

Edexcel GCSE Geography B

Practical support to help you deliver this Edexcel specification

Edexcel GCSE Geography B offers an issues-based approach to the content and assessment, with the content split by Global and UK scale. As with all GCSEs, the guided learning hours is 120 hours over two years. This document provides a topic guide for teaching Component 3, Topics 7, 8 and 9, and can be adapted by centres to fit their own contexts and teaching styles. It has been produced as an example approach and is not intended to be prescriptive. The topic booklets indicate resources that you can use to support your teaching. These are only suggestions and you are encouraged to use a wide range of resources to suit the needs of your own students.

The advised teaching time is 4 guided learning hours for Topic 7, 11 guided learning hours for Topic 8, and 10 guided learning hours for Topic 9. This requires some blending together of the detailed content. In the guidance below, suggestions are made about contextualisation or stretch challenges that may be suitable for more able students, as well as expected lesson outcomes for those less able. Please note that these are suggestions only and not specific syllabus requirements.

The two- and three-year course planners suggest appropriate times to introduce this material. For example, in centres studying over three years, you might want to start the topic in the second half of the autumn term of year 9 introducing students to the idea of DME style questions. Centres studying over two years might also like to follow this sequence but in year 10 and year 11 respectively.

Each Enquiry Question begins with a quick overview of the breadth of the enquiry question followed by a more detailed explanation of the key concepts and processes, examples of teaching strategies, guidance on integrating geographical skills, and a summary of the key terminology required. The structure is suggestive, not prescriptive.

Synoptic linkages and case study nesting

Topic 7: It is suggested that you select located examples that can be used to explore how the biosphere provides resources for indigenous and local people. These could be places within biomes, or perhaps two different biomes to contextualise the ideas presented. This unit has clear links to Topic 2 'Development Dynamics' and the chosen case study for biosphere resources could link to developing countries and their rapid economic growth. This topic also serves as a foundation to Topics 8 and 9 that build upon the knowledge, skills and understanding taught within this Topic.

Topic 8: It is suggested that you select located examples of both a tropical rainforest and taiga forest biome. These could be taken from country studies that are used in Topic 1 or Topic 2. For example, the Brazilian rainforest might be used as an example and tie in with the rapid economic growth of Brazil as a located



example studied in Topic 2. This topic builds upon the knowledge, skills and understanding taught in Topic 7 focusing on the tropical rainforest and taiga forest biomes.

Topic 9: It is suggested that you use located examples that examine environmentally sensitive areas that are being explored for energy consumption. These could be taken from places that have already been studied, for example tar sands in Canada and the exploration of energy in the Arctic. The topic builds upon the knowledge, skills and understanding taught in Topics 7 and 8 focussing on consuming energy resources.

Topic Booklet for Component 3, Topics 7, 8 and 9

Topic 7: People and the biosphere

Introduction

Quick overview

An understanding of the distribution of the Earth's ecosystems (biomes), the factors that affect their distribution and how the biosphere acts as a life-support system providing both goods and services:

- EQ: Why is the biosphere so important to human wellbeing and how do humans use and modify it to obtain resources?

The aim of this topic is to get an overview of the biosphere, why it is so important to human wellbeing and to understand how humans use and modify it to obtain resources. The ideas studied here are to help students understand a key geographical issue which is underpinned by conceptual knowledge learnt in Component 1 and Component 2.

The key ideas each tell a familiar geographical story: the distribution of the Earth's biomes is affected by global and local factors; the biosphere provides both goods and services for people. This approach is different to GCSE Specification A, where there is a topic based on ecosystems, biodiversity and management. There is not a 'making geographical decisions' paper in Specification A.

The key things to bear in mind are:

- 1) The final examination will consist of a booklet of sources, which is provided in the examination. This will exemplify a geographical issue which is drawn from either Topic 7, 8 or 9 in Component 3 and underpinning conceptual knowledge from Components 1 and 2. Students should be able to:
 - make effective use of the resource material
 - analyse and interpret the resource material.
- 2) The final question of the examination will be a 12 mark question – it is important that students can make links between physical and human geography and draw on information in the resource material provided. Students should be able to use this information to make reasoned justifications for proposed solutions in relation to their likely impact on people and the environment.

Enquiry Question: Why is the biosphere so important to human wellbeing and how do humans use and modify it to obtain resources?

Teaching approach over four hours

Lesson 1 (1hr)	The distribution of the Earth's ecosystems
Lesson 2 (1hr)	The biosphere provides resources for indigenous and local people
Lesson 3 (1hr)	The biosphere plays a wider important role for our planet
Lesson 4 (1hr)	Global demands for food, energy and water resources are increasing

Lesson 1: The distribution of the Earth's ecosystems

Overview

The first lesson should tackle Key idea 7.1 so students understand that the global distribution and characteristics of major biomes are influenced by global factors, such as climate, and local factors such as altitude. Students should also understand what biotic and abiotic characteristics are and how they are independent.

- More able students should be able to understand the complex interaction of global and local factors in influencing biome distribution and characteristics.
- Less able students could be guided to label the major biomes on a world map using pre-drawn maps and annotating key features.

Key concepts and processes

Students need to understand that the biosphere is the layer of the Earth in which life exists. It is a thin layer where all plants and animals are found. The biosphere is divided into biomes (or ecosystems) that are located in belts around the surface of the Earth. The major biomes are tropical, temperate and boreal forests, tropical and temperate grasslands, deserts and tundra, and their location and characteristics are influenced by climate factors such as temperature, precipitation, and sunshine hours.

There are also a range of local factors, such as altitude, rock and soil type, and drainage that can alter the distribution of biomes locally. Finally, students will need to be aware how the biotic (flora, fauna) and abiotic (soils, rock, water, atmosphere) components of biomes interact with each other.

Guidance on teaching

- A good starting point is to get students to complete a blank map of the world showing the major biomes. There are a wide range of templates available on the internet for doing this. Students can use atlases to mark on each of the biomes and then begin to investigate some of the reasons why different biomes are located in different parts of the world e.g. map features such as the equator and lines of latitude and longitude, relief, precipitation etc.
- Students could be given information cards with key features of the major biomes and they have to work out which links to each biome and suggest reasons why.
- Climate data could be produced for several of the major biomes and this could be used to produce climate graphs for each of them. Students could then link these to the biomes on the maps they have produced and consider how climate can affect the biome.
- Students could investigate the local features of one named ecosystem to identify the local factors that influence it. This could be done through research on the internet, or through a card-sorting exercise.
- A set of information about biotic and abiotic features of an ecosystem could be used for students to sort into two categories and then explain how they are interlinked.

Lesson 2: The biosphere provides resources for indigenous and local people

Overview

The second lesson should tackle Key idea 7.2a so students understand that the biosphere provides resources for indigenous and local people, but that there are concerns that it is becoming increasingly exploited for commercial gain.

- More able students should be able to understand the wide range of goods and services that biomes can provide and how there can be competition for these resources and commercial exploitation can threaten local people.
- Less able students should be encouraged to produce a mind map showing the goods and services that the biosphere can provide.

Key concepts and processes

Students need to understand that the biosphere is a vital life-support system that provides a wide range of goods and services for indigenous and local people such as food, medicine, building materials and fuel resources. These resources are often used sustainably by indigenous people, but increasing exploitation of energy, water and minerals for commercial use can threaten this sustainability.

Guidance on teaching

Teaching could be focused on biomes at both a local and global scale. Teachers could focus on the goods and services used by indigenous and local people within a biome such as the Tropical Rainforest and investigate how people there sustainably use the resources available and contrast this with the commercial exploitation of the forest.

- A good starting point could be using photographs of a range of biomes and asking students to consider the goods and services that people can extract from each of them and whether this is sustainable.
- Another activity might be to provide a range of goods sourced from a supermarket, or that students provide from home, and ask them to identify which biomes they may have originated from and whether our consumption of these is sustainable? Examples might include cotton (amount of water used), coffee, etc. More able students might start considering food miles as an introduction to 7.2c.
- A focus on the Tropical Rainforest could be used to demonstrate the sustainable lifestyle of groups of indigenous people and how their lifestyles are sustainable. This could be contrasted with commercial logging for example and the impact that this is having on the biome.
- Students could complete a mind map and use information cards to understand why the biosphere is important for indigenous and local people and why it is being exploited for wider global use.

Lesson 3: The biosphere plays a wider important role for our planet

Overview

The third lesson should tackle Key idea 7.2b so students understand that the biosphere providing globally important services as it regulates the composition of the atmosphere, maintains soil health and regulates water within the hydrological cycle.

- More able students should be able to understand the complex nature of the interaction between the biosphere and global life-support systems, such as the carbon cycle, nutrient cycle and the hydrological cycle.
- Less able students could produce diagrams to show the relationships that exist between the biosphere and the atmosphere, soil and hydrological cycle.

Key concepts and processes

Students need to understand that the biosphere is a vital life-support system that provides globally important services by regulating the composition of the atmosphere, maintaining soil health and regulating water within the hydrological cycle. These processes therefore play a wider role that is important for the on-going good health of our planet. Students will need to understand the three main cycles that are introduced in this area of the specification: the carbon cycle; the nutrient cycle; and the hydrological cycle.

Guidance on teaching

Teaching should be focused at a global scale as students need to be aware of how local interactions are part of a global system. There are three main areas that will need to be covered in this lesson: a focus on the composition of the atmosphere with an understanding of the carbon cycle; the maintenance of healthy soils with an understanding of the nutrient cycle (see Figure 1); and the regulation of water with an understanding of the hydrological cycle.

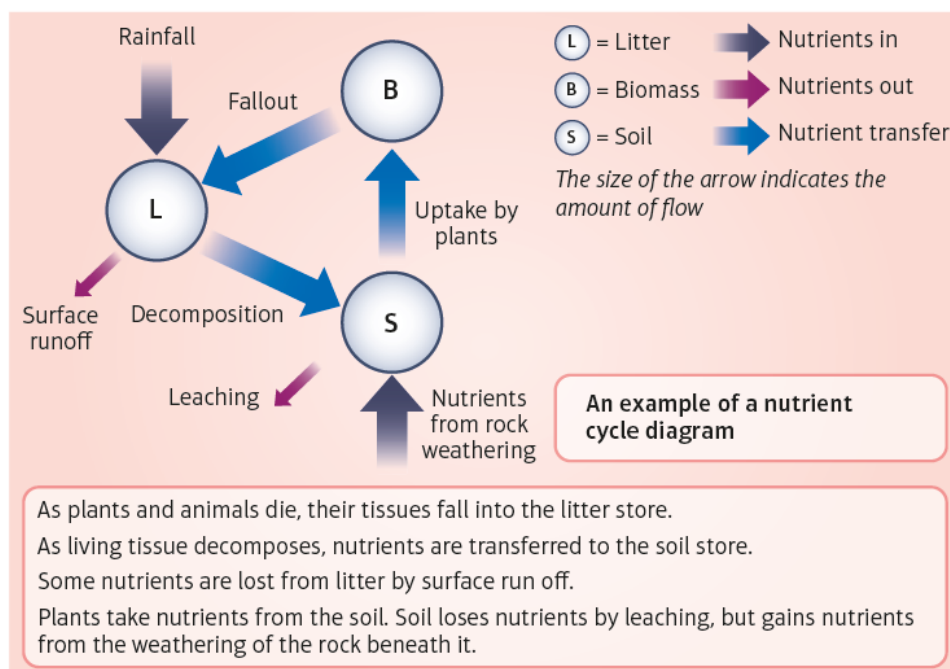


Figure 1 – Nutrient cycles

This lesson could involve a carousel activity that is based around an understanding of each of the three systems focused on.

- The starter activity could involve students being introduced to the idea of systems with inputs, processes and outputs.
- The main activity could then involve three stations, each with information about one of the three cycles: carbon, nutrient and hydrological. The students could then produce a system diagram at each of the three stations showing inputs, processes and outputs.
- Students would complete the lesson with three clear systems processes and be able to explain the importance of each in contributing to our global life-support system.

The lesson could also use a case study approach to investigate the interactions of these systems. Students could research how human interference has affected these systems e.g. flooding in Bangladesh, which has been exacerbated by deforestation, inappropriate farming techniques and climate change.

Lesson 4: Global demands for food, energy and water resources are increasing

Overview

The fourth lesson should tackle Key idea 7.2c so students understand that there is increasing demand for food, energy and water resources and that there are different theories about the relationships between population and resources.

- More able students might be able to explain how neither Malthusian or Boserupian views have proven to be right and that there is a fine balance of the resources that the Earth can provide and the number of humans who exist on the planet.
- Less able students should be able to summarise the key arguments of both Malthus and Boserup.

Key concepts and processes

Students need to understand that the biosphere is a vital life-support system that is under threat from increasing demand for food, energy and water resources because of population growth, rising affluence, urbanisation and industrialisation.

There are two main competing theories on the relationships between population and resources, those of Thomas Malthus who argued that food production would not keep up with population growth (see Figure 2), and those of Esther Boserup who argued that as population grows humans invent new ways of producing more food.

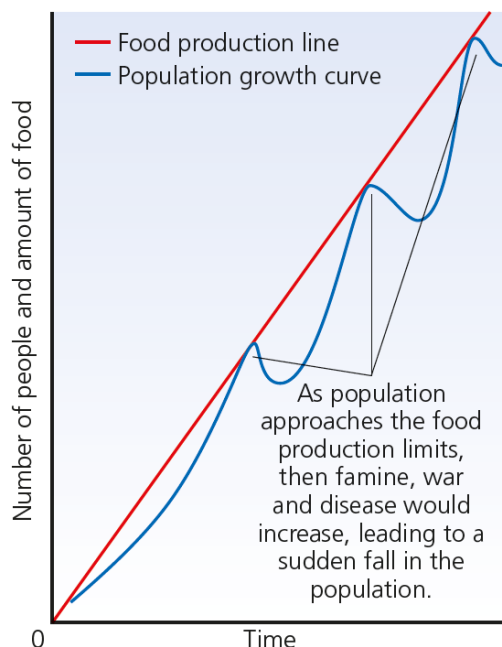


Figure 2 – The relationship between food supply and population, according to Malthus

Guidance on teaching

- A good starting point is to get students to investigate population growth, rising affluence, urbanisation and industrialisation. This could be done by using photographs or cartoons.
- Students could be shown a graph of population growth and asked to list the implications of this growth such as increasing demand for food, energy and water resources.
- Students could be divided into groups and presented with information about either the Malthusian theory or the Boserupian view. They could then produce this information as part of a summary table. Once complete they then have to partner with a student who has information about the opposite view and share their views with each other and complete their tables.
- For a plenary session the class could be divided into Malthusians and Boserupians to encourage a debate to see which view the students think is the more persuasive – will Malthus be proved right if the world's population reaches 12 billion people?

Key vocabulary for EQ

The distribution of the Earth's ecosystems	The biosphere is a vital life-support system
Abiotic Altitude Biome Biotic Ecosystem Flora Fauna Pressure belts	Affluence Biosphere Boserup Carbon cycle Exploitation Indigenous People Industrialisation Hydrological Cycle Malthus Nutrient Cycle Urbanisation

Further reading

- Information about the [distribution of the Earth's biomes](#).
- The Economist website has a discussion of the [work of Malthus](#)
- Discussion of [Malthus versus Boserup](#).

Topic 8: Forests under threat

Introduction

Quick overview

A detailed understanding of tropical rainforests and taiga forests, which looks at their processes and interactions as well as issues related to their biodiversity and to their sustainable use and management.

- EQ: What are the threats to forest biomes and how can they be reduced?

The aim of this topic is to get an overview of forest biomes, the threats that they face and how these can be reduced. The ideas studied here are to help students understand a key geographical issue which is underpinned by conceptual knowledge learnt in Component 1 and Component 2.

The key ideas each tell a familiar geographical story: the characteristics of the ecosystem, how these are being threatened by humans and how we can conserve and sustainably manage these different ecosystems. This approach is similar to GCSE Specification A, where there is a topic based on ecosystems, biodiversity and management. The specification SAMs could be useful to use, so as not to use up those from specification B. There is not a 'making geographical decisions' paper in Specification A.

The key things to bear in mind are:

- 1) The final examination will consist of a booklet of sources, which is provided in the examination. This will exemplify a geographical issue which is drawn from either Topic 7, 8 or 9 in Component 3 and underpinning conceptual knowledge from Component 1 and 2. Students should be able to:
 - make effective use of the resource material
 - analyse and interpret the resource material.
- 2) The final question of the examination will be a 12 mark question – it is important that students can make links between physical and human geography and draw on information in the resource material provided. Students should be able to use this information to make reasoned justifications for proposed solutions in relation to their likely impact on people and the environment.

Enquiry Question: What are the threats to forest biomes and how can they be reduced?

Teaching approach over 11 hours

Lesson 1 (1hr)	Adaptations to the tropical rainforest
Lesson 2 (1hr)	Tropical rainforests' high level of biodiversity
Lesson 3 (1hr)	Adaptations to the taiga biome
Lesson 4 (1hr)	The causes and impacts of deforestation in the tropical rainforest
Lesson 5 (1hr)	The indirect impact of climate change on tropical rainforests
Lesson 6 (1hr)	The direct threats of commercial development on the taiga biome
Lesson 7 (1hr)	Factors which can threaten biodiversity of the taiga biome
Lesson 8 (1hr)	Advantages and disadvantages of sustainable management in protecting the tropical rainforest
Lessons 9 and 10 (2hrs)	Sustainable management of the tropical rainforest
Lesson 11 (1hr)	Sustainable management of the taiga biome

Lesson 1: Adaptations to the tropical rainforest

Overview

The first lesson should tackle Key idea8.1a so students understand how plants and animals have adapted to living in a tropical rainforest. Students should also understand what biotic and abiotic characteristics are and how they can interact.

- More able students should be able to understand the different layers of the rainforest and explain how and why plants and animals have adapted in different ways.
- Less able students could be guided to label the key features of a rainforest using a word bank of key words.

Key concepts and processes

Students need to understand that a tropical rainforest is made up of different layers and has exceptionally high biodiversity due to the equatorial climate; there is no dry season and at least 60mm of rainfall a month, plus high temperatures all year round. Other contributing factors are the length of time that rainforests have been on the earth and their structure. This structure then leads to how plants and animals have adapted to a tropical rainforest environment, for example ferns like shaded areas and have adapted to the forest floor.

There is the opportunity to get students to draw and/or interpret a climate graph of a tropical rainforest. Students should be able to use this to explain adaptations of plants and animals in the rainforest.

Guidance on teaching

- A good starting point is to use BBC Bitesize which has a clip on [Rainforest Structure](#).
- Students can draw and/or interpret a climate graph of the tropical rainforest. Following this students should be able to locate and describe the distribution of tropical rainforests. You could ask students to explain the location, linking back to Component 1, Topic 1 and atmospheric circulation.
- Students should be able to draw an annotated diagram of the structure of a tropical rainforest with the adaptations of a range of plants and animals.
- Students could play key words 'Articulate' where they have to describe the adaptations of a plant or animal in the rainforest and their partner needs to guess the answer. This is a good way to imbed new key words and geographical vocabulary.

Lesson 2: Tropical rainforests' high level of biodiversity

Overview

The second lesson should tackle Key idea 8.1b so students understand how a tropical rainforest functions, including the concepts of the nutrient cycle and food webs. Students should gain an understanding of what happens if the nutrient cycle or food webs are interrupted.

- More able students should be able to understand why tropical rainforests have a high rate of nutrient cycling and how human activity could cause it to become unbalanced which, in turn, could affect the high levels of biodiversity.
- Less able students could be guided to describe key features of the tropical rainforest nutrient cycle, using un-labelled arrows on the diagram.

Key concepts and processes

Students need to appreciate that tropical rainforests have a very high rate of nutrient cycling (see Figure 3) and this enables them to support a high level of biodiversity and complex food webs. It is important for students to understand the key components of Gersheml's Nutrient Cycle and the difference between stores and transfers and how these look for a tropical rainforest. This is linked to Component 3, Topic 7.

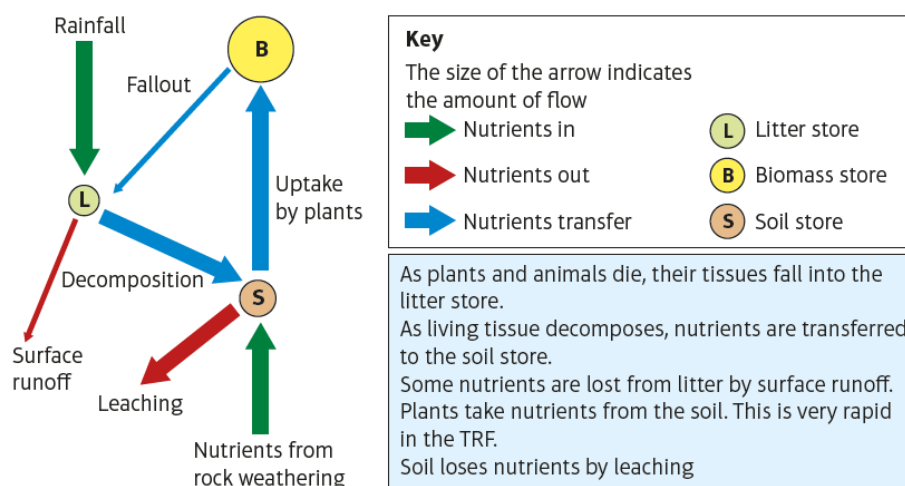


Figure 3 – The tropical rainforest nutrient cycle

Students should then look at the tropic levels and understand the complex make up of a food web in a tropical rainforest. This can be linked with previous learning on adaptations and conditions of a tropical rainforest.

Guidance on teaching

- Give students a blank nutrient cycle and a bank of key words bank and get them to categorise key words into inputs, recycling and outputs. Students need to label the key words onto their diagram. To stretch students, you can ask them to draw what they think the nutrient cycle would look like following deforestation. This shows students' ability to understand how a tropical rainforest works and the interactions between the components of the nutrient cycle.
- Students could be introduced to the taiga biome at this stage and its nutrient cycle (see Figure 4) and so they can compare and contrast the two biomes and their nutrient cycles.
- Discuss with students what trophic levels are and then give students examples of different species in a tropical rainforest. Students have to place them in the correct level and create a food web. Discuss what would happen if one of species became extinct – how would this affect the rest of the food web.

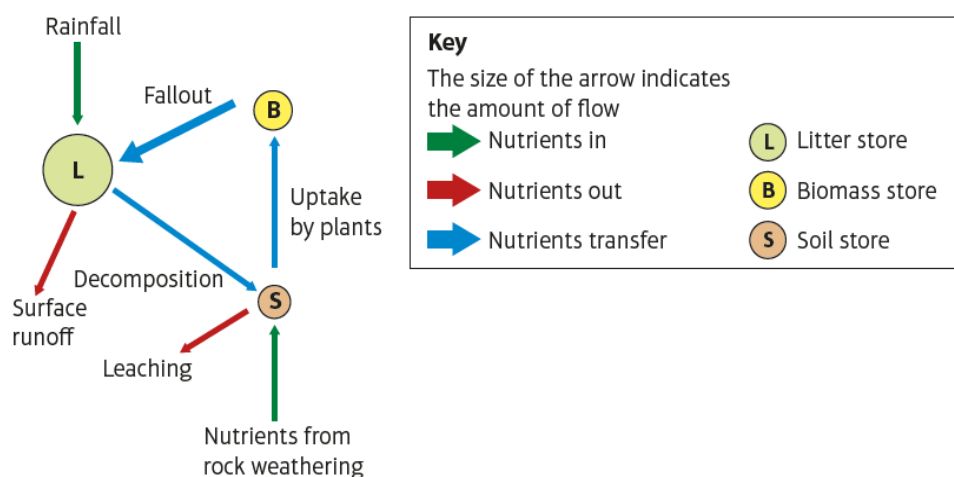


Figure 4 – The nutrient cycle of the taiga

Lesson 3: Adaptations to the taiga biome

Overview

The third lesson should tackle key ideas 8.2a and 8.2b by focussing on the characteristics of a taiga biome and how plants and animals adapt to the climate in the taiga. Students should also grasp that the taiga has lower productivity because of a less active nutrient cycle which leads to lower levels of biodiversity.

- More able students should be able to understand why taiga biomes have lower levels of biodiversity compared to a tropical rainforest.
- Less able students should focus on the adaptations of plants and animals to the taiga biome.

Key concepts and processes

See Key concepts and processes for 8.1a and 8.1b on pages 10 and 11.

Guidance on teaching

- Draw annotated diagrams of plants and animals in the taiga biome explaining how they are adapted to the climate.
- Discuss the differences between a tropical rainforest and taiga biome and how their nutrient cycling and biodiversity differ. Students then write an extended answer explaining the differences between the taiga biome and tropical rainforest. This could be done as an independent activity or as a homework between lessons 2 and 3.

Lesson 4: The causes and impacts of deforestation in the tropical rainforest

Overview

The fourth lesson should tackle key idea 8.3a in which students understand how tropical rainforests are being destroyed by human activity. Students should understand a number of direct threats to the rainforest.

- More able students should be able to understand why there are different rates of deforestation in different parts of the world.
- Less able students should focus on what deforestation is and the main human threats to a tropical rainforest.

Key concepts and processes

Students should appreciate there are direct and indirect threats to the rainforest. Students will look more in-depth at indirect threats in the next lesson. It is important for students to understand there are a range of causes of deforestation, which are strongly linked to economic reasons e.g. debt, poverty and economic development.

Guidance on teaching

- There is a good opportunity for students to use GIS to identify rainforest loss. Students can use Google Earth to identify areas of deforestation and to go back and look at how this has changed over time.
- Students can develop their understanding of attitudes and roles of different people towards the rainforest by playing the [deforestation game](#)
- Students can develop their locational knowledge by drawing areas of rainforest that have suffered from deforestation and then annotating the map with the reasons for deforestation in specific areas.
- Students can rank the range of causes in order of importance, justifying their decisions.
- Students can use a Venn diagram to organise social, economic and environmental impacts of deforestation.

Lesson 5: The indirect impact of climate change on tropical rainforests

Overview

The fifth lesson will focus on 8.3b where students will understand the indirect threats to tropical rainforests. This will concentrate on climate change and how it threatens the health of a tropical rainforest.

- More able students will be able to differentiate between indirect and direct threats to the rainforest and understand how they threaten the rainforest now and into the future. They should be able to debate why indirect threats are harder to manage.
- Less able students should understand the main reasons climate change can affect the tropical rainforest.

Key concepts and processes

Global warming is the main indirect threat to tropical rainforests and the main issue is drought. This is happening more often in tropical rainforests and puts the ecosystem under a lot of pressure. Direct threats involve the deliberate cutting down of trees which is more easily managed whereas indirect threats come from global warming, pollution and disease – these are much more difficult to manage.

There are a number of articles that can be found on the [Guardian](#) and [BBC news](#) websites about droughts in the Amazon rainforest that help students to understand the threat of climate change to the rainforest ecosystem.

Guidance on teaching

- Students will have covered climate change and global warming in Component 1, Topic 1 and they have often done it in science as well. They will need to use their understanding to link to the effects it can have on tropical rainforests.
- Students often find it trickier to understand the difference between direct and indirect threats, so you could start by getting students to discuss the differences in groups and then as a class.

Lesson 6: The direct threats of commercial development on the taiga biome

Overview

The sixth lesson will focus on 8.4a where students tackle the idea of how the taiga is under threat from commercial exploitation. Students will examine a range of ways that the taiga is exploited, focussing on commercial paper production and mining. Students will need to understand the activities that have led to deforestation and how this threatens the biome.

- More able students should be able to assess the different threats to the taiga biome and link this to their previous understanding of how disturbances to an ecosystem can threaten its balance.
- Less able students should focus on the main causes of exploitation in the taiga biome.

Key concepts and processes

Similar to when looking at tropical rainforests, students need to appreciate the reasons why the taiga biome is under threat from commercial exploitation. Students may not have come across the range of resources that can be found in the taiga biome before and it is important they understand the range of threats, for example, building of HEP in Canada, extraction of tar sands in Canada and the use of timber for paper, furniture etc.

Tar sands exploitation is of global significance due to the need for oil reserves to meet global energy needs. It is only in recent years that we have the technology to be able to extract this resource and there is more demand for it due to population growth and economic development around the world. The extraction is a contentious issue as it consumes huge amount of water and energy and produces contaminated tailings which are very damaging to the environment. More information can be found on the [RAMP Alberta website](#).

Guidance on teaching

- There is good opportunity to use satellite images to compare before and after images of deforestation of the taiga biome due to tar sand mining and get students to interpret the images and the changes shown.
- Students are given a range of resources on the different ways that the taiga forest is exploited and they then complete a carousel activity filling in information about the impacts on the taiga:

Example of Exploitation	Impact on Taiga

Lesson 7: Factors which can threaten biodiversity of the taiga biome

Overview

The seventh lesson is on Key idea 8.4b, which continues from 8.4a where students understand the threats to the taiga biome. In this lesson students move on from exploitation of the taiga to examining how precipitation, forest fires and pests and diseases can threaten the ecosystem.

- More able students should be able to link the threats to climate change, and understand how climate change may exacerbate those threats in the future.
- Less able students should focus on what the main threats to the taiga biome are.

Key concepts and processes

Students need to appreciate how acid rain, forest fires and pests can threaten the taiga biome. The Guardian and BBC news websites are useful for articles relating to forest fires in Canada, Russia and Alaska which students can use to find out causes and impacts of these threats to the taiga.

These threats will weaken the forests' biodiversity and when trees die this will impact on some species as their food source will have been reduced. Link back to Key idea 8.2 and how these threats will affect the plants and animals in the taiga.

Guidance on teaching

- Give students a pack of information and ask them to complete the following table to understand the different threats to the taiga and then how these threats might become worse in the future (climate change). Give students specific information relating to the Canadian and Russian boreal forests.

Threat	Impact	Future?
Acid rain		
Wild fires		
Pests		

Lesson 8: Advantages and disadvantages of sustainable management in protecting the tropical rainforest

Overview

The eighth lesson focusses Key idea 8.5a where students examine the advantages and disadvantages of global actions which have been designed to protect tropical rainforests. Students will look specifically at CITES (Convention on International Trade in Endangered Species) and REDD (Reducing emissions from Deforestation and forest Degradation)

- More able students will be able to appreciate different views on conservation and be able to evaluate the success of a range of global actions which aim to conserve the rainforest.
- Less able students should focus on the advantages and disadvantages of CITES and REDD.

Key concepts and processes

Students need to appreciate that sustainable management of tropical rainforests needs to happen on a global scale and this should be looked at through the global organisations of CITES and REDD.

CITES is the Convention on International Trade in Endangered Species. It is an international treaty which lists endangered species of plants and animals and bans cross-border trading of the listed species. This is in an effort to reduce illegal hunting and collection of endangered animals and plants.

Reducing Emissions from Deforestation and forest Degradation (REDD) is a United Nations project and its aim is to reduce deforestation. This is because 20% of all carbon dioxide comes from deforestation and this is the main cause of global warming.

Guidance on teaching

- Students complete a table of advantage and disadvantages for each global organisation – this could be done as a research project using their websites as a guide.
- Students could compare CITES and REDD and then discuss which they think is the most successful organisation in achieving sustainable management.

Lessons 9 and 10: Sustainable management of the tropical rainforest

Overview

The ninth and tenth lessons will focus on Key idea 8.5b which builds from Key idea 8.5a where students have focussed on global actions. In these lessons students will learn about how rainforests can be conserved through sustainable management and alternative livelihoods, for example, ecotourism and sustainable farming.

- More able students will understand a range of sustainable management techniques and be able to justify how successful they believe these will be in reducing deforestation.
- Less able students should create a table of the strengths and weaknesses of sustainable management in a specific place.

Key concepts and processes

Students need to appreciate that sustainable management can be achieved at different scales. This lesson should focus on a range of smaller scale forest management case studies.

An example of sustainable forestry can be found on [BBC Bitesize](#) which is a good starter to get students thinking about different ways of using the tropical rainforest which are more sustainable.

Guidance on teaching

- Similar to Key idea 8.5a, students need to understand the strengths and weaknesses of a range of examples of sustainable management in the rainforest.
- Students could be put into groups and each given a different example of sustainable management. A student from each group is then made the expert and they have to go around and teach the other groups about their example and its strengths and weaknesses, while the rest of the group is being taught about the other examples by the students from other groups.
- From this, students can rank which technique they think is the most successful and why. Each corner of the room could be a different technique and students need to stand at the technique they think it the most successful and then the teacher asks students to explain their decision. This ensures that all students can come to a decision and justify that decision.
- Students could then use this information to write an extended answer where they examine which technique they think the most successful in conserving the tropical rainforest.

Lesson 11: Sustainable management of the taiga biome

Overview

The eleventh lesson will focus on Key ideas 8.6a and 8.6b where students focus on the taiga biome and how that can be protected. Students also develop this to understand why there are conflicting views on whether the forest should be protected or exploited.

- More able students will understand how the taiga can be protected and be able to debate whether the taiga should be protected or exploited.
- Less able students would benefit from a table showing the different groups involved and why they may conflict over what should be done with the taiga.

Key concepts and processes

Following on from Key idea 8.5, students are now focussing on how the taiga biome can be protected. Students need to appreciate how the taiga biome can be protected by national parks, wilderness areas and sustainable forestry.

Guidance on teaching

- The lesson could start by getting the students to come up with reasons for and against protecting the taiga biome. Students should use their understanding of the taiga biome and its characteristics to come up with reasons for and against.
- Students are they given information packs on examples of how the taiga biome is managed, for example, Boreal Forest Platform and Wood Buffalo National Park. These packs should include strengths and weaknesses of the management and different people's views on the use of the scheme.
- Students could classify people's opinions on whether they are for or against and then complete a conflict matrix to show contrasting views of the taiga. Students should be able to justify their conflict matrix. Below is an example of how a conflict matrix is set out:

Name of conflicting group e.g. Environmental group			
	Name of conflicting group e.g. Tourism company		
		Name of conflicting group e.g. Industrial group	
			Name of conflicting group e.g. Political group
			Name of conflicting group e.g. Local people

Key: + = no conflict - = minor conflict x = major conflict

Key vocabulary for EQ

TRF and Taiga Ecosystem	Threats	Management
Biodiversity Buttress roots Drip tips Epiphytes Food Webs Lianas Net Primary Productivity Nutrient Cycle Stratified layers Tropic Levels	Acid precipitation Biofuel Commercial farming Deforestation Direct threats Drought Ecosystem stress Exploitation Fossil Fuels Hydro-electric Power (HEP) Indirect threats Invasive species Logging Strip mining Subsistence farming Wildfire	Conservation Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Ecotourism Geographical conflict National Parks Reducing Emissions from Deforestation and Forest Degradation (REDD) Sustainable farming Sustainable forestry

Further reading

- The [Rainforest Alliance](#) has a host of information about tropical rainforests.
- [BBC Bitesize](#) has information about sustainable management of tropical rainforests.
- The [Boreal Forest Platform](#) is a good example of an organisation that is working towards using the Boreal Forest sustainably.
- Information about [CITES](#).
- Information about the UN [REDD](#) Programme.

Topic 9: Consuming energy resources

Introduction

Quick overview

An understanding of renewable and non-renewable energy; examining its supply and demand globally and differences in access which can lead to energy security issues. Also understanding its sustainable use and different management techniques.

- EQ: How can the growing demands for energy be met without serious environmental consequences?

The aim of this topic pack is to get an overview of different energy resources, the differences in supply and demand and what energy security issues can arise from this. The topic then looks at how we can be more sustainable in our energy consumption and what management techniques there are to achieve this. The ideas studied here are to help students understand a key geographical issue which is underpinned by conceptual knowledge learnt in Component 1 and Component 2.

The Key idea tells a familiar geographical story: the nature of the resource issue, the affect it can have on people and the environment and how people respond to the issue. This approach is different to GCSE Specification A, where there is a topic based on resource management. There is not a 'making geographical decisions' paper in Specification A.

The key things to bear in mind are:

- 1) The final examination will consist of a booklet of sources, which is provided in the examination. This will exemplify a geographical issue which is drawn from either Topic 7, 8 or 9 in Component 3 and underpinning conceptual knowledge from Component 1 and 2. Students should be able to:
 - make effective use of the resource material
 - analyse and interpret the resource material.
- 1) The final question of the examination will be a 12 mark question – it is important that students can make links between physical and human geography and draw on information in the resource material provided. Students should be able to use this information to make reasoned justifications for proposed solutions in relation to their likely impact on people and the environment.

Enquiry Question: How can the growing demands for energy be met without serious environmental consequences?

Teaching approach over 10 hours

Lessons 1 and 2 (2hrs)	Types of energy resources and the impact on the environment
Lesson 3 (1hr)	Access to energy resources
Lessons 4 and 5 (2hrs)	Global energy use and uneven energy supplies
Lessons 6 and 7 (2hrs)	Costs and benefits of continued reliance on fossil fuels
Lesson 8 (1hr)	Reducing reliance on fossil fuels
Lesson 9 (1hr)	Costs and benefits of improving energy security
Lesson 10 (1hr)	Attitudes to energy futures

Lessons 1 and 2: Types of energy resources and the impact on the environment

Overview

The first and second lessons should tackle Key ideas 9.1a and 9.1b so students should have an understanding of how to classify different types of energy resources and how energy production can have an impact on the environment and landscape.

- More able students should be able to understand the different types of energy resources and be able to explain a range of environmental impacts of energy use and extraction.
- Less able students could focus on categorising a range of energy resources into non-renewable, renewable and recyclable.

Key concepts and processes

Students should examine the different ways that we can categorise energy resources into non-renewable, renewable and recyclable. The use of energy is continuing to grow due to factors such as population growth and the development of countries, and current energy use is unsustainable.

Students need to appreciate that energy use and extraction is causing problems for the environment and the landscape. Oil extraction can result in explosions of oil rigs, for example BP's Deepwater Horizon exploded in 2010, and there is now more pressure to drill for oil in more environmentally sensitive areas – e.g. the Arctic – due to the resource running out. Information can be found on the [WWF website](#).

Renewable energy resources can also cause environmental damage, for example, the building of HEP can result in large areas of deforestation.

Guidance on teaching

- Students can match key terms with their definitions and then be given a range of different energy resources which they need to sort into renewable, non-renewable and recyclable.
- Students are given a pack of information which includes different examples of energy resources and how they can impact the environment and its landscape. Information can be found about oil extraction in the Amazon on the [WWF website](#), information about deforestation in the Cameroon rainforest can be found on the [SAVE](#) website and information about land required for solar and wind power can be found on the [Energy Collective website](#). Using this information, students complete a table on the environmental impacts and how these impacts may be reduced.
- Student can play 'Taboo' at the end of the lesson using all the new vocabulary which has been introduced.

Lesson 3: Access to energy resources

Overview

The third lesson should tackle Key ideas 9.2a and 9.2b where students understand that energy is not evenly distributed and it can be affected by accessibility and technology. The global pattern of energy use will then cause variations.

- More able students should be able to describe energy resource distribution and link this to how energy poverty can affect people's lives.
- Less able students should focus on describing the range of factors which affect access to energy resources.

Key concepts and processes

Energy resources are not evenly distributed and this is affected by accessibility to the resource and technology.

This [map](#) shows that there is an uneven pattern in global energy use. There is a huge variation due to factors such as whether a country is a low income country or a high income country, as industry in low income countries is mainly based on primary sectors, whereas high income countries have higher levels of consumption. Also, the energy consumption of newly industrialised countries will greatly increase due to their economy being based on manufacturing, which uses high volumes of energy.

It is worth noting that energy consumption is measured in 'oil equivalent', ie. the amount of energy released by burning a barrel of crude oil.

Guidance on teaching

- This is a good opportunity to use a variety of maps and data on distribution of different energy resources, which the students can then interpret. Students should be able to describe patterns of distribution. Students could have a carousel activity where they move round to different stations describing the distribution of a range of energy resources.
- Students then use this information to explain the costs and benefits of having or not having access to energy sources and what possible conflict could arise.
- Students are given a map showing the global energy use per capita and they need to annotate the map with reasons for the distribution. Students should link this to three key reasons – economic development, use of traditional fuel sources and different economic sectors.
- Students use these different maps to compare and contrast the different distributions for production and use.
- Students write an extended answer on how energy poverty can affect the lives of people.

Lessons 4 and 5: Global energy use and uneven energy supplies

Overview

The fourth and fifth lessons should tackle Key ideas 9.3a and 9.3b so students understand that oil production and reserves are unevenly distributed and that the demand for oil consumption is increasing. The supply and demand for oil is affecting prices and this is affected by international relations and economic factors.

- More able students should be able to assess why oil prices and supply are affected by international relations and economic factors.
- Less able students should focus on describing the consumption of oil in different regions.

Key concepts and processes

Students need to understand that oil reserves and production are unevenly distributed. The majority of oil comes from a small number of countries and there is the issue that scientists do not know whether we have reached peak oil yet or if we are close to meeting it. This then will affect the price of oil as it becomes a valuable commodity. The price will also be affected by emerging economies whose use of oil increases as car ownership and use of energy increases in these countries.

The price of oil is also affected globally by economic and political factors that can lead to shortages. For example, students can look at the influence of the Iraq war on oil prices and at how fracking has influenced energy security in the USA. Furthermore, students could explore the more recent downturn in oil prices due to Saudi Arabia's increased production, to compete with USA and Iranian oil production, particularly after trade sanctions with Iran were lifted.

Guidance on teaching

- Students start by creating a mind map of all the reasons why consumption for oil is increasing. Students should be able to bring in ideas from what they have studied in Components 1 and 2, particularly Component 1, topics 2 and 3.
- Students are given this [image](#) and asked to annotate it giving reasons for the pattern shown.
- Students then complete a mind map on what could affect oil supply and price.
- Students are then given information cards on: the 2003 invasion of Iraq, 2008 Global financial crisis, 2011 'Arab Spring' and 2016 downturn in oil prices and complete a table on how these international conflicts could affect the global oil price.

Lessons 6 and 7: Costs and benefits of continued reliance on fossil fuels

Overview

The sixth and seventh lessons should tackle Key ideas 9.4a and 9.5b so students understand the economic benefits and environmental costs of developing oil and gas in environmentally sensitive areas.

- More able students should be able to examine the costs and benefits of developing energy resources in ecologically sensitive areas.
- Less able students should be able to create a table of the economic benefits and environmental costs associated with developing energy resources.

Key concepts and processes

Students need to appreciate that, due to the use of energy resources continuing to increase and with supplies diminishing, environmentally sensitive areas, like the Arctic, are being explored for their resources. This has both economic benefits and environmental costs.

Examples of economic benefits are the creation of jobs and money into the economy, for example the Ichthys LNG project off the coast of Australia created 900 jobs in the construction of pipelines and it produces enough liquefied natural gas to meet demand in Asia. The environmental costs of this are damage to wildlife and habitats especially due to the threat of an oil spill; for example, the 1989 Exxon Valdez oil spill in Alaska resulted in devastation of habitats and ecology, including the death of 250,000 seabirds and 22 killer whales.

It is not just the exploration of new areas but also the developing of different types of energy resources, for example tar sands and fracking, that can have economic costs and environmental benefits. This can especially be seen with the development of tar sands in Canada and fracking in USA.

Guidance on teaching

- A good starting point is to get students to investigate the implications of drilling for energy resources in the Arctic region. Students are given information on the Arctic – range of articles can be found on the [Guardian website](#) – and have to complete the following table:

Economic Costs	Economic Benefits

- Students then create a mind map of the environmental costs – this links to Component 3, Topic 8 where students can link environmental costs to the taiga biome.
- As a plenary to the first lesson, students debate whether areas like the Arctic should be left alone or whether they should be exploited for their resources.
- Students can be split into pairs; one pair has to research shale gas and one the other researches about tar sands. Each student creates a fact file on where the resource is found, how it is extracted and the economic and environmental costs and benefits. Following on from this, in pairs they have to teach the other student about the energy resource they have researched.
- Students then discuss which is the more viable unconventional fossil fuel source.
- Students use their information to write an extended answer where they assess the environmental costs and economic benefits of developing unconventional energy resources.

Lesson 8: Reducing reliance on fossil fuels

Overview

The eighth lesson should tackle Key idea 9.5a so students understand how energy efficiency and conservation, as well as reduced demand for fossil fuels, help finite resources last longer and cut carbon emissions.

- More able students should be able to understand how effective energy efficiency and conservation measures can be in reducing energy consumption.
- Less able students should be guided through the key features of energy efficient home and transport.

Key concepts and processes

Students need to appreciate that the use of fossil fuels contributes to the carbon footprint and that fossil fuels produce greenhouse gases which contribute to climate change. This links to Component 1, Topic 1. Fossil fuels are a finite resource and so it is important that students understand there are ways of reducing the use of energy consumption so the resources lasts longer and we reduce carbon emissions. Students are introduced to a range of methods: creating more energy efficient homes, improving transport energy efficiency and introducing more efficient transport systems.

Guidance on teaching

- A good starting point is to get students to [calculate their carbon footprint](#). As a class, students can discuss what the main contributor to their carbon footprints is and ways in which this could be reduced.
- Students complete a carousel activity – there are three learning stations; energy efficient homes, London congestion charge, including Sadiq Khan's new 'T charge' and London's cycle hire scheme. Students complete the following table as they move around the room.

Energy Efficient Scheme	Strengths	Weaknesses
Energy efficient home		
London congestion charge		
London's cycle hire scheme		

- Following this activity students rank the schemes and explain which they think is the most effective in lowering carbon emissions and why.

Lesson 9: Costs and benefits of improving energy security

Overview

The ninth lesson will tackle Key idea 9.5b so students understand the costs and benefits of alternative energy resources to fossil fuels.

- More able students should be able to justify which scheme they think has the greatest potential in reducing the use of fossil fuels.
- Less able students should be guided through completing a table on the costs and benefits of a range of types of renewable energy.

Key concepts and processes

Students need to understand that if we continue to use fossil fuels at the current rate, then countries will no longer be energy secure. There is currently too strong a reliance on fossil fuels and a solution to this is energy diversification, whereby countries use a range of energy resources with a particular focus on renewable energy sources.

Students should look at a range of examples of renewable energy sources and their costs and benefits in reaching energy security.

Guidance on teaching

- Students play key word bingo, where you have a set of key terms that have been introduced through the topic on the board. Students write down six terms and then the definition is read out – students tick off the words as they get them and the student who gets them all first wins. This reinforces the key words and ensures that students understand the different meanings.
- Start by discussing with students why we cannot continue to rely on fossil fuels and how this could lead to energy insecurity.
- Students are given information cards on a range of renewable resources e.g., solar power, HEP, hydrogen fuel for cars and wind power. Students create a detailed mind map on the strengths and weaknesses of each method of renewable energy.
- Students use the range of schemes to decide which would be most effective in; reducing carbon emissions and improving energy security. Question students on what factors would affect this e.g. location of country, wealth of country.

Lesson 10: Attitudes to energy futures

Overview

The tenth lesson will tackle 9.6a and 9.6b so students understand how different groups have contrasting views about energy futures and how attitudes are changing towards energy consumption and reducing ecological footprints.

- More able students will appreciate why there are differing views on energy futures and be able to examine how some attitudes towards energy consumption are changing.
- Less able students could create a mind map to show differing opinions on energy futures.

Key concepts and processes

Students need to understand that there are two possibilities for the future on energy use. These are the 'business as usual' model or a 'sustainable future'. The future depends on economic and political factors and the role of a range of key players. Students should examine a range of people's views from those who have a vested interest in energy production to those who are concerned about the impact of climate change due to current energy consumption. The agreement on how sustainable the future will be is very difficult due to the number of different players that are involved.

Students also need to understand that attitudes to energy consumption are changing, due to changing attitudes to the environment. This can be linked to a [Kuznets Curve](#), where environmental degradation is linked to a country's stage of economic development.

Guidance on teaching

- A good starting point is to get students to discuss the difference between what 'business as usual' and 'sustainable future' might mean. Then challenge students by questioning what may affect the future that we have.
- Students could be given information on characters with a range of different views e.g. a TNC, a Government official, a climate scientist, an environmental group and a manual worker. Students could hold a debate discussing why there are variations in their views.
- Following the debate, students explain why agreement about a sustainable future could prove to be difficult.
- In the following lesson, students could be given the Kuznets Curve and asked to annotate it with reasons why levels of environmental degradation change as countries move through different levels of development.
- Students could be given the opportunity to research a country for each level in the Kuznets Curve.
- Students then create two mind maps for how ecological footprints can be reduced on a local and global scale.
- Students then investigate how you can reduce the ecological footprint in the local area by: reducing food miles, increasing recycling, changing method of travel to work/school and any other actions.

Key vocabulary for EQ

Energy consumption	Energy security	Energy use in the future
Carbon emissions Energy per capita Finite stocks Fossil fuels Geology Landscape scarring Non-renewable Recyclable Renewable	Black gold Carbon emission Diplomatic relations Ecologically sensitive Economic Emerging economies Environmental Finite energy supplies GDP Industrialisation International relations OPEC Peak oil Recession Shale gas Tar sands	Biofuels Business as usual Carbon footprint Congestion charge Consumers Ecological footprint Energy conservation Energy consumption Energy diversification Energy efficiency Energy mix Energy security HEP Hydrogen Solar power Sustainable development TNCs

Further reading

- Information on [oil production and energy reserves](#).
- Information on energy can be found on the [Guardian website](#).
- Information on energy sources in USA - <http://www.energy.gov/science-innovation/energy-sources>
- BP's annual [review of world energy](#).
- BBC news article on [oil in Africa](#).
- Guardian News article on [future energy supplies](#).
- Information on European energy issues and supply - www.economist.com
- Information on [global energy futures](#).