Topic 9: Consuming Energy Resources

How can Energy Resources be Classified?

Non-renewable	These cannot be replaced once they have been used up (finite) e.g. coal, oil and gas (fossil fuels).
Renewable	These will never run out and can be used over and over again (infinite) e.g. wind, solar and hydro-electric power.
Recyclable	These provide energy from sources that can be recycled or reused e.g. reprocessed uranium for nuclear power and biofuel

Which factors affect a countries access to resources?

Distribution of energy resources has helped some countries become wealthy due to large reserves of fossil fuels (coal oil and gas). Access to resources is affected by **accessibility** (how easy it is to get to them) and levels of **technology.**

Geology	Fossil fuels (oil and gas) are found in sedimentary rocks. Saudi Arabia and Iran have 48% if the worlds oil and 43% of the gas. Countries located on plate boundaries can take advantage of heat from volcanic activity, used to heat water and create electricity e.g. New Zealand and Iceland.
Relief and Climate	Places with high amounts of rainfall and steep valley sides are chosen for dam construction. Places with lots of sunlight or strong winds are chosen for solar and wind farms.
Accessibility and development	Lack of technology to access existing energy is a problem for some countries. Countries in Africa have huge potential to develop HEP, Geothermal and solar energy but is lacking the funds and investment. Many still rely on biomass (collecting firewood) for energy.

What are the environmental impacts of mining, drilling and renewable energy sources?

Fossil fuels	Oil spills can damage ecosystems, kill animals and pollute water. Increase in CO_2 emissions causing climate change. Air pollution.
HEP	Deforestation/damage to habitats and also flooding of land behind the dam destroying habitats.
Wind Energy/Solar panels	Landscape scarring by turbines that look out of place.

Why does the global pattern of energy use vary?

Economic Development	Developed countries/high-income countries (HICs) have a high demand for energy as many individuals have electronic goods, transport, heating/cooling buildings. Emerging economies e.g. India use it to power industry.
Economic Sectors	• Low–income countries (LICs) e.g. Malawi focus largely on primary industries (farming/agriculture) therefore have a lower demand for energy. • As a country develops there is a shift to a dominant secondary sector (manufacturing) where energy use drastically increases to power these processes. • As a country develops further there is a switch to a largely tertiary economy (services). This means there is less industrial need for energy but more need in the home with increased technology and electrical goods.
Traditional Fuel Sources	In rural areas of developing countries many rely on burning biomass (firewood) for use in the home. These people that lack access to electricity are described as "**energy-poor".**

Oil Production Vs Consumption

Oil Production	Oil production is uneven. A small group of countries produce most of the world's oil e.g. Russia and Saudi Arabia. Oil is referred to as black gold because It is a valuable commodity. Peak oil (the point when half of the world's oil reserves have been used) changes as we discover new oil
Consumption	Consumption has peaked in HICs but will increase in emerging economies as car ownership increases.

What factors affect the price of oil?

Supply Vs Demand: The price of oil increases if there is more demand than there is supply (too little to go around). The price of oil falls if there is more supply than there is demand (too much oil). There are political and economic reasons that cause variations in supply and demand.

Over-supply	This can occur from poor **international relations** (relationships between countries). OPEC (Organisation of Petroleum Exporting Countries e.g. Saudi Arabia and Iran) have agreed targets on how much oil they will supply to the global market to ensure prices remain profitable. Failure to set targets and desire to increase sales has led to over-production (more supply than there is demand) and prices decrease.
Under-supply	Not enough oil to go around = price increases. Disruptions to supply (oil spills/political conflicts) can cause prices to increase. Increasing demand from emerging economies as they industrialise can cause prices to rise.
Periods of Recession	Less money in the economy meant people bought less goods. Demand for oil decreased. Price of oil decreased.

Exploiting New Areas for Energy Resources

Conventional Energy	Due to increased demand companies are searching more isolated and ecologically sensitive areas (e.g. the Arctic) as many of the accessible oil and gas fields had already been exploited. The economic costs are very high to drill in such a harsh environment but the benefits should last a long time as there is a large supply to export. Many jobs are also created. A spill in such a isolated area would be extremely difficult to clean-up and long lasting.
Unconventional Energy	• **Fracking:** Involves injecting water and sand down into shale rock to fracture the rocks, allowing trapped gas to flow out where it is collected. This created jobs and reduces dependence on importing. **Environmental impacts** of fracking include: ❑ Seismic activity ❑ Contamination of groundwater supplies from gases in the water which damages ecosystems and causes ill health in local populations. • **Tar sands** are a mix of sand and a sticky form of petroleum called bitumen. Extracting the bitumen has many environmental impacts such as: ❑ Deforestation to mine the land. ❑ Large volumes of water are required which threatens local ecosystems. ❑ Large amounts of CO2 are released. ❑ Toxic leaks can happen into rivers and lakes.

How can we improve energy efficiency and reduce our energy consumption and carbon footprint?

The Home	Minimise heat loss through: ✓ Insulating walls, floors and lofts. ✓ Installing double glazing and draught-proof windows and doors. ✓ Use energy efficient lights ✓ Installing solar panels to heat water.			The UK government offers loans and grants to help people fund these home improvements.
Transport	Some vehicles have lower **CO2 emissions** than others. Consumers are encouraged to buy vehicles with lower emissions by increasing the annual tax people must pay on higher-emitting vehicles. The lower the emissions, the lower the tax.	Public Transport: London buses now have **hybrid engines** which means they are 40% more fuel efficient (can travel 40% further on the same amount of fuel) that their older models and their carbon footprint is 40% smaller.	Encouraging cycling: London introduced a **cycle hire scheme** (Borris Bikes) to make renting a bike quick and easy. They have also created wide and highly visible **cycle highways** to make riders feel safer. A similar scheme in Paris reduce congestion by 25%.	**Reducing congestion:** London introduced the congestion charge in 2003 which charges drivers to drive into central areas of the city. It cost £80 mil to set up but generates £252 mil per annum which has been invested to improve public transport. There are now 21% less vehicles travelling through the city per day and 45% more bus passengers.

Keyword	Definition
Carbon Footprint (CF)	The calculation of the total greenhouse gas emissions caused by a person, a country, organisation, event or product.
Direct CF	Created by burning fossil fuels for energy use at home on transport.
Indirect	Those that come from owning a product, from its manufacture to final disposal.
Energy Security	Means having access to reliable and affordable sources of energy.
Countries with access to enough energy are energy secure, whiles those without enough energy are energy insecure.	
Energy Diversification	Spreading energy sources around more types e.g. renewable energy. This will reduce carbon footprints and improve energy security.
Sustainable Development	Meets the needs of the present without compromising the ability of future generations to meet their own needs.

What does the future look like?

Business as Usual	This assumes that the world will continue to reply on fossil fuels as the main source of energy, with oil production increasing to meet demand.
A Sustainable Future	More countries rely on mixed energy supplies in order to reduce CO2 emissions and combat climate change.
Whichever of the above happens in the future will be driven by those with an interest in continuing conventional energy production and those who are concerned about the impacts of climate change.	

	Costs of renewable energies	Benefits of renewable energies
Wind	✓ Landscape scarring/spoil view. ✓ Can kill birds. ✓ Expensive to transport energy from offshore windfarms.	✓ Does not produce CO_2 emissions ✓ Can create large amounts of electricity. ✓ Cheapest renewable energy source.
Solar	✓ Expensive to build. ✓ Take up a lot of space that could be used as farmland. ✓ Often in desert habitats which are fragile and damaged during construction.	✓ No noise created. ✓ Many jobs created worldwide. ✓ Little maintenance required.
Biofuels (made from plant oils)	✓ Large quantities of water required to grow crops. ✓ Increase in deforestation in some countries to create room to farm biofuel crops.	✓ Less CO_2 emissions than fossil fuels. ✓ Biofuels can be manufactured from what would be otherwise waste products e.g. crop waste + manure.
HEP	✓ Dam construction is expensive. ✓ Flooding of land behind the dam (environmental – local scale) ✓ Displacement of people (social – local scale)	✓ Water can be stored for use in dry-seasons for irrigation of farm land (regional scale) ✓ Electricity can be supplied to large urban areas (national scale) ✓ Reliable and consistent supply of energy.
Hydrogen	✓ Cost is currently extremely high as it is a future energy. ✓ Difficult to store hydrogen safely under pressure which is dangerous for hydrogen-fuelled cars. ✓ Energy is required to separate hydrogen from water which has a carbon footprint.	✓ Using it produces no greenhouse gases or air pollution. ✓ Does not rely on reserves of fossil fuels which some countries do not have access to.

What are the contrasting views about the future of energy?	
Climate Scientists	Sustainable future: We must diversify our energy supply and increase our use of energy alternatives. The risks of climate change are serious so we must do what we can to reduce the impacts.
TNCs	Business as usual: Main aims are to maintain a profitable business and don't feel their activities alone have a direct impact on the planet. However they are committed to sustainability.
Consumers	Business as usual: Want cheap and reliable supplies of energy. Struggle to see how individual habits will have an impact on a global scale.
Environmental groups	Sustainable future: Phase out fossil fuels while ensuring energy security by investing in renewable energy.
Government	The main aim of governments is to maintain energy security affordably. The UK Government is committed to tackling climate change by cutting carbon emssions and keeping energy bills low for consumers. Governments in developing countries need reliable and cheap energy to help economic growth.
How are attitudes changing?	
Rising Affluence (increase in wealth)	Despite increased demand, rising affluence means people support the investment of clean and sustainable energy as their attitude towards the environment changes and they care more. People buy energy efficient goods e.g. kitchen appliances, lightbulbs and cars and keeping their food miles low (ensuring to buy locally produced food so minimum energy was consumed transporting it from place of origin to the consumer).
Environmental Concerns	Greater awareness of climate change has led to a worldwide demand for a rapid shift to sustainable energy.
Education	Improving people's awareness of the need for more sustainable energy as young people will have a key role in the future. Schools can encourage students to reduce their carbon footprint by encouraging recycling, travelling by public transport and reducing their number of food-miles.