

## Let's plant some trees Investigating the importance of trees to our planet

Large-scale tree planting is increasingly popular in global efforts to meet carbon neutral targets. Through photosynthesis, woods and forests absorb atmospheric carbon and lock it up for centuries. The entire woodland ecosystem plays a huge role in locking up carbon, including the living wood, roots, leaves, surrounding soils and its associated vegetation. A good lead-in to this activity is the eight minutes long video 'How to re-wild our planet' by David Attenborough <https://www.ourplanet.com/en/video/how-to-rewild-our-planet/>

Despite the importance of forests and woods in the fight against climate change being well recognised, they are still being destroyed. The Amazon rain forest, often described as the lungs of the world, is being destroyed at an alarming rate. In Brazil, a total of 11,088 km<sup>2</sup> (4,281 square miles) of rainforest were destroyed from August 2019 to July 2020. This is a 9.5% increase from the previous year. In the UK where only 13% of the land area is covered by trees, ancient woods are threatened from building development. It is important that governments across the world adopt policies of both afforestation (planting new trees) and reforestation (replacing trees).



African Forest Landscape Restoration Initiative working to re-forest 100 million hectares of land in Africa by 2030  
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**Some facts and figures:** About 40% of man-made CO<sub>2</sub> emissions are dissolved in ocean water. If atmospheric CO<sub>2</sub> concentration were reduced by planting enormous numbers of trees, the partial vapour pressure of CO<sub>2</sub> would fall and some of the ocean's dissolved CO<sub>2</sub> would naturally escape back into the atmosphere - a process known as off-gassing - and planting new forests would only reduce atmospheric CO<sub>2</sub> by about 70 parts per million (ppm). By contrast, if all existing forest were cut down and burned, that carbon would pour into both the oceans and the



Tree planting on White Hill, Dumfries and Galloway, UK. Rows of tree saplings have been planted on the south-west face of the hill with broadleaf saplings in protective sleeves in the foreground. © Copyright Walter Baxter and licensed for reuse under this Creative Commons Licence

atmosphere, raising atmospheric CO<sub>2</sub> by nearly 300 ppm. For reference, atmospheric CO<sub>2</sub> concentrations are about 400 ppm today, and were about 280 ppm prior to the start of the Industrial Revolution.

A typical tree can absorb around 21 kg of carbon dioxide (CO<sub>2</sub>) per year, however this figure is only achieved when the tree is fully grown - saplings will absorb significantly less than this. In 2019, about 43.1 billion tonnes of CO<sub>2</sub> from human activities were emitted into the atmosphere. All these emissions would form a giant "CO<sub>2</sub> cube" measuring 30 km on each side.

**Ask the pupils** to calculate the following:

World population in 2021 was approximately 7.9 billion.

If we assume that one third of all those people planted one tree, how many new trees would there be?

A - 2.6 billion

If each tree, after 20 years, absorbs 21 kg (0.02 tonnes) of carbon dioxide per year how much carbon dioxide will be absorbed?

A - 54.6 billion kg or 54.6 million tonnes

How many trees would each person need to plant to soak up the 2019 figure of 43.1 billion tonnes of CO<sub>2</sub> added to the atmosphere.

A - 789

Pupils may be disappointed by their result.

Obviously 2.6 billion people cannot possibly plant more than 750 trees each; there would not be enough land anyway. However, planting trees is only one of the many measures being taken to reduce carbon dioxide emissions and every effort is worthwhile.

It is important to plant trees for many reasons other than as carbon sinks.

In small groups, **ask the pupils** to list the advantages and disadvantages of having trees and vegetation in the environment. Some groups may need some hints, like flooding, erosion, temperature, wildlife, people.

*Possible answers*

*Advantages:*

- *capture carbon – in the photosynthesis process, plants take in carbon dioxide and give out oxygen;*
- *reduce flooding – trees and vegetation can reduce storm water run-off;*
- *reduce soil erosion – tree roots stabilise the soil and prevent it from being eroded away while the trees themselves reduce wind speeds and so wind erosion of soil;*
- *reduce city temperatures – tree and vegetation cover lowers surface and air temperatures by providing shade and cooling through evapotranspiration;*

- *keep soil nutrient-rich – by maintaining the nutrient cycle with leaf fall returning nutrients to the ground;*
- *habitat for wildlife;*
- *provide wood products, using sustainable techniques, that support local economies;*
- *improve health and well-being – it is well known that having local open spaces with trees and vegetation improves people's outlook on life.*

*Disadvantages*

- *trees and vegetation take up land that could be used for housing or agriculture.*
- *peat absorbs more carbon dioxide than trees on the same area of land, so where conditions allow, peat bogs should be protected rather than cleared for trees.*
- *some people find woodlands and forests gloomy, and prefer open space.*

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## **Back up**

**Title:** Let's plant some trees

**Subtitle:** Investigating the importance of trees to our planet

**Topic:** Afforestation and reforestation are considered and all the ways that trees are important to our planet are discussed

**Age range of pupils:** 14 years upwards

**Time needed to complete activity:** 30 minutes

**Pupil learning outcomes:** Pupils can:

- explain that trees are important carbon sinks;
- explain that both afforestation and reforestation are important;
- realise that many forests and woods have been and are being destroyed;
- calculate how much carbon dioxide would be absorbed if a third of the population each planted a tree;
- list the advantages and disadvantages of trees and vegetation in our environment;
- realise that both afforestation and reforestation can mitigate carbon emissions but planting trees is not a substitute for decreasing fossil fuel emissions.

**Context:** Some facts and figures are provided about how much planting trees mitigates the amount of carbon dioxide emissions. The importance of trees to our environment and well-being plus maintaining the world's existing forests are also considered.

We should beware of an experience reported from Turkey. In November 2019, 303150 trees were planted in one hour in Çorum Celilkırı - a world record. This was part of the planting of 11 million trees across all 81 cities in Turkey. However up to 90% of the new saplings may have died after a few months (although the figures are disputed by the government). They mostly died, it was said, by being planted 'at the wrong time' and 'not by experts' as well as due to a lack of rainfall. This tells us that tree planting needs to be carefully planned if it is to be successful.

**Following up the activity:**

Look around your own area to see if you can identify any sites where trees could be established. Perhaps your own school or local community could organise some fund raising to plant some?

Investigate the Great Green Wall in Africa, a project to plant a vast wall of trees to try to stop the spread of the Sahara. Now the project has changed into a programme centred around planting trees within indigenous land use techniques, not planting a forest on the edge of a desert.

Research the kelp forests of the oceans or planting mangrove trees to prevent erosion in Bangladesh.

Search 'net-zero' on the Earthlearningidea website to find other Earthlearningideas relating to climate change mitigation or adaptation. Use a search engine like Google to explore the internet for more information about likely global impacts of 'net-zero'.

**Underlying principles:**

- Trees provide carbon sinks.
- About 80% of animal and plant life on land is associated with forest ecosystems.
- Trees regulate the movement of water through ecosystems, reducing flooding and preventing soil erosion.
- Trees cool the local climate.
- New forests generate wood products that support local economies and reduce pressure on existing forest.
- Access to green spaces is important for our physical and mental health.

**Thinking skill development:**

Developing the idea of trees as carbon sinks is construction. Discussion about the value of trees to the planet involves metacognition. Cognitive conflict occurs when it is realised that planting trees helps to mitigate rather than solve the problem of emissions. Applying the ideas in this activity to the real world is bridging.

**Resource list:**

- ordinary class-room resources

**Source:** Elizabeth Devon of The Earthlearningidea Team

This information was as accurate as possible in spring 2021. The full list of 'net zero' emissions activities can be seen below.

**The 'How will the 'net-zero' target affect your local area?' series of Earthlearningideas**

Topic		Earthlearningidea title	
Introduction		How will the 'net-zero' target affect your local area?	
Possible mitigation measures	Use alternative energy sources	Solar	Harnessing the power of the Sun
		Wave	Harnessing the power of waves
		Wind	Farming the wind: through onshore and offshore windfarms
		Tidal	Tidal energy
		Nuclear	Nuclear power - harnessing the energy of the atom
		Nuclear waste	Nuclear waste disposal
		Biofuel	Liquid biofuels: keeping our wheels turning into the future
		'Blue' hydrogen	Blue hydrogen: the fuel of the future? Also: Hydrogen of many colours
		Geothermal – hot rocks	Deep geothermal power from 'hot dry rocks': an option in your area?
		Geothermal – flooded mines	A new use for old coal mines
		Hydro – small scale	Small-scale hydroelectric power schemes
		Heat pumps	Heat from the Earth
		Waste – incineration	Energy from burning waste
		Waste – methane	Energy from buried waste
	Stop fuels releasing greenhouse gases	Carbon capture	Capturing carbon?
	Store energy from sources that give irregular energy supplies	Batteries	Nuclear batteries: the future?
		'Green' hydrogen	Green hydrogen used to even out renewable energy supplies? Also Hydrogen of many colours
		Hydro – storage	Matching supply and demand using stored water
	Provide raw materials for new technologies	Compressed gas	Storing gas underground: What can we store? How can we do it? How will it help?
		Electric vehicles	Electric vehicles: the way to go?
Remove carbon from the atmosphere	Insulation	How do I choose the best insulation?	
	Enhanced weathering	Speeding up nature to trap carbon dioxide	
Possible adaptation measures	Tree planting	Let's plant some trees	
	Coastal flooding	How will rising sea level affect our coastlines?	
	Inland flooding	Inland flooding: a Sheffield case study	
	Landslides	Landslide danger	
	Agriculture	The future for global agriculture	

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