Climate School 180
Carbon Management

Who is this information for?

This guidance document is for whoever is leading your Climate Action Plan, and for those involved in prioritising any changes to your school grounds.

It provides an overview of how your school grounds can be part of your strategy to manage carbon emissions.

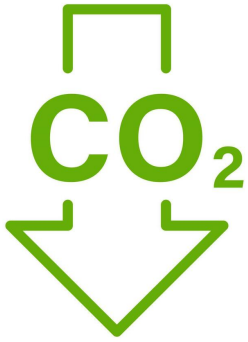
Introduction

With over 32,000 schools in the UK, each varying in size and context, schools have a mixture of outdoor spaces where pupils gather, learn, and play. Put together, these spaces present a nationwide opportunity for implementing carbon management strategies. By integrating carbon management practices, schools not only contribute to a greener environment but also provide valuable learning experiences for pupils. These initiatives foster environmental awareness, empower young minds, and equip them with practical STEM skills.

Why is carbon sequestration important?

Carbon is a remarkable element of nature. It forms the fundamental building block for everything around us. Carbon exists in various forms, from the plants and soil, or our own bodies, to the atmosphere around us.

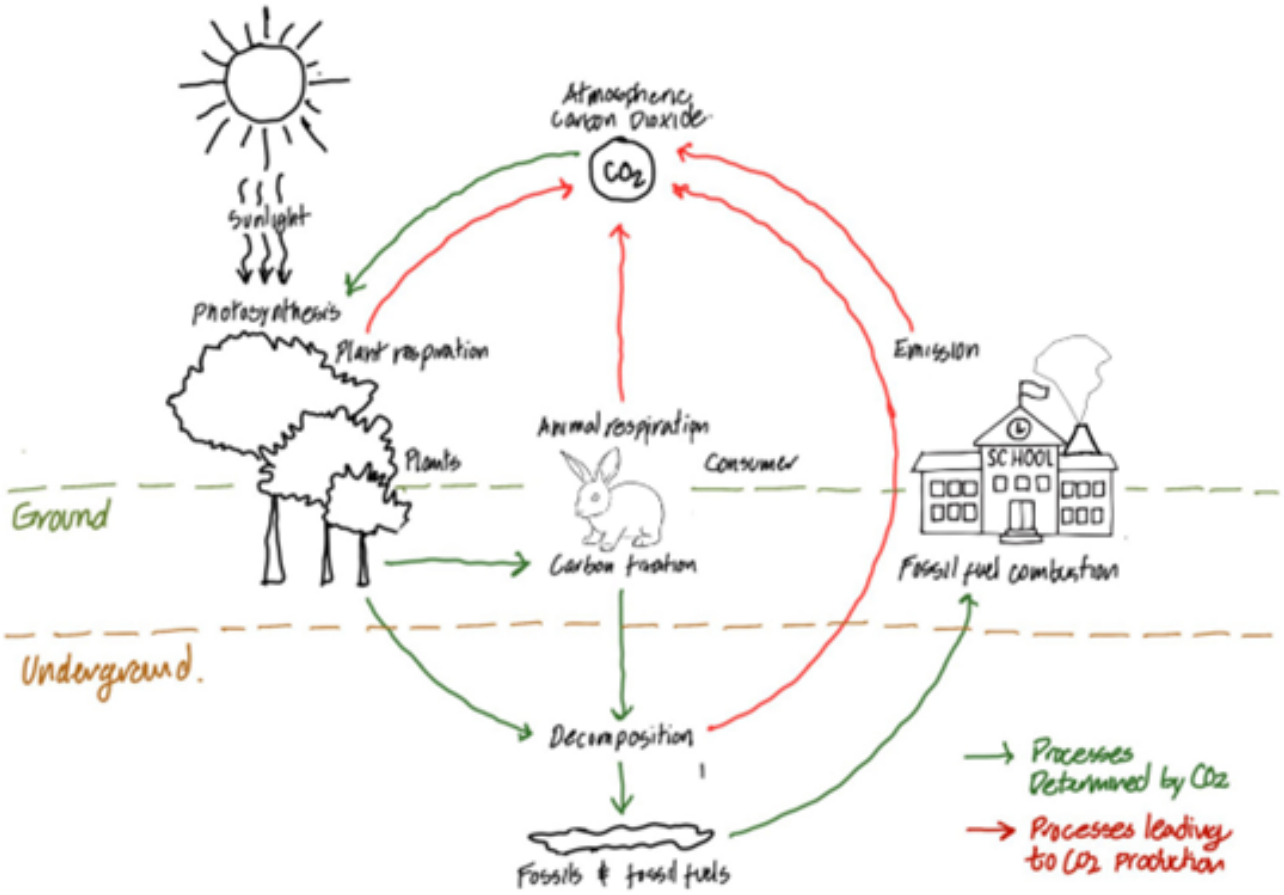
Carbon dioxide gas (CO_2) is made up of carbon and oxygen, and the levels of this gas in our atmosphere is a main driver of climate change. If we can reduce CO_2 levels in the atmosphere, we can do our part to slow climate change.



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The carbon cycle is a natural process that helps naturally balance our climate and plays a crucial role in maintaining the health of our planet.
It is important to understand the carbon cycle (below).



While much focus is on reducing carbon emissions to the atmosphere, usually by reducing CO_2 from our human activities, we can also use nature to absorb the excess of CO_2 that we have.

Sequestration is the process of capturing and storing CO_2 from the atmosphere, through natural processes such as reforestation, growing plants on land, or seaweed in the oceans. It can also occur through human carbon capture and storage technologies. All of these processes 'lock up' carbon into our soils, rocks, plants and trees.

It is important to remember that growing plants and trees absorb significantly more carbon than older or dying plants. It is also true that a greater mix of species also sequestrates carbon at a faster rate and deeper into our soils.

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It is important to remember that longer term carbon storage is in our soils, and therefore a combination of plants with longer roots and allowing decomposition on site is the important last step of the process.

Hard surfaces such as rock, concrete, wood or tarmac do not sequestrate carbon, and neither do bare soils. Increased heat because of these materials reduces the speed of carbon being absorbed by plants and trees close by, whereas cooler and wetter environments increase carbon absorption by the plants close by.



CO_2 is not the only gas which is causing climate change, but it is the most significant and the one which school grounds can do their part to manage.

What can we do?

Schools and pupils can actively participate in carbon sequestration through the creation, enhancement and protection of healthy habitats and ecosystems in their school grounds. They can do this by:

- Explaining the key concepts surrounding carbon sequestration
- Using the LtL process of change to look at carbon management and school grounds

What are the key benefits?

Beyond their role in combating climate change, carbon sequestration strategies offer significant co-benefits for the local environment, the wider community, and most importantly, for pupils and staff. Some of these benefits include:

Nature-based play: Engagement with nature directly builds children's relationship with the world, positively impacting their health and well-being, while fostering environmental awareness.



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Learning opportunities: There are opportunities across many different areas of the curriculum for learning about, in and through the outdoor environment, from the science behind climate change to sharing messages through art and drama, and so much more.



Fostering biodiversity: Implementing carbon sequestration strategies contributes to the conservation, restoration, or connection of native ecosystems, promoting diverse plant and animal life.



Water management: Certain carbon sequestration strategies include ecosystems that can play a crucial role in storing water within the soil, reducing the risk of both flooding and drought.



Climate resilience: By reducing temperatures during heatwaves and storing water, carbon sequestration strategies enhance resilience against extreme weather events.



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Working through the Learning through Landscapes (LtL) process of change

This simple process of change is a structure LtL encourages schools, and those who work with them, to use. It helps to ensure that schools do not rush into making changes to practice or their grounds without properly considering their needs. We are using this process as we look at carbon management in school grounds. Use the introductory resource 'Engaging your pupils from start to finish' to help you plan how your pupils, and others, can get involved in this process of change.



Stage 1: Where are we now?

School grounds in the UK have trees, shrubs, plants and grasses which store carbon. Your school may already be doing more than you think to help carbon sequestration. Equally, your school may have a lot of tarmac or concrete surfaces, and this does not sequestrate carbon. Unfortunately, these surfaces actually make it harder for any plants or trees to grow, which prevents sequestration from happening.

It is important to remember the carbon cycle, and that long term carbon sequestration happens when the plants become part of the soil. The more 'greenery' you have on site, and the more you can allow that 'greenery' to decompose or compost on site, the more carbon your school site will be locking away into soils.

Use the School Grounds Climate Survey carbon management section to discover how well your school grounds capture carbon now. This will also help you when you start to plan changes.

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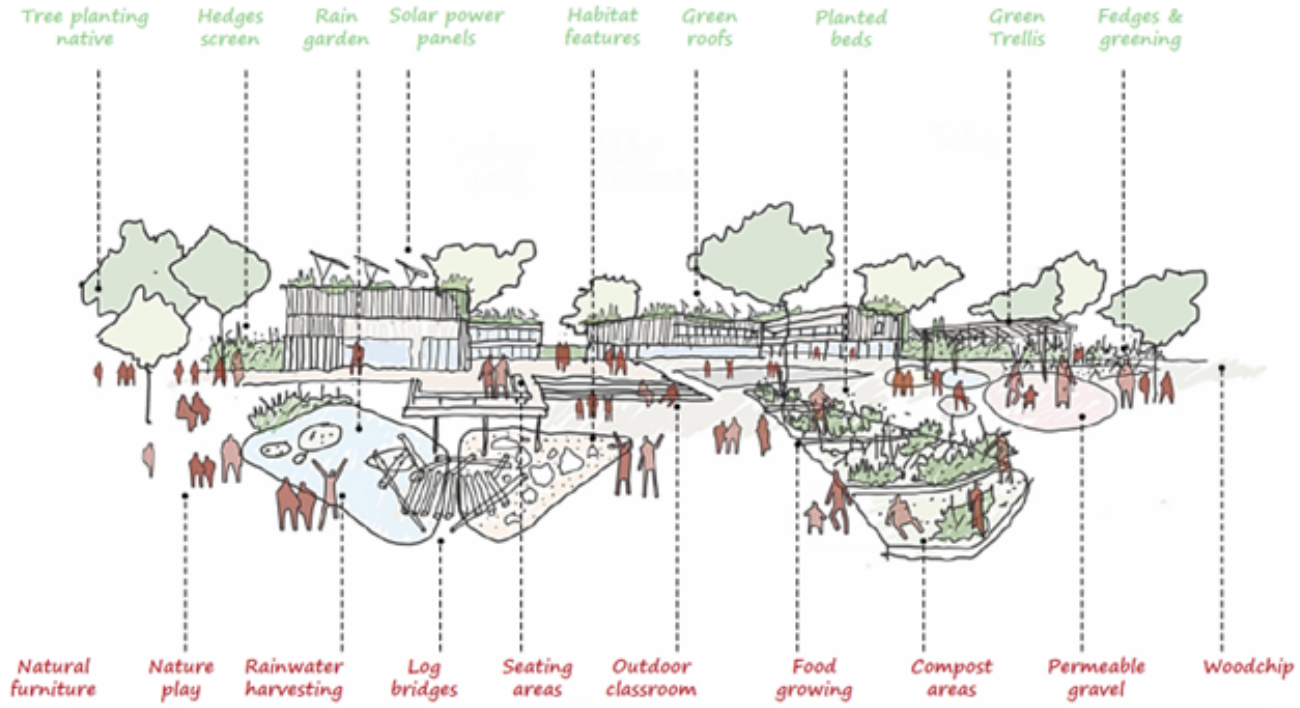
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Stage 2: Where do you want to be?

Carbon sequestration on a school site can take many forms.

A nature positive school

This illustration demonstrates how various nature positive elements – such as increasing green areas, improving soil health, opting for low carbon footprint furniture, reusing materials, and more – can collectively transform your school.



The previous section will have helped you understand the current state of your school and what is possible to achieve by combining a series of nature positive elements, through the Nature Positive School drawing. It is now time to think about the vision and purpose behind any potential improvements.

Whilst it is unlikely that your sole purpose would be increased carbon sequestration, you should aim to consider how to best embed carbon sequestration strategies as part of your proposals. For example, planting dense areas of trees will have a high carbon sequestration value. However, if these are planted in the wrong place, or hinder key activities such as access to parts of the grounds or regular PE lessons, your new strategies may not meet the everyday needs of your pupils and staff.

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Therefore, before you make any decisions about what to implement, take some time to consider the purpose of your proposed changes. Some broad questions to guide your thinking around your priorities include:

- Do you have areas which cannot be altered – for example a marked pitch or main access into school?
- Do you have underused areas of the grounds, where you can plant greenery?
- Are there areas where you can change practices to increase growing – for example not mowing all the grass or installing planters?





Stage 3: How can we get there?

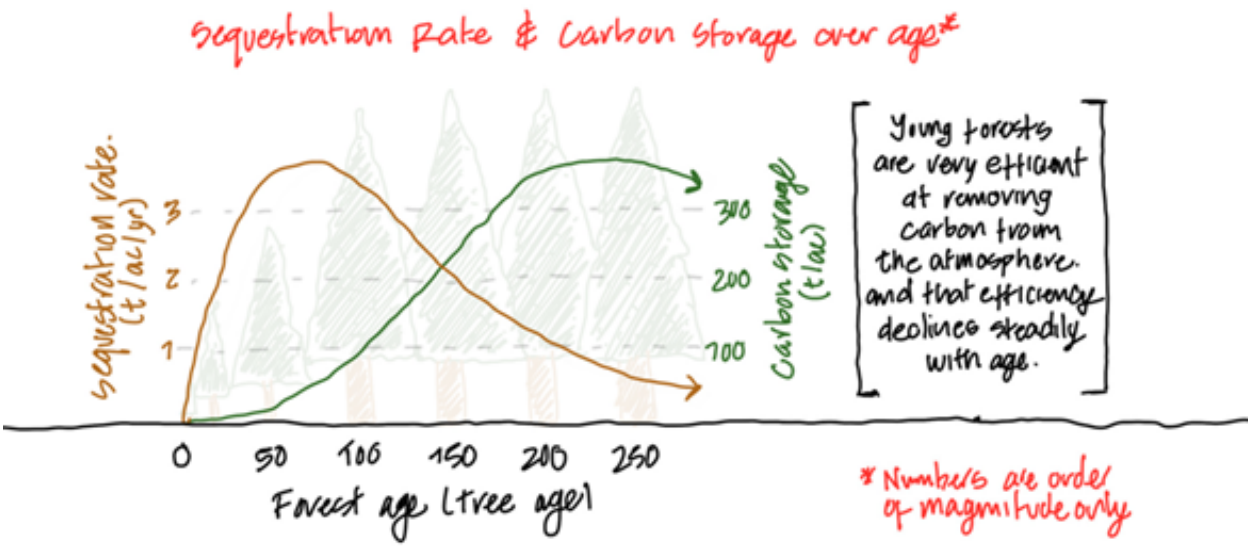
Once you have a clear idea behind the purpose of your changes, you can begin thinking about how different nature positive and nature neutral elements can come together to replace nature negative elements in our school, while fulfilling your vision and purpose. You will find help on the different design elements that may make up your desired vision, such as tree planting, grassland planting or vertical greening in our 'How to' resources.

What stores more carbon?

Carbon sequestration in trees and other plants is not constant, and is dependent on many variables, such as the plant species, soil conditions, time of year and the age of the plant. For example, trees absorb little CO_2 during the winter months, but more in spring.

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Similarly, a healthy and fast-growing younger tree sequesters more carbon than an ancient slow-growing tree. See the diagram below.



How your school begins to integrate carbon sequestration strategies should be guided by the needs of the school community, budget and the site-specific opportunities and constraints of the school grounds. All schools are different, and not all strategies will suit your specific context – however, where possible, choose the intervention with the highest possible opportunity for carbon sequestration, and lowest carbon footprint.

Stage 4: Making the changes

Change does not happen overnight, and implementing carbon sequestration strategies will require time and budget – although many changes are low-cost or even no-cost. Wherever you can begin implementing new carbon sequestration strategies, consider how you may involve the pupils from the outset:

Whether working together with technical experts to implement carbon sequestration strategies, such as landscape architects, or a gardening contractor, ensure pupil input is considered. This will bring an increased sense of ownership and agency over their school as well as introduce them to a range of 'green' careers. Review the design with the pupils and feedback any comments to the technical specialist.

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Pupils can be safely involved in some aspects of the construction and maintenance work, especially in planting. Planting and maintenance days are a great way to engage the pupils directly with nature and instil a sense of respect, care, and responsibility for their new spaces. These days can also be planned ahead of time, ensuring that there are some days of action within the busy school timetable.



The pupils' designs, or photographs of the progress of construction can be turned into captivating posters, to be displayed on notice boards, online or in newsletters. The pupils' learning and the school's collective effort towards a more sustainable future should be celebrated and shared widely, to motivate other schools to do the same.

Alongside this you should also speak to the landowner to ensure that you have permission, and any changes are suitable for the site and position suggested. This process can usually take a few weeks and is important to tackle early on. This process is something again pupils can take an active role in by writing emails and assisting on site visits.

Then back to: Stage 1: Where are we now?

By now, you should have a good understanding of the key concepts behind carbon sequestration, seen how carbon sequestration fits into the LtL School Ground Climate Audit, observed the change in practice through a case study, and started to think about possible changes to your grounds to include carbon sequestration.

Now is a good time to look back and assess how your proposed changes and what has been implemented align with your initial vision and purpose, while embedding carbon sequestration:

- How well do the implemented changes align with the initial vision and purpose?
- What impact have the changes had on the school's carbon sequestration efforts?
- Have there been any unexpected outcomes or benefits from the changes
- How have the changes been received by the school community (pupils, staff, parents)?
- What lessons have been learned from the implementation process that could inform future initiatives?

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Planning for the future

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ARUP Developed in partnership with Arup.



Irma Coulson Public School, Ontario. Image:www.evergreen.ca

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Useful definitions

Carbon: A remarkable element found in nature, serving as the fundamental building blocks for everything around us. Carbon exists in various forms, from plants and soil, to even our own bodies.

Carbon dioxide capture and storage (CCS): A process in which a relatively pure stream of carbon dioxide (CO_2) from industrial and energy-related sources is separated (captured), conditioned, compressed and transported to a storage location for long-term isolation from the atmosphere. Sometimes referred to as Carbon capture and storage. (IPCC glossary)

Carbon dioxide (CO_2): Imagine CO_2 as an invisible blanket enveloping our planet, helping to keep it warm. Without CO_2 our planet's average temperatures would be below freezing and inhabitable! Too much in the atmosphere and the planet can start to overheat. Composed of one carbon atom and two oxygen atoms, carbon dioxide is a type of greenhouse gas.

Greenhouse gases: Gases, such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N2O), that trap heat in Earth's atmosphere, contributing to the greenhouse effect and global warming. While these gases are naturally occurring, human activities, such as burning of fossil fuels, have led to a significant increase in their atmospheric concentrations. This increase is a major contributor to global warming and climate change.

Carbon dioxide production: The primary source of CO_2 production by humans is the burning of fossil fuels. Remember, CO_2 is a natural part of our world, but too much of it can cause problems, like making the Earth too warm and increasing the risk of extreme weather events (like flooding, drought, or wildfires).

Carbon sequestration: The process of capturing and storing carbon dioxide from the atmosphere, often through reforestation, afforestation, or carbon capture and storage (CCS) technologies. During photosynthesis (a process by which plants, using sunlight, convert CO_2 and water into glucose and oxygen), plants can absorb excess CO_2 from the air and securely store it within their biomass (total mass or weight of living things). As plants die, the carbon they have sequestered may then be stored for the longer term in the soil, in rocks or water in our oceans.

Carbon footprint: A carbon footprint represents the total amount of CO_2 emissions associated with everything we do – whether it's our personal actions, the products we use, or the way we power our homes. Your carbon footprint can be reduced by making more environmentally friendly choices.

For all other climate change resources, please visit www.ltl.org.uk/climate

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