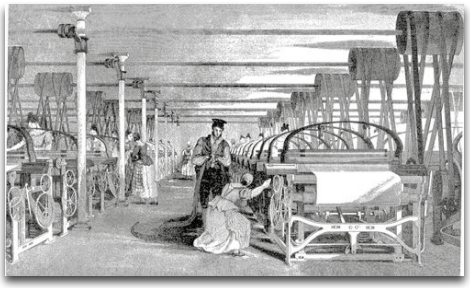
# What might a hotter planet look like?

## Global Warming vs. Climate Change

Planet Earth is, on average, getting hotter. Scientific evidence has pointed towards that happening for a long time, and historically people tended to call this process "global warming". However, you might not hear that phrase as much nowadays, as people often refer to it as "climate change" instead. What's the difference?



*Fabric production was the main driver of the industrial revolution. This image shows a factory full of weaving machines in 1835.*

Global warming refers specifically to how the average temperature of the planet is increasing.
This is because humans have been producing lots of greenhouse gases which have been absorbed into the atmosphere. We have produced a lot more over the past 200 years, ever since the Industrial Revolution - the period of time when humans started building a lot more factories and burning fossil fuels like coal. However, although the planet is getting warmer overall, different countries are experiencing many different types of weather - not just hot days.

*The Maharashtra region of India had severe flooding in June 2021, killing around 250 people and destroying infrastructure. Image credit: वर्षा देशपांडे via Wikimedia Commons*

Climate change refers to how weather patterns across the world have become a lot more changeable and extreme.
For example, some places are experiencing much hotter summers, but also much colder winters – which has been happening in the USA. Other parts of the world, such as India, experience frequent periods of heavier rainfall that never used to happen before, causing floods. Some places are getting snow at new and unexpected times of year – like when a blanket of snow disrupted travel across Scotland in May 2021!

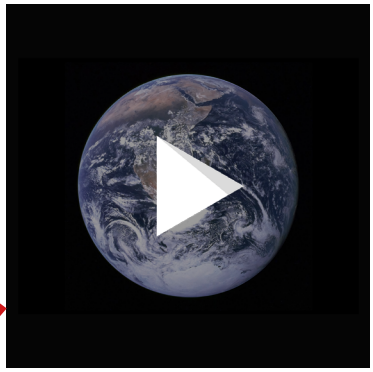
"Global warming" can still technically be an accurate phrase – the planet is getting hotter overall. However, it has become more common to talk about "climate change" instead because it makes it clearer that although not everyone across the world is experiencing higher temperatures, a lot of people are experiencing different kinds of changes in the weather.

# Weather vs. Climate

Weather and climate are easy to mix up, so we'll take a moment to clear up what the difference is.

**Weather** is what it's like outside today. For example, if it's sunny, rainy, windy, or snowy – that's the weather. Weather scientists are called **meteorologists**, and they study things like temperature, air pressure, and water vapour in the atmosphere to work out what the weather will be like every day.

**Climate** is what the weather is like over a much longer period of time – for example, 30 years. Climate scientists can study how weather patterns have changed in an area over the years to identify how the climate is changing. If certain types of weather are becoming more common, we can study these patterns to predict further changes.



You can watch a quick summary of the difference between weather and climate on this DEOnline video

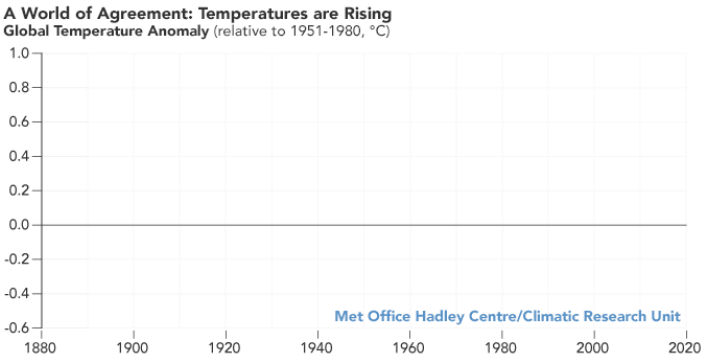
# How much hotter has the planet gotten so far?

We know that Earth is getting warmer because of an increase in greenhouse gases in the atmosphere. You can watch our short DEOnline video about the greenhouse effect to learn about how this is happening.

Having some greenhouse gases in the atmosphere is essential because they keep Earth warm enough for plant and animal life to survive. Unfortunately, if the levels of greenhouse gases get too high, environments get a lot harder to live in because weather and climate gets a lot more unpredictable.

The sharp increase in greenhouse gases found in the atmosphere started during the Industrial Revolution in the early 1800s. Creating and transporting manufactured products required the use of coal, and in later years, oil and gas. Burning these fossil fuels creates greenhouse gases, with particularly high levels of carbon dioxide.

When people talk about the temperature of the planet increasing, they are typically talking about the temperature of Earth in the 1800s as the starting point, before humans were burning huge amounts of fossil fuels. This time period is often called "pre-industrial". However, it wasn't until the late 1800s that scientists started regularly and reliably looking at temperatures across the planet.




*This animation shows recordings from five different organisations of how the global temperature has increased since 1880. This includes the Met Office in the UK (blue) and NASA in the USA (red). All the scientists got very similar results, showing the temperature has increased by over 1°C over the past 140 years.*

# How much hotter will the planet get in future?

There are a few different predictions! The primary thing to know is that we are trying to keep the increase as low as possible, with most countries trying to make sure the increase is less than 2°C. This is following the signing of the Paris Agreement, an agreement made between nations across the world that they will try to combat climate change. This happened at the COP21 meeting in 2015.

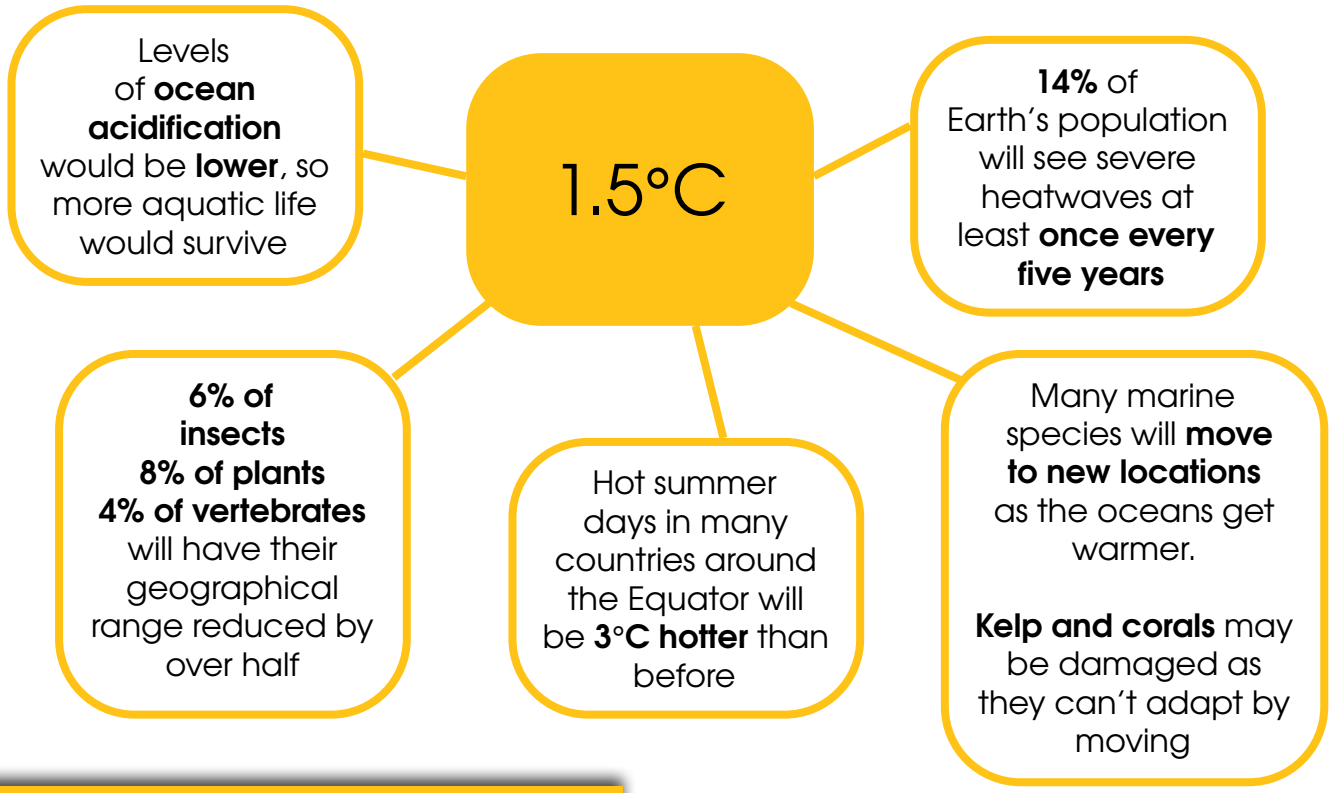
**The preferred outcome from the Paris Agreement is that the temperature increase will be limited to 1.5°C because this will substantially reduce the risk of the dangers of climate change.**

There have been various predictions over the years about how much the global temperature will increase, with some climate scientists believing it could go up by more than 2°C. What consequences could we see if the temperature increases too much?

## Different Predictions

In 2018, the Intergovernmental Panel on Climate Change (IPCC) published the Special Report on Global Warming. It was put together by scientists from 40 countries and was written to be a definitive, scientific guide to help countries deal with climate change. It contains some different predictions of what impacts we could see on the world if the temperature rises by different amounts.

The predictions are varied because climate patterns are complicated, but scientists agree that the less the temperature increases, the better. Here are some of the predictions that scientists have made:



## 2-3°C

More than 70% of coastlines will see sea levels rise by more than 20cm, causing flooding and erosion

Over **61 million** more people in urban areas would be exposed to **droughts** than in a 1.5°C warmer world

Levels of ocean acidification would be higher, meaning they contain less oxygen

Fewer aquatic species can survive these conditions

**18% of insects**
**16% of plants**
**8% of vertebrates**
will have their geographical range reduced by over half

**Growing crops** and **raising livestock** will be much harder

For example, **5% less maize** will be grown across the world

## 3°C+

**Coastal cities** will be exposed to extreme flooding, forcing millions of people to **move to new areas** and countries

Many regions, like southern Europe and large parts of North and South America, would face **water shortages** as places get drier

Summer months are likely to be consistently **much hotter**

For example, summer days could be 9°C warmer than they are now in Mediterranean countries

A **huge loss of biodiversity** is predicted as extreme weather - like droughts and wildfires - **damage habitats** and ecosystems

**Diseases** would spread more easily for a few reasons:

**Floods** can spread contaminants into clean water

Lower food production means **hungry populations**

Air pollution causes **respiratory problems**

# Activity: Adapting to a hotter planet

Scientists are hopeful that we will be able to stop Earth from getting too much hotter so that we don't see too many scary consequences like the ones above. We still might see some negative effects of climate change if the temperature increases by 1.5°C, but those effects are much easier to deal with than if the temperature increases even more.

Unfortunately, humans, plants and animals can't immediately adapt easily to all of these environmental changes because they are predicted to happen too quickly. Some species can move to new areas to survive, but many can't, so they may not live through the changes.. It's a scary thought!

Let's take a moment to think about how we could help people adapt to the possible changes we just talked about. If you could create a new invention to help humans adapt to a hotter planet in the future - say, 2200 - what might this invention be?

Think about some of the effects of climate change - for example, heavy rainfall, dry weather, fewer crops, or warmer oceans. You might want to discuss some of them if you like. Then think about what changes humans might need to make to adapt to these effects. Would we need to change where we live? The things we do every day? Or maybe the food we eat?

We've made an example for you to get you started. There's a blank version for you to fill out once you've thought about those changes!

The year is 2200 and the global temperature has risen by 3°C

Because of the warmer climate, one change has been:

*It's harder to grow food*

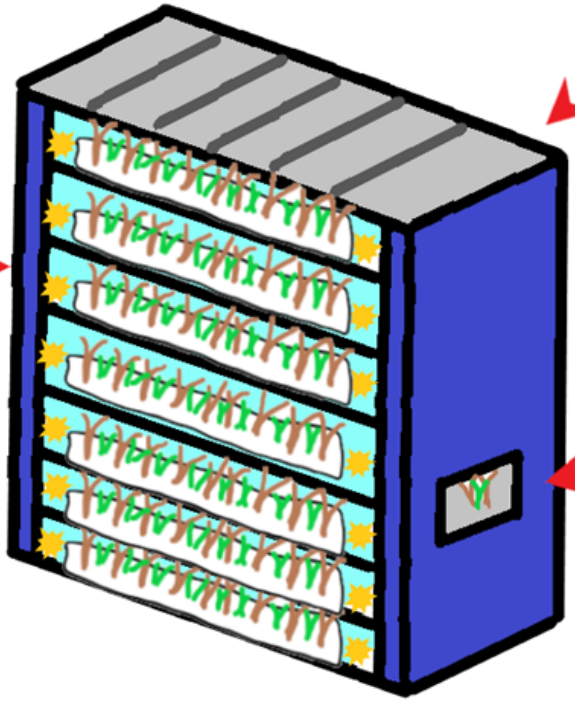
I am going to create an invention for people to adapt to this change.

My Invention is called: *The Mega Crop Shelf 5000*

This is what my invention does:

*Allows humans to grow crops upwards instead of in huge fields, allowing the space to be used for things like trees or homes for people who have lost their own*

Here's what my invention looks like:



*Solar panels - to run the lights and water supply*

*Shelves - lots and lots of shelves stacked on top of each other for crops to grow*

*Dispenser - crops are deposited here when they are fully grown and ready to eat*

The year is 2200 and the global temperature has risen by 3°C

Because of the warmer climate, one change has been:

I am going to create an invention for people to adapt to this change.

My Invention is called:

This is what my invention does:

Here's what my invention looks like: