GCSE Geography

Paper 3 Topic 7- People and the Biosphere Workbook

Lesson outline:

Lesson	Title
Lesson 1:	Global distribution and characteristics of major biomes
Lesson 2:	Local factors and biomes
Lesson 3:	Climate graphs and climatic influences
Lesson 4:	Life support system
Lesson 5:	Resources provided for people by biosphere. Exploitation
Lesson 6:	Biomes and global services
Lesson 7:	Malthus and Boserup

Extension/Challenge tasks:

Lesson	Task
Lesson 1:	**Task 1:** Complete crossword puzzle **Task 2:** Complete exam question activities (8 marks)
Lesson 2:	**Task 3:** Complete exam question activities (10 marks)
Lesson 3:	**Task 4:** Learning about Climate Graphs (use pages 248-249)
Lesson 4:	**Task 5:** 'Assess' exam question (8 marks)
Lesson 5:	**Task 6:** Complete exam question activities (12 marks)
Lesson 6:	**Task 7:** More and more resources (use pages 254-255)
Lesson 7:	**Task 8:** Complete exam question activities (14 marks) **Task 9:** Complete Glossary for Unit 7

**Learning Objective:** Describe and locate a range of major biomes.
Challenge: Be able to link different maps showing physical features to a map of the biomes.

Starter: Read in the Kerboodle Textbook pages 244-247. If you cannot access the Kerboodle text, click on this revision page from BBC Bitesize to explore the content you need to know for the first lesson.

Task 1 - Complete the table below with the correct definitions:

Ecosystem	
Biome	
Biotic	
Abiotic	

Task 2 - Label and colour the world map with the world's major biomes.
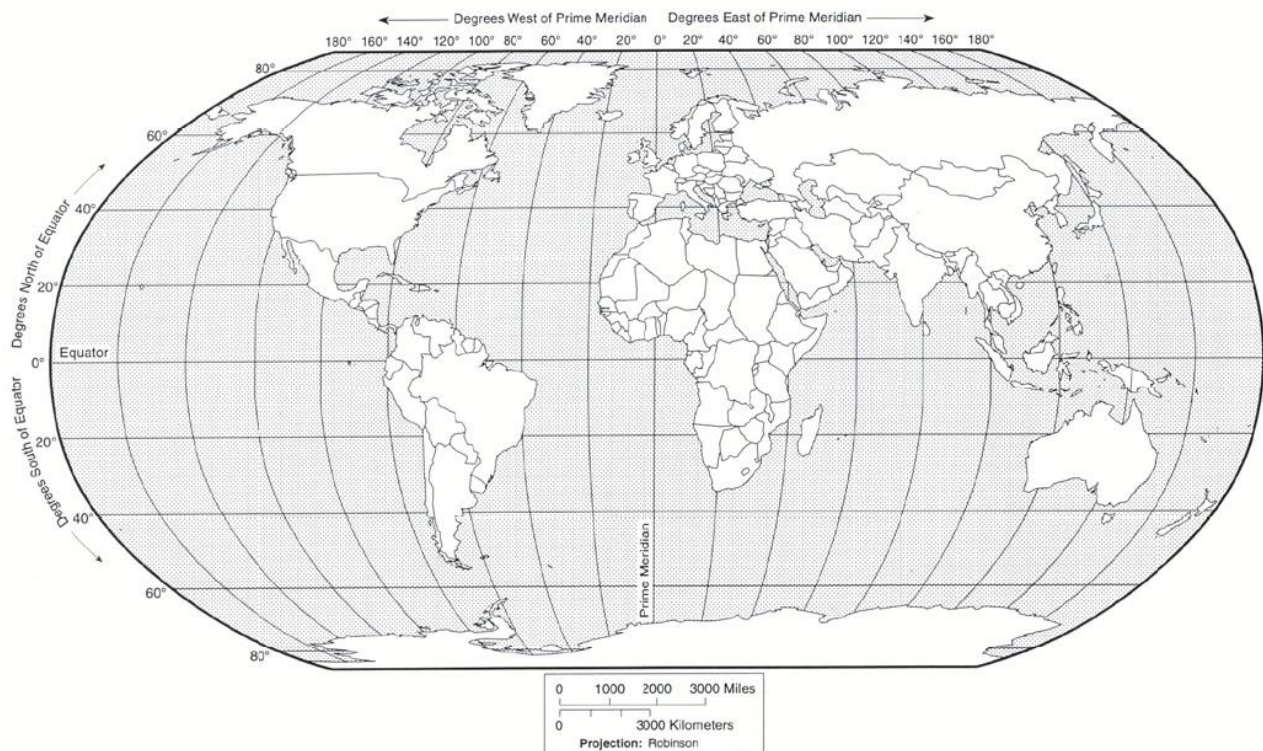
Task 3: Using the information from your reading or from this website, complete the table below to describe the climate and vegetation of 5 world biomes.

Biome	Climate	Vegetation
Desert		
Savannah		
Temperate Deciduous Forest		
Tropical Rainforest		
Tundra		

BECAUSE….

Example:

BECAUSE….

Example:

Latitude
AFFECTS THE LOCATION OF BIOMES

Temperature
AFFECTS THE LOCATION OF BIOMES

Altitude
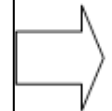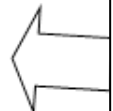AFFECTS THE LOCATION OF
BIOMES BECAUSE…

Example:

Drainage
AFFECTS THE LOCATION OF
BIOMES BECAUSE….

Example:

**Task 4: CLIMATIC FACTORS WHICH
DETERMINE THE CHARACTERISTICS
OF EACH BIOME**

**Use the reading from Kerboodle or
the detail from this website to help
fill in how different climate factors
determine the biome
characteristics.**

Precipitation
AFFECTS THE LOCATION OF BIOMES

Geology (rocks and soils)
AFFECTS THE LOCATION OF BIOMES

BECAUSE….

Example:

BECAUSE….

Example:

Areas just north and south of the tropics where scrub like vegetation (vines, olives and citrus fruits) thrive due to high temperatures but low levels of precipitation

Types of biome

Vast areas of evergreen trees with dark waxy needles which are found at high latitudes

Trees found in the mid-latitudes where there are no extremes of temperature or precipitation, which drop their leaves in autumn

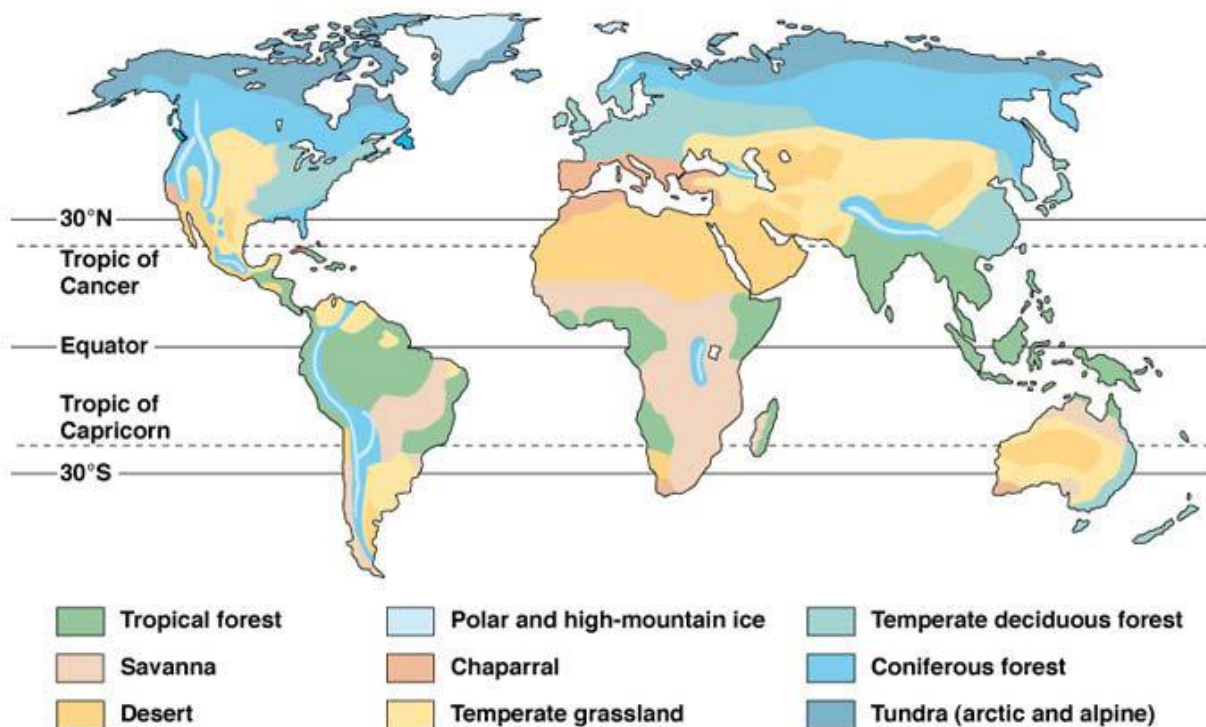Cold icy environments found in the far north and south of the globe

Cold environments found at high latitudes or high altitude

Hot wet environments found on and around the equator where vegetation thrives

Mid latitude areas which are neither too hot nor too cold, but where precipitation totals are not high enough to allow trees to grow

Extremely arid (dry) environments where very little lives or grows as days are extremely hot and nights are very cold

Areas to the north and south of the equator which have 9 dry months and 3 wet months which allows a few trees to grow amongst the grasses

30°N

Tropic of Cancer

Equator

Tropic of Capricorn

30°S

- **Tropical forest**
- **Savanna**
- **Desert**
- **Polar and high-mountain ice**
- **Chaparral**
- **Temperate grassland**
- **Temperate deciduous forest**
- **Coniferous forest**
- **Tundra (arctic and alpine)**

©1999 Addison Wesley Longman, Inc.

Q1. Explain how latitude affects temperature and precipitation **(4) pg.245-246**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Q2. Explain how altitude affects ecosystems **(4) pg. 246-247**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Lesson 2: Local factors and biomes

Learning Objective: To illustrate and describe how local factors impact biomes

Challenge: To compare and assess how local factors impact biomes

Starter: Read the detail below along with pages 246-247 in the Kerboodle Textbook. If you cannot access the Kerboodle textbook, please read this page from Study Rocket.
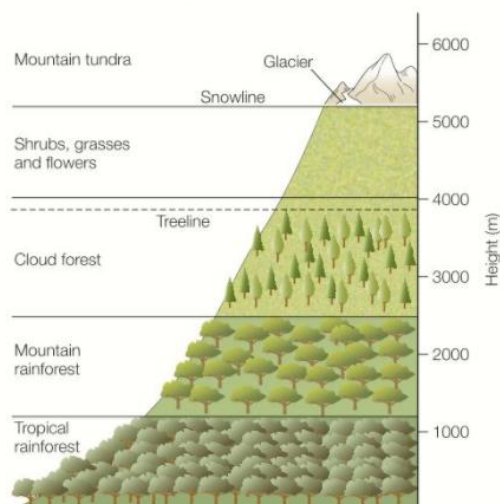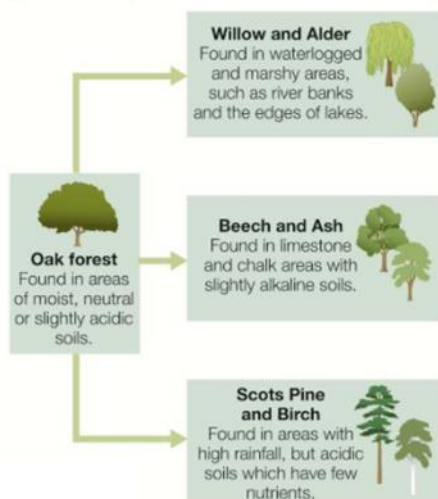
UK ecosystems

If the UK was a totally natural environment, with no urban areas or farming, almost all of it would be covered by temperate forest biome. This consists of deciduous trees that lose their leaves in autumn. The forest is dominated by oak with other species e.g. ash and hazel. However, the forest would vary because of local factors. They include

- Rock and soil type
- Water availability and drainage
- Altitude (height of land)

Task 1: Fill in the table below to summarise how these local factors influence biome location.

Rock and soil type

Water availability and drainage

Altitude
What is altitudinal zonation:

Oak forest Found in areas of moist, neutral or slightly acidic soils.

Willow and Alder Found in waterlogged and marshy areas, such as river banks and the edges of lakes.

Beech and Ash Found in limestone and chalk areas with slightly alkaline soils.

Scots Pine and Birch Found in areas with high rainfall, but acidic soils which have few nutrients.

Mountain tundra — 6000
Glacier
Snowline
Shrubs, grasses and flowers — 5000
Treeline — 4000
Cloud forest — 3000
Mountain rainforest — 2000
Tropical rainforest — 1000
Height (m)

Biotic or abiotic?

Biomes consist of two parts:
- The **biotic** (living) part is made up of plant (flora) and animals (fauna) life.
- The **abiotic** (non-living) part includes the atmosphere, water, rock and soil.

Task 2: Fill in the boxes below to identify what the factor in the diagram represents, whether it is biotic or abiotic, and how it influences the biome. Stuck? Use this link from the BBC to help.

1.

2.
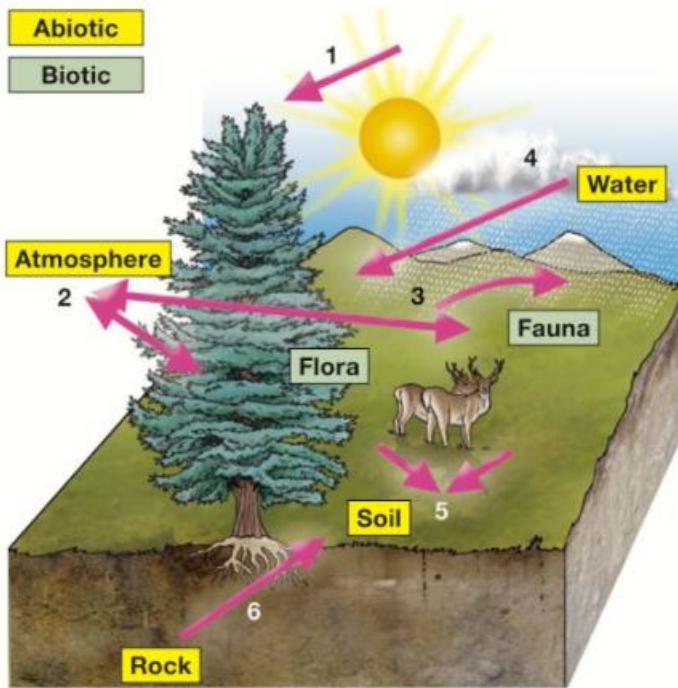
▲ *Figure 3* The biotic and abiotic parts of ecosystems

3.

4.

5.

6.

Q1. State two biomes found on the Equator **(2)**

_____

_____

_____

_____

_____

Q2. Describe the climate found in a tropical rainforest **(2)**

_____

_____

_____

_____

_____

Q3. Compare the boreal forest biome to the tundra biome **(2)**

_____

_____

_____

_____

_____

_____

Q4. Explain the difference between latitude and longitude. Which of the two affects biome distribution, and why? **(4)**

_____

_____

_____

_____

_____

_____

_____

_____

_____

Lesson 3: Climate graphs and climatic influences

Learning Objective: To create, describe and begin to compare climate graphs

Challenge: To compare and describe biomes using climate graphs

Starter: Review table 1 and use the data to complete table 2.

	Tundra Moorland 64◦N Iceland		Boreal (taiga) Forest 65◦N Norway		Tropical Rainforest 0◦N Gabon	
Month	Temp (◦c)	Precipitation (mm)	Temp (◦c)	Precipitation (mm)	Temp (◦c)	Precipitation (mm)
JAN	-0.5	145	-0.8	38	27	249
FEB	0.4	130	-7.5	30	26.5	236
MAR	0.5	115	-4.5	25	27.5	335
APR	2.9	117	2.5	35	27.5	340
MAY	6.3	131	8.5	42	26	244
JUN	9.0	120	14	48	25	13
JUL	10.6	158	17	76	24	3
AUG	10.3	141	15.5	75	25	18
SEP	7.4	184	10.5	57	25.5	104
OCT	4.4	184	5.5	57	26	345
NOV	1.1	137	0	49	26	373
DEC	-0.2	133	-4	41	27.5	249

	Tropical Rainforest	Boreal Forest	Tundra Moorland
Months above 10◦c (length of growing season)			
Months below freezing			
Mean temperature			
Mode temperature			
Total annual (yearly) rainfall			
Seasonal variation (range) in rainfall			

MODE
The number that occurs most often in a set of numbers.
HOW TO FIND THE MODE:
1) put the numbers in order from smallest to largest
2) find the number that occurs the most
i.e. 2, 8, 12, 16, 19, **30, 30**, 42, 51
Special Cases
* No mode - all numbers occur the same amount of times
* More than one mode - 1 or more numbers occur the most amount of times

MEDIAN
the middle number
HOW TO FIND THE MEDIAN:
1) put the numbers in order from smallest to largest.
2) cover up one number on each end until you get to the middle.
If there are 2 numbers in the middle: add them together and divide the answer by 2

MEAN
the average value of numbers in a set.
HOW TO FIND THE MEAN:
1) add up all of the numbers
2) divide the answer by the number of values added together
i.e. 6 + 7 + 9 + 2 ÷ 4 (the number of values)
= 6 (mean)

RANGE
The **difference** (-) between the greatest number and the lowest number in a set
**HOW TO FIND THE RANGE:**
1) put the values in order from smallest to largest
2) subtract the lowest number from the greatest number
i.e. 2, 2, 3, 5, 7, 7, 8, **9**
9 - 2
= 7 (range)

**Task 1**: Tropical Rainforest Climate Graph

If you get stuck – watch this video.

1. Draw two sets of axes like the ones on example to the right
→ on the graph paper below.

2. Plot the rainfall data (mm) for Manaus as a bar graph using
the axes on the right hand side. Shade the bars in.

3. Plot the temperature data (°C) for Manaus as a line graph,
using the axes on the left hand side.

4. Create a key to show which data is the line graph and which
data is rainfall.

Manaus, Brazil

Hebron, Canada
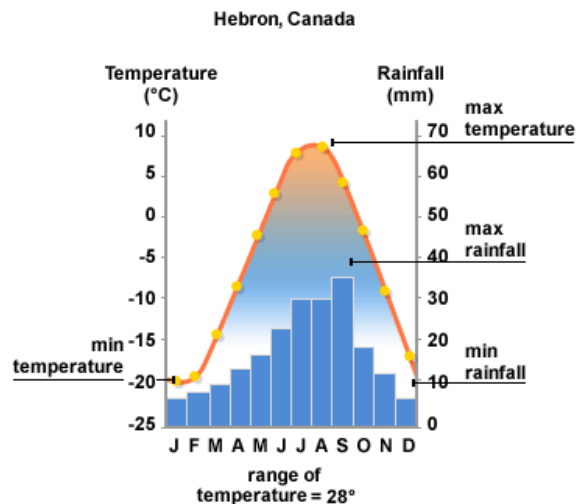
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall mm	265	265	300	285	200	100	67	45	63	110	160	220
Temperature °C	26	26	25	26	26	26	26	27	27	27	27	26
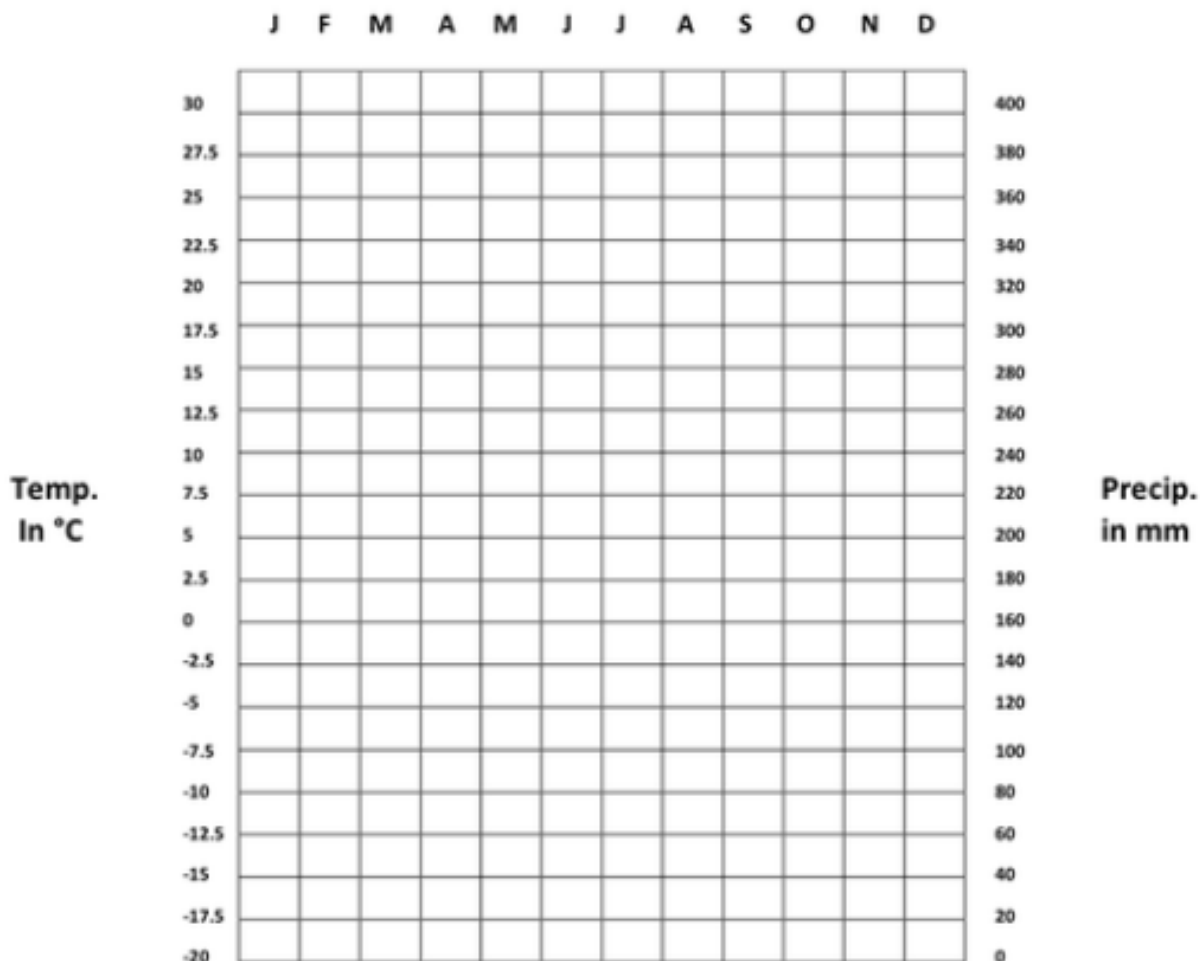
Using the graphs below, write a description of each biome

Tropical Rainforest

_____
_____
_____
_____
_____
_____
_____
_____
_____

London Climate Graph

_____
_____
_____
_____
_____
_____
_____
_____

Hot Desert Climate

_____
_____
_____
_____
_____
_____
_____

Savannah Grassland

_____
_____
_____
_____
_____
_____
_____
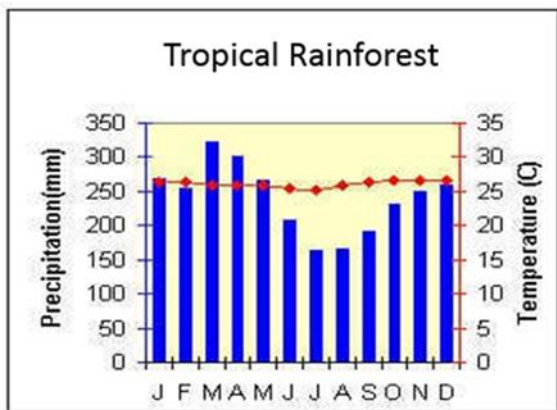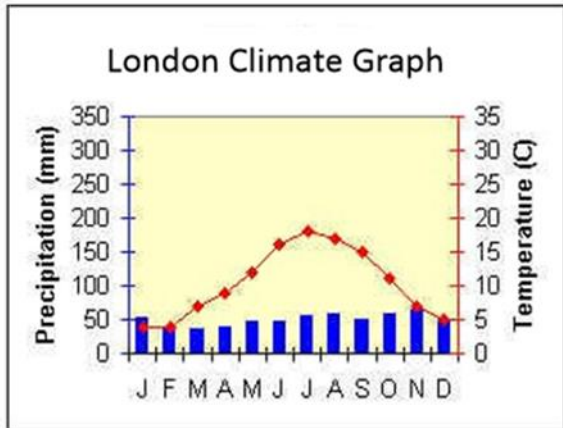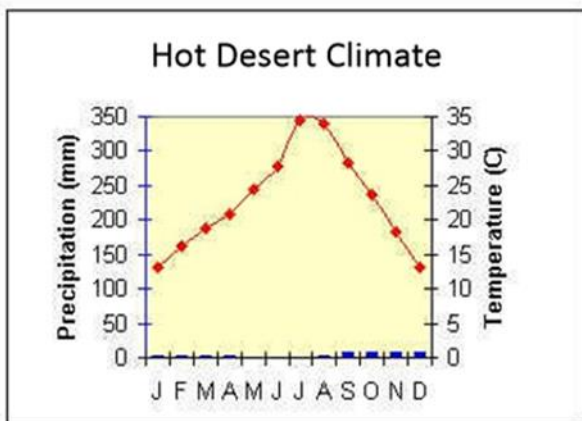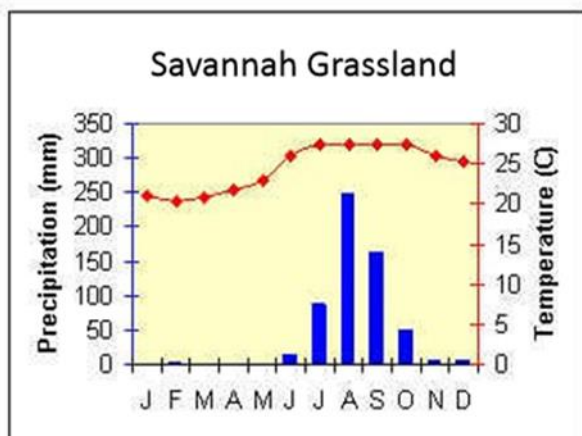
Q1. Using Figures 1-3 complete the following table

Location	Min Temp	Max Temp	Total Annual Precipitation	Number of months when rainfall is above 50mm
Nottingham, UK				
Barrow, Alaska				
Kenya, Africa				

Q2. Explain the factors that limit growth of trees in tropical grassland and tundra areas

_____

_____

_____

_____

_____

Q3a. Study Figure 4 showing photos of three biomes. Match the photos A, B and C to these places: Barrow, Nottingham and Kenya.

A _____

B _____

C _____

Q3b. Describe the differences in vegetation that you can see in the three photographs

_____

_____

_____

_____

_____

Q4. Explain how rainfall and temperature influence the location of temperate deciduous biomes **(4)**

_____

_____

_____

_____

_____

_____

_____

_____

Learning Objective: Describe and locate a range of major biomes.
Challenge: Evaluate their global and local benefits.

Recap: What is the biosphere?

_____

_____

_____

_____

What is the difference between goods and services?

_____

_____

_____

_____

Task 1: Complete table below using **pg.250** in your Kerboodle textbook – if you cannot use Kerboodle, use this link instead:

Provisioning Services	Supporting Services
Regulating Services	Cultural Services

Explain the difference between provisioning and regulating services

_____

_____

_____

_____

_____

Ecosystem services for indigenous people

Task 2: Annotate the picture below with ways in which the Efe people live a sustainable lifestyle – read page 250 as a guidance for your annotations. If you cannot access the Kerboodle textbook, please click here.

Describe the differences in biome destruction shown in Figure 3 below.

_____

_____

_____

_____

State **4** reasons for biome destruction.

_____

_____

_____

_____
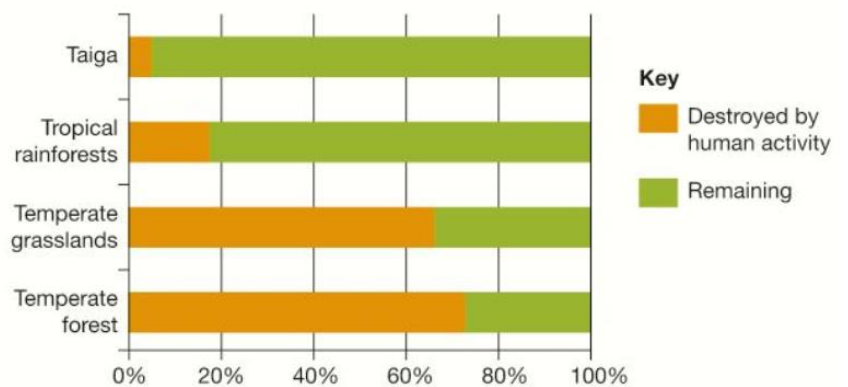
▲ **Figure 3** The destroyed and remaining percentage of four biomes

Task 3: How does the biosphere play a globally important role?

Create a key for the four categories below. Colour code the statements in the grid below to match the correct heading.

Regulating the Atmosphere	Soil Health	Managing the World's Water	Other benefits
A Plants store huge amounts of water and are a vital line of defence against flooding.	B The biosphere regulates the amount of carbon dioxide and oxygen in our atmosphere – through photosynthesis and respiration of living things	C Mangrove forests line many tropical coastal areas and soak up salt water without impacting the plants – when these are cut down, the impacts of flooding increases.	D Most temperate soils, such as brown soils, would be infertile without the breakdown of leaf litter to add nutrients to the soil.
E We cannot survive without the plants and crops grown in soils around the world			F Detoxification of human life and our waste that is produced.
G The biosphere and the pants and animals that live within them provide an important psychological and aesthetic benefit for people.	H Without respiration producing carbon dioxide the Earth would cool down and there would be another glacial period	I Allows a biodiversity of plants and animals to exist.	J In 2016 severe flooding in Bangladesh was blamed on illegal logging along the floodplain.
K Forests such as the Amazon Rainforest, breath out oxygen during the daylight hours	L Soils can filter water to remove impurities and waste.	M The decomposition is greatly aided by the biosphere, as earthworms churn up the soil and bacteria breaks it down.	N Trees and plants are a huge 'carbon sink' and store carbon that would otherwise dramatically impact our climate

Explain how the biosphere plays a globally important role **(4)**

_____

_____

_____

_____

_____

_____

Assess the reasons why some people are concerned about the destruction of rainforest for commercial uses **(8)**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Lesson 5: Exploitation and the Biosphere

Learning Objective: Be able to give case study specific examples of how the biosphere is being exploited
Challenge: Be able to explain the local and global impact of exploitation of a named ecosystem.

Starter: Read pages 250-251 in the Kerboodle Textbook. Then watch the videos linked below in the table.

Task 1: Summarise how each of the activities is threatening the biosphere.

Cattle Ranching, Rainforest (4 mins) https://www.youtube.com/watch?v=54dmDQsSqrU	
Belo Monte Dam, Brazil (6 mins) https://www.youtube.com/watch?v=wlxCu_zIt0c&t=8s	
Gold mining, Amazon Rainforest (8 mins) https://www.youtube.com/watch?v=i0N9ECWCmOE	
Palm Oil in Indonesia (6 mins) https://www.youtube.com/watch?v=t_B9IyZeyjk	

Task 2: What do you think?

Write a 300 word response to the following question: *Are biomes worth more left in their natural state, rather than being exploited?*

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Explain how the Amazon Rainforest is being affected by development **(4)**

_____

_____

_____

_____

_____

_____

_____

_____

_____

For a named ecosystem, explain two ways the ecosystem is being exploited **(4)**

_____

_____

_____

_____

_____

_____

_____

_____

Explain some social impacts of deforestation **(4)**

_____

_____

_____

_____

_____

_____

_____

_____

Learning Objective: To be able to explain the importance of healthy air and healthy soils.
Challenge: To be able to explain the critical role biomes play in maintaining a healthy planet

Starter: Read pages 252-253 in the Kerboodle Textbook. If you cannot access the Kerboodle textbook, please read over this link from Study Rocket.

Task 1: What are **carbon sinks**?

_____

_____

_____

What is the **nutrient cycle**?

_____

_____

_____

Healthy air

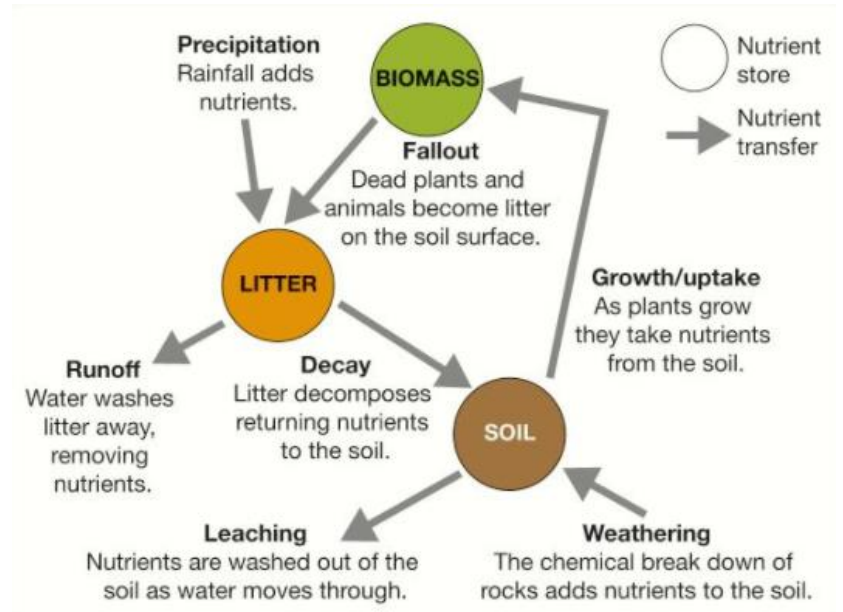**Task 2:** Write out the equation for the process of **photosynthesis**

Describe what the diagram on the right shows.

_____

_____

_____

_____

_____

_____
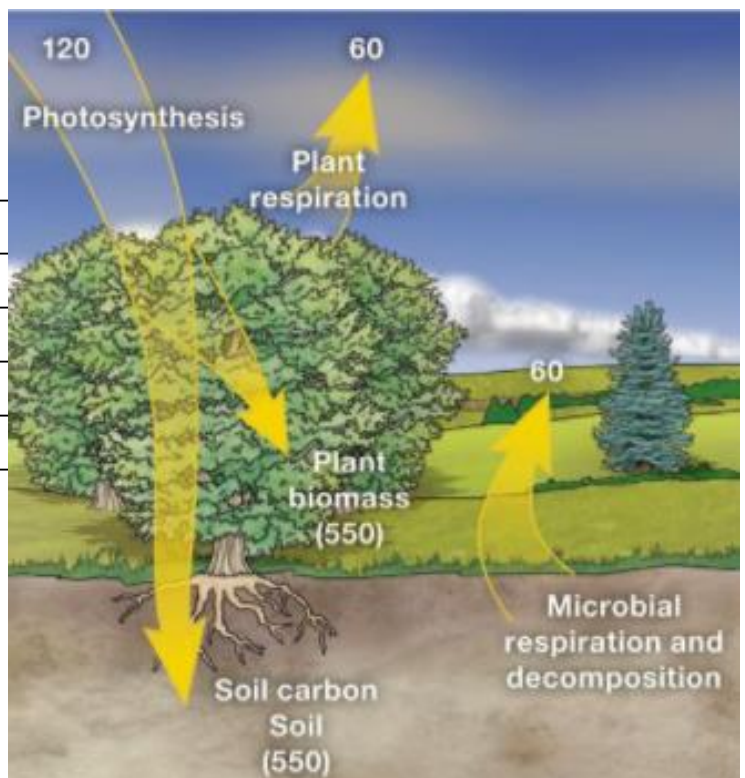
Task 3: Healthy soils

Explain how the nutrient cycle works, in less than 150 words.

Precipitation Rainfall adds nutrients.

BIOMASS

Fallout Dead plants and animals become litter on the soil surface.

LITTER

Growth/uptake As plants grow they take nutrients from the soil.

Runoff Water washes litter away, removing nutrients.

Decay Litter decomposes returning nutrients to the soil.

SOIL

Leaching Nutrients are washed out of the soil as water moves through.

Weathering The chemical break down of rocks adds nutrients to the soil.

○ Nutrient store

→ Nutrient transfer

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Task 4: Water supply and flood risk

Using the diagram on the right, explain the importance

of the biosphere to the water cycle **(4)**

1 With no trees, interception is reduced and rainfall hits the soil surface directly, causing soil erosion.
2 Without trees, there is much less infiltration of water into the soil; this means groundwater supplies, which are an important water resource for many people, are lower.
3 Surface run-off increases, which increases soil erosion and means water gets into river channels much faster.
4 Flooding becomes more frequent, and river water is made dirty by all of the soil washed into the river.
5 With no forest, the soil dries out very quickly so overall evaporation is reduced which can mean fewer clouds, less rain and a drier climate.

_____

_____

_____

_____

_____

_____
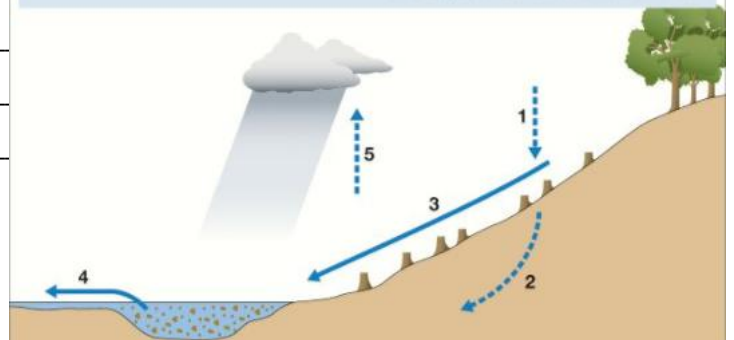
Extension/Challenge Task 7: More and more resources

What are **natural resources**?

_____

_____

_____

	Rising global population	Rising affluence (average global income)	Increasing urbanisation (% of people living in towns and cities)
1975	4.1 billion	US$3700 per person	38%
2015	7.3 billion	US$10 400 per person	55%
Resource demand	A larger population means a greater demand for resources, especially food and water; large areas of forest have been cleared to make new farmland.	Increasing average wealth means people use more energy resources, such as fossil fuels in the manufacture of consumer goods.	Over half of the world's population now live in towns and cities which have sprawled over biomes and increased demand for water and food.

▲ *Figure 2* Pressure on natural resources

Explain how the data in Figure 2 places increasing pressure on the world's resources **(3)**

_____

_____

_____

_____

_____

_____

_____

Describe the changes in population growth in Figure 3 **(4)**

_____

_____

_____

_____

_____

_____
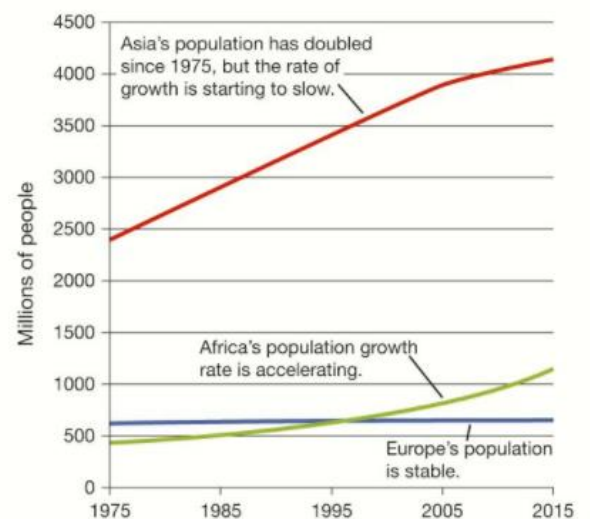
▲ *Figure 3* Population growth in Africa, Europe and Asia, 1975-2015

Task: Complete the spider diagram by describing all of the pressures on biomes that result from the changes shown in Figure 4

Asia	Water consumption (cubic km)	Oil consumption (millions of tonnes)	Coal consumption (millions of tonnes)	Meat consumption (million tonnes)
1975	1000	453	388	22
2015	1700	1450	2810	135
Percentage increase 1975 – 2015	70%	220%	624%	513%

▲ **Figure 4** The increased demand for resources

Oil

Water — Pressures — Coal

Meat
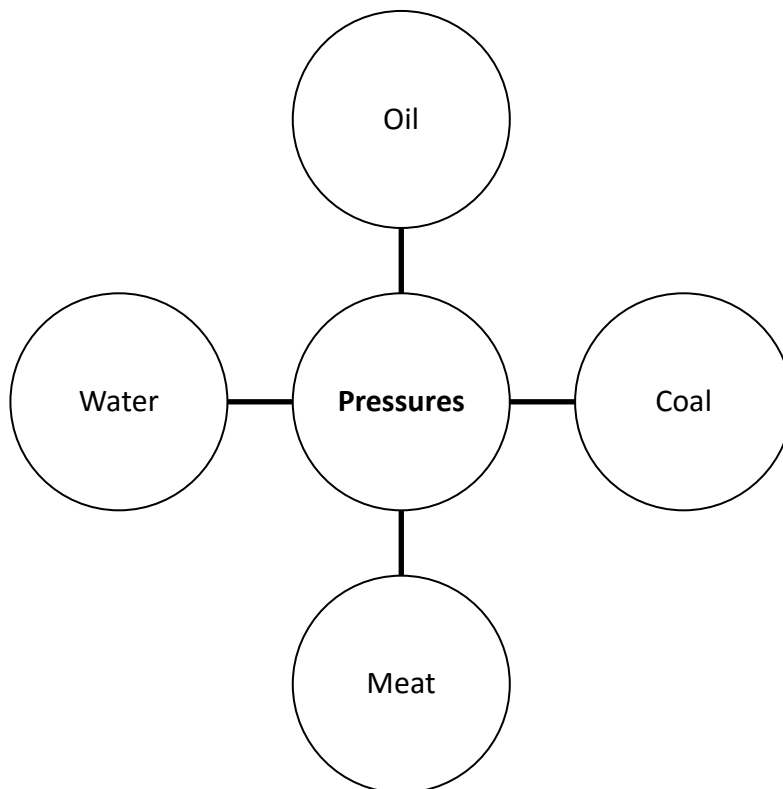
Lesson 7: Theories of Population and Resources

Learning Objective: To be able to describe different theories held to the balance between population and resources.
Challenge: To assess different theories held to the balance between population and resources.

Starter: What is the **Green Revolution**? (https://www.youtube.com/watch?v=hq8b-iCgvLM)

_____

_____

_____

_____

_____

_____

Task 1: 2030: Perfect Storm?

In 2009, Professor John Beddington, the UK government's chief scientific advisor, said:

"Our food reserves are at a 50-year low, but by 2030 we need to be producing 50% more food. At the same time, we will need 50% more energy, and 30% more fresh water"

He was describing what has been called the '2030 perfect storm' idea. It argues that by 2030 the world will be running out of resources. It is not a new idea. ***There are two key viewpoints – read pages 256-257 in the Kerboodle Textbook to examine these two points of view (if you cannot access Kerboodle – click here instead):***
- The Malthusian View
- The Boserupian View

Summarise the differences between their points of view below:

View	In a bit more detail…	People who held this view	Sometimes called…

The Malthusian View

_____

_____

_____

_____
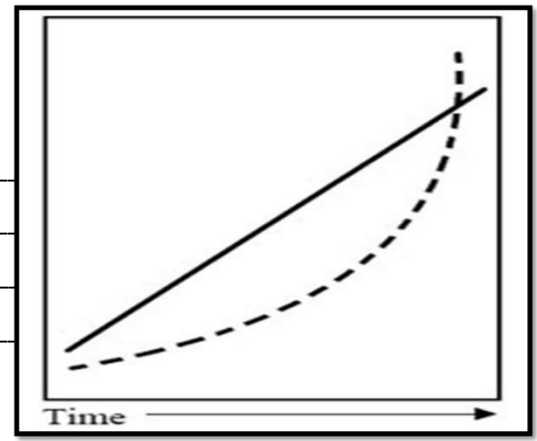
Key: ——— available resources
- - - - - population

The Boserupian View

_____

_____

_____

_____

_____
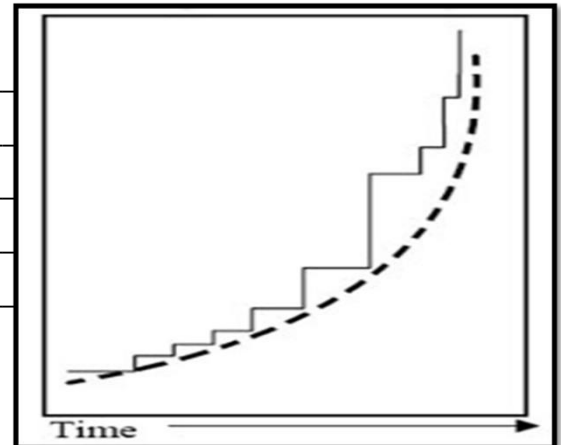
Key: ——— available resources
- - - - - population

Who's right?

GM crops

New farming technologies increase food supply over and over again (Boserup)

Fertilizers

Farm machinery

Crop rotation

Irrigation

Population falls

Crisis (Malthus)

Geometric (exponential) population growth

Population increase

Time

Key
——— Food supply growth according to Malthus
——— Food supply growth according to Boserup
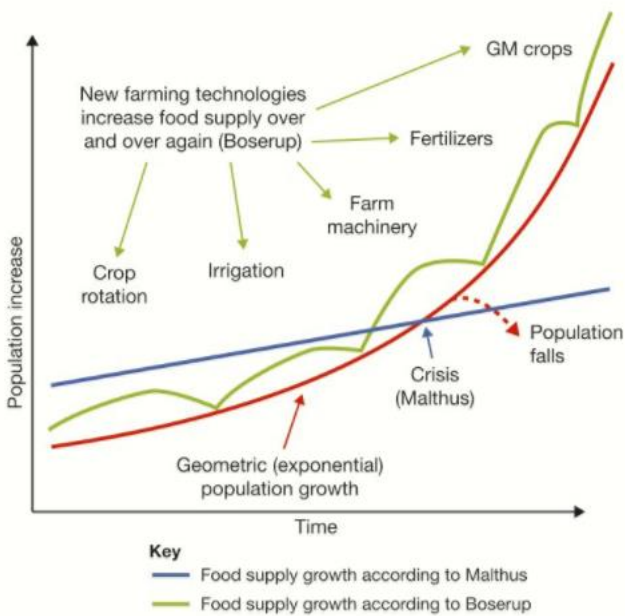
▲ **Figure 2** The theories of Malthus and Boserup compared

_____

_____

_____

_____

Explain how different theorists have differing views on the relationship between population growth and resource consumption **(6).**

Success Criteria: *Key terms:*
- *Food/agriculture*
- *Population*
- *Technology*
- *Exponential*
- *Natural/population checks*
- *Arithmetically*
- *Resource*
- *Böserup*
- *Malthus*

Paragraph One:
1. Explain Malthus theory in detail.
2. Give a named example where his theory could be applied.

Paragraph Two:
1. Explain Boserup's theory in detail.
2. Give named examples of where her theory could be applied.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Assess the reasons why population and industrialisation have increased demand for resources **(8).**

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Complete your own glossary of key geographical terms.

Key Term	Definition
Abiotic	
Altitude	
Altitudinal zonation	
Atmosphere	
Biomass	
Biome	
Biosphere	
Biotic	
Boserupian	
Carbon sequestration	
Carbon sink	

Climate	
Club of Rome	
Decay	
Decomposition	
Ecosystem	
Ecosystem services	
Ecosystems	
Evaporation	
Fallout	
Food web	
Goods	
Groundwater	

Hydrological cycle	
Indigenous peoples	
Industrialisation	
Infiltration	
Interception	
Latitude	
Leaching	
Lithosphere	
Litter	
Malthusian	
Natural resources	
Nutrient cycle	

Nutrient transfer	
Permeable	
Photosynthesis	
Precipitation	
Runoff	
Services	
Slash-and-burn	
Soil erosion	
Treeline	
Tundra	
Urbanisation	
Weathering	