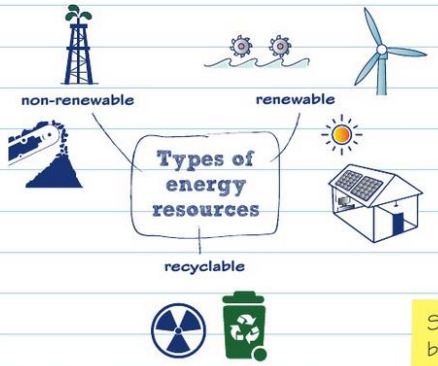
Paper 3: Consuming Energy Resources

KO9/9

Energy impacts

You need to know about three categories of energy resources (**non-renewable**, **renewable** and **recyclable**) and about the different ways that extracting energy can impact on the environment.

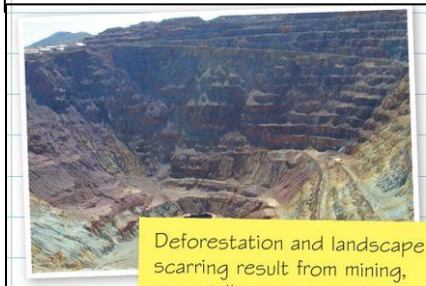


Worked example

The diagram shows different types of energy resource represented by icons.
Using your knowledge of energy resources, identify **one** type of non-renewable energy, **one** type of renewable energy and **one** type of recyclable energy. **(3 marks)**

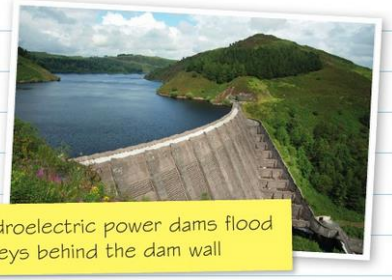
Non-renewable – coal
Renewable – hydroelectric power
Recyclable – biofuel

Short answers are fine for this kind of question, but remember to use proper sentences when describing, explaining and assessing.



Deforestation and landscape scarring result from mining, especially open-cast mining

The highest carbon emissions result from the extraction and use of fossil fuels



Hydroelectric power dams flood valleys behind the dam wall

Wind turbines and solar panels spoil some people's enjoyment of landscapes

Now try this

Describe **two** possible negative impacts on the environment of developing recyclable energy resources, such as nuclear power or biofuels. **(2 marks)**

Energy sources can be split into 3 categories:

Renewable: Wind, Solar, Hydroelectric power (HEP) These resources are in endless supply.

Non-Renewable: Fossil Fuels (Coal, oil and gas) – These resources CAN run out.

Recyclable: Nuclear energy, biomass (wood, plants, animal waste can be burnt to create energy)

Impacts of energy production:

The **extraction** of fossil fuels by **mining** or **drilling**, can damage the environment.

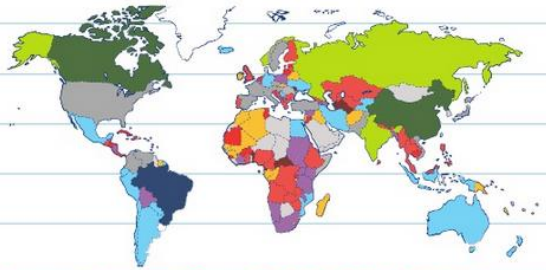
- Soil, rock and vegetation is cleared away this can permanently scar the landscape.
- Habitats are destroyed through clearing of forests leading to loss of biodiversity.
- Clearing forests can affect the water cycle because there are fewer tress to absorb water which can lead to soil erosion.
- Mining processes release harmful greenhouse gases e.g. carbon dioxide and methane. These gases contribute to climate change.
- Drilling can be done on land or at sea, so can affect anywhere
- Oil spills can cause major damage – Deepwater Horizon oil spill 2010 leaked 4 million barrels of oil into the Gulf of Mexico. Wildlife was covered in oil which meant they couldn't feed.

And so do some forms of renewable energy:

- Large numbers of wind turbines are needed to generate energy, they take up lots of space.
- Wind farms produce a humming noise – noise pollution.
- The spinning blades can kill or injure migrating birds and bats.
- Solar panels reflect heat which can kill animals.
- Solar farms use ground water for cleaning this can lead to water shortages in arid areas.
- HEP plants create reservoirs flooding areas.
- A build-up of sunlight can block sunlight causing plants and algae to die.

1. Define renewable energy.
2. Describe a recyclable energy resource.
3. Briefly describe 3 facts that affect energy consumption.
4. Give two reasons why oil consumption is increasing globally.
5. Give one reason why environmental groups support the move to sustainability.
6. Give two factors used to calculate carbon and ecological footprints.

Hydroelectric power



Not every country can generate electricity by hydroelectric power. Large volumes of water are needed, and steep drops in terrain (or massive dams).

Nuclear energy status

Access to technology can also affect access to energy resources. For example, nuclear power stations require highly sophisticated technology and expertise.

Now try this

Describe **three** ways in which climate could influence a country's ability to access renewable sources of energy. **(3 marks)**

Access to energy: (TALCG)

1. Technology: Some countries do not have money to spend on technology exploit their reserves. E.g. Niger has uranium reserves but does not have money to develop nuclear power plants. Developed countries can use technology for renewable energy whereas, developing countries are heavily reliant on fossil fuels.
2. Accessibility: Permafrost (permanently frozen ground) makes it difficult to access fossil fuels. Some resources are found in protected areas e.g. Antarctica and can't be exploited.
3. Landscape: Wind farms are most efficient in areas with a stead and reliable source of wind, e.g. on high ground or along the coast. Hydroelectric power usually requires a lot of water.
4. Climate: Solar power requires large amounts of sunlight. Countries with sunny climates, e.g. Spain, can use solar power more effectively than countries with duller climates, e.g. the UK.
5. Geology: Fossil fi=uels are found in sedimentary rocks, where impermeable rocks have trapped the oil and gas in permeable rocks below. Countries located on plate boundaries may be able to access geothermal energy

Global demand for oil

The demand for oil is growing around the world due to economic development. However, really big oil supplies are only found in a few countries. Oil prices can be strongly affected by international politics affecting these countries, as well as economic changes.

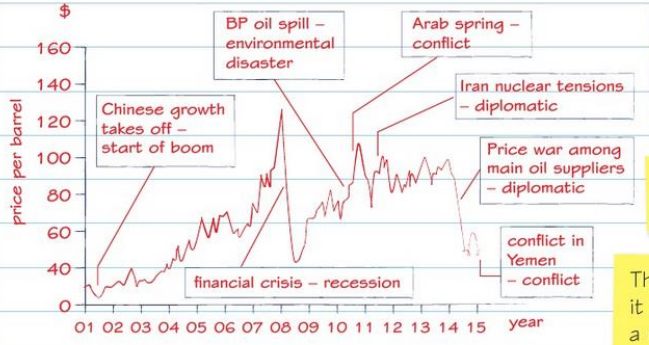
Why is oil consumption rising?

World population reached 7 billion in 2011. It is expected to peak at 9.5 billion by 2050. All these new people need energy too.

As countries get richer, their people buy more things which use more energy: air conditioning, cars, etc.

As new technology is developed, people want to buy new things or the latest version.

Price per barrel of US crude oil at end of each month



This graph shows that changes in oil prices are usually triggered by conflicts, or economic or political crises.

Oil consumption is measured in millions (m) of barrels per day.

This is a good answer because it uses the graph resource in a relevant way. It is also good because it sticks closely to what the question is asking.

Worked example

Using the graph of oil prices above, explain how China's development has affected global oil prices. **(4 marks)**

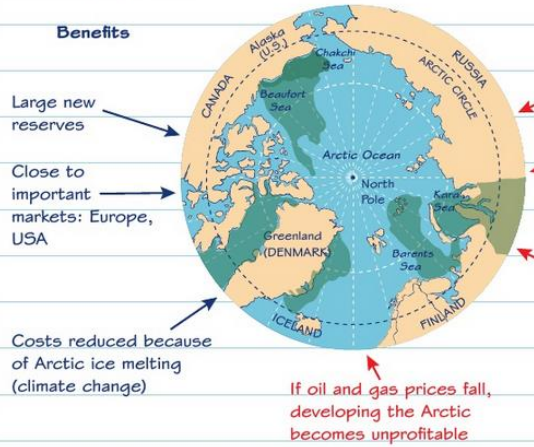
China does not have large oil reserves, but it has the world's fastest growing oil consumption: a 90 per cent change between 2000 and 2010, China's rapid industrialisation and economic development massively increased demand for oil in China causing the steep rise in oil prices between 2001 and 2008.

In 2008, however, the oil price fell very steeply. This was caused by the financial crisis ('credit crunch'). This financial crisis was global and meant that people around the world stopped buying so many things from China. China's industries stopped needing so much oil. When demand for oil is reduced, oil prices fall.

For levels 4+ PRACTICE writing out your responses to exam questions.

New developments

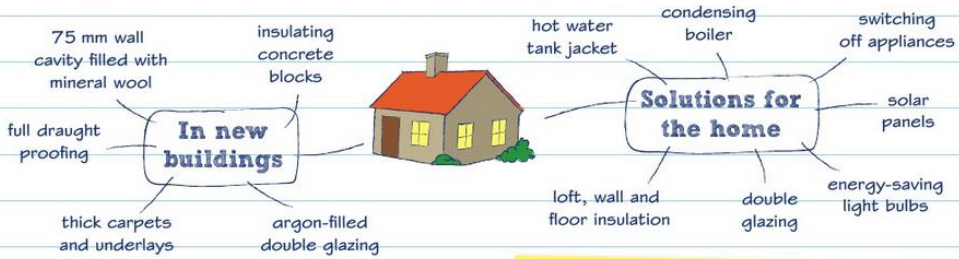
Some oil and gas reserves are in remote, challenging areas or are stored in geologically complex ways. Sometimes it is worthwhile economically (or politically) to mine these challenging areas.



Rising global temperatures have reduced the economic cost of drilling for oil and gas in the Arctic. However, there are still significant challenges to developing new sources of oil and gas in this remote and ecologically sensitive area.

Using energy more efficiently and reducing the amount of energy we waste will help our non-renewable energy supplies last longer, and will also reduce carbon emissions.

Energy conservation at home



Worked example

Highlight the key words in the question to help you focus on what the question wants you to do.

Describe **two** ways to reduce domestic energy wastage. **(4 marks)**

People could reduce energy waste in their homes by switching off electrical devices rather than leaving them on standby. Experts estimate that 8 per cent of the energy used in houses goes on powering devices on standby. Also houses could be built with energy-efficient materials such as insulation blocks for walls to keep in heat, and the use of argon in double glazing would stop heat escaping through the glass.

Global energy consumption is uneven:

Developed countries (Australia, Norway and the USA consume lots of energy per person because they can afford to.

Economic development is increasing wealth in emerging countries like China, people are buying more products which use energy e.g. cars, fridges and televisions.

Developing countries like Chad, Niger and Mongolia consume less energy per person because they are poorer, their lifestyles are less dependent on energy.

Environmental costs

Canada has the world's largest deposits of tar sand, a type of oil. Tar sand is difficult to extract, and toxic chemicals have to be used in the extraction process. Protesters are concerned that these chemicals are damaging people's health through air pollution, and threatening ecosystems (which are also at risk from oil spills).

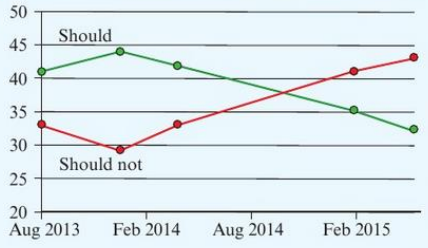
Since 2011, the USA has increasingly used fracking to supply natural gas. This means it has used less coal for electricity generation, but some people are concerned about the impact of fracking on the environment, for example contaminating groundwater, causing subsidence and destroying natural habitats.

This answer is good because it uses specific detail that shows a good understanding of the processes involved in shale gas extraction that is clearly linked to the question.

Worked example

The graph opposite shows the results of a UK poll about whether the UK should go ahead with shale gas extraction (fracking) or not. Suggest one reason why people might oppose fracking in the UK. **(2 marks)**

People are worried that fracking for shale gas will contaminate groundwater because fracking injects chemicals into underground rock formations to help extract the gas.



Assessment Objectives 3 and 4

In Paper 3, the 8-mark questions involve the command words 'Assess' or 'Evaluate'.

- 4 marks are for **Assessment Objective 3**
- 4 marks are for **Assessment Objective 4**

Assessment Objective 3 is about **applying your knowledge and understanding** to geographical issues, using evidence to come to a judgement.

Assessment Objective 4 is about **selecting the right skill or technique** to investigate the question and to communicate your answer.

What to aim for

These extended writing questions are marked by levels. A top answer will:

- **apply your understanding** to unpick the different factors involved in the question
- **put together a clear, logical argument**
- **use evidence** to decide which of these factors are more important than others
- **use your geographical skills** to get accurate information
- **use this accurate information** in all parts of your answer rather than just in one bit.

Renewable energy sources (like solar, wind, HEP and biofuel) are alternatives to fossil fuels. Renewable energy can help countries reduce both their carbon footprints and their reliance on getting oil and gas.

Costs of alternatives to fossil fuels

Cost of energy – for example, it costs more for a wind farm to generate the same amount of energy as a fossil fuel power station.

Geography – the best places for generating renewable energy are often a long way from the cities where energy is needed.

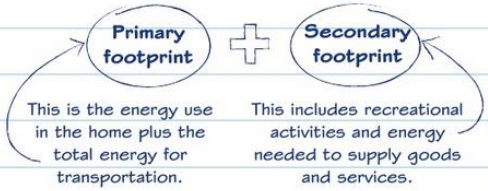
Extensive land use – wind farms, solar farms, hydroelectric power reservoirs and biofuel crops all take up a lot of land area. There may be conflict with how other people want to use the land – for example, for growing crops to feed people.

Impact on landscape – renewables are very visible and some people say they spoil the landscape; they may also create noise pollution (e.g. wind turbines).

Impact on local ecosystems – for example, deforestation to grow biofuel crops, birds being killed by wind turbines, valleys being flooded for hydroelectric power.

What is a carbon footprint?

It is a measurement of all the **greenhouse gases (GHGs)** individuals contribute to our environment as a result of our daily lives.



How is it measured?

A carbon footprint is written as kilograms (kg) of the **equivalent carbon dioxide** per person. The world average is 4000 kg, and the target to fight climate change is 2000 kg.

Changing attitudes

Climate scientists advise governments about the dangers of a 'business-as-usual' approach to energy consumption. Although environmental groups pressure governments to change energy policy, TNCs may resist changes as reducing energy consumption increases their costs.

Then again, if consumers are unwilling to pay more for renewable energy, governments will find it hard to make renewables a bigger part of the energy mix.

So what changes consumers' attitudes?

- **Education** – for example, government information about energy choices.
- **Environmental concerns** – for example, the impact of campaigns by environmental groups.
- **Rising affluence** – for example, can afford more energy-efficient options such as solar panels.

Worked example

Read the information opposite about hydrogen-powered cars. What are the costs and benefits of hydrogen as an alternative to fossil fuel? **(4 marks)**

Hydrogen and oxygen are available very cheaply everywhere. So energy security would be much better as countries would not have to rely on oil supplies from the Middle East.

Hydrogen fuel produces clean energy with no carbon emissions, reducing the impact of climate change.

However, hydrogen technology is very expensive to develop. This means that hydrogen cars are really too expensive for most people to buy. Another cost is infrastructure. Many more hydrogen fuel stations would need to be built all over the UK.

This car is powered by hydrogen. Hydrogen reacts with oxygen in a fuel cell to produce energy that charges an electric motor. The only exhaust is water vapour. This model costs £66 000 and can be driven for 300 miles on a full tank. There are fewer than 20 hydrogen fuel stations in the UK.

Now try this

Explain what is meant by energy security. **(2 marks)**

Attitudes to energy

There are contrasting views about energy consumption and whether people should reduce their carbon footprints or continue with current levels of energy consumption: 'business as usual'.

Worked example

As a country becomes more developed its carbon footprint tends to increase. Explain reasons why this occurs. **(4 marks)**

Carbon footprints measure carbon emissions in different sectors, such as food, travel and housing. When people live in poverty, they have low carbon footprints because they travel by foot or bike, have small homes without heating and eat food produced locally. As countries become more developed, people travel by moped, have larger homes perhaps with air conditioning, and eat food that has been transported from far away. These mean big increases in carbon emissions in the different sectors that contribute to the carbon footprint.

Now try this

In 2015 the Science Museum in London announced that one of the world's leading oil TNCs would no longer be sponsoring the museum's climate change exhibition. Environmental campaigners were delighted. Explain why the TNC and the environmental campaigners might each have had different views about how climate change should be presented to the museum visitors. **(4 marks)**