

What is Sustainability?

Lesson Preparation

You'll need :

- Single copy of the “What is Sustainability anyway? – Info Sheet”
- Digital projector
- Computer in the classroom with Internet access **or** a copy of Dr. Seuss’ *The Lorax*

Students will need:

- Their notebook

Lesson Summary

The class reads an info sheet, starts a glossary, watches the video “The Lorax” by Dr Suess, brainstorms how the ‘Onceler’ could have made his ‘Thneed’ production sustainable and discusses some questions based on the video.

Lesson Plan 1

As a class read through the “What is Sustainability? – Info Sheet”.

The class should start a glossary for this new topic. While reading the info sheet, help students to identify words that might start their glossary.

The class now watches episodes 1, 2 and 3 of Dr Suess’ “The Lorax”. If you have a slow download speed, you should start downloading as soon as class begins.

The Lorax (part one) 9min49sec - <http://www.youtube.com/watch?v=GECJcW2Ifm4>

The Lorax (part two) 9min51sec - <http://www.youtube.com/watch?v=Ko5oojUQe0Q>

The Lorax (part three) 5min33sec - <http://www.youtube.com/watch?v=dcT2ex5S1gI>

Alternately you could read the book.

As a class, brainstorm how the Onceler might have made his production of Thneeds more sustainable. You might get students to write up their own ideas on the whiteboard. Depending on time – the class might copy down this brainstorm into their notebooks.

Before you go on to discuss the video with the class, ask 3 students to read the following quotes to the class:

“The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired in value.” - **Theodore Roosevelt** - ex-President of the USA.

“In the long term, the economy and the environment are the same thing. If it’s unenvironmental it is uneconomical. That is the rule of nature.” - **Mollie Beattie** - first woman to head the U.S. Fish and Wildlife Service.

The ultimate test of a moral society is the kind of world that it leaves to its children.” - **Dietrich Bonhoeffer**, a German theologian who opposed Adolph Hitler and Nazi Germany.

The class now discusses the video using the following questions as a starting point. There are many correct answers for these questions.

- 1) Why was the man called the Onceler?
- 2) Why was the word “Thneed” a good choice?
- 3) What did the Lorax represent?
- 4) Where did the Lorax go?
- 5) What does the Onceler ask the boy to do at the end of the video?
- 6) What can we do to not follow in the footsteps of the Onceler?

N A R M B O O L

What is Sustainability anyway?

<http://www.landlearnsw.org.au/sustainability/what-is-sustainability>

Is sustainability about people and culture, our environment, or jobs and money? Is it about cities or the country? Is it about you and me or is it something for other people to worry about? Sustainability was a phrase coined in the 1960s, however when you look at the principles of sustainability, it has been a way of life that has been around for centuries. In the 1850s for example, it wasn't necessarily something that people made a conscientious decision to do, it was a way of life. They did things like recycle clothing, grow their own food etc., because they didn't have a choice. It came down to money – if they didn't grow their own vegetables they didn't eat.

Sustainability is about learning to do more with less. It means getting the most out of the world's scarce and finite resources. It's not about locking up the environment, it's about learning to live in it, within our means and within the means of future generations.

Sustainability could be defined as an ability or capacity of something to be maintained or to sustain itself. It's about taking what we need to live now, without jeopardising the potential for people in the future to meet their needs.

If an activity is said to be sustainable, it should be able to continue forever.

Some people say it is easy to recognise activities that are unsustainable because we know it when we see it. Think of extinction of some species of animals, often due to the activities of humans. Or salinity (salt) in our rivers due to changed land management practices. And at home, the amount of packaging you put in the bin that has to go into landfill.

Living sustainably is about living within the means of our natural systems (environment) and ensuring that our lifestyle doesn't harm other people (society and culture). It's a big idea to get your head around, for all of us. It's really about thinking about where your food, clothes, energy and other products come from and deciding whether you should buy and consume these things. For example, you can buy timber imported from other countries to use in your home, but do you know enough about the rules in place in those countries to prevent animals from being harmed during the timber harvesting process, or if the local indigenous people support the harvesting, or how much they get paid?

Increasingly our lifestyle is placing more and more pressure on natural systems. Scientists continue to investigate how human interactions with natural systems can be improved and sustained.

A good example of a sustainable practice is timber harvesting from native NSW state forests.

Native forests have many uses and values. They provide us with timber, clean water and air and we value the biodiversity they contain, their beauty and links to Aboriginal culture. Timber is harvested from the same native forests over and over again in NSW. These forests continue to provide us with timber. How? No more timber is cut than the forest can regrow.

Also, many other factors are considered before any trees are cut down, including soil type, plants and animals and cultural heritage sites. Timber harvesting in native forests is carried out so that erosion is minimised, threatened species habitat and cultural heritage sites are protected, and trees remain to provide seed so the forest can regrow naturally after harvesting. In fact timber harvested from NSW state forests has been independently certified as a sustainable product.



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Lesson Plan 2

Lesson Preparation:

SmartBoard or other Video Playing Device

Internet Connection

Brainstorm

What are some things that you can do or are already doing to live sustainably? Why? How does it help?

A very wise person once said about the future of energy use, “ I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until coal and oil run out before we tackle that!”

Who do you think said that? When was it said?

Thomas Edison made that comment in 1931. Thomas Edison, inventor of the power hungry incandescent lightbulb, wasn't an environmentalist by any stretch of the word. Many of his inventions were power hungry, but in 1912 Edison unveiled an energy self-sufficient home. Like many scientists at the time, Thomas Edison was beginning to realise that fossil fuels wouldn't be around forever.

Activities :

Modern society is heavily reliant on electricity. Electricity heats our homes, runs traffic lights, many communication systems, our offices are filled with electronic devices many of which will not function without it. What if the lights went out?

On August 14th, 2003 New York City experienced it again (first time in the 1960's) and became shockingly aware of how detrimental electric is to our modern world and how detrimental our modern world can be to the fabric of our communities and communality as a people. For some the day was a nightmare, for others it was one of the greatest evenings of their life.

The world's consumption of electricity is staggering and with it come the burning of numerous types of fossil fuels, oil, coal and natural gases. What are our alternatives, bio-fuels, solar, wind, hydro, hydrogen and nuclear. Students have an opportunity to investigate each and the pro's and con's of these choices.

Questions:

What do we use electric for, what would your life be like without electrical power? Have you ever experienced a blackout? What would it be like if the power never went back on?

What sources of fuel are mainly consumed to produce electricity in the world? What are our alternatives? What are the benefits and repercussions of all of these sources?

Activity 1: New York City Blackout Documentaries

Have students watch several documentaries of the New York City Blackouts in 1965 and 2003, then discuss their thoughts on each one in small groups followed by a class discussion.

New York Black out 1965 : <http://www.youtube.com/watch?v=IMaTOJSAU1A>

New York Black Out 2003 : <http://www.youtube.com/watch?v=J6wBTKz3HV4&feature=related>

Activity 2: Electrical Consumption Boggle

Quick Boggle Style Game:

Have students list in 3 minutes the items that they use daily or on a regular basis that require electric in some fashion.

Have one student read off their list, all other students should cross off their item if it matches the other student. So long as someone has an item still listed the read off should continue. This will help students realize items they may have forgotten about and how much their daily lives call for electric.

Activity 3: Fossil Fuel - Think, Pair, Share

Have students discuss their thoughts and ideas about the three different fossil fuels (oil, coal, natural gas). Students should address these questions:

Which of these is less harmful to our environment? Which has a greater supply available? Where are the supplies? What are the benefits and detriments of each of these fuels?

Class sharing after 10-15 minutes.

4: Alternative Fuel Debate

Split the class into four-six groups, each group will argue for the use of a particular fossil fuel and try to refute all others in a debate. Students should be given time in class to collaborate, conduct additional research.

The groups are in favor of:

Bio-fuel

Solar

Wind

Nuclear

Hydrogen

Ocean Current/Hydroelectric

Conclusion and Wrap Up

"All power corrupts, absolute power corrupts completely" this thought is usually used in regards to political ideals however in hind sight the world's reliance on fossil fuels has corrupt many aspects of daily life, the economy and world relations. Students should walk away with a better understanding that diversification and not sole reliance on one energy source is currently the only true solution to our energy problems.

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Lesson Plan 3

Hazardous foods

Lesson Preparation

You'll need :

- Food catalogues – Safeway, Coles IGA etc.

DDT and Nitrates

There are numerous chemical used in daily lives to benefit mankind from household cleaners, to pesticides, beauty products and more. One of the most controversial is pesticides, we see the revolt of millions through the purchase and increasing popularity of organic products.

Perhaps one of the most controversial of chemicals in the 20th century was DDT. Nitrates are also commonly used as fertilizers, within streams, lakes and water tables are poisoned because of natural run-off. Populations of fish suffer, people are poisoned and more.

No impact has been greater on the Peregrine Falcon than the widespread use of DDT, which saw their decline and extinction from vast areas of the world during the 1960s and 1970s. Pesticides build up in concentration as they spread through the environment, eventually reaching peak concentrations in the tissues of the predators at the top, namely human beings and birds of prey such as the Peregrine Falcon.

The impact of DDT on the species went unnoticed for a long time. This was due to the long lived adults continuing to inhabit the nesting sites for many years thus masking the low numbers of young birds and corresponding reduction in the breeding population. When the devastating effects of DDT and similar pesticides did come to light, as documented in Rachel Carson's landmark book *Silent Spring*, the Peregrine Falcon became a worldwide symbol for the environment movement. The decline of this species, found on all continents except Antarctica, alerted the world to the characteristics of these agricultural chemicals.

The drastic thinning of eggshells caused by DDT affected Australian populations of Peregrine Falcons to some extent, but losses were not as severe as those in the Northern Hemisphere before restrictions on pesticide use were introduced.

Food as a Hazard

Through the evolution of plants and animals, nature has come up with pesticides and chemicals of her own. Is organic farming an answer to issues like DDT and nitrates? It has been said already that our arable land is all but used up, organic farming produces less food, what if we have already committed to land use for bio-fuels?

Questions:

Is buying organic products a good thing for the environment and others in the world? Is the use of herbicides and pesticides always bad? Thinking into the future and knowing that the Earth may not be able to sustain the population after a certain level with our current technologies, will these ideas change your food purchasing decisions?

Activity 1: Organic or Regular?

Bring in items and their prices of both organic and inorganic foods. Break class into four groups of up to eight students and have the students go "shopping". Each group should discuss their purchases and decide on what is best to buy for the week's supplies and why they are choosing those particular items. Price limit should be given as well or picked out of a hat. Adding a rich family a moderate income family, a below income family and a family on benefits should add interesting results to the game.

Class discussion/debate on resulting decisions.

Activity 2: Understanding Our Decisions

Each student should write up a brief summary of why each income level has chosen what food products. Students should give their opinions to the decisions made after each summary.

Activity 3: Calculating Vegetarianism

Students will be broken up into small groups of no more than four, half the groups will promote vegetarianism and the other group will promote standard diets.

Each group needs prove mathematically why their side is correct, *i.e. imagine the world's population is 11.5 billion people, each person needs 1.5 acres of arable land to supply enough vegetarian food for a year. How much land is needed to sustain the whole world as vegetarians?*

Students will debate their side in the next class.

Activity 4: Self Reflection and Your Future

Students have become increasingly more aware of how our daily decisions can change the world for better or worse. Have students reflect quietly in about themselves now and their thoughts about their decisions in the future. This may be collected, though I suggest allowing the students to put them away in a safe place to read several years later like a time capsule.

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Lesson Plan 4

Technology for a Sustainable Retreat

Now that you have some idea of sustainability your task is to **design a house** that uses resources in a sustainable way. You will need to consider these aspects:

- Energy use
- Water use
- Climate control

You need to find out what features you should include in your house design to take account of sustainable use of resources. To achieve this you will need to consider ways to achieve:

- Sustainable use of energy
- Water collection and storage
- Climate control for comfortable living

Your **first research activity** involves looking at **how things were done in the past**. This will help make decisions about what might be useful ideas for the future.

Activity: Analysis of early Victorian/Melbourne House

1. Find a photo or series of photos of an older style house. You may even be able to find one around your school.
2. Complete the Sustainable Housing Features worksheet below (you may need multiple copies if analysing more than one feature).

Activity: Analysis of modern Victorian/Melbourne House

Repeat 1 and 2 above for a modern Victorian House. You might choose your own house for this activity.

Compare the two types of houses for design and materials then choose what features and materials you might like to use in your house design.

A visit to the CERES Community Environment Park's EcoHouse in Brunswick East may be of some use to your project. The EcoHouse is open on the last Saturday of every month from 10am til 1pm.

SUSTAINABLE HOUSING FEATURES

	Old House	Modern House
<p>Features :</p> <p>What is it? Describe, draw or photograph your house feature.</p>		
<p>Construction :</p> <p>How was your feature made? What materials were used to make your chosen feature?</p>		
<p>Purpose :</p> <p>What was the main use for your feature?</p> <ul style="list-style-type: none"> - Structure strength? - Energy saving? - Water control? - Heating or cooling? - Decorative? - Safety? - Pest control? 		
<p>Design :</p> <p>What special features does it have to perform its purpose?</p>		
<p>Function :</p> <p>How well do you think it worked?</p>		
<p>Sustainability Value :</p> <p>How sustainable is the use of this feature?</p>		
<p>Past Present Future</p> <p>What have we learned from this feature about how to do things better?</p>		

Your **second research activity** requires you to **search reference books and websites** for more information about design features and materials for sustainable housing.

Make a list of the features and materials you would use in your house. Remember you must choose on the basis of energy, water or climate control.

Draw a sketch of a house and add some labels to highlight features and materials.

Activity: Information search

1. Use your library to search for reference books on sustainable housing.
2. Use the internet to search for reliable sources of information. Try government and business sites that have research data to present. Be careful of sites that may not have research data to back up their claims.
3. Make a summary of your findings and create a new list of features and materials.

Sustainable Features to include	Materials you would use

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A Sustainable House



Your **third research activity** requires you to conduct some **scientific tests** to determine suitable materials or design features to include. You are not expected to perform all tests but **at least one** should be completed and referenced in your design.

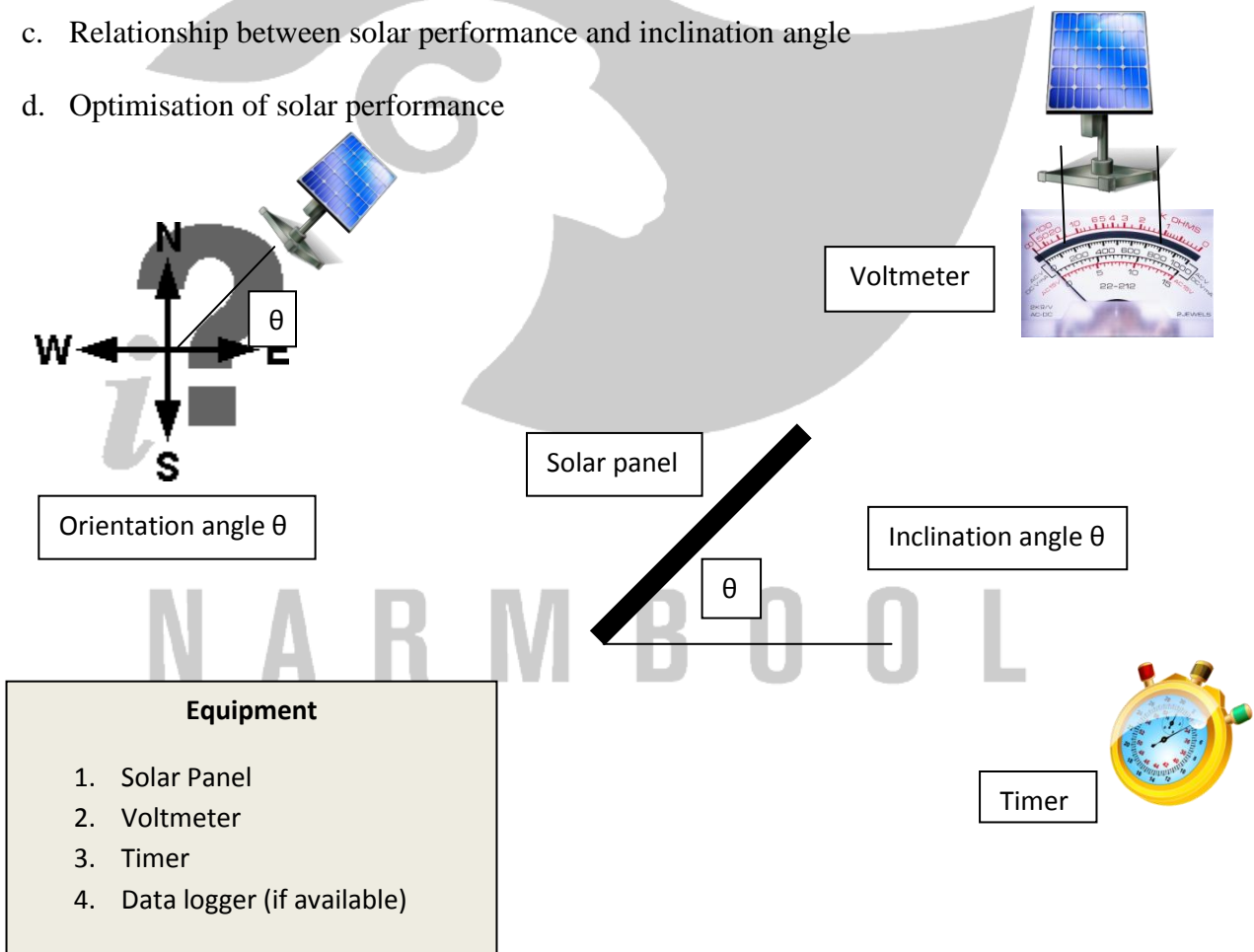
Activity: Scientific Investigations

For each of the possible topics below, you will need to design and carry out your own experiment. Before carrying out the experiment, you will need to show your method, equipment list and result table to your teacher.

1. Solar Energy

Investigations:

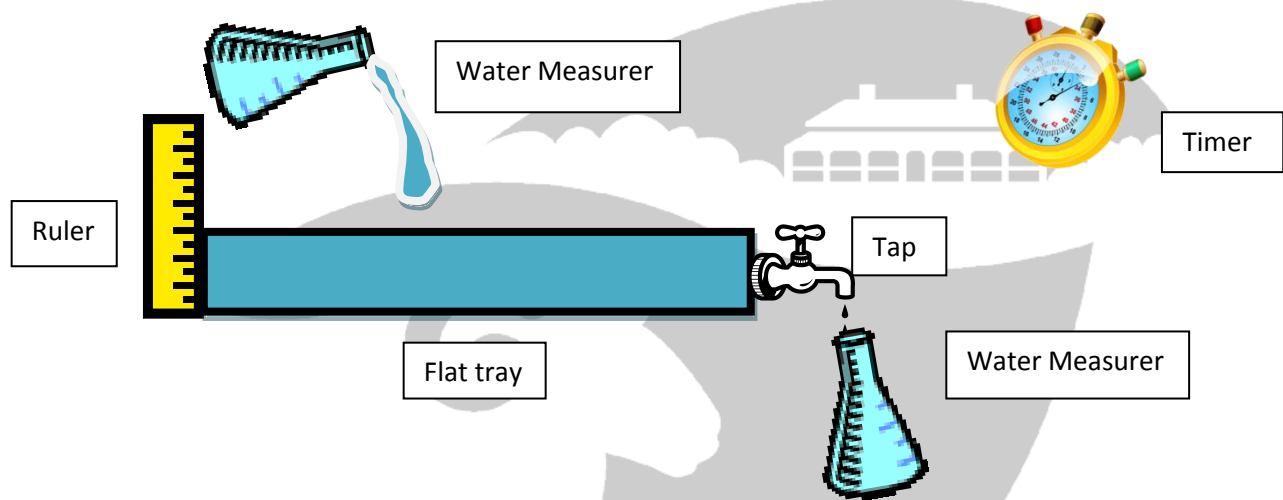
- Solar path determination
- Relationship between solar performance and orientation angle
- Relationship between solar performance and inclination angle
- Optimisation of solar performance



2. Water collection and storage

Investigations :

- Relationship between rainfall, water collection and roof area
- Rate of usage vs rate of collection
- Determination of required storage capacity



Equipment :

- 2 x Water measurers (beakers, conical flasks etc.)
- Ruler
- Large flat tray with tap at the bottom
- Timer
- Data Logger if available

B O O L

3. Thermal properties

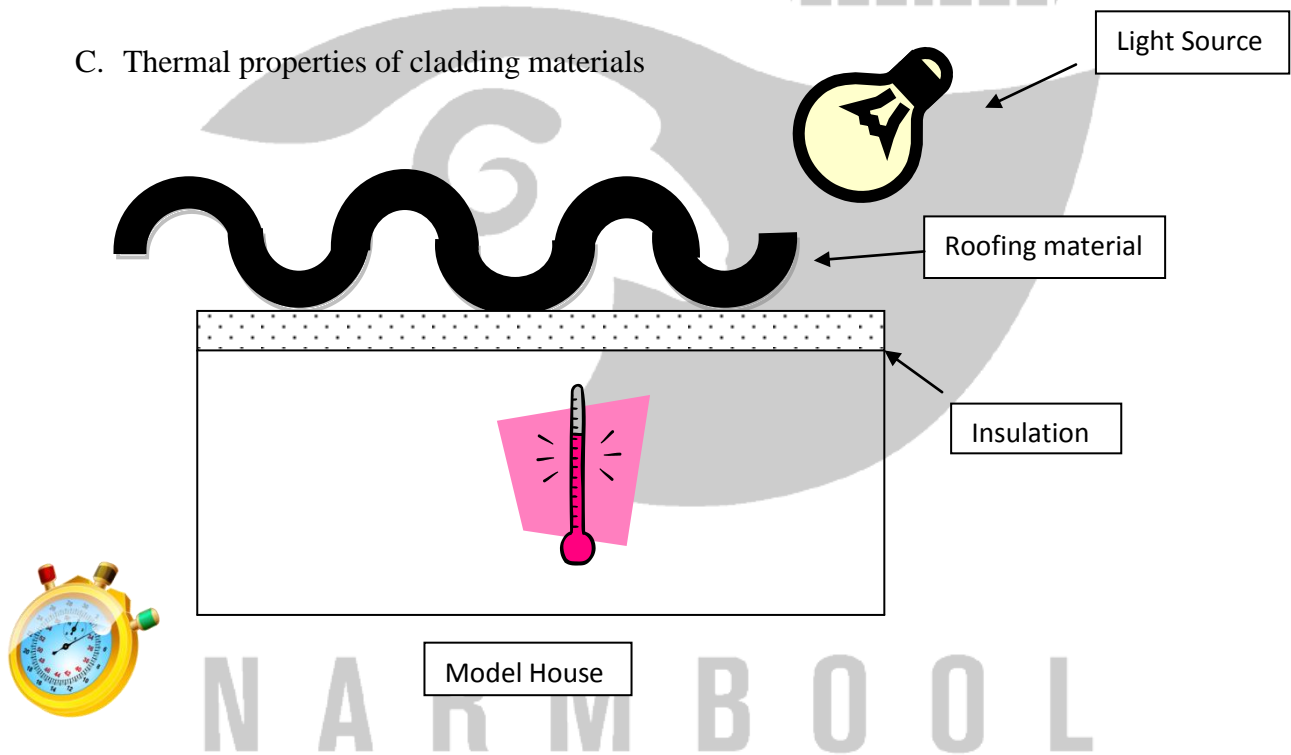
Investigations :

A. Heat transfer to air cavity

- i) Control
- ii) Insulation materials
- iii) Roofing colours
- iv) Roofing with insulation

B. Effects of overhang (eaves) on air cavity temperature

C. Thermal properties of cladding materials



Equipment :

1. Model house (shoe box)
2. Digital thermometer (internal and external temperature)
3. Insulation materials cut to size
4. Samples of roofing colours cut to size
5. Data logger if available

Revisit your list of materials and features and add to it to include some of your research findings.

You should now have considered all the features and materials that you wish to include in making your sustainable house.

- a. Using suitable graphics software or pencil and paper, make a labelled drawing of your design.
- b. Also include a list of included features and materials with the reason for inclusion in terms of energy, water or climate control.

What have you learned about sustainable house design?
How well do you think you achieved your design brief?
How you might improve your design?

Activity:

In groups of four:

1. Create your own first draft drawing of your sustainable house on A4 paper
2. Share your idea with the other three in your group and discuss different designs
3. Create a combined design and draw this with written explanations on A3 paper
4. Post the design on the wall and nominate a group design explainer.
5. The remaining group of three circulates and asks questions about other designs
6. Return to home group and discuss findings. Make changes to your design as necessary.

Activity: Model

Either:

1. You now may be able to **construct a model** of your design or a key feature of it. This will require additional resources for which you will need to consult with your teacher. Make sure your model is **built to scale** and is an accurate representation of your design.

Or:

2. You may be able to develop a presentation of your design to present it to a selected audience. Consult with your teacher on who the audience will be.

Resources :

DVDs :

An Inconvenient Truth - DVD

The Lorax (download in three parts from You Tube).

Books:

Carson, R (1962) *The Silent Spring*, Houghton Mifflin, United States

Lovelock, J (2006) *The Revenge of Gaia*, Penguin, England

Internet sites :

- 1) Bluescope Steel thermal properties : <http://www.colorbond.com/news/10-tips-for-a-good-investment-in-home-energy-reduction>
- 2) Cradle to Cradle : <http://www.closedloop.com.au/casestudy.php?id=2>
- 3) James Hardie Building materials : <http://www.jameshardie.com.au/designtools> (click on the Smarter Green Book)
- 4) Master Builders Association Sustainable Housing design :
<http://www.mba.org.au/public/page.php?id=79>
Part one – Site and building access Part two – The Entrance Part three – Thermal comfort
- 5) Renovators Guide and Technical Manual are the most informative links.
- 6) Roof design : <http://www.texas huntfish.com/app/wildlife-resources/24585/Texas-Manual-on-Rainwater-Harvesting>
- 7) Your Home Design : <http://www.yourhome.gov.au/>



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