secondary: Tsunamis and fire

Case studies: Nepal 2015, Tohoku, Japan, 2011

<u>Responding</u> :	Protection – Earthquake proof designs for buildings. Preparation – Practising drills and evacuations, educating the people on how to respond. Get emergency supplies (medicines, water, food and tents) to people	
2) Volcanic	hazards -	Primary: <b>Lava</b> , Ash and Pyroclastic flows Secondary: Mudflows (lahars) Case studies: Mount Merapi 2010, Monserrat 1995
<u>Responding</u> :	Protection – Dive Prediction – Mor	erting lava flow with barriers. nitoring heat, gas minor earthquakes, hazard mapping.

## Unit 2 - Year 11 work (3 themes)

# <u>Core Topic</u> <u>Theme 3 - Weather, Climate and Ecosystems (BLUE)</u> <u>Climate change (causes and evidence)</u>

Most of the chemicals that make up living tissue contain **carbon**. When organisms die the carbon is **recycled** so that it can be used by future generations. The model that describes the processes involved is called the **carbon cycle**.

#### The enhanced greenhouse effect

 Sunlight (solar radiation) reaches the earth.
 The solar radiation passes through natural greenhouse gases in the atmosphere and heats the earth's surface.

 3) Some energy in the form of invisible infrared radiation is reflected back to space.
 4) The layer of greenhouse gases reflect heat back to Earth keeping it warm.

5) The earth maintains a stable temperature as some heat is lost and some reflected back.

\* <u>Humans</u>; use transport (cars, lorries, planes);





burn **fossil fuels** (coal, oil) for electricity; burn and cut down trees. This increases the concentration of greenhouse gases in the atmosphere. They act like a blanket around the atmosphere. Therefore, more heat is reflected back and the earth's temperature rises.

#### Evidence for climate change

- Long-term: CO<sub>2</sub> extracted from **Ice cores** show that world temperatures have varied over the last 600,000 years. Temperature seems to follow CO<sub>2</sub> levels very closely.
- Medium-term: **Historical records** show that the earth has gone through warm and cold periods over the last 1000 years.
- Short-term: Accurate CO<sub>2</sub> measurements have been taken for the last 100-150 years showing the link between **atmospheric CO<sub>2</sub> levels** and temperature.

Direct evidence such as CO<sub>2</sub> levels, **sea level changes** and tree rings are accurate but historical records are not as reliable.

• Volcanoes – There is no doubt that large volcanic eruptions can affect global temperatures but only on a small-scale for a short period of time. Volcanoes account for less than 1% of greenhouse gas emissions.

# <u>Causes and consequences of weather hazards</u> Global air circulation creates areas of LOW and HIGH pressure around the world. These control the type of weather that dominates and can create distinctive weather hazards.



Extreme low pressure hazards = Hurricanes (Hurricane Katrina 2005) Hurricanes are caused by low pressure depressions forming over the **warm tropical ocean**. The huge storm clouds form and start to swirl as winds combine at the **ITCZ** (Inter tropical convergence zone). They move to the west across the Atlantic heading towards the Caribbean and USA. **Hurricane Katrina** was a category 5 (strongest) storm that hit New Orleans in the USA causing huge flooding (**storm surge**) affecting many poor areas and killing over 1800 people.

# <u>Responses</u>

Planning: where to build and stronger, flood proof housing. Prediction: giving warning through accurate tracking and prediction. Preparation: ensuring people know how to prepare, evacuate and rescue.

• Hurricanes around the world are becoming stronger and more regular as sea temperatures rise due to climate change.

Extreme high pressure hazards = Drought (Sahel, Africa 1980s-today)

The **Sahel** region of **North Africa** area naturally experiences alternating wet and dry seasons. If the rains fail it can cause **drought**.



In the last thirty years, **climate change** has caused rains to fail more often and the area suffers from a severe shortage of water. Lack of water often leads to the land being overused and causes **desertification**.

# Responses (all ideas must use 'appropriate technology')

Improving water supply: **Storing water** in water butts and water tables. Improved farming: Drip irrigation and 'drought proof' crops. **Great green wall** – planting millions on trees to stop the spread of desert.

• With all types of weather (and tectonic) hazards **LICs are affected more severely than HICs**. This is because they are **more vulnerable** and less able to cope, due to the poverty and lack of resources.

## What affects the weather and climate of the UK?

Factors controlling our weather

- Latitude we are quite far north (52-55°N) so quite cool.
- Altitude higher areas of UK are cooler and get more relief rainfall.
- Oceans UK is surrounded by seas so we have mild and wet weather.
- Air masses where the air comes from has a big effect on the weather conditions in the UK.

## High and low pressure in the UK

**High pressure** weather systems are called **anticyclones**. They bring longperiods (up to a week) of stable, sinking air. This gives us **warm and dry** (summer - drought possible) or **cold and dry** (winter - icy) conditions.



Low pressure systems are called depressions. As the name suggests they

bring us cooler, wetter conditions than expected. They can happen all year round and have the same general pattern of weather over the 24-48 hours they take to pass over the UK. Lots of rain, cloud and



strong winds can be expected.

Microclimates - weather can change on a very small-scale often due to:

- > Shelter this can slow winds and warm temperatures
- > Buildings provide shelter and give off heat
- > Aspect south facing slopes receive more sunlight = warmer
- > Natural features such as forests provide shelter and warmth
- > Surfaces darker ground absorbs more heat, ice/snow reflects it

## Processes in large-scale ecosystems (Biomes)

Large areas with similar climate and vegetation are known as **biomes**. The world's biomes are controlled by their location and climate. There are three broad groups of biomes: Tropical (rainforest, desert and grassland), Temperate (Mediterranean, UK) and Polar (Arctic tundra and forest).

\* Knowledge of two case studies: Food web, climate, nutrient, water and carbon cycles \*

## Case study 1 - Arctic tundra biome

Very cold and dry with very little rainfall all year. Frozen through winter.

Nutrient cycle: <u>Arctic Tundra</u> Show how energy and nutrients are transferred through the biome. Notice that in the Arctic there is little biomass (living material) and so little energy/nutrients are moved. Frozen for most of the year.



<u>Case study 2 - Tropical rainforest biome</u> Hot and wet conditions throughout the year. Two seasons - wet and dry.

Nutrient cycle: <u>Tropical Rainforest</u> Notice that in the Rainforest there is huge amounts of biomass (living material) and so more energy/nutrients are moved. Litter rots quickly back into soil and nutrients are quickly taken back in by rapidly growing plants and animals.



Both the Arctic Tundra and Tropical Rainforest biomes are known as **carbon sinks** as they store huge amounts of carbon (Frozen in the soil in the Arctic and in the biomass in the rainforest). However, as global temperatures rise this carbon is released as  $CO_2$  into the atmosphere, so both biomes could become **carbon sources**.

# <u>Key services provided by biomes/ecosystems (smaller-scale biomes)</u> Ecosystems provide many **key services** for humans:

\* Water supply

\* Climate control

- \* Food supply
- \* Fuel supply
- \* Biodiversity \* Education
- \* Resources
- \* Water control (flooding)
- \* Leisure and recreation

We must use our ecosystems carefully or they will be damaged or destroyed.

Arctic Tundra	Tropical Rainforest
Damaged by: <b>Mining</b> for oil, gas and other resources, <b>transport</b> of these resources. <b>Overhunting/Overfishing</b> of bio-resources. <b>Climate change</b> is threatening the biome.	Damaged by: <b>Deforestation</b> to provide land for <b>cattle ranching</b> or smaller-scale farming ( <b>shifting cultivation</b> ). Also mining for resources, dam building and road transport.
<ul> <li><u>Sustainable development:</u></li> <li>North-East Greenland National Park</li> <li>Adventure tourism – getting people to visit to protect traditional way of life and culture.</li> <li>Transport – only traditional methods allowed, no environmental damage.</li> <li>Local people – involved in guiding the tourists and educating them.</li> <li>Money re-invested in local villages and younger people to create jobs.</li> </ul>	<ul> <li><u>Sustainable development:</u></li> <li>Agroforestry – farming natural crops of the forest without destroying it.</li> <li>Buffer zones – protected areas around the forest slowing damage.</li> <li>Wildlife corridors – linking areas of forest to allow animals to breed.</li> <li>Ecotourism – getting people to visit and stay within the natural forest, guided by locals who gain jobs e.g. Costa Rica (see Theme 8).</li> </ul>

# Core Topic

# <u>Theme 6 – Development and Resource Issues (PINK)</u> What is Economic Development?

Measured in two ways:

<u>GDP</u> (Gross Domestic Product) Total amount of money produced by all of the industries in a country.

<u>GNI</u> (Gross National Income) Total amount of money earned by a country's residents plus it people living abroad.

\* Both are sometimes worked out per capita (person).

# Global patterns of development

The process in which people in a country become wealthier, healthier, better educated, and have greater access to good quality housing.





- The group of countries, mostly in the north, have high standards of living, access to the basic needs in life (food, water, shelter and healthcare) and good education for almost all. These are the HICs (High Income Countries). Examples are the UK and Canada.
- Some countries are rapidly developing and improving their industry, standard of living and education for some people. These are the NICs (Newly Industrialised Countries). Examples are India and China.
- The third group of countries, mostly in the south, have poor quality of life and far less access to the basic needs in life. These are the less developed LICs (Low Income Countries). Examples are Malawi and DR Congo.

# Why have some countries become NICs? (India)

# India and its development

**Globalisation** is the process of countries becoming more inter-connected and interacting more. This has benefited some countries more than others. India is a rapidly developing **NIC** because of a number of factors:

- Cheap labour (encouraging big companies MNCs to move there)
- Improving education (many Technology and Science graduates)
- Growing population
- Improved transport (ports and airports)
- Developing technology
- Large Indian owned companies (e.g. Tata Steel)

This has brought a **positive multiplier effect** to India.

# Multinational Companies (MNCs)

These are companies with operations all over the world but that are based in one (home) country e.g. Nike, Mercedes, McDonalds, Sony. **MNC**s can bring benefits such as jobs and investment (through **outsourcing** - getting other companies to make their products), but also bring some negative effects to countries they operate in. These include exploitation of workers (low wages, poor working conditions), overusing resources, polluting the host country and taking all the profits out of the country.

These companies help to promote international trade - the buying and

selling of goods between countries. However, trade can be unfair as HICs often add taxes (tariffs) to products brought in or set limits (quotas) on imported products. Trade blocs (such as the EU) allow free trade between member countries.



FAIRTRADE Guarantees a better deal for Third World Producers

## The Global Tourist Industry

There has been huge increase in global tourism due to a number of factors:

- Increased life expectancy (Saga holidays)
- More leisure time from work
- Transport improvements
- Better technology (internet)
- Cheaper prices (budget airlines)



# Tourism in NICs (Cancún, Mexico)

Cancún in Mexico is one of the most popular resorts in the country. Tourism brings both positive and negative effects to NICs:

Positives +	Negatives -
+ Provides jobs	- Jobs low paid and seasonal
+ Brings money into the country	- Can lead to drug problems etc.
+ Provides taxes (health, education)	- Locals culture often lost
+ Can preserve local culture	- Benefits stay in tourist <b>enclaves</b>
+ Can protect the environment	- Pollution problems
+ New facilities can be built	- Local resources overused
+ Creates a <b>positive multiplier effect</b>	- Environment is damaged

# Responding to Inequalities (differences in development)

In 2015 the UN set seventeen **Sustainable Development Goals** (SDGs) to be achieved by 2030. Poor countries (LICs) such as Malawi will require **development aid** (help, resources or money) from both governments and charities in richer countries (HICs) in order to try and achieve the goals.

Example of a sustainable development project - Meru Dairy Goats (Kenya) Farm Africa (a UK charity) sent 130 dairy goats to villages in the region.



- > Goats are shared by families and bred.
- > Goats now provide over 400 families with milk and wool.
- > Goats kept in pens so don't damage natural environment.
- Villages are now self-sufficient and can now produce all the milk it requires. Some now even sell young goats at market.
- > Some villagers have been trained as goat health workers.

\* Project is sustainable as it is now run by locals and provides them with a reliable supply of milk, wool and other products. It can keep going into the future as the number of goats keeps on rising.

## Managing Water Resources

As countries develop their demand for water rises. We all have a **water footprint** - the amount of water we use plus the water that goes into producing the products and foods we consume. **Water security** means that countries have enough safe, clean water to provide for people and farming without damaging the environment or ecosystems. In South Africa (NIC) they have built dams in neighbouring Lesotho (LIC) and pipe water to South Africa. In return Lesotho gets electricity for its people and industries.

## Reducing Inequalities within Countries (India and UK)

In India the North of the country (Bihar) is poor with areas in the west being richer (Goa and Maharashtra). In the UK there is a similar north/south divide between the wealthier south east around London and the poorer north and western regions. The most important way of trying to reduce inequalities is to invest in the **infrastructure** (transport and communications) of poorer regions. In the UK billions are being invested in the motorway network and thee HS2 rail system. It is hoped that this will encourage new businesses to set



up in the poorer regions creating a **positive multiplier effect**.

# <u>Options Topic</u> <u>Theme 8 – Environmental Challenges (ORANGE)</u> <u>Consumerism and its Impact</u>

**Consumers** are people who buy or sell goods (products) or services. Our consumer choices here in the UK have impacts on those people all around

the world that produce/grow the products that we buy. Our choices define our **ecological footprint**: the amount of land required to sustain our way of life.

Cropland 15.6% 20.3% Forest Fishing 3.6% 4.7% Built-up land 0.1% Forest for carbon sequestration 55.7%

Consumerism highlights a number of global issues:

- a) Kenyan flower industry some of the best farmland in Kenya is sued to grow flowers for export. Although this produces a multiplier effect for the local people it also means that lots of water resources are used and less food is grown.
- b) Food miles the distance our food travels to us can create a huge carbon footprint as the transport of the food produces CO<sub>2</sub> emissions. Could we grow and buy more seasonal, local food?
- c) **Bio-fuels** these are fuels produced from crops such as palm oil and used in countries like Brazil. However, forests are chopped down and farmland is used up to grow these.
- d) **E-waste** this is the waste from electrical devices and they are often exported to be 'recycled' for their valuable metals. However, in countries such as Ghana they often create enormous pollution and health problems.

# Climate Change (Potential Effects and Responses)

The potential effects of climate change could bring both benefits (increased tourism, lower heating bills) and problems (increased flooding, storms and droughts) for the UK. However, for larger countries such as Australia the effects are likely to be mostly negative - wildfires, drought, rising sea levels (environmental refugees) and loss of Great Barrier Reef. What can be done? - Change needed at all levels from **international** agreements (Paris 2016 - keep temperature rise below 2oC above pre industrial level). **Governments** - invest in renewable, green energy and new transport. **Individuals** - change lifestyle to lower your **carbon footprint**.

# Managing and Restoring Damaged Ecosystems

<u>Ecotourism in Costa Rica</u>: Costa Rica is a big promoter of **Ecotourism**. This is where tourist money is contributing to efforts to protect the natural environment and habitats. It is sustainable as local people are employed and involved in protecting their natural rainforest environment.

What has been done?

- 40% of the land in Costa Rica is protected as National Parks
- Ecotourism focus in all areas (5% tourist tax re-invested)
- Eco-friendly lodges built in forest
- Locals employed in hotels as guides etc.
- Wildlife corridors to allow rare animals to survive and breed
- Debt for nature swaps with USA

<u>Trophy Hunting in South Africa</u>: In the Kruger National Park in South Africa they are protecting wildlife by allowing limited **trophy hunting** to control numbers of some species.

## What has been done?

- Diversifying from farming as little money is made
- Hunting reserves set up (controls numbers of some species)
- Money goes back into conservation
- Locals employed as guides (higher wages and look after wildlife)
- Wildlife and environment is protected
- National Park zoning so hunting only allowed in certain areas

<u>Restoring Wetlands in the New Forest, UK:</u> **Wetlands** are particularly fragile environments that can help to control flooding if well managed. In order to restore lost wetlands and species in the New Forest people have:

- Reintroduced meanders on rivers
- Blocked and filled in drains
- Stripped out non-native species
- Built debris dams to encourage seasonal flooding of the forest

# <u>Sustainable Tourism</u>: This is any form of tourism that meets the criteria below:

