



Big Understandings

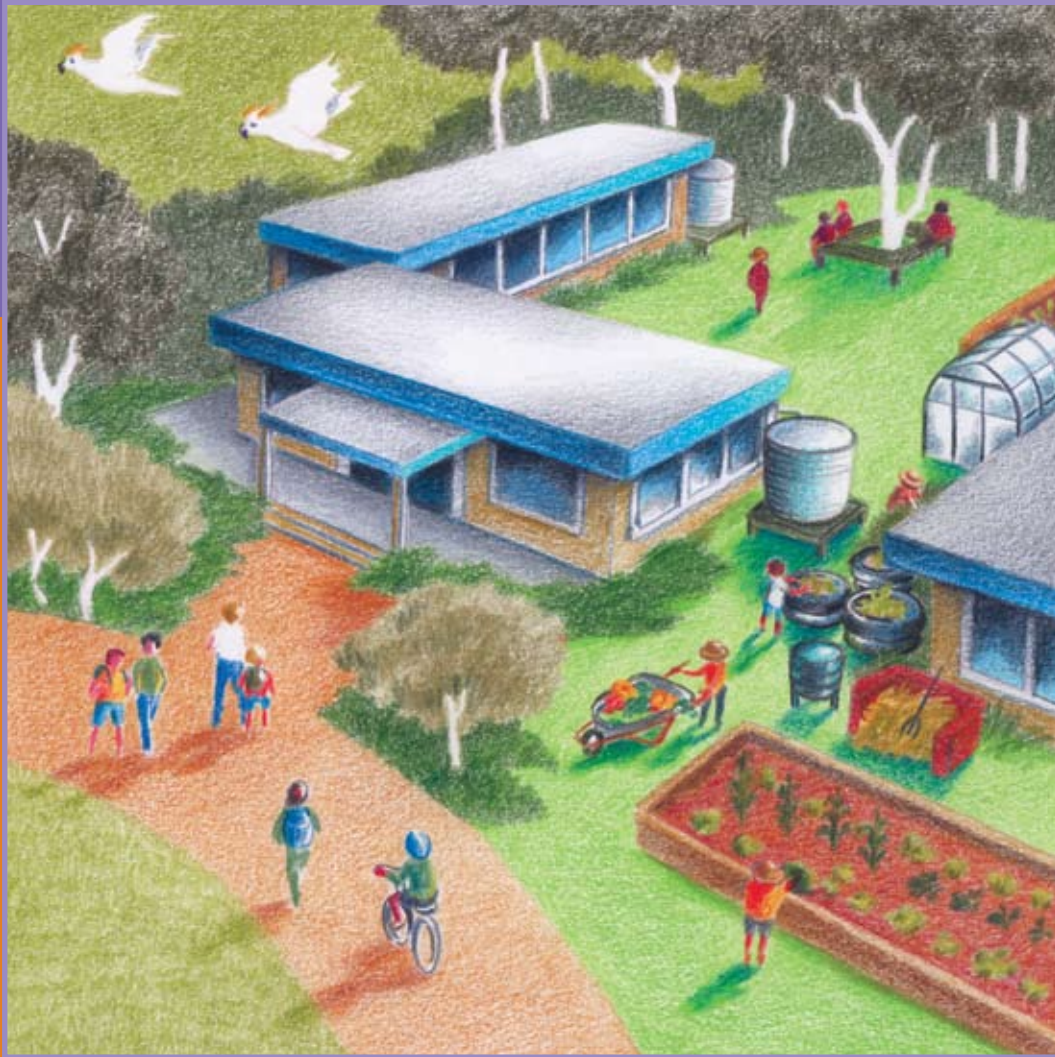
1. To understand what climate change is.
2. The causes of climate change.
3. The effects of climate change.
4. Actions we can take to make a difference.
5. Not too hot, not too cold - perfect for life.

Unit Description

| Early Childhood P-2 | Later Childhood 3-5 | Early Adolescence 6-8 | Later Adolescence 9-10 |
|---|---|---|---|
| <p>This unit of work is designed to raise awareness and develop understanding in early childhood students about:</p> <ul style="list-style-type: none"> • the atmosphere • the weather • the climate • climate change • simple causes, effects and consequences of climate change <p>Students will explore the responsibility of individuals and communities:</p> <ul style="list-style-type: none"> • in making informed choices and taking action to address climate change • in changing lifestyles with a sense of hope and optimism | <p>This unit of work is designed to raise awareness and develop understanding in later childhood students about:</p> <ul style="list-style-type: none"> • the inter-relationship of weather and climate • what climate change is • the Greenhouse and the enhanced Greenhouse effect • how having an opinion and making predictions about Climate change will impact their future <p>Students will explore the responsibility of ACT individuals, communities and Local Governments:</p> <ul style="list-style-type: none"> • in making informed choices to find a balance to live both comfortably and sustainably • to address the issue of climate change and take positive action | <p>This unit of work is designed to raise awareness and develop understanding in early adolescence students about:</p> <ul style="list-style-type: none"> • what climate change and global warming are • the difference between the greenhouse effect and the enhanced greenhouse effect • the difference between abatement and adaptation • the opinions and predictions of individuals, governments, countries, scientists, organisations, vary depending on needs, understandings and values <p>Students will explore the responsibilities of:</p> <ul style="list-style-type: none"> • individuals • communities • governments <p>Students will develop personal actions to minimise climate change.</p> | <p>This unit of work is designed to raise awareness and develop understanding in later adolescence students about:</p> <ul style="list-style-type: none"> • what global warming and climate change are • the opinions and predictions of individuals, governments, countries, scientists, organisations, vary depending on needs, understandings and values • the impact of the enhanced greenhouse effect • the complex consequences and threats to civilisations of not acting on climate change <p>Students will explore the responsibilities and actions of:</p> <ul style="list-style-type: none"> • Individuals • Governments • Global organisations <p>Students will develop personal actions to minimise climate change by considering how their actions affect their environment.</p> |



climate change for a sustainable future



early childhood
years P-2

Australian Sustainable Schools Initiative -ACT

Class: Preschool to Year Two

Band of Development: Early childhood

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The design for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Dept of Education and Training Curriculum Framework, *Every Chance to Learn*.

Unit Description

This unit of work is designed to raise awareness and develop understanding in early childhood students about:

- the atmosphere
- the weather
- the climate
- climate change
- simple causes, effects and consequences of climate change

Students will explore the responsibility of individuals and communities:

- in making informed choices and taking action to address climate change
- in changing lifestyles with a sense of hope and optimism

Big Understandings

1. To understand what climate change is
2. The causes of climate change
3. The effects and consequences of climate change
4. Actions we can take to make a difference
5. We need to keep the Earth not too hot, not too cold - perfect for life

Values and Attitudes

In early childhood, students have opportunities to develop values and attitudes about:

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Worthwhile Learning Schools may choose to include other worthwhile learning linked to the unit. For example:

- Water
- Energy
- Waste
- Biodiversity

Essential Learning Achievements covered in this unit of work are ELAs 2, 3, 19, 20 and 21. Essential Content has been selected from the early childhood band of development.

ELA 2 The student understands and applies the inquiry process

Essential Content

In the early childhood band of development, students have opportunities to:

- ask questions and identify possible sources of information to seek answers
- make observations about what is happening around them using their senses
- follow suggestions to collect and record data or information from a small range of sources (e.g. from simple experimentation, mathematical procedures, talking with others or from one or two text sources)
- revisit their questions in the light of results or information collected
- share and communicate observations, findings, ideas and understandings

ELA 3 The student makes considered decisions

Essential Content

In early childhood, students have opportunities to:

- be aware when they have a choice
- notice if someone else has been affected by their decision

ELA 19 The student understands and applies scientific knowledge

Essential Content

In early childhood, students have opportunities to understand and learn about:

- scientific aspects of their everyday activities and applications of science in their own lives (e.g. uses of energy in the home, ball games, pet care, decisions influenced by weather) and the place of science in the work of people in the community
- some of the ways in which living things depend on their environment and each other (e.g. basic needs for survival)
- changes on Earth and in space (e.g. weather, night and day, seasons), recognising that some are more predictable than others
- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes

ELA 20 the student acts for an environmentally sustainable environment

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- why it is important to conserve resources, protect the environment and participate in positive environmental action

In the early childhood band of development, students have opportunities to learn to:

- observe and discuss changes evident in the local environment, both natural (e.g. seasonal changes) and caused by human action (e.g. changes to the built environment)
- share responsibility for the quality of their immediate environments and for resource conservation (e.g. dispose of litter, reuse and recycle some materials, and switch off unused lights)
- use their imagination to describe preferred future scenarios in relation to particular aspects of their local environment (e.g. suggest ways the school playground could be improved)

ELA 21 the student understands world events and issues

Essential Content

In early childhood, students have opportunities to understand and learn about:

- some differences between Australia and places they talk about (e.g. climate, landscape, housing, population)

In early childhood, students have opportunities to learn to:

- locate places on a globe where significant events and issues are occurring

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

What they know about climate change, climate, weather and atmosphere.

Some of the causes, effects and consequences of climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- ask questions and identify possible sources of information to seek answers
- share and communicate observations, findings, ideas and understandings

Assessment for Learning

What evidence will there be that they have learnt?

Students complete an individual word association chart on key concepts. Select from: climate change, climate, weather and/or atmosphere.

Respond to What if statements. e.g.

What if...

- we chopped down all the trees in the ACT?
- everyone drove their cars to school and work?
- everybody left the lights on in their houses all the time?

- everyone left the taps running while they were cleaning their teeth?
- everyone sent all their waste to the dump?

Strategy

What is/are the most effective strategy or strategies to teach this?

Brainstorming.

Asking Questions.

Defining.

Prediction.

Representing ideas.

Visually.

Strategic.

Questioning.

Sharing ideas and knowledge with others.

Activity

What is the best vehicle to deliver the learning?

View YouTube multimedia presentation about climate change to tune students in, e.g.

(<http://www.youtube.com/watch?v=ov6GPTB4Tio>).

Use the poster from the back of the book *It's a climate for change* as a cover puzzle to promote discussion about the various causes and effects of climate change.

Provide a set of key words from the glossary. Ask the students to suggest definitions, write a sentence, list words or draw pictures that come to mind when they hear or see these words. Use these topics as a basis to begin a class glossary.

Create a KWFL chart based on climate change. Use student's ideas to inform class questions, ideas, statements and ways to find out chart.

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

There are different types of weather.

That climate is a year long weather pattern.

The atmosphere insulates and protects the Earth.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- make observations about what is happening around them using their senses
- follow suggestions to collect and record data or information¹ from a small range of sources

ELA 19 understands and applies scientific knowledge:

- changes on Earth and in space (e.g. weather, night and day, seasons), recognising that some are more predictable than others

ELA 23 world events and issues:

- some differences between Australia and places they talk about (e.g. climate, landscape, housing, population)
- locate places on a globe where significant events and issues are occurring

ELA 20 acts for a environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action

Assessment

What evidence will there be that they have learnt?

Answer or respond to questions about their weather graph.

A completed X chart or information report about the weather.

Compare the climate of Canberra to a different region in the world by creating a visual timeline.

Draw and label the Earth protected by the atmosphere.

Strategy

What is/are the most effective strategy or strategies to teach this?

Communicating.

Compare and contrast.

Extract main ideas.

Inferring.

Listening.

Locate and select relevant information.

Observing.

Organising.

Questioning.

Reading and viewing.

Summarising.

Activity

What is the best vehicle to deliver the learning?

Begin reading *It's a climate for change*.

Invite a guest speaker from Sustainable Schools or Bureau of Meteorology.

Define weather as what we experience each day.

Record and graph the weather in Canberra for one week.

In pairs, students will use an X chart to record their understanding about different types of weather e.g. hail, rain, tornado.

Define climate as the pattern of weather that a region experiences over a year. As a class create a year long timeline of typical seasonal patterns from a Polar region (Greenland) and a Pacific Ocean region (Maldives).

Introduce the concept of the atmosphere as a fragile, invisible, security blanket that insulates and protects the earth. Use concrete materials to demonstrate the atmosphere, e.g. cellophane to wrap a globe or a blanket to wrap a person.

Dictagloss

Read out aloud 'That's a wrap', page 6 from *Weather or Not ... it's a Climate Change*. Students write down key words or phrases and then in groups reconstruct the passage in their own words or pictures with labels.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

We need to keep the earth not too hot, not too cold - perfect for life.

The climate is changing because the earth is warming up.

The earth is warming up because the atmosphere is being damaged.

The atmosphere is being damaged by extra gas.

Human activity produces gases.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- share and communicate observations, findings, ideas and understandings

ELA 3 makes considered decisions:

- notice if someone else has been affected by their decision

ELA 19 understands and applies scientific knowledge:

- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes

ELA 20 acts for an environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action
- observe and discuss changes evident in the local environment, both natural (e.g. seasonal changes) and caused by human action (e.g. changes to the built environment)

Assessment

What evidence will there be that they have learnt?

Illustrate an example of 'good stuff' and 'bad stuff'. Support with labels and caption.

Role-plays of the atmosphere being damaged by 'bad stuff' and the effects of human activity.

Strategy

What is/are the most effective strategy or strategies to teach this?

Analysing.

Classifying.

Compare and contrast.

Explaining.

Interpret information.

Making choices.

Organising.

Performing.

Presenting ideas to others.

Seeing patterns.

Thinking creatively.

Working cooperatively.

Working within the time limit.

Activity

What is the best vehicle to deliver the learning?

Good Stuff v Bad stuff

Use a selection of products, or pictures of products, that represent good stuff and bad stuff.

Examples include:

Good stuff - compost bins, recycling bins, walking and cycling as clean transport, products that can be recycled, solar power, wind power.

Bad stuff - plastic bags, toxic chemicals, salination, excessive consumerism, nuclear waste and non-recyclable products.

Discuss content of each category. Select relevant examples and compile a class data chart. Allocate examples to pairs of students to illustrate using labels and add to class chart.

Focus on the bad stuff - how does the bad stuff affect the blanket? Model the blanket getting sick/damaged/ can't do its job due to excess gases produced using previous concrete example.

Demonstrate the affect on the earth as it warms up because the blanket can't protect or insulate properly.

Students' work in small groups and role play scenarios of cause and effect.

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

We need to keep the earth not too hot, not too cold - perfect for life.

Use information to identify issues and make considered and positive decisions.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- share and communicate observations, findings¹, ideas and understandings
- revisit their questions in the light of results or information collected

ELA 3 makes considered decisions:

- be aware when they have a choice

ELA 19 understands and applies scientific knowledge:

- some of the ways in which living things depend on their environment and each other
- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes

ELA 20 acts for an environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action
- observe and discuss changes evident in the local environment, both natural (e.g. seasonal changes) and caused by human action (e.g. changes to the built environment)

ELA 23 world events and issues:

- some differences between Australia and places they talk about (e.g. climate, landscape, housing, population)
- locate places on a globe where significant events and issues are occurring

Assessment

What evidence will there be that they have learnt?

Use DeBono's *Thinking Hats*, to show ways to keep the earth perfect for life.

Use Gardner's multiple intelligences to present models of the effects of climate change in different regions.

Strategy

What is/are the most effective strategy or strategies to teach this?

Revising.

Comparing and contrasting.

Making choices.

Elaborating.

Evaluating.

Working independently.

Working to a time limit.

Activity

What is the best vehicle to deliver the learning?

KWFL - Revisit previous entries and use a different coloured pencil to add current understandings. Consider questions and share answers about what they now understand. Add new questions.

Refer to polar and tropical climate timelines. Students work in small groups to present the effect of climate change in those regions and the ACT. Encourage a range of creative presentation ideas to cater for individual learning styles, e.g. dioramas, raps, maps, poems and artworks.

Presentations delivered orally and displayed for reference.

Making Connections

Outcomes

What understandings will my students have at the end of the Making Connections stage?

We need to keep the earth not too hot, not too cold - perfect for life.

Individuals can choose to make lifestyle changes.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- share and communicate observations, findings, ideas and understandings

ELA 19 understands and applies scientific knowledge:

- scientific aspects of their everyday activities and applications of science in their own lives and the place of science in the work of people in the community
- some of the ways in which living things depend on the Earth (e.g. soil, water, air) and are affected by its changes

ELA 20 acts for a environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action
- share responsibility for the quality of their immediate environments and for resource conservation (e.g. dispose of litter, reuse and recycle some materials, and switch off unused lights)

Assessment

What evidence will there be that they have learnt?

Individual “Effects Wheels” about one of the designated ‘What If’ statements.

Putting you in the picture responses.

Strategy

What is/are the most effective strategy or strategies to teach this?

Generalising.

Interpreting.

Linking cause and effect.

Sequencing.

Reflecting.

Restating.

Revising.

Self assessing.

Activity

What is the best vehicle to deliver the learning?

Refer back to Tuning In for **What if** statements.

Use them for small group discussions about cause, effect and consequences. Compile whole class display of responses as ‘**Effects Wheels**’.

We chopped down all the trees in the ACT?

Everyone drove their cars to school and work?

Everybody left the lights on in their houses all the time?

Everyone left the taps running while they were cleaning their teeth?

Everyone sent all their waste to the dump?

Putting you in the picture

Students think about climate change. Ask them "What has this got to do with you? Where do you fit into the picture?" Draw, write or map their ideas in showing their connection between climate change and themselves. Encourage them to think more deeply about their own feelings, attitudes and how they can take action.

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

What we do affects the rest of the world.

Positive lifestyle choices, with a sense of optimism will make a difference to climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- share and communicate observations, findings, ideas and understandings

ELA 3 makes considered decisions:

- be aware when they have a choice

ELA 19 understands and applies scientific knowledge:

- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes

ELA 20 acts for a environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action
- use their imagination to describe preferred future scenarios in relation to particular aspects of their local environment (e.g. suggest ways the school playground could be improved)

Assessment

What evidence will there be that they have learnt?

Choose an action from personal pledge and create advertising poster or slogan to display in school or wider community.

Strategy

What is/are the most effective strategy or strategies to teach this?

Communicating with a range of audiences and for different purposes.

Considering options.

Justifying.

Persuading.

Planning.

Presenting.

Activity

What is the best vehicle to deliver the learning?

Personal pledge.

Students consider what changes they can make to their lifestyles to reduce climate change. Refer to *Weathering the Change* and *It's a Climate for Change*, p. 30-31 for strategies.

Create personal pledges and compile as class book to share with other classes.

Compile list of climate change strategies and publish one in the school newsletter each week.

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

We need to keep the earth not too hot, not too cold - perfect for life.

What climate change is.

The causes of climate change.

The effects and consequences of climate change.

Actions they can take to make a difference.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 19 understands and applies scientific knowledge:

- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes

ELA 20 acts for an environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action

Assessment

What evidence will there be that they have learnt?

Current understandings and attitudes on KWFL.

Reflection on learning activity.

Strategy

What is/are the most effective strategy or strategies to teach this?

Prioritising.

Reflecting.

Self assessing.

Evaluating.

Providing feedback.

Express feelings and attitudes.

Explaining.

Activity

What is the best vehicle to deliver the learning?

Revisit KWFL and refer back to big understandings. Reflect on current understandings and add relevant information.

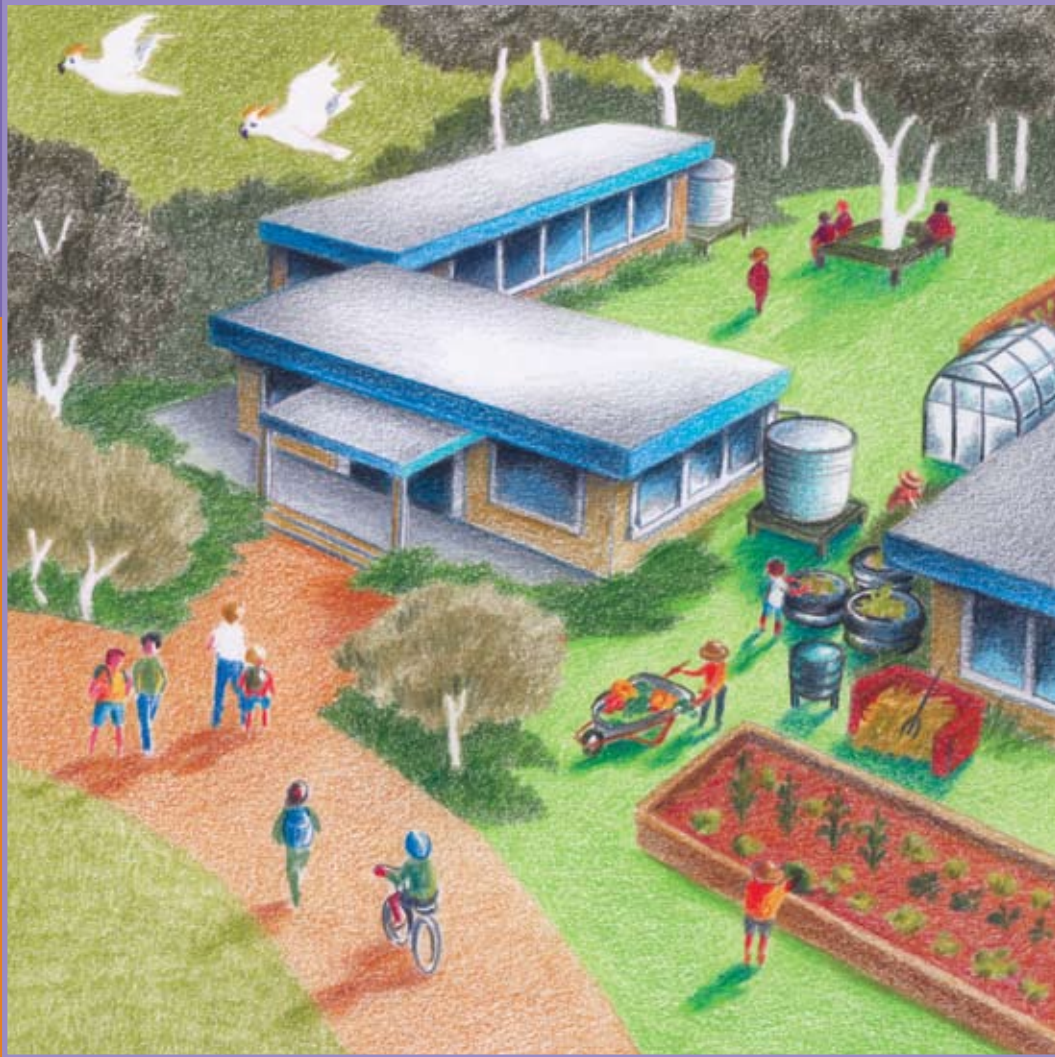
Students complete Reflection on Learning;

- three things I have learned about climate change that I didn't know before are ...
- the most important thing I learned about climate change is that ...
- the most important thing I am going to do to keep the earth perfect for life is ...
- what I enjoyed most is ...
- what I did well was ...
- what I didn't do so well was ...



climate change for a sustainable future

climate change for a sustainable future



later childhood
years 3–5

Australian Sustainable Schools Initiative -ACT

Class: Year 3- 5

Band of Development: Later childhood

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The design for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Dept of Education and Training, Curriculum Framework, *Every Chance to Learn*.

Unit Description

This unit of work is designed to raise awareness and develop understanding in later childhood students about:

- the inter-relationship of weather and climate
- what climate change is
- the greenhouse and the enhanced greenhouse effect
- how having an opinion and making predictions about climate change will impact their future

Students will explore the responsibility of ACT individuals, communities and Local Governments:

- In making informed choices to find a balance to live both comfortably and sustainably
- To address the issue of climate change and take positive action

Big Understandings

1. To understand what climate change is.
2. The causes of climate change.
3. The effects and consequences of climate change.
4. Actions we can take to make a difference.
5. We need to keep the earth not too hot, not too cold - perfect for life.

Values and Attitudes

During this unit of work students will have the opportunity to develop the following values and attitudes:

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Other Worthwhile Learning Schools may choose to include other worthwhile learning linked to the unit. For example:

- non/renewable energy sources
- Kyoto Protocol
- Sustainable housing
- Heating and insulation
- Ozone layer
- Water
- Energy
- Waste
- Biodiversity
- Antarctica
- International Polar Year (IPY)

Essential Learning Achievements

Covered in this unit of work are ELAs 2, 3, 19, 20 and 23. Essential Content has been selected from the later childhood band of development.

ELA 2 the student understands and applies the inquiry process

Essential Content

In later childhood, students have opportunities to understand and learn about:

- different contexts for inquiry

In later childhood, students have opportunities to learn to:

- use the inquiry process in authentic situations as part of topics or themes across the school's curriculum
- create from their interests or experiences, appropriate questions, conjectures and predictions for investigation

- collect and record data, checking and repeating observations or measurements as appropriate
- plan and conduct structured searches from different sources
- use a range of print and media sources to gather information and data
- use agreed criteria to evaluate the accuracy, relevance and credibility of information or data

ELA 3 the student makes considered decisions

Essential Content

In later childhood, students have opportunities to understand and learn about:

- influences on decision-making (e.g. family, peers, media, other people's needs and feelings)

In later childhood, students have opportunities to learn to:

- identify what influenced them in a recent decision
- identify possible consequences of different decisions
- make decisions and put them into effect in authentic situations as part of topics or themes in the school's curriculum

ELA 19 the student understands and applies scientific knowledge

Essential Content

In later childhood, students have opportunities to understand and learn about:

- how energy can be transferred between objects, and different forms and sources of energy used in their community (e.g. heat, sound, light, electricity)

ELA 20 The student acts for an environmentally sustainable environment

Essential Content

In later childhood, students have opportunities to understand and learn about:

- some effects of human action on natural environments (e.g. land clearing, air and water pollution)
- how protecting the environment requires that people work together as citizens and consumers and participate in appropriate actions as environmental stewards or in other civic action to effect positive change

In later childhood, students have opportunities to learn to:

- take responsibility for caring for a local environment (e.g. part of school grounds, class garden, local park)
- investigate how their actions contribute to sustainability of resources and local environments (e.g. investigate issues relating to packaging and plastic bags, develop reuse and recycling systems in their classroom and school)

- explore probable and preferred futures in relation to environmental issues familiar to them, and discuss actions needed to make preferred futures happen

ELA 23 The student understands world events and issues

Essential Content

In later childhood, students have opportunities to understand and learn about:

- significant world events and how they affect people's lives in different places (e.g. natural disasters, war)
- how present and future global events and issues may influence people in Australia and Asia (e.g. environmental, health, conflict)

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

What they know about climate change, climate, weather and atmosphere.

Determine students' understanding about causes, effects and consequences of climate change.

What weather and climate is and how they are related.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 The student understands and applies the inquiry process:

- different contexts for inquiry
- use the inquiry process in authentic situations as part of topics or themes across the school's curriculum
- create from their interests or experiences, appropriate questions, conjectures and predictions for investigation

Assessment for Learning

What evidence will there be that they have learnt?

The students will have compiled a list of words with appropriate definitions about weather, climate, climate change, greenhouse effect, enhanced greenhouse effect and atmosphere.

Strategy

What is/are the most effective strategy or strategies to teach this?

ICT.

Discussion.

Mind map.

A-Z.

Learning Log.

Activity

What is the best vehicle to deliver the learning?

Search Global Warming videos from the YouTube website (<http://www.youtube.com>). Students are to write down keywords, thoughts or feelings about the pictures that have been screened. Following the viewing, promote discussion about the various causes and effects of climate change.

Mind Map

Ask the students to suggest definitions, write a sentence, list words or draw pictures that come to mind when they hear or see the following words or pictures.

Atmosphere, climate, weather, greenhouse effect, greenhouse gases, climate change.

A - Z

Begin to compile a class and individual glossary of terms and definitions from the above words.

Learning Log

Students begin a learning log by writing down questions and reflections about what they already know, what they would like to know and interesting facts or information.

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

What the greenhouse and enhanced greenhouse effects are.

What the six greenhouse gases are.

Stationary energy is the heating and lighting of buildings.

Information about climate change is presented in a variety of ways.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 The student understands and applies the inquiry process:

- collect and record data, checking and repeating observations or measurements as appropriate
- plan and conduct structured searches from different sources
- use a range of print and media sources to gather information and data

ELA 19 understands and applies scientific knowledge:

- how energy can be transferred between objects, and different forms and sources of energy used in their community (e.g. heat, sound, light, electricity)

Assessment

What evidence will there be that they have learnt?

Identify and label sources of natural and unnatural greenhouse gases.

Use a retrieval chart to name, define and clarify the six greenhouse gases and their properties.

In their Learning Log, students respond to the sentence starter “Stationary energy is...” Then write down what they know about stationary energy in the ACT, now and in the future.

Give an oral presentation to present findings about issues relating to climate change.

Strategy

What is/are the most effective strategy or strategies to teach this?

Graphic Organisers.

PMI charts.

Venn Diagrams.

Discussion.

Information.

Processing.

Higher Order Thinking.

X, Y Charts.

Activity

What is the best vehicle to deliver the learning?

Guest Speaker

Invite an expert on climate change / sustainability to speak to the students about the causes, effects and consequences of global warming.

Natural v Enhanced

Discuss and compare the diagram found at (http://www.sustainableschools.act.gov.au/climate_change) showing the greenhouse effect and the enhanced greenhouse effect.

The GHG gang aka the big 6!

Using a retrieval chart complete details for each of the six greenhouse gases. Name, scientific symbol, sources, positives and negatives. Refer to *It's a climate for change*, p. 22.

Interpreting a graph

Present the graph Fig 1. ACT Greenhouse Gas Emissions, 2004 from the website (http://www.sustainableschools.act.gov.au/climate_change). Cover the sources of CO₂ emissions and encourage students to brainstorm their ideas about what the possible sources are. Progressively remove labels and discuss ACT CO₂ emissions. Focus more explicitly on stationary energy (energy used to heat and light buildings) and CO₂e (e=equivalent)

Fact cards

Read passages or articles related to climate change. Compose a mind map by summarising the four most important pieces of information and including keywords. Design and create a poster relating this information. Present the information orally and display poster for class reference.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

Overabundances in volume of greenhouse gases cause climate change.

Climate change occurs naturally and through human activity.

The ACT has higher emissions per person.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

Collect and record data, checking and repeating observations or measurements as appropriate

Plan and conduct structured searches from different sources

- use a range of print and media sources to gather information and data
- use agreed criteria to evaluate the accuracy, relevance and credibility of information or data

ELA 19 understands and applies scientific knowledge:

Identifiable causes for some of the short and long term changes to the surface of the Earth or the atmosphere (e.g. volcanic activity, soil erosion, air pollution).

Assessment

What evidence will there be that they have learnt?

Individual calculations of carbon footprints and an explanation as to why the footprints are high or low.

A comparison and contrast of predictions with the scientific reasoning.

Present research project findings about causes of climate change.

Use Value Lines based on the sentence: People in the ACT are higher emitters of greenhouse gases.

Add supporting statements.

Completed cause, effect and consequence flowchart chart.

Strategy

What is/are the most effective strategy or strategies to teach this?

Flowcharts.

Discussion.

Design.

Survey.

Graphic organiser.

Activity

What is the best vehicle to deliver the learning?

Calculate your carbon footprint

Go to the Victorian EPA website: (<http://www.epa.vic.gov.au/GreenhouseCalculator/calculator/default.asp>). Using the greenhouse calculator determine what greenhouse gases you use.

Survey

Compile survey that covers topics of transport, housing, waste and food choices (eating meat). Students complete survey and graph data as whole class. Interpret and discuss findings. Consider what choices are made that contribute to greenhouse gas production.

Research project

Brainstorm how the growing of crops produces greenhouse gases naturally. Examine how the mass cultivation of rice produces increased greenhouse gas emissions. Use a graphic organiser to compare and contrast the greenhouse effect and the enhanced greenhouse effect

In groups investigate the causes of increased greenhouse gases. Allocate groups to investigate:

- Carbon dioxide (CO₂) production as burning fossil fuels (cars, electricity) and deforestation.
- Methane (CH₄) as digestive processes of livestock (body burps) and the decomposing of waste in landfill.

Use information gathered to address 'How much is too much?' Interpret and present information with text and visuals sequentially, e.g. storyboards, flowcharts, mind maps.

Comparison graph

Look at the graphs relating to Residential Consumption per Person in Australia <http://www.sustainable-schools.act.gov.au/>

Cover the information on the vertical axis and ask students to predict what information the graph is presenting. Discuss predictions and then reveal the actual content. Exclude Tasmania as CO₂ electricity consumers as they use hydro. Draw conclusions about the level of greenhouse gas emissions in the ACT.

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

Climate change has direct and indirect impacts.

Climate change has predicted social, economic and demographic consequences.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 20 acts for an environmentally sustainable future:

- some effects of human action on natural environments (e.g. land clearing, air and water pollution)

ELA 23 The student understands world events and issues:

- significant world events and how they affect people's lives in different places (e.g. natural disasters, war)
- how present and future global events and issues may influence people in Australia and Asia (e.g. environmental, health, conflict)

Assessment

What evidence will there be that they have learnt?

Choose a case study and report on all three consequences for that region in the student's preferred learning style.

Strategy

What is/are the most effective strategy or strategies to teach this?

Expert groups.

Reporting.

Discussion.

Presenting.

Activity

What is the best vehicle to deliver the learning?

Case studies - countries at risk from climate change.

Select different countries at risk from climate change e.g. Bangladesh, Kiribati and Tuvalu, The Maldives, Papua New Guinea, Indonesia, Samoa, Fiji, Africa, Greenland and The Caribbean. The Canberra Times supplement 'The poles, the climate and change' and Google Earth search engine are recommended resources.

Divide students in home groups and allocate a region. Form expert groups to focus on the social, economic and demographic consequences for each of the regions. Reform as home groups, report back and discuss findings. Present the group's findings orally to the class.

Making Connections

Outcomes

What understandings will my students have at the end of the Making Connections stage?

That people have different perspectives.

We can work together to come up with sustainable solutions.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 making considered decisions:

- influences on decision-making (e.g. family, peers, media, other people's needs and feelings)

ELA 20 acts for an environmentally sustainable future:

- how protecting the environment requires that people work together as citizens and consumers and participate in appropriate actions as environmental stewards or in other civic action to effect positive change

Assessment

What evidence will there be that they have learnt?

Students argue in a debate and then complete a self-assessment and peer assessment about their participation.

In their Learning Log, students evaluate each of the presented arguments and respond to the reflection questions.

Strategy

What is/are the most effective strategy or strategies to teach this?

Role play.

Argue.

Discuss.

Evaluate.

Debate.

Learning log.

Activity

What is the best vehicle to deliver the learning?

POV Role play

Provide students with scenarios that relate to the consequences of climate change. See roles and scenarios in the resource and references pages.

Students debate the issues and work towards sustainable solutions.

Students evaluate all the presented arguments and justify reasons for:

- who presented the strongest argument?
- which argument do they most identify with?
- which argument would you support?
- which argument is the sustainable option?

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

The need to make informed choices to adapt to climate change.

The need to find a balance to live both comfortably and sustainably by reducing emissions.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 making considered decisions:

- make decisions and put them into effect in authentic situations as part of topics or themes in the school's curriculum

ELA 20 acts for an environmentally sustainable future:

- take responsibility for caring for a local environment (e.g. part of school grounds, class garden, local park)
- investigate how their actions contribute to sustainability of resources and local environments (e.g. investigate issues relating to packaging and plastic bags, develop reuse and recycling systems in their classroom and school)
- explore probable and preferred futures in relation to environmental issues familiar to them, and discuss actions needed to make preferred futures happen

Assessment

What evidence will there be that they have learnt?

Complete pledge to take action for the future.

Create a list of ten actions they could take to use energy more efficiently at home to reduce emissions. Present these as a fridge magnet to take home and share with family and friends.

Strategy

What is/are the most effective strategy or strategies to teach this?

ICT.

Present.

Cooperative groups.

Advertise.

List.

Create.

Activity

What is the best vehicle to deliver the learning?

Access *Ollie's Island* DVD and click on the link to Design our Sustainable Future World. Students make sustainable choices to create a possible future.

Present an Eco-assembly.

Work in groups to create imaginative ways to get the message of sustainable action across to their local community. Support with advertising campaign to encourage attendance and inform community.

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

What climate change is.

The causes of climate change.

The effects and consequences of climate change.

Actions we can take to make a difference.

We need to keep the earth not too hot, not too cold - perfect for life.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 making considered decisions:

- identify what influenced them in a recent decision
- identify possible consequences of different decisions

Assessment

What evidence will there be that they have learnt?

Participation in class discussion.

Completed learning log.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discuss.

Learning log.

Question.

Reflect.

Respond.

Activity

What is the best vehicle to deliver the learning?

Concentric circle

Discuss the following:

Share one fact you think is true about climate change.

Share one question you have about climate change.

How do you feel about climate change?

Learning Log reflection to respond to strategic questions:

What is climate change?

What are the causes of climate change?

List five effects and five consequences of climate change.

Describe five actions I have taken this week to make a difference.

Describe five actions I will take to make a difference in the future.

Three things I know now that I didn't know before.

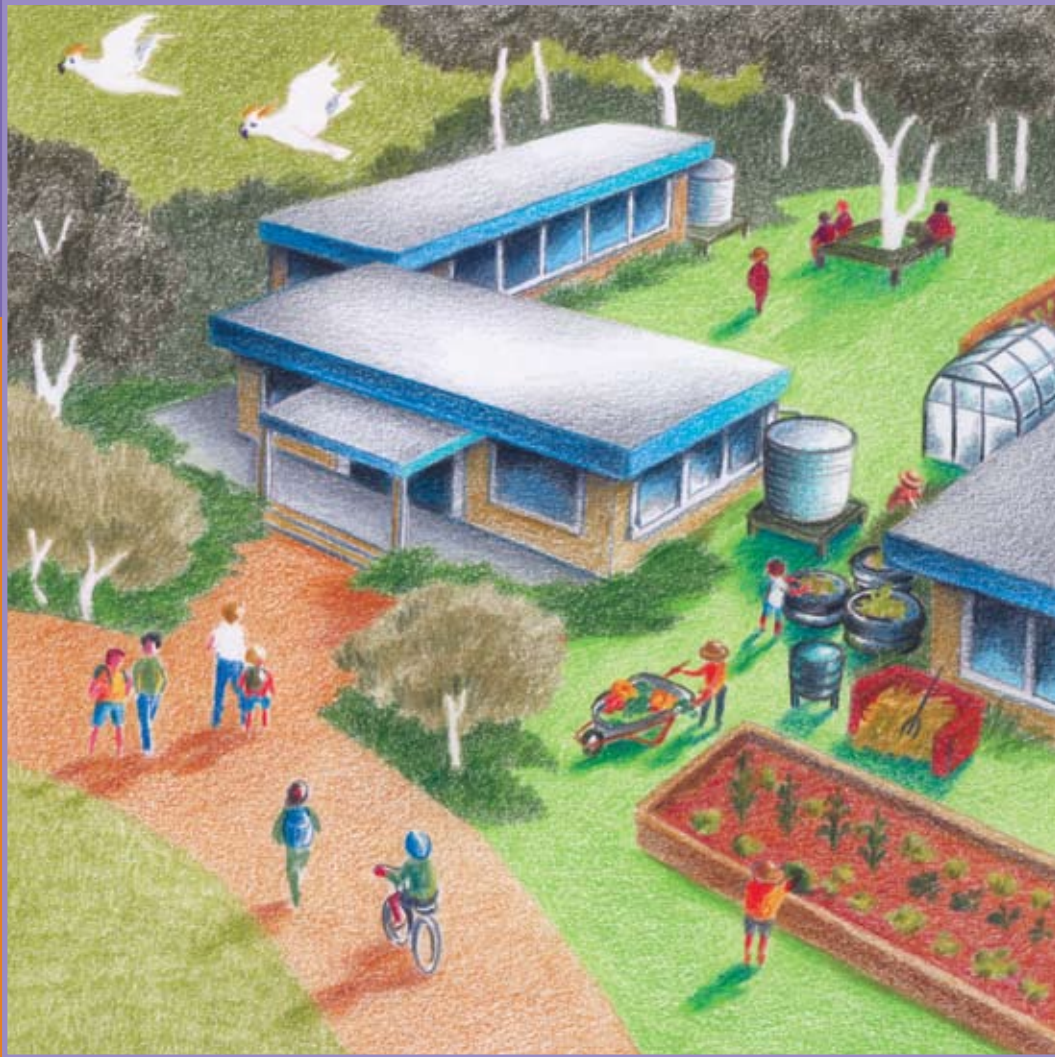
What is the most important message about climate change?

How are you feeling about climate change?



climate change for a sustainable future

climate change for a sustainable future



early adolescence
years 6–8

Australian Sustainable Schools Initiative -ACT

Class: Year 6- 8

Band of Development: Early adolescence

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The design for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Dept of Education and Training Curriculum Framework, *Every Chance to Learn*.

Unit Description

This unit of work is designed to raise awareness and develop an understanding in early adolescence students about:

- What climate change and global warming are
- The difference between the greenhouse effect and the enhanced greenhouse effect
- The difference between abatement and adaptation
- The opinions and predictions of individuals, governments, countries, scientists, organisations, vary depending on needs, understandings and values

Students will explore the responsibilities of:

- individuals,
- communities and,
- governments.

Students will develop personal actions to minimise climate change.

Big Understandings

1. To understand what climate change is
2. The causes of climate change
3. The effects and consequences of climate change
4. Actions we can take to make a difference
5. We need to keep the Earth not too hot, not too cold - perfect for life.

Values and Attitudes

During this unit of work students will have the opportunity to develop the following values and attitudes:

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Other Worthwhile Learning Schools may choose to include other worthwhile learning linked to the unit, *for example*:

- Prior to students commencing the independent/paired research task under 'Going further', discuss and define the areas students will examine. Eg define different industry areas and ecosystems as part of classroom activities
- Reading from *We Are the Weather Makers* (Tim Flannery, 2007). Follow with activities based on Bloom's Taxonomy from the associated website

Essential Learning Achievements

Covered in this unit are ELAs 2, 3, 19, 20, 21 and 23. Essential Content has been selected from the early adolescence band of development.

ELA 2 the student understands and applies the inquiry process

Essential Content

In the early adolescence band of development, students have opportunities to:

- formulate questions, predictions or propositions suitable for investigation and clarify the inquiry focus
- access and interpret a range of primary and/or secondary sources of information (e.g. historical documents, images, oral histories, biographies, articles, media sources, statistical data sets)
- evaluate the accuracy, relevance, completeness and the credibility of data and information and their sources (e.g. recognise evidence, opinion, bias and perspective; identify credentials of authors or websites)

ELA 3 the student makes considered decisions

Essential Content

In the early adolescence band of development, students have opportunities to:

- use the inquiry process to gather information from a variety of sources to identify additional options
- assess the impact and consequences of decisions they have already made to identify whether they will impact on their future choices
- predict possible benefits, consequences and risks

- clarify feelings, values and beliefs in relation to particular decisions
- make decisions and put them into effect as part of topics or themes across the school's curriculum

ELA 19 the student understands and applies scientific knowledge

Essential Content

In early adolescence, students have opportunities to learn to:

- explore, identify and model relationships (e.g. solar system, food chains and webs) to explain interrelationships and predict change
- apply scientific knowledge and language in interpreting information and forming explanations, arguments and lines of reasoning
- safely and correctly use laboratory equipment
- use their scientific understandings to consider and respond to appropriate ethical and social issues relevant to them (e.g. those related to health and wellbeing)

ELA 20 the student acts for an environmentally sustainable future

Essential Content

In the early adolescence band of development, students have opportunities to understand and learn about:

- the concepts of the interdependence of living things within a habitat, an ecosystem, and how change in one part of an ecosystem impacts on other parts
- some of the processes by which human activities change natural environments in positive and negative ways (e.g. reduce feral cat population in a national park, small

native animal and bird populations increase, animal and bird activity encourages native plant growth; overuse of organo-phosphate fertilisers on farms, run-off into waterways, increased nutrient load in rivers, toxic algal blooms, native fish extinction)

- population growth impacts on environmental systems (e.g. urbanisation, locust, cane toad or weed infestation)
- responsibilities of global citizenship for individuals, organisations and governments and the roles and responsibilities of companies, producers and consumers in relation to sustainability
- how countries work together to protect the environment

In the early adolescence band of development, students have opportunities to learn to:

- conduct case study investigations into local and/or national ecosystems to identify changes and predict their impacts
- investigate practical ways for individuals, households or communities to conserve resources (e.g. waste recycling, energy and water saving,) and evaluate their practicality and effectiveness
- participate in raising awareness about environmental issues
- examine issues of sustainability of the natural, built or social environment, extending from local to global perspectives (e.g. investigate arguments and studies about climate change and its effects; generate probable, possible and preferred future scenarios for future sustainable living)

ELA 21 the student understands about Australia and Australians

Essential Content

In the early adolescence band of development, students have opportunities to understand and learn about:

- current issues and challenges facing the local community and Australian society

ELA 23 the student understands world events and issues

Essential Content

In the early adolescence band of development, students have opportunities to learn to:

- compare and contrast representations of a current event or issue in the media
- engage in “what if” discussions about how an issue or event might have unfolded differently if people had chosen a different course of action

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

What they know about climate change and global warming.

That the way in which we live and the actions we take have an impact on climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- clarify feelings, values and beliefs in relation to particular decisions

ELA 20 acts for an environmentally sustainable future:

- the concepts of the interdependence of living things within a habitat, an ecosystem, and how change in one part of an ecosystem impacts on other parts

Assessment

What evidence will there be that they have learnt?

Brainstorm what they know and provide a definition of weather, climate, climate change, global warming, greenhouse effect and enhanced greenhouse effect.

List five positive and five negative ways in which their actions impact on climate change.

Strategy

What is/are the most effective strategy or strategies to teach this?

Brainstorming.

Glossary.

Discussion.

Think, pair, share.

Listing.

Describing.

Recognising.

ICT.

Activity

What is the best vehicle to deliver the learning?

Class discussion and brainstorm on what we know about climate change and words that we associate with climate change.

Review difference between weather and climate.

Glossary activity - students are given the following list of words and terms: weather, climate, climate change, global warming, greenhouse effect and enhanced greenhouse effect. Students write their own definitions and then as a class/ small group discuss their responses and agree upon a definition. Compare their answers with a prepared definition.

Think, pair, share ways our actions impact on climate change. Students then list five positive and five negative actions. Discuss student responses.

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

The opinions and predictions vary depending on the needs, understandings and values.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- access and interpret a range of primary and/or secondary sources of information (e.g. historical documents, images, oral histories, biographies, articles, media sources, statistical data sets)
- evaluate the accuracy, relevance, completeness and the credibility of data and information and their sources (e.g. recognise evidence, opinion, bias and perspective; identify credentials of authors or websites)

ELA 3 makes considered decisions:

- use the inquiry process to gather information from a variety of sources to identify additional options

ELA 20 acts for an environmentally sustainable future:

- examine issues of sustainability of the natural, built or social environment, extending from local to global perspectives (e.g. investigate arguments and studies about climate change and its effects; generate probable, possible and preferred future scenarios for future sustainable living)

ELA 21 Australia and Australians:

- current issues and challenges facing the local community and Australian society

ELA 23 world events and issues:

- compare and contrast representations of a current event or issue in the media

Assessment

What evidence will there be that they have learnt?

E-scrapbook of articles (newspapers and magazines), pictures and graphs, policy, podcasts, YouTube clips and web sites. Students assess and evaluate five entries for the needs, understandings and values of the author/producer of the entry.

Students should collect between 15 and 20 entries with a full assessment of a minimum of 5 by the end of the unit of work.

Strategy

What is/are the most effective strategy or strategies to teach this?

Interpreting.

Inferring.

Classifying.

Comparing.

Explaining.

ICT.

Structured observations.

Newspapers and magazines.

Discussion.

Modeling.

Activity

What is the best vehicle to deliver the learning?

Use selected articles on climate change collected from a variety of sources to model how to access and interpret a source of information. Identify who wrote it, the audience, when it was written, what it is about, opinions and facts. Then identify the authors' needs, understanding and values that they hold on climate change.

Students begin to collect their own articles etc and follow the above model.

Hold class discussions weekly to discuss articles found by the students. This scrapbook activity and discussion should be on going throughout the unit.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

The difference between abatement and adaptation.

The ability to identify their own ideas, feelings and values about climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- formulate questions, predictions or propositions suitable for investigation and clarify the inquiry focus

ELA 3 makes considered decisions:

- assess the impact and consequences of decisions they have already made to identify whether they will impact on their future choices
- clarify feelings, values and beliefs in relation to particular decisions

ELA 20 acts for an environmentally sustainable future:

- responsibilities of global citizenship for individuals, organisations and governments and the roles and responsibilities of companies, producers and consumers in relation to sustainability
- investigate practical ways for individuals, households or communities to conserve resources (e.g. waste recycling, energy and water saving,) and evaluate their practicality and effectiveness

Assessment

What evidence will there be that they have learnt?

Define actions as abatement or adaptation. With reference to the E-Scrapbook select strategies that different sources are using or propose to use. Classify as abatement or adaptation strategies, and explain why.

Ask students to imagine it is 2025. Write a letter to themselves identifying their current ideas, feelings and values about climate change and their expectations about the future and the world they will be living in.

Strategy

What is/are the most effective strategy or strategies to teach this?

Defining.

Three level guide.

Classifying.

Explaining.

Inferring.

Paraphrasing and summarising.

Letter writing.

Activity

What is the best vehicle to deliver the learning?

Three level guide: With reference to *Weathering the Change: ACT Climate Change Strategy 2007-2025* (p. 12-13). Students respond to literal, interpretive and analytical questions about the definitions of abatement and adaptation. Students respond individually, then discuss their responses in small groups then report back to the class. For an example of this activity, see the resources guide.

Using their e-scrapbook students begin to classify actions and strategies mentioned in their entries as abatement or adaptation.

Students complete an X chart to analyse their thinking about climate change: What does it look like, feel like, sound like and think like?

Ask students to imagine what their world and lives will be like in 2025. What are they doing? Where do they live? How do they travel? What are their energy options? How is the world different to the way it is now? Students then write themselves a letter in which they identify their current ideas, feelings and values about climate change and their expectations about the future and the world they will be living in.

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

There are six greenhouse gases of which the levels in the atmosphere have increased significantly over the past 200 years.

The increased level of greenhouse gases in the atmosphere is impacting on climate.

The possible impacts of climate change on ecosystems and industry.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 19 understands and applies scientific knowledge:

- explore, identify and model relationships (e.g. solar system, food chains and webs) to explain interrelationships and predict change
- use their scientific understandings to consider and respond to appropriate ethical and social issues relevant to them (e.g. those related to health and wellbeing)
- apply scientific knowledge and language in interpreting information and forming explanations, arguments and lines of reasoning

ELA 20 acts for an environmentally sustainable future:

- some of the processes by which human activities change natural environments in positive and negative ways

Assessment

What evidence will there be that they have learnt?

Draw and label two diagrams showing the greenhouse effect and the enhanced greenhouse effect. Write an explanation of the interrelationship between humans and the natural environment.

Choose either an ecosystem or an industry and research the impact of climate change. Students present research to the class.

- industry: agriculture, tourism, manufacturing, health, retail, leisure, transport
- ecosystem: waterways, rainforests, deserts, temperate forests, coasts and the sea, grasslands

Strategy

What is/are the most effective strategy or strategies to teach this?

Discuss.

Read.

Describe.

ICT.

Model.

Draw.

Label.

List.

Experiment.

Interpret.

Explain.

Research.

Activity

What is the best vehicle to deliver the learning?

The greenhouse effect: Using an online animation (<http://epa.gov/climatechange/kids/animations.html>) or illustration (<http://www.greenhouse.gov.au/science/faq/question1.html>) discuss the greenhouse effect and the enhanced greenhouse effect.

Read chapter 3 of *'We are the weather makers' - "The Greenhouse Gases"* or access http://www.bbc.co.uk/climate/evidence/greenhouse_gases.shtml. Students record the six greenhouse gases, their chemical symbol and structure, common sources of each gas, impact on the atmosphere, and details of changing levels of each gas in the atmosphere on a retrieval chart.

Complete an experiment to demonstrate the impact of global warming (e.g. <http://www.picotech.com/experiments/global/globalwarming.html>)

Focused class discussion on the question 'What are the scientists predicting?' Use students' e-scrapbooks, other current media reports, and data from the BOM on predictions and models of climate change and its impact.

Independent or paired research activity:
Research the impact climate change is having or will have on an Australian ecosystem or an industry. Consider the following:

- what are the needs of the community?
- what is or would be the impact of climate change on the ecosystem or industry?
- what needs to change to reduce the impact of climate change on the ecosystem or industry?
- what is the preferred future for the ecosystem or industry?
- what can individuals and communities do to reduce the impacts?

Making Connections

Outcomes

What understandings will my students have at the end of the Making Connections stage?

Choices governments make impact on climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- predict possible benefits, consequences and risks

ELA 20 acts for an environmentally sustainable future:

- how countries work together to protect the environment

ELA 23 world events and issues:

- engage in “what if” discussions about how an issue or event might have unfolded differently if people had chosen a different course of action

Assessment

What evidence will there be that they have learnt?

Complete this questionnaire:

- What is the state or territory you are looking at?
- Does the state or territory have a climate change strategy?
- Does it contain both abatement and adaptation strategies?

- what is its timeline for action?
- what is its strategy for local environments?
- what is its strategy for schools?
- what is its strategy for homes?

Strategy

What is/are the most effective strategy or strategies to teach this?

Analyse.

Debate.

Discuss.

Cooperative group work.

Research.

ICT.

Report.

Outline.

Activity

What is the best vehicle to deliver the learning?

Debate or discuss: Australia produces more greenhouse gases per person than any other country in the world. We have a global responsibility to undo the damage. Is ratifying the Kyoto Protocol the right step to take?

What adaptation strategies does the Australian Government have in place? Model to students how to access information on government websites, and research current policies on climate change.

Small group task: Allocate each group a state or territory. Students research and report back to the class on adaptation policies in their State or Territory. For the ACT use the *Weathering the Change* document.

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

We can act to address climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- make decisions and put them into effect as part of topics or themes across the school's curriculum

ELA 20 acts for an environmentally sustainable future:

- participate in raising awareness about environmental issues

Assessment

What evidence will there be that they have learnt?

Keep a record for a week of the activities undertaken that contribute to the enhanced greenhouse effect. This could be done in a table format. How can you reduce your impact on climate change? Suggest alternatives to your actions.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discuss.
ICT.
Research.
Read.
Plan.
Design.
Devise.
Produce.
Implement.

Activity

What is the best vehicle to deliver the learning?

Using a range of print, and multimedia resources

Some suggested examples are:

“Be Climate Clever” (<http://cc.greenhouse.gov.au/publications/pubs/climateclever.pdf>)

TAMS Brochure “Weathering the Change - What can I do?” (http://www.tams.act.gov.au/__data/assets/pdf_file/0003/63624/Climate_Change_Strategy.pdf)

or

“It’s a climate for change” - p. 31 create a list of possible actions students can take to address climate change.

As a class decide on a series of actions to raise awareness about climate change in the school community eg create posters, put suggestions in the school newsletter and daily notices. Host a climate change forum with guest speakers.

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

What climate change is.

The causes of climate change.

The effects and consequences of climate change.

Actions we can take to make a difference.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- evaluate the accuracy, relevance, completeness and the credibility of data and information and their sources (e.g. recognise evidence, opinion, bias and perspective; identify credentials of authors or websites)

ELA 3 make considered decisions:

- clarify feelings, values and beliefs in relation to particular decisions

Assessment

What evidence will there be that they have learnt?

Presentation to class and participate in discussions. Within their e-scrapbook identify varying opinions and predictions from different sources.

Completed e-scrapbook.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discuss.

Reflect.

Respond.

Share.

Activity

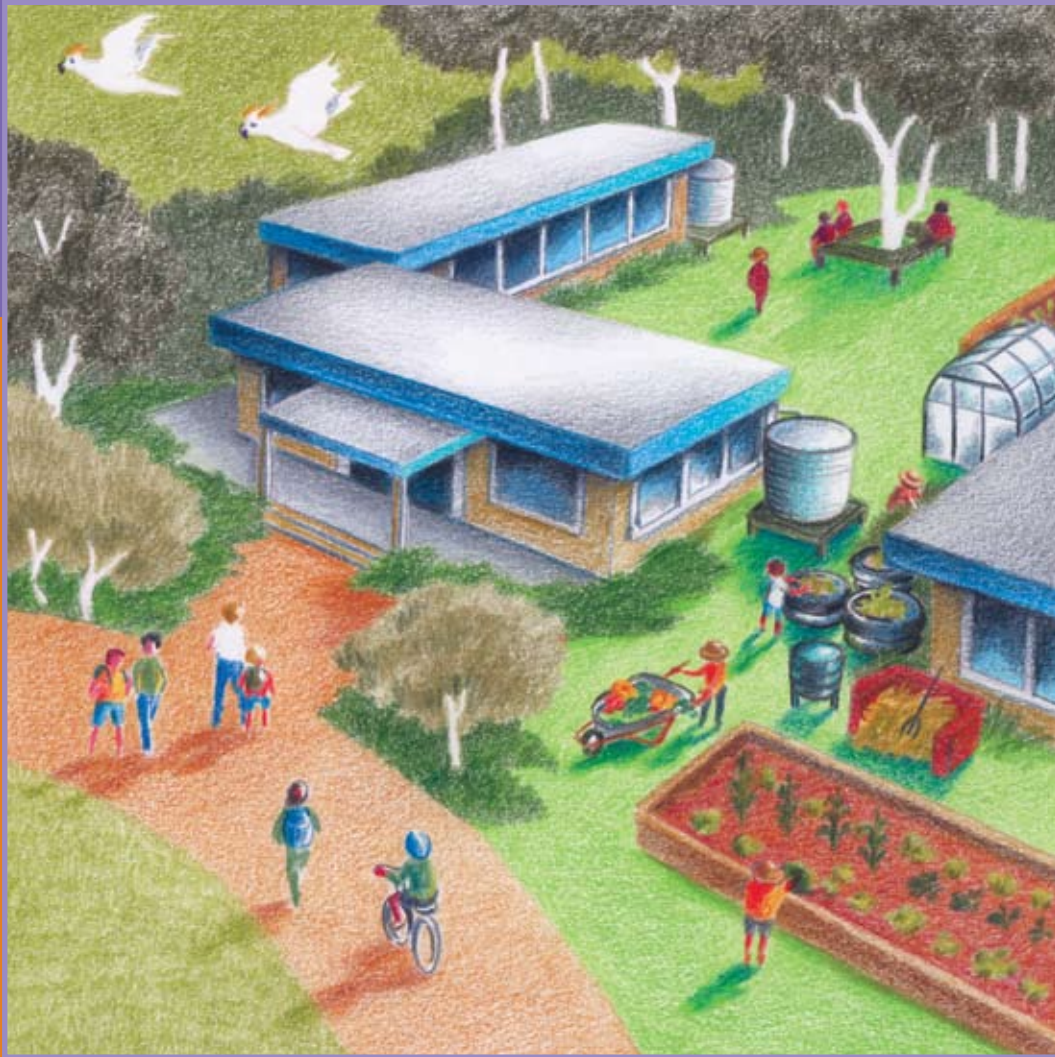
What is the best vehicle to deliver the learning?

Students present their e-scrapbooks to the class for discussion and reflection on their learning during the unit. Students need to address the following strategic questions in their presentation:

- what opinions and predictions were made?
- what examples of abatement and adaptation strategies did you identify?
- what is the difference between greenhouse and enhanced greenhouse effect?
- what causes and impacts of climate change do you see as being important?
- what government strategies do you consider worthwhile?
- what example of a personal strategy do you have?

Reflect on their own needs, understandings and values that you now have. Compare with your thoughts and feelings from the beginning of this unit of work.

climate change for a sustainable future



later adolescence
years 9–10

Australian Sustainable Schools Initiative -ACT

Class: Year 9 - 10

Band of Development: Later adolescence

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The format for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Department of Education and Training Curriculum Framework, *Every Chance to Learn*.

Unit Description

This unit of work is designed to raise awareness and develop understanding in later adolescence students about:

- What global warming and climate change are
- The opinions and predictions of individuals, governments, countries, scientists, organisations, vary depending on needs, understandings and values
- The impact of the enhanced greenhouse effect
- The complex consequences and threats to civilisations of not acting on climate change

Students will explore the responsibilities and actions of:

- Individuals
- Governments
- Global organisations

Students will develop personal actions to minimise climate change by considering how their actions affect their environment.

Big Understandings

1. To understand what climate change is
2. The causes of climate change
3. The effects and consequences of climate change
4. Actions we can take to make a difference
5. We need to keep the Earth not too hot, not too cold - perfect for life

Values and Attitudes

During this unit of work students will have the opportunity to develop the following values and attitudes

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Other Worthwhile Learning Schools may choose to include other worthwhile learning linked to the unit.

- Reading from *We Are the Weather Makers* (Tim Flannery, 2007). Follow with activities based on Bloom's Taxonomy from the associated website.

Essential Learning Achievements

Covered in this unit are ELA 2, 3, 19, 20, 21 and 23. Essential Content has been selected from the later adolescence band of development that is specific to this unit of work.

ELA 2 The student understands and applies the inquiry process

Essential Content

In the later adolescence band of development, students have opportunities to:

- formulate questions, hypotheses propositions and conjecture suitable for testing or investigation in relevant disciplines and frame these to clarify the purpose and scope of the inquiry
- explain trends, patterns, relationships and discrepancies in data and information
- draw conclusions that are consistent with the data or information and provide evidence or supporting details
- document sources of information using reference lists, in-text referencing and captions on images, tables and figures

ELA 3 The student makes considered decisions

Essential Content

In the later adolescence band of development, students have opportunities to:

- make plans and decisions and put them into effect as part of topics, themes or activities across the school's curriculum
- evaluate the role of intuition, feelings, values, beliefs in decision-making and strengthen their capacity for moral and ethical decisions

ELA 19 the student understands and applies scientific knowledge

Essential Content

In later adolescence, students have opportunities to understand and learn about:

- current issues that involve implications of research or applications of science (e.g. Human Genome project)
- scientific concepts and models to explain the interdependence of populations of organisms and the environment, and predict the consequences of changes to an ecosystem⁸
- causes and consequences of global atmospheric changes resulting from natural and human activity (e.g. climate change)
- In later adolescence, students have opportunities to learn to:
 - examine, question and consider scientific ideas, concepts and theories
 - apply scientific knowledge in exploring and constructing views around ethical and social issues relating to science (e.g. genetic modification, stem cell research, animal testing of products, nuclear energy)

ELA 19 The student acts for an environmentally sustainable future

Essential Content

In the later adolescence band of development, students have opportunities to understand and learn about:

- key concepts used in contemporary information and debates about environmental sustainability (e.g. biodiversity, carrying capacity, ecological footprint, preservation, conservation, wilderness, heritage, sustainability, sustainable development)

- events that have significant effects on regional or global ecosystems and describe related environmental, social or economic consequences (e.g. drought, cyclones, bushfires, earthquakes, El Nino, climate change)
- how environmental decision-making often involves dealing with conflicting values and interests of different individuals or groups (e.g. preservation of wilderness, development of non-renewable and renewable resources)
- how peoples' views on the environment influence government policy and non government organisations, and the ways in which governments attempt to address issues of development and sustainability

In the later adolescence band of development, students have opportunities to learn to:

- apply relevant scientific understandings to form personal views and make responsible and informed decisions about issues concerning sustainability (e.g. salinity, nuclear energy production, land degradation)
- consider and explain their own decisions about lifestyle choices and participation in social actions for environmental sustainability
- examine examples of individual and global actions to create sustainable futures, assess their strengths and limitations, and propose further appropriate actions

ELA 21 The student understands about Australia and Australians

Essential Content

In the later adolescence band of development, students have opportunities to understand and learn about:

- contemporary and future issues and challenges facing Australian society

ELA 23 The student understands world events and issues

Essential Content

In the later adolescence band of development, students have opportunities to understand and learn about:

- the relationship between geographical context and particular world events and issues (e.g. the location of water or oil, the rise in sea levels)

In the later adolescence band of development, students have opportunities to learn to:

- analyse and explain different perspectives on a significant world issue or event

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

What climate change, greenhouse effect and enhanced greenhouse effect are.

That decisions and actions students take in their lives have an impact on climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- draw conclusions that are consistent with the data or information and provide evidence or supporting details

ELA 19 understands and applies scientific knowledge:

- current issues that involve implications of research or applications of science
- examine, question and consider scientific ideas, concepts and theories

ELA 20 acts for an environmentally sustainable future:

- key concepts used in contemporary information and debates about environmental sustainability

Assessment

What evidence will there be that they have learnt?

Explain the difference between weather and climate.

Label and explain drawings of the greenhouse effect and the enhanced greenhouse effect.

Identify the greenhouse gases.

Define climate change and global warming.

Identify five actions taken by students that impact on climate change.

Strategy

What is/are the most effective strategy or strategies to teach this?

Review.

List.

Define.

Label.

Identify.

Viewing.

Discuss.

X chart.

Activity

What is the best vehicle to deliver the learning?

Review prior learning about climate change.

Students:

- explain the difference between weather and climate
- label and explain drawings of the greenhouse effect and the enhanced greenhouse effect
- identify the greenhouse gases
- define climate change and global warming

View *An Inconvenient Truth - A Global Warning* or similar documentary. Discuss the films findings, predictions and suggestions for action. Students write three 'what if?' questions to address during the unit.

Students complete an X chart on what they believe climate change looks like, feels like, sounds like and thinks like. Include this in a learning journal to be completed during the unit.

Students identify actions they take at home and in their lives that reduce greenhouse gas emissions.

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

The enhanced greenhouse effect and the way it will impact on the earth.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 19 understands and applies scientific knowledge:

- causes and consequences of global atmospheric changes resulting from natural and human activity

ELA 20 acts for an environmentally sustainable future:

- apply relevant scientific understandings to form personal views and make responsible and informed decisions about issues concerning sustainability

Assessment

What evidence will there be that they have learnt?

Identify and discuss the impact of the enhanced greenhouse effect.

List what some of the impacts are, *e.g. rising sea levels, changing rainfall patterns, decreasing sea ice and melting glaciers, thawing permafrost, increasing cloud cover, global dimming, decreasing evaporation from the earth's surface, changing distribution of plants and animals.*

Strategy

What is/are the most effective strategy or strategies to teach this?

Experiment.

Observation.

ICT.

Question.

Discuss.

Research.

Activity

What is the best vehicle to deliver the learning?

Conduct an experiment exploring how greenhouse gases impact on temperature and on plants. See resources.

In pairs, use the internet and library resources to find a list of the impacts of the greenhouse effect on the Earth. Select three impacts from this list. Prepare questions to further explore each impact: where is it happening? what is directly causing it? what are the indirect causes? what might be the consequences for the ecosystem or human populations?

In small groups discuss the questions students have prepared. Students record thoughts in their learning journals.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

There are differing views, opinions and evidence on climate change.

That well-formed opinions are based on evidence.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- explain trends, patterns, relationships and discrepancies in data and information
- document sources of information using reference lists, in-text referencing and captions on images, tables and figures

ELA 20 acts for an environmentally sustainable future:

- how environmental decision-making often involves dealing with conflicting values and interests of different individuals or groups
- apply relevant scientific understandings to form personal views and make responsible and informed decisions about issues concerning sustainability

ELA 23 understands world events and issues:

- analyse and explain different perspectives on a significant world issue or event

Assessment

What evidence will there be that they have learnt?

Complete issue analysis on one of the impacts of climate change.

Strategy

What is/are the most effective strategy or strategies to teach this?

ICT.

Research.

Analyse.

Synthesise.

Reason.

Consider different perspectives.

Evaluate information and ideas.

Activity

What is the best vehicle to deliver the learning?

Class discussion: If climate change is causing all these problems around the world, why aren't we doing more?

Working in small groups, students collect information from different media (newspapers, government brochures, internet, businesses). Create a spreadsheet collating the information from these sources. Column headings: issues; views; concerns. Summarise the information in the spreadsheet by looking at the similarities and differences between the items.

Working individually, students identify one of the impacts of climate change that is disputed by scientists/environmentalists/ governments. Complete an issue analysis on that impact, including student's personal view on the issue. Students identify the sources of the different views they have collected.

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

There may be complex consequences of climate change that threaten ecosystems and human environments.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- formulate questions, hypotheses propositions and conjecture suitable for testing or investigation in relevant disciplines and frame these to clarify the purpose and scope of the inquiry

ELA 19 understands and applies scientific knowledge:

- scientific concepts and models to explain the interdependence of populations of organisms and the environment, and predict the consequences of changes to an ecosystem

ELA 20 acts for an environmentally sustainable future:

- events that have significant effects on regional or global ecosystems and describe related environmental, social or economic consequences

ELA 21 understands Australia and Australians:

- contemporary and future issues and challenges facing Australian society

ELA 23 understands world events and issues:

- the relationship between geographical context and particular world events and issues

Assessment

What evidence will there be that they have learnt?

Choose one of the impacts of climate change and research its effect on an ecosystem or human society. Present work as a webpage, PowerPoint, poster, project, research report etc.

Research topics could include continuing drought in Australia, declining rainfall in Australia, bushfires, extreme weather events, drought in Africa, Greenland, coral reefs, islands and countries at risk of flooding (Fiji, Tuvalu, Samoa, PNG, Kiribati, Indonesia, Bangladesh, Maldives), Arctic region, changing spread of animal populations, and the loss of animal species.

Strategy

What is/are the most effective strategy or strategies to teach this?

View.

Discuss.

Read.

Comprehend.

Plan.

Research.

KWL chart.

Present.

Activity

What is the best vehicle to deliver the learning?

View the DVD *State of the planet* by David Attenborough. Discuss the impacts of climate change on the environments featured in the series.

Class discussion: Are developing countries at greater risk from climate change?

Reading and comprehension: Refer to part two of *We Are the Weather Makers*. Choose a chapter (or more) to read, then refer to the associated website for activities based on the reading:

<http://www.theweathermakers.com/learn/part2.php>

Select research activity topic and complete a KWL chart. Outline a plan for research and identifying useful sources. Students need to use print, web and visual sources in their research.

Making Connections

Outcomes

What understandings will my students have at the end of the Making Connections stage?

The actions governments and organisations are taking to address the possible consequences of climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 19 understands and applies scientific knowledge:

- apply scientific knowledge in exploring and constructing views around ethical and social issues relating to science

ELA 20 acts for an environmentally sustainable future:

- how peoples' views on the environment influence government policy and non government organisations, and the ways in which governments attempt to address issues of development and sustainability

Assessment

What evidence will there be that they have learnt?

Write a formal letter to the Minister for the Environment (or Shadow Minister) expressing their considered view about an aspect of policy related to a research project or another aspect of climate change.

Prepare an information retrieval grid on the policies of three different environmental organisations. e.g. government actions, emission targets, water usage, carbon trading, individual actions.

Strategy

What is/are the most effective strategy or strategies to teach this?

Write.

Note take.

SWOT analysis.

ICT.

Research.

Information retrieval.

Discuss.

Listen.

Activity

What is the best vehicle to deliver the learning?

Find out the policies of the five major political parties on climate change. In small groups complete a SWOT analysis of the policies.

Select an environmental organisation active in Australia (e.g. Greenpeace, Worldwide fund for nature, Australian Conservation Foundation). Complete as an independent task by using ICT research, or contacting the organisation for information. What is their policy on climate change? What actions are they suggesting governments make? What action are they suggesting individuals make? Share results in class, then complete information retrieval grid.

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

The need to create personal actions for now and the future to minimise climate change.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- make plans and decisions and put them into effect as part of topics, themes or activities across the school's curriculum

ELA 20 acts for an environmentally sustainable future:

- consider and explain their own decisions about lifestyle choices and participation in social actions for environmental sustainability

Assessment

What evidence will there be that they have learnt?

Complete an online survey of an environmental footprint.

Develop an action plan that will reduce the size of the footprint.

Participate in a class action to raise awareness about climate change in the school.

Strategy

What is/are the most effective strategy or strategies to teach this?

ICT.

Self reflection.

Discuss.

Learning journal.

Activity

What is the best vehicle to deliver the learning?

Record their environmental footprint in learning journal and actions they will take to reduce their footprint.

As a class decide on a series of actions to raise awareness about climate change in the school community e.g. create posters, put suggestions in the school newsletter and daily notices. Host a climate change forum with guest speakers.

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

What climate change is.

The causes of climate change.

The effects and consequences of climate change.

Actions we can take to make a difference.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- evaluate the role of intuition, feelings, values, beliefs in decision-making and strengthen their capacity for moral and ethical decisions

ELA 20 acts for an environmentally sustainable future:

- consider and explain their own decisions about lifestyle choices and participation in social actions for environmental sustainability

Assessment

What evidence will there be that they have learnt?

Self-assessment of their activity and work.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discuss.

Reflect.

Respond.

Share.

Activity

What is the best vehicle to deliver the learning?

Students complete the following strategic questions in their learning journal:

- what opinions and predictions were made?
- what is the difference between greenhouse and enhanced greenhouse effect?
- what causes and impacts of climate change do you see as being important?
- what government strategies do you consider worthwhile?
- what environmental organisations strategies do you consider worthwhile?
- what example of a personal strategy do you have?

Review the X chart and reflect on their learning during this unit of work. Students comment on developments and changes in their needs, understandings and values that they now have.

Resources and References

Books and Articles

- Boehm-Jerome, K 2003, *Protecting the Planet*, Rigby, Port Melbourne
- De Bono, E 1999, *Six Thinking Hats*, Edward De Bono, MICA Management Resources, United States of America
- Flannery, T 2006, *We Are the Weather Makers*, Text Publishing, Melbourne
- Gardner, H 1983, *Frames of Mind. The Theory of Multiple Intelligences*, Basic Books, New York
- Jakab, C 2007, *Clean Air and Water, Global Issues*, MacMillan Education Australia Pty Ltd, South Yarra, Victoria
- Jakab, C 2007, *Overpopulation, Global Issues*, MacMillan Education Australia Pty Ltd, South Yarra, Victoria
- Jarman, M 2006, *The Impact of Big Business*, Franklin Watts Australia, Sydney
- Lang, J 2007, *How to Succeed with Education for Sustainability*, Curriculum Corporation, Carlton, Victoria
- Our Environment, Topics to Go*, 2007, Rigby, Port Melbourne
- Poddington, L 2006, *Global Warming - Understanding Pollution*, Franklin Watts Australia, Sydney
- Stewart, S 2004, *Save our Earth*, Pearson Education Australia
- Territory and Municipal Services, ACT Government, 2007, *Weathering the Change*, The ACT Climate Change Strategy 2007–2025
- The Canberra Times, supplement 2007, *The Poles, the Climate and Change*
- Trafford, C and Wilsher, D 2007, *Weather or Not... It's a Climate for Change*, Etram, Australia

Websites

- ACT Sustainable Schools website - provides excellent links to websites and other resources about climate change
http://www.sustainableschools.act.gov.au/climate_change
- An Inconvenient Truth website <http://www.aninconvenienttruth.com.au/truth/>
- Australian Government Greenhouse website - education fact sheets <http://www.greenhouse.gov.au/education/factsheets/index.html>
- Be Climate Clever brochure (pdf) <http://cc.greenhouse.gov.au/publications/pubs/climateclever.pdf>
- Be Climate Clever - Australian Government website www.australia.gov.au/climateclever
- Bureau of Meteorology website <http://www.bom.gov.au/>
- Climate Change Kids website <http://epa.gov/climatechange/kids/index.html>
- Cool the Globe - a website that provides information on climate change and ideas to reduce the impact of global warming
<http://www.cooltheglobe.com/index>
- Experiment using data loggers to show the thermal properties of CO₂ website
<http://www.picotech.com/experiments/global/globalwarming.html>
- Global Warming - YouTube multimedia presentation about climate change <http://www.youtube.com/watch?v=ov6GPTB4Tio>
- Graphs related to Residential Consumption per Person in Australia <http://www.sustainableschools.act.gov.au/>
- Greenhouse Co-operative Research Centre website http://www.greenhouse.crc.org.au/about_greenhouse/
- Greenhouse Calculator (<http://www.epa.vic.gov.au/GreenhouseCalculator/calculator/default.asp>)
- Greenhouse Effect and the Enhanced Greenhouse Effect website http://www.sustainableschools.act.gov.au/climate_change
- Google Earth search engine <http://earth.google.com>
- Kyoto Protocol - Australian Government Greenhouse website <http://www.greenhouse.gov.au/international/kyoto/index.html>
- Kyoto Protocol for Beginners website <http://www.cana.net.au/kyoto/>
- Ollie's Island and Ollie Saves the Planet website <http://www.olliesworld.com/>
- SA Department of Environment and Heritage website <http://www.environment.sa.gov.au/reporting/education/index.html>
- Weathering the Change - The ACT Climate Change Strategy 2007–2025. Publication available online
http://www.tams.act.gov.au/__data/assets/pdf_file/0003/63624/Climate_Change_Strategy.pdf
- Weather or Not... It's a Climate for Change website www.planetkids.biz
- We Are the Weather Makers website <http://www.theweathermakers.com/>
- What is the Greenhouse Effect website <http://www.greenhouse.gov.au/science/faq/question1.html>

Resources and References

CD-ROMs, DVDs, Videos, Kits, and Posters

An Inconvenient Truth - A Global Warning 2006, Documentary film, Participant Productions, USA. Distributed by Paramount Classics

Ollie's World Series

Ollie Saves the Planet 2002, CD-ROM, Sustain Ability International Pty Ltd, Camberwell, Victoria

Ollie's Island 2007, CD-ROM, Sustain Ability International Pty Ltd, Camberwell, Victoria

State of the Planet 2000, DVD, three-part environmental documentary series, British Broadcasting Corporation, London. Presented and narrated by David Attenborough

The three programmes cover the scientific understanding of the crisis, the extent to which humans are implicated in the wave of extinctions currently sweeping across our planet, and the ways in which we might slow or halt the current precipitous decline in Earth's biodiversity.

Scenarios for Climate Change for a Sustainable Future - Later Childhood

Scenario 1: The local landfill site will be full at the end of the following year. A new landfill site needs to be developed to store the waste of the community. The proposed site is near a residential development.

Stakeholders: Chief Minister, local resident, environmental impact spokesperson, waste contractor.

Scenario 2: Your local shopping centre keeps all their lights on 24 hours a day.

Stakeholders: ACTEW, cleaning contractor, facility manager or shop owner, energy expert (HEAT Team).

Scenario 3: A community that lives in the Arctic needs to relocate to another region because their homeland is disappearing due to changing sea levels.

Stakeholders: Immigration Minister of Homeland, Immigration Minister of relocation region, community members from both locations.

Scenario 4: A road near your home needs to be widened to accommodate increasing traffic flow.

Stakeholders: Resident from local area, road construction company manager, environmental conservation representative, public transport representative, car driver that will be using the new road.

(The model scenario to use for the whole class introduction could be a similar scenario to number 3, but an island that is disappearing that was researched from the previous tasks).

Resources and References

Three level guide activity

Abatement and Adaptation

Abatement - any action to reduce the emission of greenhouse gases from human activities- eg installing energy efficient light bulbs.

Adaptation - any action to respond to the anticipated or actual conditions related to climate change - eg the development of future water options.

Abatement and Adaptation

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 citizens we must take responsibility for our own emissions and work to reduce them.

Adaptation strategies can reduce our vulnerability to changes in climate at the local and regional level and over short time scales. They allow communities to develop a capacity to avoid or minimise the negative effects of climate change.

Solutions must focus on both abatement and adaptation.

From: http://www.tams.act.gov.au/__data/assets/pdf_file/0003/63624/Climate_Change_Strategy.pdf

Literal

1. "Installing energy efficient light bulbs is an abatement strategy." True or false?
2. "Developing future water options is an adaptation strategy." True or false?
3. "Solutions must focus only on abatement." True or false?

Interpretive

1. "Although Australians contribute very little to global emissions, every small step has an impact on climate change." True or false?
2. "Communities can avoid the negative impacts of climate change by working together." True or false?

Analytical

1. "As global citizens, we all have a responsibility to the planet to reduce our impact on climate change." True or false? Explain your answer.

The Greenhouse Effect in a Jar

This simple experiment serves as an introduction to the greenhouse effect. Students can see for themselves the effects of a greenhouse, and relate this understanding to what occurs in our atmosphere.

Objectives:

1. Help students understand the greenhouse effect as a physical phenomenon.
2. Use simple experimentation techniques including: observing and recording data, use of a control, drawing conclusions from results, use of a model.

Materials:

For every group of (about) four students:

- 2 Small thermometers
- 1 Jar or other see-through container
- 1 Clock or watch
- 1 Copy of the worksheet

Sunlamp or access to a sunny area to perform the experiment

Method:

Group the students and distribute the materials. Each group should place their thermometers a few inches apart under the sunlamp or in direct sunlight.

Wait about three minutes so the thermometers will be giving accurate readings, and then have the students record the temperature readings on both thermometers as well as the time.

Each group should now place their jar over one of their thermometers, taking care that the jar does not cast a shadow over the uncovered one. If the thermometers are too large to remain horizontal inside the jars, it is fine to stand them against an inner side. Every minute, for ten minutes, the students should record the readings of both thermometers.

Explanation

The air over the exposed thermometer is constantly changing, and as it gets warm it is replaced by cooler air. Because the air in the jar cannot circulate to the rest of the room, this air stays in the sunlight and gets warmer and warmer. A similar trapping of heat happens in the Earth's atmosphere. Sunlight passes through the atmosphere and warms the Earth's surface. The heat radiating from the surface is trapped by greenhouse gasses. Without an atmosphere, the Earth's temperature would average about 0°F. This warming due to heat-trapping gasses is called the "Greenhouse Effect." Both the atmosphere and the jar allow light to enter, but then trap that energy when it is converted to heat. They work differently, however, because the jar keeps in the heated air, while the greenhouse gasses absorb radiative heat.

Going Further:

Students can graph their data. To simulate global warming, the experiment can be done using two jars, one filled with air and the other with carbon dioxide.

The Greenhouse Effect

Instructions

- 1) Place the two thermometers in the sunlight for a few minutes to let them get warm.
- 2) Record the readings of both thermometers at the top of the columns.
- 3) Record the time next to the starting temperatures and place the jar over thermometer #1.
- 4) Every minute, record the readings of both thermometers without disturbing them.

Data

| Observation Number | Thermometer #1 | Thermometer #2 |
|--------------------|----------------|----------------|
| Time | | |
| Start | | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

This experiment could be extended to witness the impact of greenhouse gases on plants. Plant three seedlings in separate containers. Cover two with a jar or plastic cup. Into one of these add CO₂. The third jar should be left uncovered. Observe the impact on the plants over a period of seven days.

Issue analysis

This is the issue:

Some ways of thinking about the issue:

View one

View two

View three

View four

****Provide reference details of where these views came from. ****

The way I think about the issue and why:

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. | direct impact | Something that has a direct and instant impact on the earth e.g. A.C.T. 2003 bushfires, Chernobyl. |
| 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. | energy | The power which lets people and machines move, or provides light and heat. |
| atmosphere | The mixture of gases surrounding the Earth, any star or planet. | emissions | Sending gases out into the atmosphere. |
| 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. | emission target | Limitations to reduce the release of air-borne substances. |
| 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. | 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) |
| BOM | Bureau of Meteorology (Australian Government) | enhanced greenhouse effect | The increase in the concentration of greenhouse gases in the atmosphere due to human activity. |
| Carbon Dioxide | A colourless odourless gas formed by the CO ₂ 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 CO ₂ in the atmosphere. | fugitive emissions | Emissions from transporting energy from generators to customers (e.g. through powerlines). |
| carbon neutral | Being carbon neutral means that you produce no net emissions of carbon dioxide. | gases | Any irrespirable aeriform fluid. |
| carbon trading | The buying and selling of permits allowing people to emit set amounts of carbon in the atmosphere. | greenhouse gases | Gases that trap heat close to the Earth's surface. There are around 30 greenhouse gases, of which CO ₂ is the most important. |
| Chlorofluorocarbons(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. | greenhouse effect | A phenomenon where greenhouse gases re-radiate the sun's warmth and maintain the Earth's surface temperature. |
| climate | The regular weather conditions of an area. | global warming | The warming of Earth's surface through air pollution or the natural release of greenhouse gases into the atmosphere. |
| climate change | Changes to the climate systems as a result of global warming. | Hydro fluorocarbons HFCs (Greenhouse gas) | Gases that are created by processes such as aerosol use, air conditioners, production 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) (Greenhouse gas) | A naturally occurring gas generated by 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. |

Glossary

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 our houses, 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