

Topic: Trees / Climate change

Dr Katharine Pemberton, PSTT College Fellow, and **Prof. Dudley Shallcross**, Professor of Atmospheric Chemistry at the University of Bristol, link cutting-edge research with primary science

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Tree restoration now or never

What is climate change?

Climate change is an issue for all of us living on Earth. **Greenhouse gases** in our **atmosphere**, such as **carbon dioxide** (CO₂), act like layers of blankets around the Earth. If they were not there, the planet would be covered in ice. We would have a 'snowball Earth' and it would be too cold to live on. However, for the last 170 years, humans have been burning **fossil fuels** and the amount of carbon dioxide in our atmosphere has increased too much (Figure 2). The high levels of greenhouse gases in the atmosphere are causing the surface of the Earth to become too warm (Figure 3). As the surface of the Earth becomes warmer, it becomes more likely that the climate will change.

From the graph in figure 3, can you say what might happen to the temperature of the Earth in the future?

Can we stop climate change?

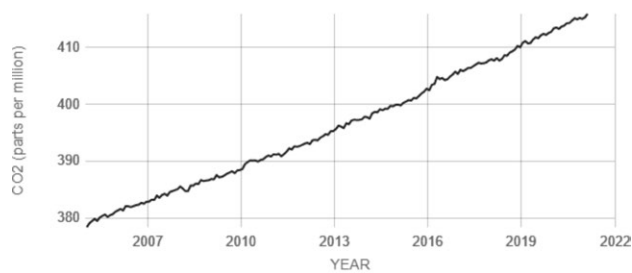
One way to slow down climate change is by using **clean energy** (Figure 1). Another way is to replant areas that were once covered by trees but are not anymore. Trees absorb carbon dioxide, so the more trees we plant, the more of this gas is removed. In a recent paper, scientists estimated how many more trees we could grow on the whole planet to try to slow down climate change.

How can we slow down climate change?

How can growing trees help limit climate change?

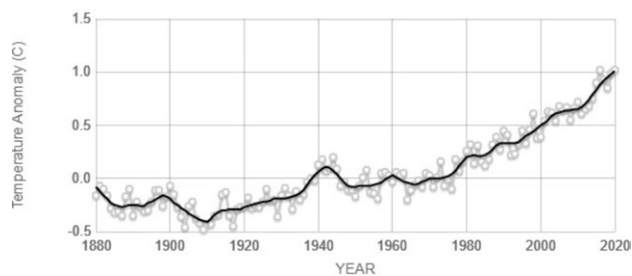


Figure 1. Examples of clean energy sources. A) wind turbines, B) solar panels, C) a hydroelectric dam, D) a geothermal power plant.



Source: climate.nasa.gov

Figure 2. Carbon dioxide levels measured every month at Mauna Loa Observatory in Hawaii, from 2005 – 2022.



Source: climate.nasa.gov

Figure 3. The change in the surface temperature of the Earth compared to an average from 1951-1980. Nineteen of the warmest years (except for 1998) have happened since 2020.

What did the scientists do?

First, scientists looked at **satellite** images of the Earth to see where trees are growing now. They worked out that trees are grown on 2.8 billion **hectares** of land worldwide (that's 116 times the size of the UK).

Then, they looked at other land areas and worked out many more trees could be planted. They looked at maps of soil and climate data to tell them where the best conditions for growing trees are, e.g., not too hot, not too cold, not too wet, not too windy! Not all spare land is suitable for growing trees. They found that, around the world, 0.9 billion hectares more land could be used for growing trees. That is an area thirty-seven times the size of the United Kingdom.

Why can't we plant trees on the entire surface of the Earth?

The scientists suggested that if trees were grown on all of that extra land, they would remove two thirds of the carbon dioxide that humans have added to the atmosphere in the last 170 years. That would reduce the greenhouse effect and could really slow down global warming.

How will the climate be different in 2050?

The scientists also worked out how many trees we could grow if we do not act now but wait to plant them until 2050. The Earth is expected to get warmer between now and 2050. Some of the places where trees could grow now may become too hot or too dry for them to grow there in the future. In fact, about one quarter of the land available now would no longer be suitable for trees in 2050. This means that if we wait to plant more trees, a quarter less carbon dioxide would be removed from the atmosphere compared to planting trees now.

The scientists concluded that tree restoration is probably the most effective way to offset climate change, but we need to act now and not wait.

Glossary

atmosphere – the layer of gases surrounding the Earth or another planet

carbon dioxide – a colourless, gas with no smell, that is naturally present in air. It is made from carbon and oxygen

clean energy – energy that comes from renewable resources that do not pollute the atmosphere when used, e.g. solar energy, wind energy, hydro energy, tidal energy and geothermal energy

climate change – a long-term change in the average weather patterns on Earth

greenhouse gases – gases in the Earth's atmosphere that trap heat and contribute to global warming, e.g. carbon dioxide, water vapour, methane

fossil fuels – fuels containing carbon that have been created by natural processes, such as decomposing plants and animals, over millions of years, e.g. coal, crude oil, natural gas and petrol

hectare – a square with sides of 100 m in length; the area of the square is 10,000 m²

satellite – anything that orbits a planet or a star

The paper that inspired this work was:

The global tree restoration potential.

By Jean-Francois Bastin, Yelena Finegold, Claude Garcia, Danilo Mollicone, Marcelo Rezende, Devin Routh, Constantin M. Zohner, Thomas W. Crowther.

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Investigations for children are described in the Teacher Guide which can be accessed [here](#).