# Designing urban carbon sinks lesson

## Years 9 and 10

In this lesson, students learn about the role of vegetation as carbon sinks, conduct field work to evaluate local carbon sinks and explore urban design issues..

Curriculum alignment

### Science

AC9S9U03 – represent the carbon cycle and examine how key processes including combustion, photosynthesis and respiration rely on interactions between Earth’s spheres (the geosphere, biosphere, hydrosphere and atmosphere).

[AC9S10I01](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/science_design-and-technologies_digital-technologies/year-10/content-description?subject-identifier=SCISCIY10&content-description-code=AC9S10I01&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) – develop investigable questions, reasoned predictions and hypotheses to test relationships and develop explanatory models.

[AC9S10I02](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/science_design-and-technologies_digital-technologies/year-10/content-description?subject-identifier=SCISCIY10&content-description-code=AC9S10I02&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) – plan and conduct valid, reproducible investigations to answer questions and test hypotheses, including identifying and controlling for possible sources of error and, as appropriate, developing and following risk assessments, considering ethical issues and addressing key considerations regarding heritage sites and artefacts on Country/Place.

[AC9S10I03](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/science_design-and-technologies_digital-technologies/year-10/content-description?subject-identifier=SCISCIY10&content-description-code=AC9S10I04&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick) – select and use equipment to generate and record data with precision to obtain useful sample sizes and replicable data, using digital tools as appropriate.

## Learning hook

Ask students to think about their family’s travel in cars, trains or planes over the past week or month. Ask them to record the start and end point of each journey or the trip distance if they know it.

They can then use the carbon footprint calculator at to calculate their carbon emissions and the number of trees required to absorb that amount of C02.

As a class, discuss the strengths and limitations of the calculator. Do they think this is a fair way to calculate your carbon footprint? Explore whether they think carbon offset programs such as tree planting are a viable solution.

## Learning input

One strategy that can partially combat global warming and climate change is to increase the amount of carbon stored in plants – that is, to create a ‘sink’.

These carbon sinks include plant material above ground, below ground (roots) and soil that is enriched in carbon by dead plant material.

Students can view this [video](https://www.landscape.sa.gov.au/lc/land-and-farming/soil-management/carbon-explainer-video-series) about carbon sequestration in primary industry and read this [article](https://www.qld.gov.au/environment/climate/climate-change/land-restoration-fund/carbon-farming/australia) to develop a broad understanding of carbon farming.

## Learning construction

In urban areas, vegetation and soils can play a role as carbon sinks. Proponents of urban carbon farming initiatives also point out that vegetation and soils can provide other ecosystem services, such as improved stormwater management, recreation and even food production. See the ABC Science article ‘Cities can be carbon sinks too: study’ for more information.

Students will explore local areas to determine current carbon sinks and develop a proposal to improve carbon storage in the future.

1. Have students use Google maps to identify significant green spaces in your local area and identify at least two sites to compare. Use the scale in the bottom right-hand corner of the screen to estimate the size of each site. Note: consider selecting a site close to the school, not too large and easy to walk around. This will enable easier field studies.
2. Switch to satellite view, identify zones within the park and estimate the percentage of tree cover for each zone.
3. Ask students to individually construct a hypothesis regarding which site represents the larger carbon sink.
4. Ask students to work collaboratively in teams of four or five to design a method for a field investigation to test their hypothesis. Depending on the size of the site, they can determine whether they map the entire site or whether they will map a sample.

Some ideas students might like to consider:

1. They could use this calculator to estimate the amount of carbon stored in a tree or shrub. They’ll also need a tape measure. Note that in this calculator, CO2-e refers to carbon dioxide equivalent – students only need to use the measure of stored carbon.
2. They could estimate the amount of leaf litter by measuring depth of leaf litter across different zones in the park
3. They could estimate the amount of deadwood in different zones of the park.
4. Once they have designed their method, students should compare their ideas with others and discuss the relative merits of different approaches. They can adapt their methods following this discussion.
5. Students plan their field work, including researching the significance of the site to First Nations Australians, and any cultural protocols that should be followed. Students then collect data to estimate the carbon storage represented by each site.
6. Back in class, support students to represent and analyse the data. They should share and discuss their findings as a class and have the opportunity to revise their representations following this discussion.
7. Following discussion, students work individually to construct a report to share their findings, including a recommendation for ways to improve the value of the sites as a carbon sink while considering community values.

Girls in focus: Girls often assume that STEM careers require independent, isolated endeavours. By demonstrating how STEM communities work together to refine practices and ideas, you can begin to combat these stereotypes.

## Resources

Activity: [Calculate and reduce your flight’s carbon footprint (EcoTree)](https://ecotree.green/en/calculate-flight-co2)

Video:  [Carbon Explainer video series (Landscape South Australia)](https://www.landscape.sa.gov.au/lc/land-and-farming/soil-management/carbon-explainer-video-series)

Article: [There aren’t enough trees in the world to offset society’s carbon emissions and there never will be (Bonnie Waring, The Conversation)](https://theconversation.com/there-arent-enough-trees-in-the-world-to-offset-societys-carbon-emissions-and-there-never-will-be-158181)

[North Sydney Council Carbon Calculator](https://www.northsydney.nsw.gov.au/environment)

[Carbon farming in Australia](Carbon%20farming%20in%20Australia%20(Queensland%20Government))

Articles: [Cities can be carbon sinks too: study (ABC Science)](https://www.abc.net.au/science/articles/2011/07/12/3267464.htm)

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