

# What's my Carbon Footprint?

Science, Social Science,  
Mathematics

Curriculum Levels 5-6

---

## Activity Description

This inquiry learning resource guides students to investigate and calculate their own carbon footprint, and then formulate an individual action plan to reduce their carbon emissions. Students will gain insight into how their activities compare on the local and global scales and may take up the opportunity to communicate with students in other countries.



## Teaching rationale

This resource allows the student to conduct their own inquiry into the concept, measurement and application of carbon footprint. It is intended to be a largely student-driven inquiry learning project following some initial background and context setting. Students will carry out independent research about carbon emissions individually or in a small group (three is ideal), and then apply the concepts gained to calculate their own carbon footprint. Following this they will formulate an action plan to reduce their carbon footprint.

It would be ideally suited to Year 9-10 science students and could serve as a basis of prior knowledge on carbon for NCEA Science 1.14 (Demonstrate understanding of carbon cycling). This resource could also be used as extension for younger students as well.

“ *Information of itself has no value. Knowledge is when information has become relevant enough to the individual to act. As knowledge and understanding grow, learners move from merely reacting to information to being able to make valid, informed, reasoned and insightful decisions.* ”  
- Trevor Bond

## Background on Carbon

Carbon dioxide is a colourless, odourless gas naturally present in small quantities in the atmosphere. Plants absorb carbon dioxide during the process of photosynthesis. Animals and plants emit carbon dioxide during the process

of respiration. Carbon in its various forms, cycles through the atmosphere, hydrosphere, biosphere and geosphere. Combustion of fossil carbon (coal, oil, gas) mined from the geosphere increases the amount of carbon dioxide in the atmosphere. Carbon dioxide is a greenhouse gas meaning that it is transparent to short wave solar radiation (largely visible, ultraviolet and near infrared light) but absorbs longer wave length infrared radiation heading back into space from warm surfaces. Increasing carbon dioxide in the atmosphere decreases the amount of long-wave radiation escaping back into space which results in increased heat content of the ocean-atmosphere system.

Carbon dioxide is emitted through fossil fuel combustion by a wide range of human activities including electricity generation, transport, construction and agriculture. Carbon emissions, especially in the form of carbon dioxide, impact the global environment through enhancing the natural Greenhouse effect of the atmosphere. The effects of these emissions are already being observed through a measured increase in the average global surface temperature trend, increasing heat content of the oceans, increased extremes of climate events, melting of polar ice, sea-level rise, acidification of the oceans and other effects.

Carbon emissions of people are affected by the established infrastructures of the country and area in which they live, but they are also able to be hugely influenced through the conscious lifestyle choices and behaviours of individuals. The carbon footprint is a way of quantifying the amount of carbon in tonnes emitted by one person for one year and the contribution they are making to global warming.

## Curriculum Links

Area	Achievement Objectives (Level 5-6)
Science	<p><b>Nature of Science:</b> Participating &amp; Contributing – Develop an understanding of socio-scientific issues by gathering relevant scientific information to draw evidence based conclusions and to take action where appropriate.</p> <p><b>Planet Earth &amp; Beyond:</b> Develop an understanding of how the geosphere, hydrosphere, atmosphere and biosphere interact to cycle carbon around the Earth.</p>
Social Studies	<p><b>Students will gain knowledge, skills and experience to ...</b> Understand how peoples' management of resources impact on environmental and social sustainability.</p>

Values	Key Competencies	Principles
<p>Excellence</p> <p>Innovation, inquiry and curiosity</p> <p>Community and participation</p> <p>Ecological sustainability</p> <p>Integrity and respect</p>	<p>Thinking</p> <p>Managing self</p> <p>Relating to others</p> <p>Participating and contributing</p>	<p>Learning to learn</p> <p>Community engagement</p> <p>Future Focus</p> <p>Coherence</p>

This inquiry could also be linked into several other curriculum areas:

<b>Maths &amp; Statistics</b>	<p>This resource could be the basis for a class to share, collate and process information they have gained about their carbon footprints.</p> <p>Eg- graph class data as a histogram and find the mean and standard deviation.</p> <p>Compare with other students around the world through a programme run by Stanford University called the International Student Carbon Footprint Challenge.</p> <p>Teachers could enrol their class or classes in the challenge and be part of this global initiative <a href="http://footprint.stanford.edu/participate_form.html">http://footprint.stanford.edu/participate_form.html</a></p>
<b>Economics and/or Geography</b>	<p>The Carbon Footprint of Nations website is an excellent source of data allowing customisable spatial, graphical and numerical comparison of such data as nation's populations versus GDP/CO2 per capita and viewing how it has trended over time (since 1990).</p>

# What's my Carbon Footprint?

## Student Inquiry

### Overview

You will use Internet-based research to find out about your carbon footprint using online carbon calculators. You will then plan practical ways that you can reduce it!

To start with you will need to do some research so that you understand the key concepts you are dealing with. Some good website resources are given on the next page to help you make a start.

#### I will ...

1. Define key words so that I understand them in my own words:

**Carbon, carbon dioxide, combustion, greenhouse gas, global warming, climate change ...**

Create your own glossary of these and related terms as you go along if it will help you.

2. Research: What is a carbon footprint?  
**Describe.**
3. Make a list of information sources that I decide to use through my inquiry.
4. Research: What are some benefits of knowing the carbon footprint?  
**Explain.**
5. Calculate my own carbon footprint.
6. Create an **action plan** to reduce my carbon footprint.
7. Identify easier areas of the action plan. **Describe.**
8. Identify more challenging (harder) areas of the action plan. Explain why.

9. What actions could I realistically commit to take over the next year?

#### Outline.

#### After this I could ...

1. Find the carbon footprint of the whole of New Zealand for a recent year and compare it to some other countries. What might be causing the differences?
2. Compare my carbon footprint with other students around the world through the International Student Carbon Footprint Challenge run by Stanford University and communicate with them online.
3. Discuss how would you respond to this statement in a scientific way: "Carbon dioxide is purely natural and an essential part of life so there is no problem with it"?
4. Come up with your **own curious question or idea** that has come out of this inquiry into carbon. - Research it, and write an essay, prepare a poster or presentation, make an art work that addresses it.



## Resources to Start

### ▲ CarboNZero carbon footprint calculator

This is a New Zealand based carbon footprint calculator from Landcare Research. To use the carbon calculator you will need to register on the website, you can then determine what information you will need to gather before you can complete the calculation.

<http://www.carbonzero.co.nz/calculators/>

Choose the 'Household' calculator at first. Later you might like to do the 'School' calculator.

### ■ International Student Carbon Footprint Challenge

This website has a very good carbon footprint calculator and allows you to compare your result with other students from around the world. <http://footprint.stanford.edu/calculate.html>

### ● You may find this worksheet useful to fill in as you go through the calculator.

[http://footprint.stanford.edu/documents/ISCFC\\_assignment.pdf](http://footprint.stanford.edu/documents/ISCFC_assignment.pdf)

### ▲ Carbon footprint of Nations

This website has some outstanding infographics about 4 types of environmental footprints (including carbon footprint).

[http://carbonfootprintofnations.com/content/environmental\\_footprint\\_of\\_nations/](http://carbonfootprintofnations.com/content/environmental_footprint_of_nations/)

How does New Zealand compare with other countries in the world?

### ■ School-gen Useful Websites

Visit this School-gen page to explore more helpful links to good websites: <http://www.schoolgen.co.nz/teach-and-learn/useful-websites/>

