

# Climate change

Global warming is one of the greatest environmental threats currently facing life on Earth. This factsheet looks at the potentially devastating impacts of this climate change on the Earth's ecosystem and wildlife, and suggests some things that everyone can do to help.

## What is global warming?

Global warming is a form of climate change. An 'ice age', for example, is a period of natural climate change when the Earth cools. At the moment however the Earth is undergoing a period of rapid anthropogenic (manmade) climatic warming caused by the greenhouse effect.

## What is the greenhouse effect?

The greenhouse effect is a process that happens when gases in the Earth's atmosphere trap the Sun's heat. Greenhouse

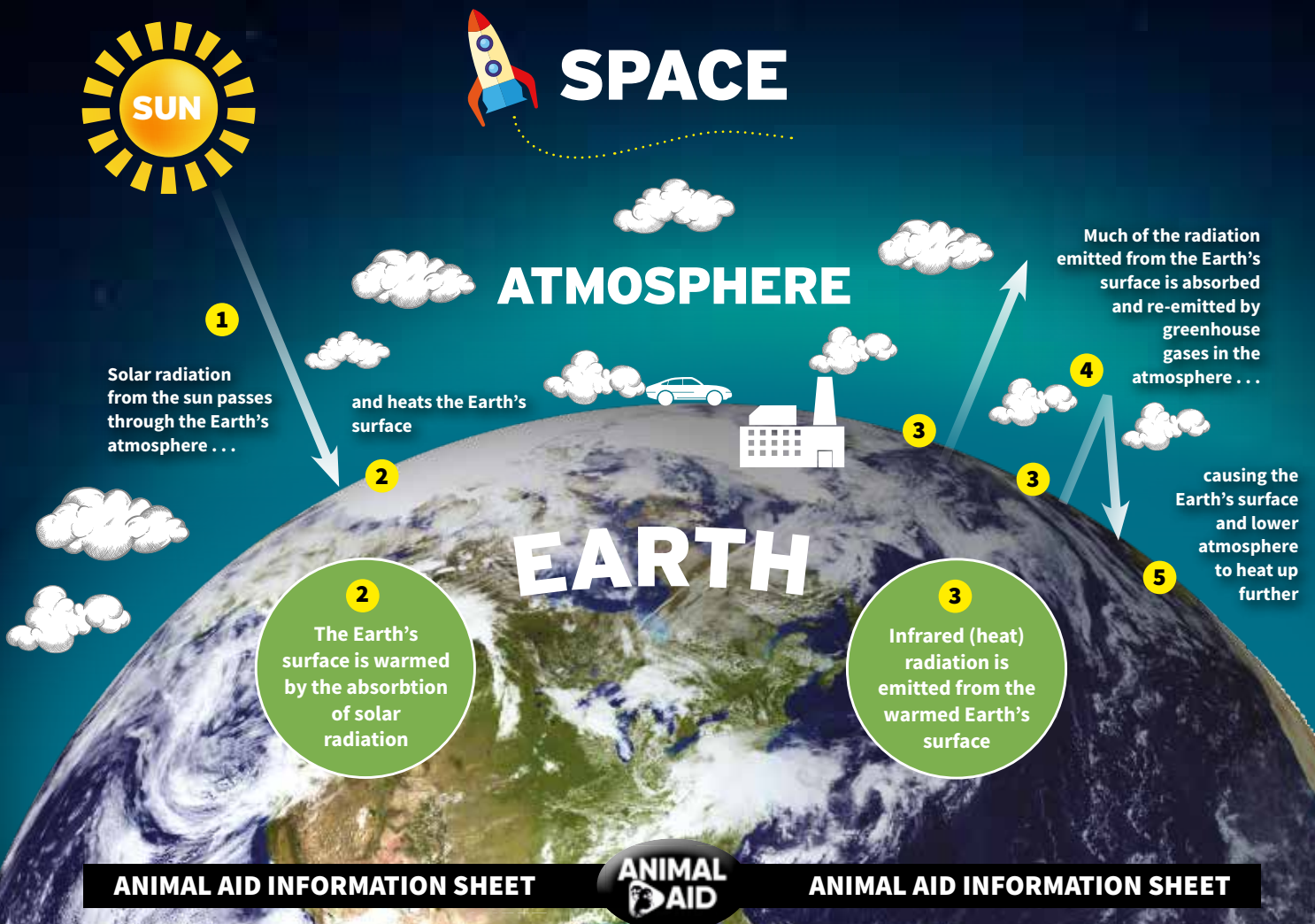
gases (GHGs) such as water vapour ( $H_2O$ ), carbon dioxide ( $CO_2$ ), methane ( $CH_4$ ) and nitrous oxide ( $N_2O$ ) act like a blanket keeping the Earth's heat in. This makes the Earth much warmer than it would be without an atmosphere.

This was a totally natural process before we started polluting the atmosphere. The greenhouse effect would normally keep the average temperature of the Earth's surface at about  $15^\circ C$ . Without any greenhouse effect at all, the planet would be a lifeless  $18^\circ C$  below freezing.<sup>1</sup>

## How does the greenhouse effect work?

Shortwave solar radiation from the sun passes easily through the atmosphere **1** and heats the Earth's surface **2**. The warmed Earth gives off heat in the form of longwave infrared radiation **3**. While some of this escapes into space, most of it is absorbed and re-emitted by the GHG molecules in the atmosphere **4**, causing the Earth's surface and lower atmosphere to heat up **5**. The more of these gases there are in the atmosphere, the warmer the Earth gets.

The trouble is that people are pumping more and more greenhouse gases into the atmosphere, causing the climate to warm up so fast that people and animals may not be able to adapt to the change.



# What is causing global warming?

Human activity is increasing the concentrations of gases in the atmosphere such as carbon dioxide and methane, which is boosting the power of the greenhouse effect and causing the Earth to warm up.

## Where do greenhouse gasses (GHG) come from? <sup>2</sup>

### Energy supply

The burning of fossil fuels such as coal, oil and gas to generate electricity releases CO<sub>2</sub>. This is the biggest source, contributing around a third of all greenhouse gas emissions.

### Industry

The manufacture of products such as iron and steel, chemicals and cement releases large amounts of CO<sub>2</sub> and is the second biggest source contributing around a quarter of all greenhouse gas emissions.

### Transport

Motor vehicles, aircraft, trains and ships that burn petrol and diesel release CO<sub>2</sub>.

### Agriculture

The growing of crops and the rearing of animals for food releases gases such as methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O). (See below for more information on the contribution of animal farming to greenhouse gas emissions.)

### Buildings

The burning of fossil fuels such as coal, oil and gas to heat buildings releases CO<sub>2</sub>.

### Other sources of GHG emissions

These include forestry, land use and land-use change. Land-use change, for example, includes deforestation which releases CO<sub>2</sub> when the trees are chopped down and burnt (see below).

## The impact of animal farming

According to the Food and Agriculture Organization of the United Nations animal farming accounts for 14.5% of all greenhouse gas (GHG) emissions.<sup>3</sup>

From the pie chart opposite you can see that the main sources of emissions from animal farming are:

- deforestation for grazing land and animal feed production mainly in the Amazon tropical rainforest
- animal manure (poo)
- animal burps and farts

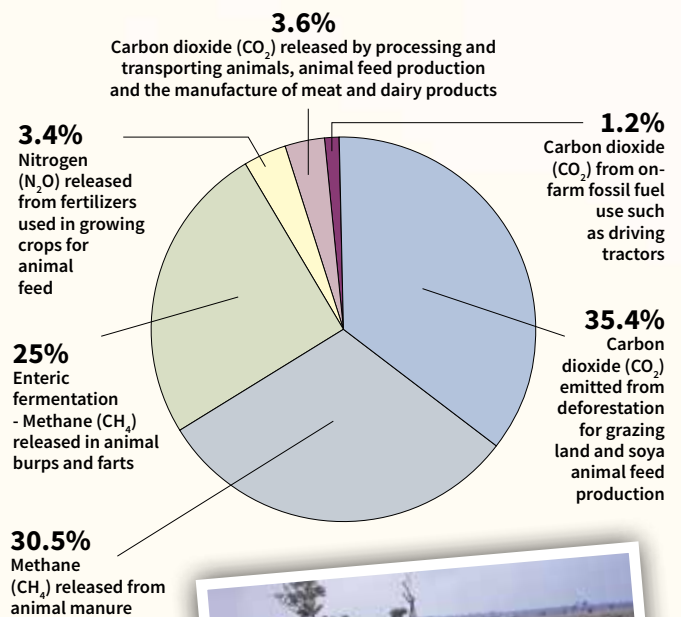


Each cow produces 120kg of methane a year

An industrial-scale cattle feedlot in the Amazon rainforest.



## Sources of GHG emissions from animal farming: <sup>4</sup>



Deforestation of the tropical rainforest to create cattle grazing land is a major source of carbon dioxide emissions.



# What is happening?

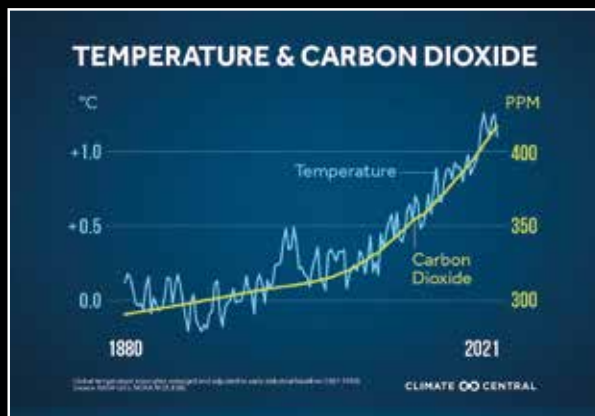
Since the start of the industrial age just over 170 years ago the CO<sub>2</sub> concentration in the Earth's atmosphere has increased by 50%,<sup>5</sup> and the concentration of methane in the Earth's atmosphere has increased by 200%.<sup>6</sup>



**The Earth is warming faster than at any time in the past 10,000 years.**

2023 was Earth's warmest year since modern record-keeping began in around 1880, and the past 10 consecutive years have been the warmest 10 on record.<sup>7</sup>

**Graph of atmospheric CO<sub>2</sub> concentration (PPM) average global temperature (°C) from 1880 to 2021.**<sup>8</sup>



As carbon dioxide levels rise, so do temperatures.

The average surface temperature has increased by about 1°C since the beginning of the Industrial Revolution in 1750.<sup>9</sup>

The Earth's ice cover is melting at a faster rate than at any time since records began. Also, as the water of the oceans warms, it expands. Scientists estimate that thermal expansion of the oceans and melting of glaciers and land-based ice sheets have caused sea levels to rise globally by about 10 - 20 cm in the last 100 years.<sup>10</sup>

## What could happen next?

If we continue to burn fossil fuels, rear animals for food and clear forests, the levels of greenhouse gases in the atmosphere will keep rising. It is predicted that CO<sub>2</sub> levels could double by the year 2100 unless we take dramatic action to reduce emissions.<sup>11</sup>



The Paris Agreement signed in 2016 by most countries set a target to keep the global temperature rise this century below 2°C above pre-industrial levels, but to try to limit the increase to 1.5°C.

An increase of 2°C in the average global temperature is thought to be the critical level above which there would be catastrophic climatic effects.<sup>12</sup>

In 2015 global temperatures broke through the 1°C barrier as the amount of greenhouse gases in the atmosphere reached an all-time high.<sup>13</sup>

It is very difficult to judge what will happen to the world's climate as a result of global warming. Scientists use complex computer models of the Earth's climate and oceans to try to make predictions. These indicate that without swift reductions in emissions the world's average global temperature could rise by between 2.9 - 3.4 °C<sup>14</sup> and that sea levels could rise by between 61 cm and 110 cm by 2100.<sup>15</sup> These changes may not sound much but the consequences could be catastrophic.

There will be regional differences that are difficult to predict. Some areas of the world may warm up more than others. It is thought that temperatures will increase most at higher latitudes - in the Arctic and Antarctic regions, causing ice sheets to melt.

Other areas may experience heat waves and wildfires. In some parts of the world, rainfall will increase causing flooding, while elsewhere rainfall will decrease causing severe drought.

Agricultural yields will probably fall in most parts of the world. The rise in sea levels will lead to the flooding of low-lying coastal areas. No one really knows what will happen for sure - it's rather like using the Earth in a giant climatic experiment.

# What will be the consequences for wildlife?

Around the world a great variety of ecosystems have evolved in balance with their local climate. These ecosystems range from tropical rainforest, savanna and hot dry desert in the tropics, to frozen Arctic tundra and ice at the poles.

As the world's temperature increases due to global warming, these climate zones will shift towards the poles. The ecosystems and their wildlife habitats will have to migrate as the climate changes. Some adaptable plants and animals will be able to keep up. But others will be threatened with extinction. Many species are already under stress due to human activity and will be less able to cope.<sup>16</sup>

A recent study by scientists at the University of Arizona predicted that a third of all plant and animal species on our planet could be threatened with extinction by 2070 if current temperature trends continue.<sup>17</sup>

The Intergovernment Panel on Climate Change (IPCC) estimates that 20-30% of the plant and animal species evaluated so far in climate change studies are at risk of extinction if temperatures reach the levels projected to occur by the end of this century.<sup>18</sup>



Examples of species that are particularly climate-sensitive and could be at risk include animals that are adapted to mountain environments, such as the pika<sup>19</sup> and the snow leopard,<sup>20</sup> those that are dependent on sea ice habitats, such as ringed seals and polar bears, and animals that inhabit coral reef ecosystems.

## Case studies:

### The Arctic

Many Arctic marine species depend on the presence of sea ice. There is evidence that Arctic sea ice is beginning to melt due to global warming. Recent data shows that there will be almost no summer sea ice cover left in the Arctic in the next few decades. The average September Arctic sea ice (its minimum extent at the end of the summer) is shrinking at a rate of just over 12% per decade<sup>21</sup>. If this rate continues the Arctic could be ice-free in the summer by the middle of the century.<sup>22</sup> This could spell disaster for many Arctic species.<sup>23</sup> Sea ice provides a platform from which polar bears can hunt seals, who they catch through holes in the ice – they cannot catch them in the water. Polar bears could become extinct if the Arctic ocean is free of ice for long periods in the summer.

A study in 2016 found that there is a 70% chance that the global polar bear population (estimated at 26,000) will decline by more than 30% over the next 35 years – a period corresponding to three generations.<sup>23</sup>

## Things you can do to help make a difference

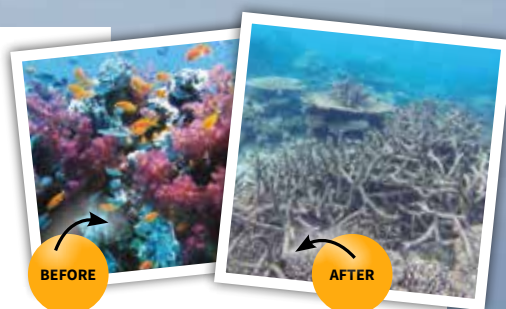
### Reduce your greenhouse gas emissions:

- Eat less meat, or better still go vegan. The carbon footprint of a vegan diet can be up to 60% lower than a meat-based one and 24% lower than a vegetarian one.<sup>25</sup>
- Walk, cycle or use public transport rather than travelling by car.

### Find out more and spread the word:

- Visit [animalaid.org.uk/youth](http://animalaid.org.uk/youth) to order a free *Go vegan* info pack.
- Ask your geography or citizenship teacher whether a speaker from Animal Aid can visit your school to give a talk on the environmental impact of animal farming.

Walrus use the sea ice as a platform from which to feed on sea floor shellfish. Several species of seal (including harp, spotted, ringed, ribbon and bearded) rely on the sea ice as a platform to give birth and nurse their young.



### Coral reefs

The tiny animals who are responsible for building the world's coral reefs in tropical waters are very sensitive to changes in water temperature. There is evidence that many of the world's coral reefs are already dying because of higher sea temperatures. Coral reefs are projected to decline by a further 70-90% if global temperatures increase by 1.5°C. At a warming of 2°C virtually all coral reefs will be lost.<sup>24</sup>



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