Factsheet 1: The basics - carbon dioxide

The world is getting warmer. The main cause of this is carbon dioxide (CO2). Since 1850, but especially since 1950, humanity has been putting more and more CO2 into the air.

This happens because we are burning more and more coal, oil and natural gas. Oil and natural gas are partly made of carbon. Coal is almost completely made of carbon. When coal, oil, and gas burn, the carbon combines with the oxygen in the air to make carbon dioxide. This new carbon dioxide from burning is called “CO2 emissions”.

CO2 in the atmosphere traps heat that is rising from the earth and going into space. The more CO2 in the air, the more the earth warms up.

Luckily, not all of the CO2 stays up in the air. Each year about half of the new CO2 emissions are absorbed by plants, trees, and the ocean. This means we don't have to get rid of all emissions. On a global level, we only need to cut these emissions by about one half.

But the other half now stays up in the air for an average of more than 100 years. This is why the world is warming, and why it will get much hotter.

Other warming gases

Burning CO2 is not the only cause of man made climate change. Factsheet 4 – Methane, Nitrous Oxide and Forests – explains the other main greenhouse gases and the effect of cutting down forests. But CO2 is the most important gas, and burning CO2 accounts for more than half of global warming.

Natural warming and man-made warming

Climate change is not new. But we have a new kind of climate change.

For hundreds of thousands of years, the earth has been going back and forth between cold ice age periods and warm periods – like the warm period now.

The earth warms and cools over thousands of years as the earth's orbit around the sun changes. There are three slow changes in the orbit. One takes 21,000 years, another 41,000 years, and a third 100,000 years. These changes interact to create gradual change in the temperature. This is why the earth has warmed and cooled.

But man made warming is different, because it is happening at least 200 times faster than natural warming. No one knows exactly what difference that will make. We can't know, until it happens. But the big danger is what scientists call 'abrupt climate change'.

Scientists are now worried about this because of what happened in the past. For hundreds of thousands of years, the earth has gone back and forth between cold ice ages and warm periods. When the earth cooled into an ice age, temperatures and CO2 levels went down slowly and gradually.

When the earth warmed, it started gradually. Then suddenly there was a swift increase in both CO2 and temperatures. The pace moved from thousands of years to tens of years, and sometimes faster.

Scientists know this from drilling down through the ice in Greenland, Antarctica, and glaciers around the world, from drilling into the mud on the continental shelf in several oceans, and from analysing rock formations in caves in Brazil, France and Israel.

Feedbacks

As soon as scientists found these fast explosions in temperature, they knew the reason had to be some kind of feedback effect. But they are not yet agreed what feedback effect will be crucial.

Here are two examples of global warming feedback: One starts because snow and ice are dazzling white. That means they reflect heat. But as the temperature

rises, the snow and ice in the Arctic begins to melt. That exposes dark tundra and dark sea, which absorb heat. That raises the temperature, which melts more summer snow and ice, and so on. This feedback has already begun.

A second feedback starts because rising temperatures melt the frozen peat bogs of Siberia. As the bogs melt, they release trapped methane, a much more powerful warming gas than CO2. That raises the temperature, which unfreezes more methane, and so on. This feedback has already begun.

The scientists are not yet agreed which feedback or feedbacks will be crucial. It looks likely that feedbacks will work together, reinforcing each other. Because scientists don't know which feedback effects will be critical, they don't know how long we have before abrupt climate change. A very rough guess is twenty years. But it could be fifty, or even a hundred years. It could be five years or less.

There is that worrying statistic – we have changed the CO2 in the air more than the difference between an ice age and the nineteenth century.

The cuts we need

How much do we need to cut CO2, and how fast?

There are many complex, confusing ways of calculating this. They involve scenarios, percentages, models, degrees, and what will happen in 2050.

The easier way to understand is to focus on a simple truth. We need to stop increasing the amount of CO2 we put in the air. Some scientists argue we can increase it by a bit. An increasing number of scientists argue we have to reduce it by a bit. But the truth is that when we get serious about CO2, the big challenge will be stabilising the levels. If we can keep the amount of CO2 in the air steady, we can reduce it a bit.

Luckily, we don't have to cut all the CO2 emissions. We don't need 'zero carbon' globally. Remember, trees, plants and the ocean currently absorb about half the CO2 emissions each year. So on a global level we will stabilise if we cut emissions by half – 50%.

The global average of emissions is:
4 tonnes per person now.

A 50% cut would be:
2 tonnes per person.

However, rates of emissions per person each year vary enormously from one country to another:

	CO2 per person per year
USA	20 tonnes
Germany	10 tonnes
Europe	8 tonnes
China	5 tonnes
Brazil	2 tonnes
India	1 tonne
Kenya	0.3 tonnes
Nepal	0.1 tonnes

We need to get the average down to 2 tonnes. That means:

USA	90% cut
Germany	89% cut
Europe	75% cut
China	60% cut
Brazil	no change
India	twice as much
Kenya	six times as much
Nepal	twenty times as much

This is the fair way to do it. Just as important, people in poor countries will refuse to control emissions if richer countries don't share. (See also Factsheet 18 on *North and South*.)

To summarise, we need to cut CO2 globally by about 50%, and by about 80% in the rich countries. And we need to do it in 20 years.

Our great challenge is that what the scientists are telling us is different from what the politicians are doing. No government is currently planning cuts this deep and fast. And every year global CO2 levels keep rising.

This is part of a series of factsheets on climate change produced by the ITF, www.itfclimatejustice.org