

**WithOnePlanet**

- > Module 1:  
Carbon
- > Level:  
Years 7 to 8
- > INQuIRY:  
Investigate
- > Lesson 5:  
Life's a carbon balancing act
- > Teacher notes



# Investigate

Lesson 5

Teacher notes

**Life's a carbon balancing act**

Years

7 to 8



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INQuIRY



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# Life's a carbon balancing act

## Lesson 5: Teacher notes

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This document provides the teacher with the details of the lesson.

### At a glance

To provide students with hands-on, shared experiences of:

- > the connection between the release of energy from carbon and climate change via the enhanced greenhouse effect
- > the similarities and differences between renewable and non-renewable resources and their relative impacts on sustainability
- > The impacts of changing our energy use behaviours from a range of different perspectives.

To support students to represent and explain their understanding of the energy that can be released from carbon, and its consequences for the Earth.

### Activity 1: Carbon can change the climate

Students:

- > investigate how the release of carbon dioxide into the atmosphere from a variety of different human activities and natural events contributes to the enhanced greenhouse effect and climate change.

### Activity 2: Renew and reduce

Students:

- > investigate the similarities and differences between non-renewable and renewable resources in terms of their origins, processes of electricity production and impacts on the environment.

### Lesson focus

The *Investigate* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records, such as science journal entries. The *Investigate* phase ensures all students have a shared experience that can be discussed and explained.

In the *Investigate* phase students develop a literacy product to represent their developing understanding. They discuss and identify patterns and relationships within their observations. Students consider the current views of scientists and deepen their own understanding.

## Assessment focus

This assessment guide supports teachers in identifying the types of assessment that are appropriate for this lesson.

**Formative assessment** is an important aspect of the *Investigate* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. It involves monitoring students' developing understanding of:

- > the release of carbon dioxide from many different natural events and human activities, including the burning of fossil fuels, as having many impacts on planetary climate systems, including the enhanced greenhouse effect.

You will also monitor their developing science inquiry skills.

**Summative assessment** of the science inquiry skills is another important focus of the *Investigate* phase. Rubrics can be used to gauge the level of student achievement on performance tasks.

## Key lesson objectives

### Science

Students will be able to:

- > explain how natural and human influences on the movement of carbon within the carbon cycle can cause excess carbon dioxide production
- > explain the connection between increasing levels of carbon dioxide and the enhanced greenhouse effect
- > understand the consequences of the enhanced greenhouse effect on the Earth's temperature
- > explain how different forms of energy production for human use can have advantages and disadvantages for both the environment and society.

### Literacy

Students will be able to:

- > contribute to discussions about the role of carbon dioxide in climate change and the impacts of both renewable and non-renewable energy sources on society and the environment
- > record ideas, descriptions and explanations in diagrams and words in a variety of written modes.

This lesson also provides opportunities to monitor the development of students' general capabilities.

## Teacher background information

Carbon dioxide is also a greenhouse gas and, as well as by natural means, is produced as a by-product of human activities. Burning fossil fuels – coal, oil and natural gas – is the number one source of global CO<sub>2</sub> emissions. In 2009, the world got more than 80% of its energy from fossil fuels. Electricity production is one of the biggest sources of global CO<sub>2</sub> emissions.

Although atmospheric carbon dioxide can be absorbed by some elements of the carbon cycle, including trees and the oceans, the amount of carbon dioxide being emitted by human activity is far greater than can be absorbed. The excess carbon dioxide remains in the atmosphere contributing to the greenhouse effect. Humans have enhanced this greenhouse effect through their carbon-intensive activities, so that more heat than previously is being absorbed and reflected back to the Earth by atmospheric CO<sub>2</sub>, rather than being released back into space. Thus, the excess CO<sub>2</sub> acts as a thicker and thicker blanket for the Earth, increasing global temperatures as a result.

Most of the electricity used in Australia is made from power plants that burn fossil fuels to create steam. A turbine is used to create the energy. A turbine spins like a fan, converting the energy from the steam into mechanical energy. This mechanical energy is used by a generator to produce electricity.

There are other non-carbon dioxide emitting methods of producing electricity. The energy for this type of electricity production is mostly from renewable sources, such as the wind, the sun, water, tides and biomass. Nuclear power produces no carbon dioxide either, but its energy resource – uranium – is finite.

## Activity 1: Carbon can change the climate

### Equipment

For each Student

- > Access to a computer, a digital still or movie camera, video editing software and the internet
- > Coloured paper, a pair of scissors, pens, pencils, textas
- > A copy of the *Carbon can change the climate – Student worksheet*.

### Preparation

- > Read through all worksheets and check that all weblinks contained within are working
- > Prepare all equipment for the Stop Motion video task, according to the *Carbon can change the climate – Student worksheet*
- > Determine which type of video editing software is compatible with your computers for the Stop Motion video task. Examples are provided in the *Carbon can change the climate – Student worksheet*.

### Lesson steps

1. Explain to students that this lesson is about the connections between the carbon cycle, the greenhouse effect and climate change. Students can review their understanding of the carbon cycle using this video: <http://www.youtube.com/watch?v=A4cPmHGegKI><sup>1</sup>
2. Students to complete *Carbon can change the climate – Student worksheet*.

## Activity 2: Renew and reduce

### Equipment

For each Student

- > Access to a computer and the internet
- > A copy of the following two student worksheets:
  - *Renew and reduce – Student worksheet*
  - *The great energy debate – Student worksheet*.

### Preparation

- > Read through all worksheets and check that all weblinks contained within are working
- > Assign students to expert groups for *The great energy debate*.

## Lesson steps

1. Students to complete the *Reduce and renew – Student worksheet*. This worksheet is based on the E.ON UK Energy Experience – Energy Nation website: <<http://www.eon-uk.com/EnergyExperience/479.htm><sup>5</sup>>
2. Students to complete *The great energy debate – Student worksheet*.

### Sources:

1. TED-Ed 2012, *The carbon cycle* - Nathaniel Manning, [Online Video] 2 October, viewed 1 January 2014, <<http://youtu.be/A4cPmHGegKI>>.
2. NPR 2012, Episode 4: *Global Warming, It's All About Carbon*, [Online Video] 3 February, viewed 1 January 2014, <<http://www.youtube.com/watch?v=EvphJO8VKlc&feature=youtu.be>>.
3. Planet Nutshell 2011, Climate Science in a Nutshell #5: *Where Does Carbon Dioxide Come From?* [Online Video] 10 February, viewed 1 January 2014, <<http://vimeo.com/19796560>>.
4. Planet Nutshell 2011, Climate Science in a Nutshell #4: *Too Much Carbon Dioxide*, [Online Video] 10 February, viewed 1 January 2014, <<http://vimeo.com/19797487>>.
5. E.ON UK 2013, *Energy Experience - Energy Nation*, viewed 1 January 2014, <<http://www.eon-uk.com/EnergyExperience/479.htm>>.