energy envoys

Energy Tutorial: Energy and Sustainability

Energy and climate change

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THE LINK BETWEEN ENERGY AND CLIMATE CHANGE

Every time we switch on a light or turn on the central heating, or even eat a hot meal, we use energy. Whatever kind of fuel we use, whether we burn it directly or indirectly by buying electricity generated from fossil fuels (coal, oil or gas), we are releasing carbon dioxide (CO_2) into the atmosphere. CO_2 is one of the main gases that contribute to global warming, which is now scientifically recognised as a real threat to today's climate. This doesn't just mean warmer summers and milder winters: global climate change is responsible for there being more floods, storms and droughts around the world than ever before. Over the past 20 years, scientists have gathered conclusive evidence that temperatures have been rising sharply since the start of the industrial revolution, and that mankind is the main cause of global climate change.

Figure 1: Variations in the Earth's surface temperature (year 1000 to year 2100)

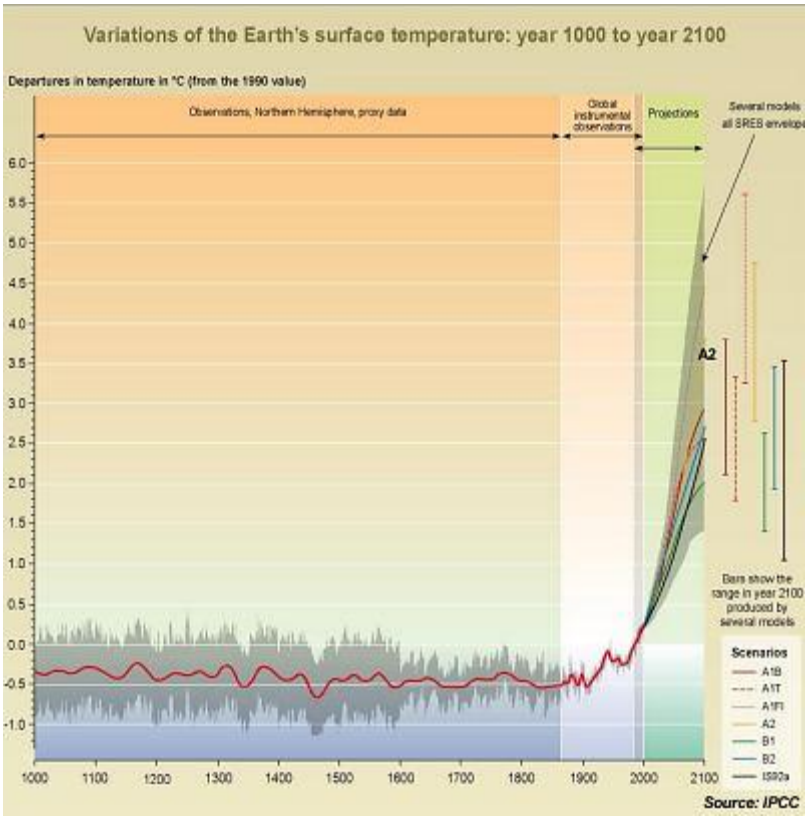


Figure 1 above was produced by the Intergovernmental Panel on Climate Change (IPCC) and shows how global average temperatures have risen over past 1000 years. Most of the change has been in the past century as the world industrialised and its population has grown rapidly. From fluctuating in a narrow band around 0.5°C below the average 1990 temperature, it has started to rise sharply and is most likely to be between 1.5°C and 5.5°C above current temperatures by 2100.

This would have a catastrophic effect on the Earth, with widespread melting of glaciers and ice-sheets, and a highly probable rise in sea level that could lead to the inundation of countries such as the Netherlands and Bangladesh. Latest scientific concern is focused on melting ice lowering salinity in the North Atlantic Ocean, which could lead to the reversal of the 'Great Atlantic Conveyor' - better known as the Gulf Stream. If this were to happen, we could find that temperatures in north-west Europe, including Britain, *fell* by up to 10°C, despite temperatures elsewhere in the world rising.

Recent years have seen a huge rise in the number of abnormal weather events. These have included summer droughts, flooding in Yorkshire, the Severn Valley and East Sussex, more frequent winter storms and even a number of small tornados! Meteorologists agree that these exceptional conditions are signs that global climate change is happening already. Scientists agree that the most likely cause of the changes are man-made emissions of 'greenhouse gases' that trap heat in the Earth's atmosphere in the same way that glass traps heat in a greenhouse, partly through the warming of the surface of the oceans causing them to store greater energy that in turn leads to more severe storms. Although there are six major groups of gases that contribute to global climate change, the most common is carbon dioxide (CO_2).

WHICH COUNTRIES HAVE THE HIGHEST CARBON EMISSIONS?

Climate change is a global problem, but the countries that contribute the most greenhouse gas emissions are China and the USA. If significant carbon dioxide reductions are to be made, there is a role to be played by all high emitting countries. Most carbon dioxide in these countries comes from burning fossil fuels, such as coal, gas and oil to heat buildings (including homes) and provide transport. Carbon emissions in the UK are also well above the world average. Although they have fallen in recent years, this has largely been as a result of a rapid change from coal to gas for electricity generation. We can all do a lot more to reduce our energy use and to encourage the uptake of renewable energy sources.

HOW ARE GOVERNMENTS TACKLING CLIMATE CHANGE?

Globally

Governments across the world have met in a series of Climate Change Conferences and set targets for the reduction of emissions of CO_2 from burning fossil fuels. The main international agreement is known as the Kyoto Protocol, under which certain industrialised nations agreed to a cap on their emissions of CO_2.

Europe

Within Europe, there are the "20-20-20" targets. These are based on the three pillars of European energy policy: security of supply, competitive markets and sustainability. The targets are to achieve a 20% (or even 30%) reduction in CO_2 emissions compared to 1990 levels, for 20% of energy to come from renewable energy sources and to achieve a 20% increase in energy efficiency by the year 2020.

UK

The UK government has been signed up to the Kyoto Protocol since 1995 and has enacted legally binding targets to reduce carbon emissions through the Climate Change Act of 2008. The Act commits the UK to an 80% reduction in CO_2 emissions from 1990 levels by 2050. In 1990, UK emissions averaged 10 tonnes per person a year so we will need to fall below 2 tonnes by 2050 to meet this target! Cutting our carbon emissions will not only help us reach the targets set but will also bring us closer to living within our share of the planet's environmental resources. Living a more carbon efficient life can also reduce energy costs and help tackle to fuel poverty.

In terms of renewable energy targets, the UK has its own sub-targets relating to the European 20-20-20 targets, recognising that we have historically had a lower level of renewable energy than other European countries. Under these targets, the UK aims to produce 15% of its energy from renewable sources by 2020. We are well on the way to achieving this target, with electricity generated from renewable sources reaching 19% in 2014. However, the overall energy target includes transport and heating, in addition to electricity generation. The contribution of renewables to meet this total energy need reached 7% in 2014, so we still have some more work to do. It's thought that electricity generation from renewable sources is likely to have to increase to above 30% by 2020 to reach the overall target of 15% of our energy coming from renewables.

WHAT CAN I DO TO HELP TACKLE CLIMATE CHANGE?

Over a quarter of the CO_2 produced in the UK comes from the energy we use in our homes. By insulating our homes, controlling the way we use energy and using renewable energy sources we can have a major impact on the amount of CO_2 produced.With another quarter of British energy used by cars, we can also help reduce the risks from global climate change by avoiding unnecessary car trips, using public transport and either cycling or walking whenever possible.

But what should we prioritise in order to save energy and carbon? Figure 2 below illustrates the Energy Hierarchy. This ranks the actions we can take to progress towards a more sustainable energy system, with the most favourable actions at the top and the least favourable actions at the bottom. It shows how we should prioritise our actions as follows:

1. **Energy saving** – minimise our energy demand and prevent unnecessary use of energy by changing wasteful behaviour (e.g. switch off lights and appliances when not in use and only boil the required amount of water in a kettle)

2. **Energy efficiency** – where we do use energy, use it as efficiently as possible (e.g. use energy efficient lighting and appliances and ensure we have well-insulated homes which keep in the heat)

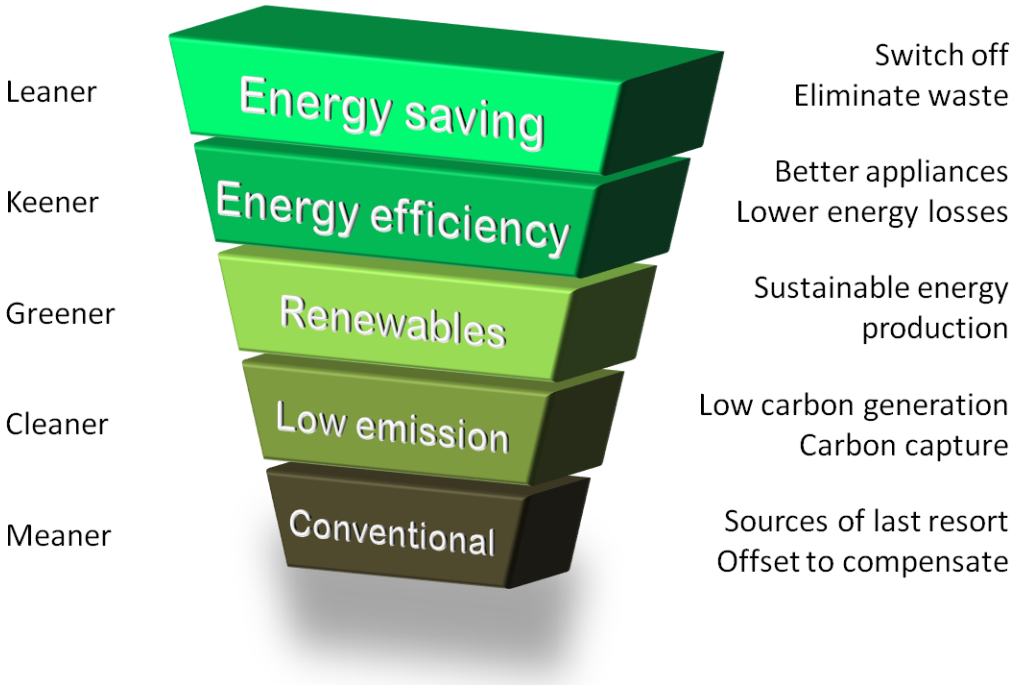
3. **Renewables** – use energy from renewable energy sources

4. **Low emission** – when we have to use non-renewable energy sources, reduce the carbon emissions produced by using low carbon technologies (e.g. carbon capture and storage)

5. **Conventional** – use fossil fuels as normal

Figure 2: The Energy Hierarchy

Source: Wikipedia (Author: Philip R Wolfe)



Energy saving and energy efficiency should therefore always be the top priority when trying to make our energy use more sustainable. Although using renewable energy is also very important, if we haven't ensured our energy use is as efficient as possible, we'll have to produce extra renewable energy that could otherwise be avoided. This would be more difficult and expensive than if we reduced our energy use and would waste renewable energy that could be used to reduce environmental impacts elsewhere. The average household can cut at least £200 a year off its energy bills without losing either warmth or comfort by simply using energy efficiently and effectively. Throughout the Energy Tutorial you will find lots of information and ideas that will help you to improve the use of energy in buildings, and in turn to help save the planet!