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Energy in the field of Geography

1) How do we get energy?
2) Why do we need energy?
3) Which forms of energy do we use?
4) Why is the demand for resources and energy growing?
5) How can we manage the use of energy?
6) Do we have alternative energy?

1) How do we get energy?
Our sun is responsible for all life on earth. The sun is the main energy source for plants and animals. This we call solar energy. Plants and animals can store energy. Some of this energy remains with them when they die and becomes to fossil fuels, like coal or oil. But fossil fuels are non-renewable energy sources and will run-out one day.

On the other hand we also get energy from water or wind (kinetic energy). This energy we call renewable resources, like hydro-electric, solar, wind, wave, geothermal and tidal power.

When people use something from the earth it becomes a resource. An example: In former times people didn't use petroleum or uranium – until using them they weren't resources. And mankind always tries to replace materials by better ones such as coal has been replaced in many cases by oil.

There some resources do exist which are as well as renewable and non-renewable ones. Wood is used for fuel. Therefore it is cut. But the trees will be replanted – the resource is renewable. But in practice many forests are not replanted like the rain forests. In that case the resource is non-renewable.

2) Why do we need energy?
Humans are animals, so we store and use energy for survival just as any other consumer does. However, humans also use energy in ways that other animals do not - to heat our houses or run factories and cars.
Humans often turn energy into electricity before turning that into yet another form of energy which we can use.

For example, coal (potential energy) is burnt in a power station, releasing chemical energy as its chemical bonds are broken. The power station uses this to generate electricity (electrical energy), which in turn is used to power domestic cookers (heat energy).

Energy is used to run machines and to produce heat and light. We get the energy out of resources. Today the main form of energy is electricity. It can be produced from all the fuels.

3) Which forms of energy do we use?
Energy can be either potential or kinetic. Potential energy is stored or latent. It is energy that is not being used at the moment, but could be used in the future. Kinetic energy is found in anything that is moving. That includes the smallest atom that is moving around fast because it is hot (heat energy) to a very big avalanche coming down a mountain or an elephant pushing down trees.

Forms of energy:
Gravitational energy – something is moved by gravitational pull. For example: A fruit on a tree has the potential to fall, and kinetic energy as it falls to the ground.
Heat energy – is the result of the particles in a substance moving around. We measure it as temperature.
Chemical energy – is the energy stored in the chemical bonds between a substance's molecules, which can be released through a chemical reaction such as combustion.
Electrical energy – is the result of the movement of electrons through a conductor, causing an electrical charge.
Elastic energy - is stored when a spring is compressed or an elastic band is pulled. When they are released the potential energy becomes kinetic.
Nuclear or atomic energy – is stored in the nucleus of atoms. The energy is released through processes called nuclear fission (splitting the atom), fusion (combining two atoms) or radioactive decay.

4) Why is the demand for resources and energy growing?
The demand for energy is growing day by day. World's population and the world's economic increase permanently. Any development without energy wouldn't be possible. But the demand for resources and energy is not evenly spread across the world. MEDCs (more economically developed countries) have only 25% of the population of the world but they use up to 80% of the energy produced.

Some MEDCs are trying to reduce their energy demand by developing more efficient motor vehicles and machines and better insulation.

Most LEDCs (less economically developed countries) get their energy from the efforts of people or animals or through imported fuels. This is because they don't have significant reserves of energy of their own. There is a demand of those countries to raise energy because they also want to industrialise and to have a similar living standard as MEDCs.

5) How can we manage the use of energy?
As mentioned before we should be aware of using energy. There are kinds of energy which are non-renewable and it's just a question of time, when we can't use them any more. Some of them cause problems – e.g. global warming.

Let's have a look on some examples:
Coal: There are some advantages to use coal for producing energy. One is that coal is a read-made fuel. It can be mined underground (shaft mining) or on the surface (open-cast). There are still 300 years of reserves for this relatively efficient fuel and the supply will last longer than oil or gas. It is relatively cheap to mine and to convert into energy.

But there are also some disadvantages. Coal mines create visual, noise and air pollution, mining can be dangerous and accidents do occur (China, Russia). But the biggest problem is that burning coal creates acid rain and adds to global warming.

Oil and natural gas: A carbon-based liquid formed from fossilised animals.
Lakes of oil are found under land or sea, sandwiched between seams of rock in the earth (land or sea). Pipes are sunk down to the reservoirs to pump the oil out. It's used a lot in industry and transport.
The advantages to use oil or natural gas are nearly the same as for coal. They are a relatively cheap form of energy and they are a ready-made fuel. They are often used for heating, cooking and transport.
The disadvantage is that when they are burnt they give off atmospheric pollutants and cause problems in case of global warming. It also can be dangerous to produce it, e.g. explosions and fire in difficult environments such as Alaska or North Sea. Serious environmental damage is caused if pipelines break or an oil tanker is grounded (Exxon Valdez in 1989). Very dangerous can be the situation that oil has become a political weapon with the oil-producing and oil-exporting countries (OPEC) limiting supplies to maintain higher prices.

Nuclear energy: Nuclear energy is stored in uranium atoms and is released as heat to turn water into steam that moves turbines. By that electricity is produced. Nuclear energy was seen as the source of energy for the future. But some accidents especially Chernobyl in 1986 have caused many discussions if it is wise to use nuclear energy further more. Except such accidents there is one big problem: nuclear waste remains radioactive and dangerous for many hundreds of years. Nuclear energy is a politically unpopular source of power.

6) Do we have alternative energy?
Using fossil fuels to generate energy can influence the environment in a bad way. And such fuels will run out in the future. Therefore governments and NGOs (Non-governmental organisation) are developing alternative sources of power. They should be cleaner, saver and more permanent.

Biomass: This is decaying plant or animal waste. It is an organic material which can be burnt to provide energy, e.g. heat or electricity. An example of biomass energy is oilseed rape (the fields of yellow flowers you see in the countryside in summer) which produces oil. After treatment with chemicals it can be used as a fuel in diesel engines. It is a cheap and readily available source of energy. If the crops are replaced, biomass can be a long-term, sustainable energy source.
When burnt, it gives off atmospheric pollutants, including greenhouse gases.
If crops are not replanted, biomass is a non-renewable resource.

Hydro-electric power (HEP): Energy harnessed from the movement of water through rivers, lakes and dams. It creates water reserves as well as energy supplies and doesn’t produce any greenhouse gases. But it is expansive to build and can cause the flooding of surrounding communities and landscapes (Ghana, China, or Austria: Hainburg). Dams have major ecological impacts on local hydrology.

Wind: Wind turbines (modern windmills) turn wind energy into electricity. It can be found singularly, but usually many together in wind farms. It's often burnt to provide heat or electricity. The electricity produced is cheap and does not cause much pollution. There can only be some noise pollution for people living in the surrounding. Therefore it is necessary to

find out the best locations for building up wind parks. The production of energy is inefficient and you need many windmills to make any major impact on the demand for fossil fuels.

Solar power: Energy from sunlight is captured in solar panels and converted into electricity. The panels are placed on different places e.g. on the roof of houses or beside motorways. Sunny areas are necessary. Therefore is its use limited by night and by clouds. The technology has to be improved, because the technology is only 15% efficient at converting sunlight into energy.

Geothermal: It is possible to use the heat under the earth. This source gets more and more popular. Cold water is pumped into the earth and comes out as steam. We can use this energy for heating or to power turbines. In some countries it is used very common (Island, New Zealand, Japan). The disadvantage is that it is often very expansive to build up such stations.

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