

CLIMATE CHANGE

‘Everybody talks about the weather, but nobody does anything about it,’ said the American writer Mark Twain in 1897. More than 100 years later, everybody is certainly talking about the weather and climate change. From hurricanes in Brazil to floods in Bangladesh, from heat waves in France to drought in Australia, the weather is never out of the news.

But is anybody doing anything about it? The climate is changing, but why? What can we do about it, and what should we do about it? These are important questions – and perhaps there is not a lot of time to find the answers. Climate change is going to have an effect on the lives of everybody in the world.

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1 What is climate change?

The Earth is very old. It has changed often during its long life, and it is still changing. Millions of years ago, when dinosaurs like *Tyrannosaurus rex* were alive, the Earth was much warmer. There was very little ice on the land or on the sea, even in the very north or the very south of the world. And the sea was much higher than it is today.

There have been many changes since that time, sometimes to a warmer climate, sometimes to a colder one. About 20,000 years ago, for example, a time called an Ice Age began. There was ice over much of the world, and it was 3 kilometres deep over much of North America and Europe. And the sea was not as high as it is today. Our climate has changed many times, and it will change again.

Why does our climate change? Sometimes the change comes from *outside* the Earth. For example, the Earth moves around the Sun – this is called the Earth's orbit. Every few thousand years, the Earth changes its orbit around the Sun. The change happens slowly, and it brings the Earth near to the Sun or it takes it far away from the Sun. When this happens, it can finish an Ice Age – or it can start a new one.

Changes can also come from *inside* the Earth. An

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example of this is the volcano of Krakatoa. When it erupted in 1883, the sky became dark over many countries, and stayed dark for months. And for more than a year, the Earth was 1 °C colder than before.

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But now, for the very first time, *people* are changing the climate. In the year 1900, the Earth was 0.7 °C colder than it was in 2000, just one hundred years later. This change did not happen because of the Earth's orbit – it happened because of us. Some people think that this is a small change. But think about this. A change of just 5 to 7 °C can start or finish an Ice Age.

Does climate change happen quickly or slowly? The film *The Day After Tomorrow* is about a change that happens very quickly. In the film, the Earth's climate changes in only a few days, and a new Ice Age begins in the north of the world.

Can the climate change like this? Scientists think that it can – but not as quickly as this. Scientists do not always agree. Some think that the climate is changing a lot, and some think that it is changing a little. Some think that it will change quickly, and some slowly. But *all* scientists agree that climate change is happening. The important question is this: how dangerous will the change be?

Al Gore, who worked next to President Clinton of the USA between 1993 and 2001, thinks that the change will be dangerous. In his film *An Inconvenient Truth*, Al Gore describes how the Earth's climate has changed. He has talked about the dangers of climate change for more than twenty years, but is he right? Is climate change a dangerous problem? Must we do something about it? And what *can* we do?

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How does our climate work?

Why can people live on the Earth but not on Mars or Venus? The answer is all around us: our atmosphere. Our atmosphere is made of gases that are necessary for life. The two most important gases are nitrogen (78 per

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cent) and oxygen (20 per cent). The other 2 per cent of our atmosphere is made of many other gases – and the most important of these gases for our climate is carbon dioxide (CO₂).

Our atmosphere is important because it gives us air, and we need air to live. But it has another important job. Because of our atmosphere, the Earth does not get too hot or too cold. Mars has a thin atmosphere and its temperature is about -50 °C. Venus has a thick atmosphere and its temperature is about +460 °C. The atmosphere of the Earth is somewhere between the two.

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Two hundred years ago in France, a scientist called Joseph Fourier had some questions about the Sun and the Earth. When the Sun shines, the Earth becomes hot. But what happens at night, he asked himself, when the Sun is not shining? Why does the Earth not lose its heat? In his garden, Fourier had a greenhouse (a building made of glass), and he put young plants in it because the air was warmer. He thought that the Earth's atmosphere was like the glass of a greenhouse. Warm air stays in a greenhouse because of the glass, and warm air stays on the Earth because of the atmosphere. We know much more

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about the atmosphere now than Joseph Fourier knew, but we still use his words (the ‘greenhouse effect’) today.

So why does the Earth not become cold? How does the greenhouse effect work?

Light from the Sun comes through the Earth’s atmosphere and heats the Earth. But this heat is different from the Sun’s light. Not all of this heat from the Earth can go back through the atmosphere and escape into space. There are some gases in our atmosphere that stop the heat from escaping into space. That is why these gases are called ‘greenhouse gases’. The most important of them is CO₂, which stays in the atmosphere for 100 years – much longer than any other greenhouse gas!

But what stops the hot places in the world from getting hotter and hotter? And why do the cold places not get colder and colder? To answer these questions we must learn a little about the sea.

The water in the oceans moves around the world like a river. Warm water travels to cold places in the world, and makes them warmer. And cold water travels to warm places, and makes them cooler. Because there is so much water in the sea, this can make big changes to our climate. A famous example is the Gulf Stream. In the North Atlantic, the Gulf Stream carries warm water northeast from the Gulf of Mexico to Britain, Ireland and Scandinavia. The Gulf Stream brings heat to Europe; it carries fifty times more heat than all the houses, all the offices, and all the factories in the world! When the water of the Gulf Stream gets to Iceland in the north, the water becomes cold. Cold water is heavier than warm water, so

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the cold water goes down under the warm water, and it goes back south.

This is what happens now. But what happens when something changes? In the next chapter, we will look at some of the changes that are happening to our atmosphere and to our seas. And we will look at the greenhouse gas CO₂.

YOU HAVE REACHED THE END OF THE SAMPLE.

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