

World Heritage and Climate Change

Heritage is all the things that make up Australia's identity - our spirit and ingenuity, our historic buildings, and our unique, living landscapes. Our heritage is a legacy from our past, a living, integral part of life today, and the stories and places we pass on to future generations.

Many different people and agencies are involved in managing places that are included on the World Heritage and National Heritage lists.

Together, governments, industries, the community and individuals help to identify Australia's places of national and universal significance and look after these extraordinary places for the future.

World Heritage

Australia has 17 World Heritage places. These places are recognised as having outstanding universal value to the global community.

Australia's World Heritage properties join over 800 places from throughout the world which reflect the wealth and diversity of the Earth's cultural and natural heritage. The splendour of World Heritage places enriches our lives and illustrates the diversity of our planet and its inhabitants. They are ours to share, to cherish and to respect. And their disappearance would be an irreparable loss to humanity.

Australia focuses on building resilience of its World Heritage properties today to ensure that these places of outstanding universal value will be around for future generations to enjoy. Climate change is one threat to our natural world heritage properties that needs to be managed carefully.

National Heritage

From the places that define who we are and tell the story of our country's past, to the places that reflect our evolving heritage and where we are going, the National Heritage List is representative of Australia.

The National Heritage List currently includes 78 places located throughout Australia and its External Territories. The List includes historic, Indigenous and natural places of outstanding importance to the nation. The National Heritage List is an exceptional collection of the most significant heritage places in Australia. Inclusion of a place in the National Heritage List means its National Heritage values are protected under the *Environment protection and Biodiversity Protection Act 1999* so they are maintained for present and future generations.

Introduction

Why teach about climate change and its affect on Australia's World Heritage and participate in the *Patrimonito Storyboard Competition*?

As a topic, both climate change and Australia's World Heritage sites are powerful vehicles for learning about a range of concepts and issues within science, technology, and society and environment. The knowledge, skills, values and actions linked with these topics are diverse and significant. There are many opportunities for real-life experiences and for the integration of a range of curriculum areas, and the storyboard competition enables students to express these using the Arts as a curriculum area.

Climate change is everyone's problem. Everyone will be affected by climate change and we are all needed to reduce the greenhouse gases we produce.

We often only stop to think about how our climate is changing during times of drought or negative media coverage, yet it is an integral part of our daily life.

The familiarity we have with the topic is often accompanied by ignorance about what we can do as individuals, and at school and home to help conserve our resources, tackle climate change and make changes for a sustainable future.

The *Patrimonito Storyboard Competition* is one way your students can be involved in thinking about how to tackle climate change. In this teaching resource is some further information and ideas to help you, your class and your school to get involved at the school level in protecting World Heritage and our amazing natural resources for the future.

Using this resource

The information and activities outlined in this resource will assist classes to:

- investigate climate change
- broaden teachers' and students' understandings of climate change and its impact on World Heritage sites like the Great Barrier Reef World Heritage Area
- find out about schools actively tackling climate change at a school level
- get involved and tackle climate change at your school
- demonstrate understanding and the ability to alert, entertain and communicate to an intended audience, as learning in and through the Arts is a means by which the deep issues around sustainability can be engaged.

Enhancing primary and secondary school students' understanding of local and global climate change issues, in particular its impact on Australian World Heritage properties like the Great Barrier Reef, provides opportunities for personal behaviour change particularly in relation to students' own current and future greenhouse gas emissions.

Background Information

The Great Barrier Reef is internationally renowned for its biodiversity. Its network of reefs – about 2900 in total – is home to thousands of species. Extensive areas of seagrass meadows, mangrove stands, salt marsh and sand and mud areas also provide a diverse range of habitats for many species. The diversity of the Great Barrier Reef's natural values makes it a particularly unique and valued ecosystem.

Changes in the climate that will directly impact the Great Barrier Reef include:

- Increased water temperature
- Increased sea level
- Increased severity of storms and cyclones
- Ocean acidification
- Changed rainfall and runoff
- Changes to the El Niño Southern Oscillation.

The ecological consequences of climate change is serious. Mass coral bleaching, which is caused by sustained high water temperatures, have already begun to increase in frequency and severity. The range of other potential impacts on the Great Barrier Reef are numerous with many only just coming to light.

See the following web sites for more information:

Climate Change on the Great Barrier Reef

http://www.gbrmpa.gov.au/corp_site/key_issues/climate_change

Coral Bleaching on the Great Barrier Reef

http://www.reefed.edu.au/home/explorer/hot_topics/coral_bleaching/coral_bleaching_on_the_great_barrier_reef

Frequently asked questions about the Great Barrier Reef Marine Park World Heritage Area

http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/world_heritage_faq

What schools can do

Climate change is a global issue but there are many things that individuals, schools, businesses and governments can do to help minimise its impact on World Heritage sites like the Great Barrier Reef.

There are two main steps that everyone can take to help World Heritage sites and the Great Barrier Reef in the face of climate change. The first is to reduce greenhouse gas emissions, as increases in their concentrations are responsible for climate change. The greenhouse gas emissions that we produce come from using electricity, from burning fuel in vehicles and from using products that require fuel and electricity to produce. Some things you can do at school and home to reduce greenhouse gas emissions are:

- Use energy efficient lights
- Choose energy efficient products
- Turn off electrical devices such as televisions
- Turn off lights around the house
- Refuse, reduce, re-use and recycle
- Use less hot water
- Dry your clothes the natural way, not in the dryer
- Plant trees which take up carbon dioxide as they grow
- Heat and cool your house efficiently
- Drive less: car pool, use public transport, walk or cycle
- Spread the word to others
- Switch to 'green' electricity produced from renewable sources by contacting your energy provider
- Offset or neutralise your greenhouse gas emissions.

The second step is to reduce the direct impact that you have on the Reef. A healthy Reef is more resilient and can recover quickly from the impacts of climate change, such as coral bleaching.

See The Great Barrier Reef: *Doing your bit to look after it* page at

http://www.gbrmpa.gov.au/corp_site/doing_your_bit

for more information on what you can do to look after our Great Barrier Reef.

Get started

Investigate Australian places on the World Heritage List

Using the Heritage website at <http://www.environment.gov.au/heritage> locate and find out about Australia's 17 World Heritage places.

Great Barrier Reef is one of Australia's first World Heritage Areas. It is the world's largest World Heritage Area, and is probably the best-known marine protected area in the world. It is the world's most extensive coral reef system and is one of the world's richest areas in terms of biological diversity.

The Great Barrier Reef was inscribed on the World Heritage List in 1981.

Collect/download photographs of the Great Barrier Reef Marine Park.

See <http://www.reefed.edu.au/home/library>

Students share these and talk about features and activities they recognise. Identify things that are found only on the Great Barrier Reef as opposed to other areas. Ask students:

- What do we mean by the Great Barrier Reef?
- Why is it important?
- What does it support?
- What plants and animals live on the Reef?
- What is the Reef made of?
- What threats might it face from climate change?
- How and why is the Great Barrier Reef under pressure from climate change? and
- What can we do and why is it important to get involved?

Make charts of student responses and use these to develop focus questions for the activity.

See:

http://www.reefed.edu.au/home/reefbeat/reef_beat_2003/feature_articles

<http://www.reefed.edu.au/home/explorer>

http://www.reefed.edu.au/home/students/web_quest/reef_rescue

Prepare a Class Chart

With the class, prepare a class chart of things students know about the Great Barrier Reef and the threat it faces from climate change. Prepare a list of questions students want to investigate. Ask students to offer possible answers to these.

Assess prior knowledge

As a class discuss and brainstorm what is known about climate change. Brainstorm words associated with climate change. For example: weather, climate, climate change, global warming, greenhouse effect, enhanced greenhouse effect, impacts, emissions, energy etc.

On paper strips, students record facts, feelings and opinions about greenhouse gases being emitted to air. (Note: There are about 30 greenhouse gases, of which CO₂ is the most important).

Place five hoops in a circle on the floor, each one with the following statements written on a card:

- Things we know about greenhouse gases being emitted to air in Australia;
- Things we like about Australia's World Heritage sites;
- Things that concern us about greenhouse gases being emitted to air;
- Things about Australia's World Heritage sites which are interesting and intriguing; and
- Things we would like to know about reducing greenhouse gases being emitted to air.

Students sort their responses into the categories, and discuss the results. Bundle the responses and paste them onto a class chart.

Introduce the importance of improving actions at home, school and in the community to reduce greenhouse gases being emitted to air

- Discuss and identify how emissions from human activities, in particular those commonly emitted from the home, school and sources in the local area are impacting on our climate. Talk about what impacts they have on human health and the environment. Talk about what actions might help to prevent them being emitted in the future.
- Share lists and make a collective one. Consider whether the list can be classified in any way.
- In groups, use reference material to clarify and modify lists, and report to the class group. See the following websites for information.
<http://www.climatechange.gov.au/education/tips/school.html>
http://www.gbrmpa.gov.au/corp_site/key_issues/climate_change

With the class prepare a class chart of things students know about climate change and actions that might help to prevent greenhouse gases being emitted to air. Include a list of questions students want to investigate. Ask students to offer possible answers to these.

- Encourage students to design their own list actions that might help to tackle climate change.

Setting the Inquiry – the *Patrimonito Storyboard Competition*

Explain to the class that in pairs or small groups (3 people or less) their task is to prepare a storyboard for the *Patrimonito Storyboard Competition*. If you do not want students to submit a storyboard you could also do a play, multi-media presentation, a report or a brochure instead.

The storyboard should convey information about the:

- Importance of Australia's Great Barrier Reef World Heritage Area;
- The impact of climate change and other threats on the Great Barrier Reef; and
- Why it is important to preserve and conserve it.

In developing the storyboards you class could also communicate how actions at school, home and in the community can help minimise the impact of climate change on World Heritage sites like the Great Barrier Reef.

Display these details as an ongoing reference for students to use. Use brainstorming to guide the investigation and suggestions as to where relevant information might be found. Students work in groups to prepare for their investigation.

Decide on 'what' to present and how to do so

Re-state the purposes of the investigation, and ask students to consider how they are going to bring their information together and present it so that the main points come across clearly. Model the construction of the storyboard genre. Students now use the information they have gathered to construct a storyboard for the *Patrimonito Storyboard Competition* or a piece of work of their choice.

Further activities using the storyboard

Information Chart

When storyboards (or plays, presentations, reports and brochures) are finalised, a class retrieval chart could be developed on which to show

collected information and ideas. This is important as students will begin to see patterns emerging.

Concept Mapping

Draw conclusions about what has been learned. Develop concept maps using key words. Students draw connecting lines between words and indicate how they believe their words relate to each other. From the concept maps, students come up with one statement about climate change and what we can do at home and school to tackle it. Share and prioritise statements.

Take Action and Do Something

Encourage students to choose one local issue associated with living more sustainably or reducing greenhouse gases. As a class, brainstorm possible solutions and talk about why something should be done about each of these issues. Discuss what the class can do.

Suggestions might include:

- When not in the room, turn off lights
- Turn off the computer if not in use and activate the computer sleep mode
- Put on another jumper instead of turning on a heater
- Sometimes you can ring, text or email a friend rather than being driven around the neighbourhood
- When possible, walk, ride a bike or catch public transport rather than being driven around
- Refuse, reduce, re-use and recycle
- Buy things with less packaging
- When going out, take your refillable sports drink bottle rather than buying a drink
- Shorter showers also reduces our use of energy.

Small Group Investigations

Students work in groups. Each group is to locate relevant information on what schools are doing within the Australian Sustainable Schools Initiative (AuSSI) or Reef Guardian Schools program to work towards being more sustainable.

See <http://www.environment.gov.au/education/aussi>

For AuSSI-ACT see <http://www.sustainableschools.act.gov.au/>

For Sustainable Schools NSW see <http://www.sustainableschools.nsw.edu.au/>

For AuSSI-NT see

http://www.deet.nt.gov.au/education/programs_initiatives/environmental_education/

For QESSI see

<http://education.qld.gov.au/schools/environment/outdoor/qessi.html>

For AuSSI-SA see <http://www.decs.sa.gov.au/efs/>

For AuSSI-VIC see

<http://www.education.vic.gov.au/about/deptpolicies/environment.htm>

For AuSSI-WA see <http://www.sustainableschools.wa.edu.au/>

For Reef Guardians see <http://www.reefed.edu.au/home/guardians>

Find out about schools actively tackling climate change at a school level

Learn about schools that are already actively involved in managing climate change by implementing energy efficiency and conservation programs and offsetting actions, protecting the environment, developing School Environmental Management Plans (SEMPs) or an equivalent to minimise climate change and acting for a sustainable future.

Many of these schools are implementing energy efficiency and conservation in addition to offsetting activities and actively undertaking Landcare, revegetation or bio-sequestration projects with community agencies.

Encourage students to read the following case studies for information. See:

<http://www.environment.gov.au/education/aussi/case-studies.html>

<http://www.sustainableschools.nsw.edu.au/Default.aspx?tabid=266>

<http://www.sustainableschools.nsw.edu.au/Default.aspx?tabid=266>

<http://www.sustainableschools.wa.edu.au/air.html>

<http://www.sustainableschools.wa.edu.au/waste.html>

<http://sustainability.ceres.org.au/schoolProjects.php?action=category&categorysId=1>

<http://sustainability.ceres.org.au/schoolProjects.php?action=category&categorysId=2>

<http://sustainability.ceres.org.au/schoolProjects.php?action=category&categorysId=3>

Reflect

Complete a self-assessment and reflection activity using the following questions:

- What is the most important thing I have learned?
- What is the one thing I have learned about myself and how I treat resources and how I use and the environment?
- What does this mean for me, my family, my school and my community as urban/country dwellers?
- What would I still like to find out about being more sustainable and how I can get my school involved?
- What piece of work am I most satisfied with? Why?
- What could a positive future look like?

Glossary

acid rain

Pollution emitted by power stations, factory emissions and motor vehicles mixed with rain or other precipitation. When mixed with rain, the acidity of this pollution destroys forests, eats away buildings and poisons water and soil.

air pollution

Chemical, biological or particulate matter that changes the characteristics of the atmosphere. Two examples of very harmful air pollution are car exhausts emitting carbon monoxide and coal burning producing sulphur dioxide.

atmosphere

The mixture of gases surrounding the Earth, any star or planet.

abatement

Any action to reduce the emissions of greenhouse gases from human activities. Abatement acts on a global level over long time scales, slowing the rate of climate change and delaying or deferring the date of impact and its magnitude. While we may contribute only a very small amount to global emissions, as good global citizen we must take responsibility for our own emission and work to reduce them.

adaptation

Any action to respond to the anticipated or actual conditions related to climate change. Such strategies can reduce our vulnerability to change in climate at the local and regional level and over short time scales. They allow communities to develop a capacity to avoid or minimize the negative effect of climate change.

BOM

Bureau of Meteorology (Australian Government)

Carbon Dioxide

A colourless odourless gas formed by the CO₂ burning of carbon or breathed out by animals in respiration. The burning of fossil fuels (oil, coal and natural gas) to create electricity and produce fuel for transport is increasing the amount of CO₂ in the atmosphere.

carbon neutral

Being carbon neutral means that you produce no net emissions of carbon dioxide.

carbon trading

The buying and selling of permits allowing people to emit set amounts of carbon in the atmosphere.

Chlorofluoro- carbons (CFCs)

Chemical compounds which have no natural source: they are produced entirely by human activity. Even though CFC production has been vastly reduced (previously used in aerosol cans and refrigerators), they will remain in the atmosphere for a long time.

climate

The regular weather conditions of an area.

climate change

Changes to the climate systems as a result of global warming.

direct impact

Something that has a direct and instant impact on the earth e.g. bushfires, Chernobyl.

energy

The power which lets people and machines move, or provides light and heat.

emissions

Sending gases out into the atmosphere.

emission target

Limitations to reduce the release of air-borne substances.

emission trading

Under an emissions trading scheme, limits (or caps) are set on the amount of a pollutant (greenhouse gas) that can be emitted. Companies or groups are given credits that represent the right to emit a specific amount. (Linked to carbon trading)

enhanced greenhouse effect

The increase in the concentration of greenhouse gases in the atmosphere due to human activity.

fugitive emissions

Emissions from transporting energy from generators to customers (e.g. through powerlines).

gases

Any irrespirable aeriform fluid.

greenhouse gases

Gases that trap heat close to the Earth's surface. There are around 30 greenhouse gases, of which CO₂ is the most important.

greenhouse

A phenomenon where greenhouse gases effect re-radiate the sun's warmth and maintain the Earth's surface temperature.

global warming

The warming of Earth's surface through air pollution or the natural release of greenhouse gases into the atmosphere.

Hydro fluorocarbons

Gases that are created by processes such HFCs as aerosol use, air conditioners, production (Greenhouse gas) of aluminium and magnesium and used in semi conductor manufacture.

indirect impact

Something that has secondary impact on lifestyles, ecosystems, societies and cultures.

Kyoto Protocol

The Kyoto Protocol is a global agreement that aims to limit greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. It was made under the United Nations Framework Convention on Climate Change.

Methane (CH₄)

A naturally occurring gas generated by (Greenhouse gas) bacteria that break down organic matter. The main causes of this increase come from the digestive processes of livestock, the cultivation of rice, escaping natural gas and decomposing waste in garbage dumps or landfills.

Nitrous Oxide N₂O (Greenhouse gas)

A gas that forms when fossil fuels are burnt.

Ozone (O₃)

A colourless gaseous substance (O₃) obtained (as by the silent discharge of electricity in oxygen) as an allotropic form of oxygen, containing three atoms in the molecule. It is one of the main constituents of smog.

pollution

Dirt or harmful substances in the air, water or soil.

smog

Is a mixture of smoke and fog produced by industry, motor vehicles, incinerators and open burning. Smog hangs around over densely populated cities.

stationary energy

Energy used to heat, cool and light ourhouses, offices and other buildings.

Sulphur hexafluoride (SF6), Hydro fluorocarbons (HFCs) and Per fluorocarbons (PFCs)

Gases created by processes such as aerosol use, air conditioners, production of aluminium and magnesium and used in semi conductor manufacture.

weather

The state of the air or atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness, or any other meteorological phenomena; meteorological condition of the atmosphere; as, warm weather; cold weather; wet weather; dry weather, etc

Source: ACT Department of Territory & Municipal Services, *Educating for Sustainability through the ACT Curriculum – Climate Change for a Sustainable Future*, Canberra, pp19-20

See

http://www.sustainableschools.act.gov.au/_data/assets/pdf_file/0007/17296/Climate_Change_curriculum_program.pdf