

Setting the Scene: Climate Change

What is Meant by 'Climate Change'?

As we all know, weather can change every day, when we talk about the 'climate' and specifically 'climate change' we are talking about long term averages and patterns, usually of at least three decades, if not more. Climate change refers to long-term changes in these averages, and includes factors such as rainfall and temperature. Climate change can lead to an increase in the severity and frequency of extreme weather events, such as the floods of 2007 which affected many areas of the UK.

While there are some natural forces that affect the climate, the levels of greenhouse gases in the atmosphere have a direct impact, and humans are largely responsible for recent increases in greenhouse gas concentrations, since the industrial revolution and the burning of fossil fuels for the generation of electricity.

We Live in a Greenhouse

The 'greenhouse effect' is so called because the effect is exactly like being in a greenhouse; in a greenhouse it is the glass that prevents heat escaping back out, whereas in the atmosphere it is gases such as Carbon Dioxide (CO₂). There are a few other gases that have the same effect, but the impact of CO₂ is greater, and more directly linked to human activity. These gases are collectively known as greenhouse gases because of the role they play in this process.

The Impact of Humans

There is a lot of debate as to whether climate change is a direct impact of human activities, but the Intergovernmental Panel on Climate Change (IPCC) recently concluded that the rises in global average temperature was 'very likely' a result of man-made greenhouse gas emissions. In this instance, 'very likely' means a greater than 90% chance.

Global temperature increases correspond very closely to the industrialisation of our civilisation, and as a result of this industrialisation, we have burnt ever-greater quantities of oil, gas, and coal, and cleared large areas of forest for agriculture and other development. All of these activities release CO₂ and other greenhouse gases into the atmosphere.

What is Carbon Dioxide?

Carbon dioxide (CO₂) is the most important of greenhouse gases. Made up of one carbon and two oxygen atoms, which are two of the most commonly occurring elements on the planet, it is the most influential greenhouse gas. It is also the one that man has contributed most in terms of increasing emissions due to the burning of fossil fuels to create electricity. CO₂ occurs naturally in freshwater and seawater, in some rock formations and in the soil. CO₂ is not toxic, explosive or flammable.

The Carbon Cycle

Taking a step back, the element of carbon, one of the components of CO₂ is naturally present in the Earth's atmosphere, water, soils, rocks, plants and animals. All of the carbon present in the Earth today has been here since the birth of the solar system, and it moves in a cycle, from one physical place and form to another. The amount of carbon in the cycle does not change it is simply exchanged between one store and another – land, sea and air. The human activity of burning fossil fuels changes the balance of this system, meaning more carbon is present in the atmosphere than the land or sea phases, and this in turn contributes to the greenhouse effect.

The Challenge Ahead

There are several options for changing the effect we are having on the climate; we can change our fuel generation practices for renewable or low-carbon options, we can increase fuel efficiency, so we use less to generate the same power, and we can prevent CO₂ from being released to the atmosphere by deploying CO₂ capture and storage (CCS).

Over the longer term, low carbon technologies and energy efficiency improvements provide the biggest and best chance for change. However if we do nothing while we wait for these technologies to be developed to the stage of readiness, so that they can replace fossil fuels in the energy generation mix, we will have passed the point of no return, and climate change will be insurmountable and the way in which we live will be changed forever.

We need to develop and deploy CCS technologies in the short to medium term in order to reduce the amount of carbon that we emit. The technology of CCS means that we can continue utilising fossil fuels while alternative fuel technology is developed, without releasing the CO₂ into the atmosphere.

The impact of insurmountable climate change would include social, economic and environmental effects, and could include impacts such as: spread of diseases, displaced communities, food shortages, extreme weather events, water shortages, drought and much more.

Summary

There are many options for reducing greenhouse gas emissions and all will be needed in order to prevent insurmountable climate change. The use of CCS does not mean that other options will be neglected or not researched and developed, all the options will be needed and CCS has the potential to make a big impact, relatively early. That is why more action is needed to deploy CCS projects around the world; it can make a difference quickly while other technologies are developed and brought to maturity.