

Knowledge Organiser

World Studies

KS4 Geography
Topic 3 - Ecosystems



Big Question: Why are ecosystems important and how are they under threat from human activity?

1. What are the key characteristics of the world's ecosystems and how are they distributed?
2. What role does climate and local factors play in the distribution of ecosystems?
3. What resources are provided by the biosphere?
4. What ecosystems does the UK have and where are they found?
5. How do the biotic and abiotic components of the tropical rainforest interact?
6. Why do rainforests high biodiversity and how are species adapted to it?
7. Why are tropical rainforests important and why are they under threat?
8. What political and economic factors have contributed to the sustainable management of the Costa Rican rainforest?
9. How do the biotic and abiotic components of the deciduous forest interact?
10. Why do deciduous forests have moderate biodiversity and how are species adapted to it?
11. Why are deciduous forests important and why are they under threat?
12. What different approaches have been used to ensure the sustainable management of The New Forest?

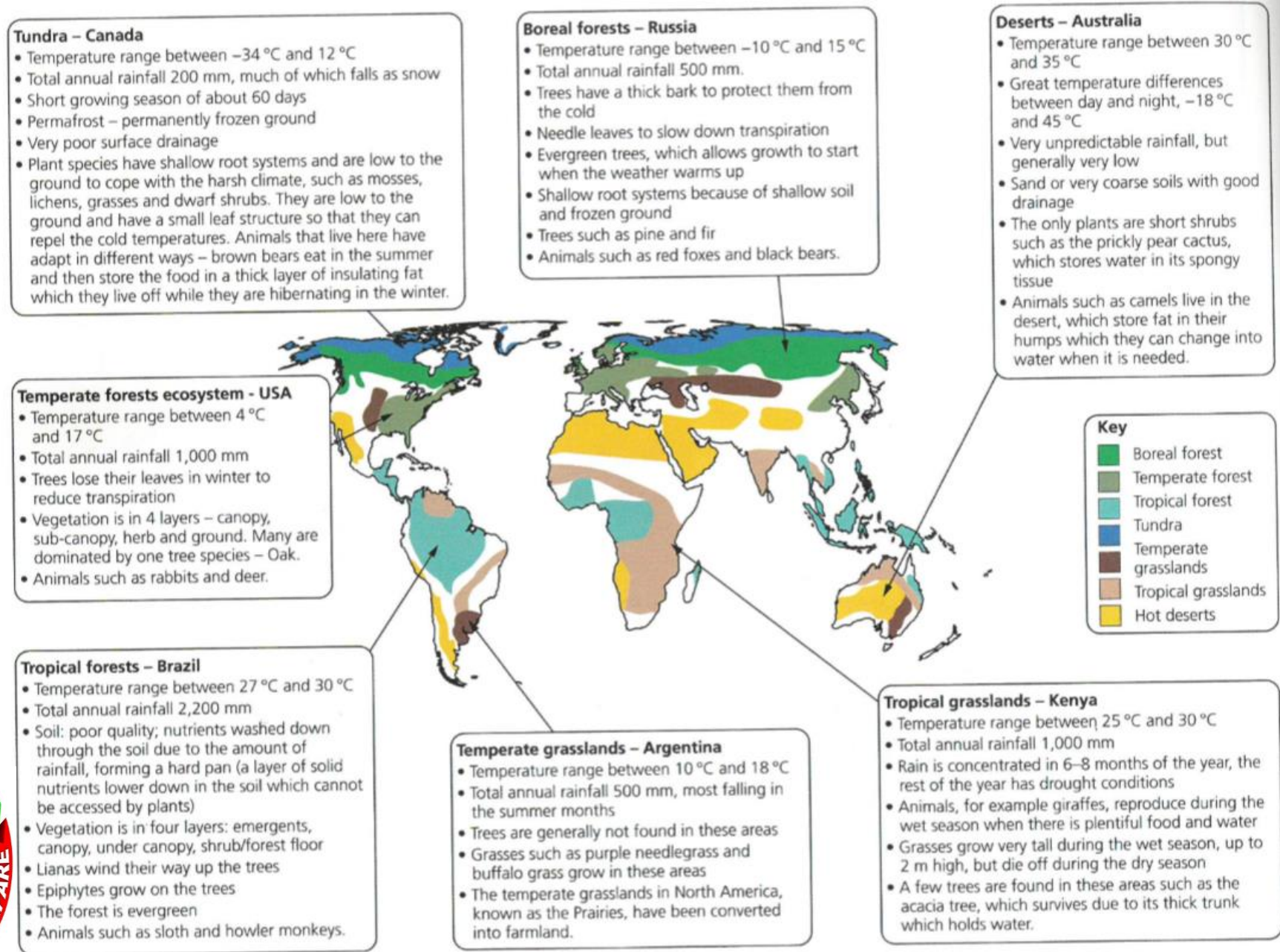
Altitude	Height above sea level	Exploitation	The act of using natural resources
Aquaculture	Breeding of fish in pens under controlled conditions.	Finite resources	A resource that will eventually run out
Biodiversity	The amount and variety of species present in an area.	Global atmospheric circulation	The worldwide movement of air which transports heat from tropical to polar latitudes
Biome	An ecosystem on a global scale	Heathlands	Tends to be open countryside in lowland areas. The plants are small shrubs e.g. heather
Biosphere	The part of the Earth and its atmosphere in which living organisms exist or that is capable of supporting life.	Moorlands	Land which is not intensively farmed. It is found in upland areas of the UK and tends to have acidic, peaty soils.
Climate	The average temperature and precipitation figures for an area.	Renewable resources	Energy resources which are potentially infinite
Coniferous	Trees which stay in leaf all year round (evergreen)	Resource	A stock or supply of something that is useful to people
Deciduous	Broad-leaved trees e.g. oak, which lose their leaves in autumn.	Wetlands	Areas of low-lying land that is mostly wet and boggy.
Distribution	Where something is located	Woodlands	Tree-covered area
Ecosystem	A community of plants and animals and their non—living environment		

3.1 Large-scale ecosystems are found in different parts of the world and are important

a. Distributions and characteristics of the world's large-scale ecosystems (tropical, temperate and boreal forests, tropical and temperate grasslands, deserts and tundra).

A biome is a large geographical area of distinctive plant and animal groups, which are adapted to that particular environment. The climate and geography of a region determines what type of biome can exist in that region.

An ecosystem is a system in which organisms interact with each other and with their environment.



Potential exam questions:

1. Study the map showing global distribution of the world's ecosystems. Describe the distribution of tropical forests (3)
2. State one characteristic of hot deserts (2)



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3.2 The biosphere is a vital system

b. The role of climate and local factors (soils and altitude) in influencing the distribution of different large- scale ecosystems.

Role of climate

- Temperature decreases with **latitude**. The equator receives the most heat from the sun as it is directly overhead.
- High surface temperatures at the equator drive the Hadley cell i.e. hot air rises, condenses to clouds, creating high amounts of rainfall.
- Tilt of the earth on its axis creates seasons. The equator is least effected by the tilt, so precipitation is similar all year round
- **Inter-Tropical Convergence Zone (ITCZ)** shifts northwards in June, bringing a wet season to the tropical grasslands in the Northern Hemisphere.
- Interior of continents, summer temperatures are higher and winter temperatures are colder than places nearer the coast. (Remember Tea and Toast!) Temperate grassland and deserts are affected by this.
- High mountains force air to rise and cool , meaning precipitation is high in the mountains. Creates the **rain shadow effect** as once the air has passed over it, it has lost its moisture.

Local Factors

Altitude	For every 100 metres of ascent, temperatures decrease by roughly 1°C. The air becomes less dense and does not hold heat as easily.
Prevailing wind	Winds blowing across oceans will bring moisture and rainfall, whereas winds blowing across warmer continents bring warm dry air.
Soils	Different vegetation requires different soil types. Thinner soils such as in the Boreal forests contain less organic matter, and may be more acidic, whereas in the Tropical rainforest soils are more nutrient-rich because of the decaying litter layer.
Distance from the sea	Land heats and cools faster than the sea. Therefore, coastal areas have a lower temperature range than areas inland. On the coast, winters are relatively mild and summers are cool. Inland, temperatures are higher in the summer and colder in the winter.
Ocean currents	Warm ocean currents, especially in the North Atlantic, moderate the land temperatures of cold areas.
Relief/Topography	Hills and mountains play a decisive part in local weather patterns, especially where moist air is forced to rise and cool, forming precipitation.

a. How the biosphere provides resources for people (food, medicine, building materials and fuel resources) but is also increasingly exploited commercially for energy, water and mineral resources

Food <ul style="list-style-type: none">• Fish, nuts, fruits, replacing natural vegetation with crops	Medicine <ul style="list-style-type: none">• Periwinkle, aloe plants and poppies for morphine.	Building material <ul style="list-style-type: none">• Timber, clay bricks, cereal plants used for roofing.	Fuel <ul style="list-style-type: none">• Animal dung, timber, biofuels.
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Commercial exploitation

1. Energy:

- Oil is extracted from the ground and used to power engines in forms of transportation.
- Coal is mined and used in developing countries for industry and some parts for heating homes.
- Wind turbines built on land and sea to provide energy using the wind.
- Solar panels put into fields to provide electricity using solar radiation.

2. Water

- Domestically used for drinking, washing, toilets and cleaning.
- Used in production of electricity in HEP
- Farmers use it for irrigation of their crops e.g. In USA, 37% of all water use is for irrigation
- Transportation means

3. Mineral resources

- Gold and silver used in jewellery
- Concrete is made from limestone, sand and gravel
- Copper used for plumbing pipes.

Potential exam questions:





1. State two resources provided by the biosphere (2)
2. Describe one way that climate influences the distribution of large-scale ecosystems (2)
3. Name one local factor that affects ecosystems (1)
4. State the correct term for the layer of Earth where life exists (1)
5. Explain how the biosphere provides one fuel resource (2)



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3.3 The UK has its own variety of distinctive ecosystems that it relies on

a. Distribution and characteristics of the UK’s main terrestrial ecosystems (moorlands, heaths, woodlands, wetlands)

	Distribution	Characteristics
<div>Moorland</div> 	Found in upland areas where rainfall levels tend to be high. In the UK they occur mainly above 250 metres, so can be found in the Pennines, North Yorkshire, the Cheviot Hills on the Scottish Borders and most of upland Scotland such as the Cairngorms.	Moorlands are heavily influenced by people. Most of the UK’s moorlands would have been covered by trees and shrubs at some point. However, over time the moorlands of the UK have been heavily used as grazing land. High altitude, strong winds, heavy rainfall and cloud cover can restrict the growth of plants. Common plants are heather and bracken. Common animals are deer, foxes and grouse.
<div>Heathland</div> 	Found in lowland areas of southern UK such as the New Forest, Surrey Heaths and parts of Suffolk.	Heathland forms on porous sandy soils. These lack fertility as nutrients can be easily washed out and the soil can be acidic. Lowland heathland is often dominated by heather, ling and gorse, and if poorly managed, bracken or silver birch may also be present. Common plants are heather and gorse. Common animals are rabbits.
<div>Woodland</div> 	Woodland covers around 12% of the UK land area, making the UK one of the least wooded areas in Europe. At least 80% of UK woodland is less than 100 years old.	Some woodlands are dominated by deciduous broadleaved trees that lose their leaves in winter. Some woodlands are coniferous woods which have needle-like leaves. Common plants are bluebells and ferns. Common animals are deer and badgers.
<div>Wetland</div> 	Wetlands include open waters, floodplains, rivers, streams and ponds. Floodplains are a key location of wetlands such as the River Severn and the Somerset Levels.	Most wetland environments contain waterlogged soils that are extremely fertile and so support a lot of vegetation. Common plants include reeds and bulrushes. Common animals are otters and many types of birds.

b. importance of marine ecosystems to the UK as a resource and how human activities are degrading them

Marine ecosystems are divided up by:

- 1. Inshore habitats – close to the shore and are important for tourism and recreation
- 2. Offshore ecosystems – found away from the shoreline and are important for commercial fishing and energy production.

Importance:

- 1. Provide goods and services e.g. 90% of our imports travel through Ports
- 2. Absorb greenhouse gases while releasing oxygen
- 3. Moderate our climate, making it warmer in the winter than it should be given our latitude and cooler in the summer
- 4. Opportunity for leisure and recreation, employing 114,670 people and bringing £1.29 billion into the economy.

Role of human activities

- **Over-fishing** – laws have been introduced at a national and EU level to address this e.g. Creation of Marine Protected Areas (MPA) where no fishing is allowed.
- **Extraction of oil and natural gas** – can lead to pollution of the seas
- **Eutrophication** – fertilisers used on farmland are washed into the sea
- Construction of **deep water ports** needed for global trade – disturb the sea bed
- Construction of large **offshore wind farms** – interfere with bird migration routes and disturb animals that rely on sound to navigate.

Potential exam questions:

- 1. State two characteristics of moorlands (2)
- 2. Suggest one way humans can damage marine ecosystems (2)
- 3. Explain why marine ecosystems are important to the UK as a resource (4)



Abiotic	The physical, non living environment e.g. water, wind and oxygen.	Food chain	A series of steps by which energy is obtained and used by living organisms.
Biotic	The living organisms found in an area	Food web	A network of food chains by which energy and nutrients are passed from one species to another.
Biomass	The amount of weight of living or recently living organisms in an area	Functioning	The function of a tropical rainforest is its ecosystem and how it works
Buttress roots	Buttress roots are large, wide roots on all sides of a shallowly rooted tree. Typically, they are found in nutrient-poor rainforest soils and do not penetrate to deeper layers.	Leaching	Created by heavy rains that remove nutrients from the soil
Carbon Sink	An environmental reservoir that absorbs and stores more carbon than it releases.	Litter	Leaves, twigs and other dead organic material that falls on the surface of the soil
Drip tips	Drip tip leaves are specially adapted leaves that are commonly known to grow on plants in the rainforest. They have a curved, and bent down surface, which allows the rain to fall and trickle down the leaf. The rain then drops off, aiming at the plants roots, which then suck it in and use it as nutrients.	Nutrient cycle	The movement and exchange of organic and inorganic material into living matter.
Ecotourism	Travel to natural areas that does no damage, conserving the environment and improving the wellbeing of local people	Shifting cultivation	Shifting cultivation, also known as slash and burn agriculture, is an agricultural system that involves clearing a section of land and using it for farming activities for a relatively short time before abandoning it.
Epiphytes	An epiphyte is an organism that grows on the surface of a plant and derives its moisture and nutrients from the air, rain, water or from debris accumulating around it.	Sustainable management	Using energy resources in a way which ensures that they are not exploited and will hopefully be able to meet the needs of future generations.
Exploitation	The way in which people make use of the resources from the Earth		

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3.4 Tropical rainforests show a range of distinguishing features

a. Biotic and abiotic characteristics of the tropical rainforest ecosystem

Abiotic characteristics

- Climate
- Temperature range between 27c and 30c
 - Very little light variation throughout the year – 12 hours daylight, 12 hours night
- Soils
- Poor quality
 - Nutrients are washed through the soil in heavy rain
 - Forms a hard pan – layer of solid nutrients lower down in the soil that cannot be accessed by plants.

Water

- Rains every day – total annual rainfall of 2,200 mm

Biotic characteristics

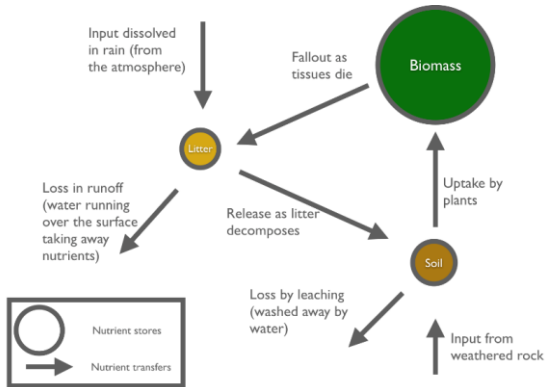
- Plants
- Are deciduous but different species lose their leaves at different times and only for a few weeks.
 - Grow up to 30-40m
- Animals
- Sloth live in the canopy. Use camouflage via the green algae on their fur to escape predators.
 - Toucans live in the canopy. They have long bills to reach fruit on branches that are too small to support their weight.
- Humans
- People hunt animals for food, spread the seeds of the rainforest plants through fruit, seeds they eat.

b. The interdependence of biotic and abiotic characteristics (climate, soils, water, plants, animals and humans) and the nutrient cycle (Gersmehl model).

- The hot, damp conditions on the forest floor allow for the rapid decomposition of dead plant material.
- This provides plentiful nutrients that are easily absorbed by plant roots.
- These nutrients are in high demand from the many fast-growing plants, they do not remain in the soil for long and stay close to the surface.
- If vegetation is removed, the soils become infertile
- Chemical weathering is the most common due to the warm and wet conditions.

Nutrient Cycle (Gersmehl model)

- Majority of nutrients are stored in the biomass, small amounts stored in the litter and soil.
- Caused by heavy rainfall, leaching nutrients down through the soil to areas that the plants can not reach.
- Very high biodiversity due to hot and wet conditions and consistent hours of sunlight = few limiting factors.



c. Why rainforests have very high biodiversity and how and animals are adapted to that environment.

High biodiversity

1. Optimum conditions for plant growth
2. Rainforests are very old = evolutionary variation in species
3. Complex layered structure, creating a range of wildlife habitats i.e. Stratification: Emergent, canopy, understorey, shrub layer, forest floor.
4. Hot, wet climate all year round
5. Long hours of sunlight and warm temperatures are excellent for photosynthesis

Vegetation	Animals
Plants adapt to high levels of rainfall – thick waxy leaves with pointed drip tips.	Many animals have adapted to living in the canopy where there is plenty of food.
Trees have large crowns (where they absorb sunlight) with very few branches.	Animals hunt at night when they have more energy and it is cooler.
Large trees have buttress roots to support them.	Many animals are camouflaged to avoid predators.
Epiphytes grow on the trees.	Some animals have a good sense of smell or hearing because of low light levels on the forest floor.
Fungi have adapted to take nutrients from dead organic matter in the litter layer.	Animals learn to swim or have webbed feet because of the many rivers in TRF.
Evergreen appearance due to constant growing season, even though many trees are deciduous.	
Trees’ roots spread far horizontally due to thin soils.	

Potential exam questions:

1. In ecosystems, abiotic and biotic components are interdependent. Define the term ‘biotic’ (1)
2. State the type of weathering that occurs in tropical rainforests (2)
3. Suggest one reason why tropical rainforests have high levels of biodiversity (2)
4. Compare the biotic components and abiotic components of the tropical rainforest (3)
5. Explain 2 ways in which animals have adapted to living in the tropical rainforest (4)
6. Explain two reasons why tropical rainforest soils are nutrient poor (4)



3.5 Tropical rainforest ecosystems provide a range of goods and services some of which are under threat

a. Examples of goods and services provided by tropical rainforest ecosystems

Goods	Services
Food stuffs <ul style="list-style-type: none">Bananas grow in tropical forests. They are a \$5 billion global industryCoffee is traditionally grown in the shade of the rainforest canopy. 25 million people make their living from coffee.Palm oil – used globally for food products e.g. pizzas	Recreation <ul style="list-style-type: none">White-water raftingNature trails on the forest floor or through the canopyRiver boat ridesZip wires through the canopy
Timber <ul style="list-style-type: none">Wood from trees e.g. teak, used in flooring and furniture in temperate regions i.e. USALocal people use wood for building material and fuel	Climate change <ul style="list-style-type: none">Plants store carbon and soak up CO₂. Amazon rainforest removed 2 billion tonnes of CO₂/yr
Medicines <ul style="list-style-type: none">Quinine, helps cure malaria is found in the bark of the cinchona treeRosy periwinkle, found in Madagascar, can halt the progress of Hodgkin's disease of 58% of sufferers. Worth \$160 million in sales/yr	Water cycle <ul style="list-style-type: none">Influences precipitation due to the large amount of water vapour from the extensive vegetation.

b. How climate change presents a threat to the structure, functioning and biodiversity of tropical rainforests

TRF Structure

Likely to change to seasonal tropical rainforest = dry season

- Most trees drop leaves in dry season to avoid water loss
- No canopy in dry season = thick underbrush can grow
- Falling leaves creating thick litter but slow decomposition in the dry season = soil bigger nutrient store and biomass store is smaller.

Functioning

- Less vegetation cover, so when it rains = increased surface runoff = more sediment washed into drainage systems = polluting water quality
- Less dense vegetation = lower rainfall
- Drier forest = more CO₂ emitted than it soaks up and increased chance of forest fires.

Biodiversity

- Species cannot cope with fluctuations in climate e.g. Flying fox bats will die due to heat levels
- Other alien species will spread out and out-complete TRF species
- TRF on mountains will not heat up as much so biodiversity will be higher here.

c. Economic and social causes of deforestation (conversion to agriculture, resource extraction, population pressure).

- 7.3 million hectares of rainforest are cleared each year

Economic causes	Social causes
Second main cause of Madagascan deforestation is logging. High demand for rosewood due to its dense pink wood. Corruption is widespread	Population pressure – (over 180 million people) since 1960 the government have wanted to open up the interior of the Amazon.
Extension of agricultural land for cattle ranching – Brazil is the leading producer of beef.	In Madagascar, the population has grown from 4 million in 1950 to 20.7 million in 2010.
Land required for growing soybeans – this was Brazil's leading export for a period in the 2000s and has helped Brazil pay off debts.	Expanding cities. Cities like Parauapebas have grown rapidly due to workers arriving to work in the iron-ore mines.
Minerals – the largest concentration of mineral resources is at Carajas, where there are large deposits of gold, iron ore, nickel, copper, manganese and bauxite (a key ingredient for making aluminium).	An opportunity for landless people to own their own plot of land.
HEP	Exploiting the Amazon to reduce poverty.
Building roads – (especially paving roads, e.g. BR163)	
Around 80% of deforestation is due to 'Tavy' which is a type of slash and burn agriculture.	

Potential exam questions:

- State one example of a service provided by tropical rainforests (1)
- State one social cause of rainforest deforestation (1)
- Suggest two ways climate change presents a threat to tropical rainforests (4)
- Suggest why the structure of the tropical rainforest might change (4)
- Explain one reason why tropical rainforests are being deforested for agriculture (2)
- Explain why resource extraction is causing the deforestation of tropical rainforests (4)
- Assess the following statement: 'Population growth is the most important cause of tropical rainforest deforestation' (8+4 SPAG)



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3.5 Tropical rainforest ecosystems provide a range of goods and services some of which are under threat

d. Political and economic factors (governance, commodity value and ecotourism) that have contributed to the sustainable management of a rainforest in a named region

Sustainable Rainforest Management in Costa Rica

- Costa Rica is a small country in Central America.
- It is home to 6% of the world’s biodiversity.
- The country attracts 6 million tourists a year.

Factors leading to decline of the Costa Rican rainforest

- Cattle Ranching and agricultural development by clearing land through slash & burn methods.
- Gold and other metal mining meant large scale soil and rock removing. This meant areas were deforested and chemicals entered water systems.
- By 1990, 32,000 hectors of forest were cut down each year – devastating the fragile ecosystem.

Potential exam questions:

- Define the term ‘ecotourism’ (1)
- Define the term ‘sustainable management’ (1)
- Explain one way that ecotourism contributes to the sustainable management of a tropical rainforest (2)
- For a named tropical rainforest, explain two ways ecotourism is helping to manage the tropical rainforest more sustainably (4)
- Explain one reason why tropical rainforests require sustainable management (2)

Governance	Commodity Value	Ecotourism
<ul style="list-style-type: none">1979 the government passed a law giving tax deductions and grants to owners of rainforest if they conserved the forest area.1995 Government created 28 National Parks with 24% of the country’s land protectedForest protection certificates issued, with \$50 per hectare of land/year for land they protectGrouped the protected areas of the country into 11 eco-regions, with each area making its own decisions on how the rainforest should be protected.1997- Certificate for Sustainable Tourism (CST) for businesses that prove their commitment to sustainable tourism.	<ul style="list-style-type: none">Agroforestry encourages growing trees and crops together to create better farming conditions.Afforestation has led to the replanting of trees to replace original forest that have been lost.Selective logging of trees to ensure maximum sustainable yieldForest management and monitoring plansEducate and train local people and land owners on the importance of the rainforest.Carbon credits: Wealthy countries buy them to offset carbon emissions that they produce.	<p>Ecotourism is tourism that is directed towards the natural environments & conservation.</p> <p>Association Mitsinjo</p> <ul style="list-style-type: none">10,000 hectare natural reserve created in 1999 by residents to work as guides for tourists visiting the area.Money from tourism accounts for 1/3rd of their incomePrevents illegal logging and hunting2002 created a rainforest restoration project: Farmers agree to set aside some land as a nursery for young rainforest trees in return for help in improving their yields.Educated farmers to move away from ‘Tavy’ to System of Rice Intensification (SRI). Allows more crops to grow but no need to clear land.
<p>Impact</p> <ul style="list-style-type: none">Laws and enforcement meant that deforestation had fallen from 1.8 to almost zero by 2005.	<p>Impact</p> <ul style="list-style-type: none">Carbon credits: Costa Rica is earning money from the rainforest without cutting the trees down e.g. 1999, earned \$20 million.	<p>Impact</p> <ul style="list-style-type: none">1 million new trees have been plantedFunded better healthcare and environmental education14,000 people live in the area, but many live in poverty.Association depends for 2/3rds of its income on international aid organisations.



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3.6 Deciduous woodlands show a range of distinguishing features

a. Abiotic and biotic characteristics of the deciduous woodland ecosystem

Abiotic characteristics

Climate

- Temperature range between 4c and 17c
- Long periods of light in the summer, around 18 hours and short days in the winter i.e. 8 hrs

Soils

- Soil is fertile and not as deep as TRF as they are younger
- Autumn leaf fall ensures there are plenty of nutrients
- Earthworms in the soil help to mix up the nutrients
- Leaf litter and ground layer of plants prevent much surface runoff.

Water

- Total annual rainfall 1,000 mm

Biotic characteristics

Plants

- In spring, species in the herb layer flower early, before the trees in the canopy block out the available light. Deciduous trees then grow thin, broad lightweight leaves. These capture the sunlight and allow the tree to grow quickly as the temperature warms and the days grow longer.
- In the winter, the trees loose their leaves as it becomes colder and the days are shorter.
- Deep root system to access groundwater and nutrients

Animals

- Hedgehogs hibernate from November to April
- Squirrels store food in the ground under fallen leaves so they have food in the colder months.

Humans

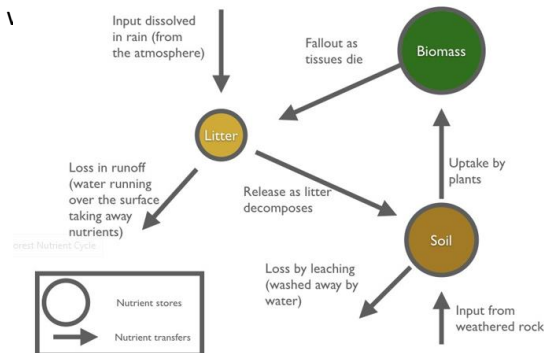
- People have rights to keep livestock in the forest and these animals have a significant impact. There are 3000 New Forest ponies, which live wild in the New Forest. They graze selectively, meaning they eat tall grasses but leave flowers behind.

b. The interdependence of biotic and abiotic and the nutrient cycle (Gersmehl model)

- Has a moderate biodiversity because of warm summers \ sunlight. The autumn lead provides plenty of nutrients.

Nutrient Cycle (Gersmehl model)

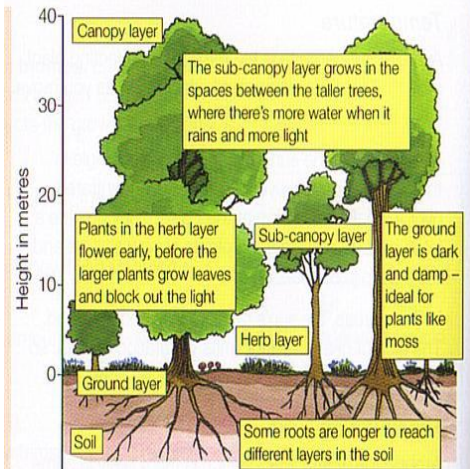
- Biomass store is smaller than the TRF
- Soil and biomass stores are similar sizes
- Annual leaf litter adds lots of nutrients to the soil but temperatures are too low in the winter for soil bacteria to function. In spring, decomposition becomes rapid as the temperature rises.



c. Why deciduous woodlands have moderate biodiversity and how plants and animals are adapted to that environment

Moderate biodiversity:

- Lower food production levels in the winter
- Smaller size ecosystems that the TRF = less space for plant and animal species
- Higher latitude = lower temperatures and fewer sunlight hours: not as efficient for photosynthesis or food production for animals.
- Has a **stratified structure** i.e. the vertical layering of a habitat; the arrangement of vegetation in layers. It classifies the layers vegetation largely according to the different heights to which their plants grow .



Plant adaptations

Oak Tree:

1. Spread branches horizontally to capture sunlight
2. Leaves are broad and soft. Width = increased amount of sunlight. Soft because they don't need a waxy coating to protect them from excess water loss.
3. Autumn the supply of water to leaves is stopped causing the leaf to fall off. This allows the oak to survive through the winter months.
4. Leaves and acorns contain acid tannin which is poisonous to animals e.g. horses = protection from grazing.
5. Large root system = anchors the tree during winter gales and accesses groundwater during drier months.

Animal adaptations

1. **Migration** – bird species move south to warmer winter conditions. E.g. Swallow leaves in September for C. Africa.
2. **Hibernation** – Animals spend the winter months in a deep sleep, in which their metabolic rate drops so that they only need a small amount of energy to survive. E.g. Hedgehogs
3. **Food storage** – Species like squirrels store nuts on either the forest floor (red) or bury them (grey). This also helps acorns to germinate as they often forget where they have buried them.

Potential exam questions:

1. State one characteristic of deciduous woodlands (1)
2. Describe the stratification shown in deciduous forests (4)
3. Explain two ways in which plants have adapted to living in deciduous woodland (4)
4. Explain why the Gersmehl model (nutrient cycle) for deciduous woodlands has biomass and nutrient stores that are similar in size (4)



ECOSYSTEMS

3.7 Deciduous woodlands ecosystems provide a range of goods and services some of which are under threat

a. Examples of goods and services provided by deciduous woodlands ecosystems

ecosystems	Goods	Services
	Timber <ul style="list-style-type: none">• Production increased by 6.9% between 1998 and 2007• In 2014, 13million tonnes of timber was produced• Used in construction and furniture making	Recreation <ul style="list-style-type: none">• 250-300 million day visits to woodlands each year in the UK• Valued at £484 million in 2010• Venue for activities e.g. GoApe• Health benefits e.g. cycling
	Fuel <ul style="list-style-type: none">• Of the 0.4 million tonnes in 2009, 69% was used as fuel• Fuel for major power stations through co-firing• Increasing popularity of wood burning stoves – 2 million tonnes/year needed in 2016	Conservation <ul style="list-style-type: none">• New Forest is important for woodland birds e.g. 75% of UK's Dartford warblers live there
	Non-timber forest products (NTFP) <ul style="list-style-type: none">• Forest moss – used by florists• Venison – deer meat• Rearing birds e.g. partridge for shooting	Carbon Capture <ul style="list-style-type: none">• UK's woodlands capture 1 million tonnes of carbon each year

b. How climate change presents a threats to both the structure, function and biodiversity of the deciduous woodland ecosystem

1. Biodiversity: Milder winters

- Key processes i.e. seed germination are triggered by cold temperatures. Without this, processes become altered.
- New tree species not adapted to cold winter are able to out-compete native deciduous trees if winters become milder.
- Pests and diseases can now spread as they are not killed off during cold winters.

2. Functioning: Increased risk of drought

- Not adapted to survive drought conditions year after year
- Beech trees are particularly vulnerable to stress = less able to fight disease and pests

3. Structure: Increased risk of fire

- High temperatures and drought make forest fires more likely
- Other ecosystems are adapted to fire, plant species from these could replace deciduous woodland plants.

c. Economic and social causes of deforestation

Economic	Social
Timber extraction <ul style="list-style-type: none">• New Forest in 1608 – 124,000 trees used for navy timber• WW1: Used to build trenches• 1919: Shift to planting of coniferous trees which produce softwood, which grows faster = generates money quicker.• Recent deforestation occurring in the 20th Century when it was cut down and replaced with coniferous forest: 38% loss of ancient woodland• Coniferous have lower biodiversity as dense evergreen canopy doesn't allow for light to reach the ground.	Population growth and Urbanisation <ul style="list-style-type: none">• Increased as more demand for housing and cleared for towns in North England during Industrial Revolution.• 1945-1975, trees cut down for suburbs of towns or for New Towns.• UK needs to build 240,000 new homes each year to keep up with demand.• Number of vehicles has increased i.e. 2013 – 35 million. Pressure to relieve congestion by widening roads etc.
Agricultural change <ul style="list-style-type: none">• Only 7% of ancient woodland cleared for farming.• Woodland usually surrounded by farmland so can be affected by pesticides and herbicides that are sprayed on crops.	

Potential exam questions:

1. Describe one service provided by deciduous woodlands (2)
2. Explain how climate change presents a threat to deciduous woodlands (4)
3. Explain two causes of deforestation in deciduous woodlands (4)
4. Assess the following statement. *Climate change presents a greater threat to tropical rainforests than it does to deciduous woodlands.* (8)



On one hand, climate change is the most significant threat to tropical rainforests. This is shown by.....

- Temp will increase – reduce rainfall – drought – reduce biodiversity in the TRF
- Biodiversity on a global scale will be reduced. Seasonal forests. Dry season will be longer/ongoing
- Location driven – developing and emerging countries – cost management is too much.

However, on the other hand climate change presents a greater threat to deciduous woodlands. Shown by.....

- Seed germination – lack of new trees – reduce biodiversity
- Milder winters – leads to increase in pests – these will then damage plants/trees reducing biodiversity.

Overall, I agree that climate change presents the greater threat to tropical rainforests. The key evidence to support this:

- Tropical rainforest biodiversity
- Carbon sink
- Large areas of TRF are found in developing/emerging countries

ECOSYSTEMS

3.7 Deciduous woodlands ecosystems provide a range of goods and services some of which are under threat

a. Different approaches to the sustainable use and management of deciduous woodlands in a named region



The New Forest

The New Forest is a National Park, which requires sustainable management for a number of reasons.

- 1 The National Park is a popular tourist attraction, with over 15 million visitors each year contributing towards the local economy.
- 2 The movement of visitors through the forest is increasing litter, causing erosion of paths and increasing air pollution from traffic.
- 3 Softwood and hardwood timber is being extracted for commercial use.
- 4 40 per cent of the woodland is privately owned, and is often left unmanaged.



Potential exam questions:

- 1. Explain why deciduous woodlands require sustainable management (4)
- 2. Suggest how two different policies make the management of deciduous woodlands more sustainable (4)
- 3. Using a named example, explain two ways in which a deciduous woodland is being sustainably managed (4)
- 4. Management of tropical rainforests is more complex than the management of deciduous woodlands (8 +4 SPAG)
- 5. Assess the approaches used to achieve sustainable use of a deciduous woodland in a named region (8 + 4 SPAG)
- 6. Assess the following statement: ‘Sustainable management of tropical rainforests and deciduous woodlands is vital for their future existence (8+ 4 SPAG)

Woodland Management	Wildlife management	Recreation/Education
<ul style="list-style-type: none">• When conifers in conservation areas are cut down for timber, they are replaced by native species of deciduous trees.• Pesticides and herbicides are used sparingly to avoid damage to the ecosystem.• Foresters work in the forest in the winter when there are few visitors.• Tree felling controlled – some trees left; older trees felled and left to rot on the forest soil = maintains nutrient cycle.• Designating woodland SSSIs or Special Conservation Areas (SCA)• Marketing and selling sustainable timber products by Forest Marque.	<ul style="list-style-type: none">• Work in the forest between April and August is minimal so not to disrupt nesting birds.• Monitor grazing• Fencing off areas of forest against animal grazing• Encourage growth and development of a variety of habitats and ecological niches• Preventing invasive species	<ul style="list-style-type: none">• Green Leaf Tourism scheme – promotes the use of local products; businesses give percentage of land for wildlife and encourage tourists to walk or use bikes.• Awareness raising by National Park Authority (NPA) to educate people on the importance of sustainability in the New Forest.• Sustainable Transport schemes for tourists e.g. bike and electric car hire) to reduce congestion and air pollution.• Well managed visitor centres• Signposted woodland trails• Car parks• Well managed activities, e.g. Go Ape

