



## Introduction

The EcoLogic exhibition is suitable for both the very young and senior students. It will help equip students with a knowledge and understanding of environmental and social issues and encourage them to work with the environment and each other in shaping their future.

EcoLogic presents the magnitude of environmental problems facing Australia and the world. It also presents a positive picture of an ecologically sustainable future through case studies and real life stories that are changing the way we live, manufacture and work.

The exhibition takes a good look at the science, causes and predicted consequences of global warming. It provides clear information, explores the options we have for responding to the scientific evidence, and emphasises strategies for adapting to changing climatic conditions.

The exhibition is divided into four sections:

1. Carbon Gallery
2. Redesigning our world
3. Water Gallery
4. City Living

## In these notes you will find

- Curriculum links (page 2)
- Exhibition floor plan (page 3)
- Exhibition themes for each section (page 4-8) – highlighting key messages, objects, audiovisuals and interactives
- Related Powerhouse exhibitions, programs and learning resources (page 9) – to further enhance your students' visit to EcoLogic before, during and afterwards.

## Curriculum links

EcoLogic provides an integrated, interactive, contextual and multimedia environment that encourages reflection, enquiry, experiential and collaborative learning. Both issues on climate change and water presented in the new EcoLogic exhibition provide the perfect context in support of students' learning in this area. The exhibition and its resources support education for sustainability in helping students:-

1. assess competing viewpoints, values and interests;
2. manage uncertainty and risk
3. make connections between seemingly unrelated concepts, ideas and outcomes;
4. test evidence and propose creative solutions that lead to improved sustainability (Sustainability Curriculum Framework, pp. 4 & 5, Department of the Environment, Water, Heritage and the Arts, 2010)

### Primary curriculum links

EcoLogic has a cross-curricular focus and is highly relevant for primary school students. All strands of the Science and Technology syllabus are featured. Ecologically sustainable lifestyles are a major focus of the Environmental strand of the HSIE syllabus.

### Secondary curriculum links

EcoLogic meets the Stages 4&5 Science syllabus objective that students will develop knowledge and understanding of the implications of science for society and the environment.

The exhibition supports Stages 4&5 Geography that students develop a knowledge and understanding about how people and communities modify, and are affected by, the natural environment.

For Stages 4&5 Design and Technology, it supports the objective of developing a knowledge and understanding about the impact of technology on the environment.

The exhibition also supports Stage 6 subjects of Geography, Earth and Environmental Science, Senior Science, Design and Technology and Society and Culture.

### Environmental Education Policy

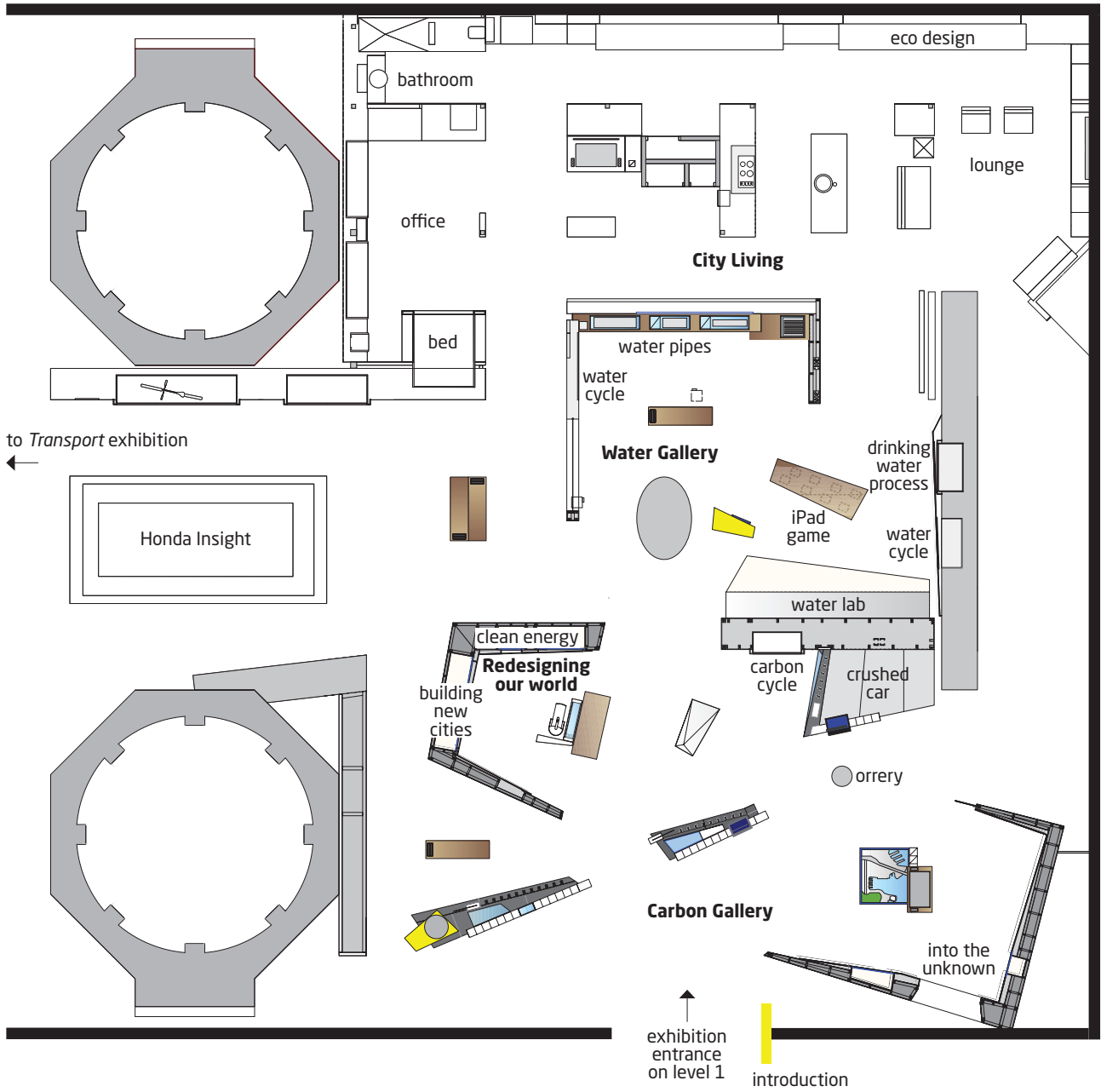
In 2001 the Department of Education and Training released its Environmental education policy for schools, which is mandatory for all government schools from Kindergarten to Year 12.

*EcoLogic* endeavours to satisfy the aim of the policy, which is 'to foster students' understanding of the environment as an integrated system, and to develop attitudes and skills which are conducive to the achievement of ecological sustainable development.'

A visit to *EcoLogic* meets the curriculum objectives of the policy. Students will develop:

- knowledge and understanding about
  - the nature and function of ecosystems and how they are interrelated
  - the impact of people on environments
  - the role of community, politics and market forces in environmental decision-making
  - the principles of ecologically sustainable development
- skills in
  - applying technical expertise within an environmental context
  - identifying and assessing environmental problems
  - communicating environmental problems
  - resolving environmental problems
  - adopting behaviours and practices that protect the environment
  - evaluating the success of their actions
  - a respect for life on Earth
  - an appreciation of cultural heritage
  - a commitment to act for the environment by supporting long-term solutions to environmental problems

## Exhibition floor plan



## Carbon Gallery

### GLOBAL WARMING A BIG ISSUE

The world's climate scientists agree that the Earth is getting hotter and that it will affect the way we live. Systems that supply our food, water, clothing and shelter are changing and we will all have to adapt. There is strong evidence that we are altering the climate by burning coal, oil and gas. Although it's hard to believe, the risks are too great to ignore. How will you respond?

**THE EARTH'S CLIMATE CHANGES NATURALLY. IT DEPENDS ON THE AMOUNT OF ENERGY THAT FLOWS FROM THE SUN TO EARTH, THEN BACK OUT INTO SPACE. ANYTHING THAT INTERFERES WITH THAT FLOW OF ENERGY CHANGES THE CLIMATE.**

When light and heat from the Sun reaches Earth it is absorbed by the land and ocean, captured and stored by plants, converted to other forms of energy like wind or waves, or radiated back into space. The Sun's energy drives a system of biological, chemical and physical reactions that, together, make up the climate. Change is constant.

### Eco fact

The average Australian's lifestyle emits about 20 tonnes of greenhouse gases per year.

### Key messages

- Climate change is real, has happened before and will happen again. Only those plants and animals that can adapt will survive.
- Earth's climate changes naturally as a result of the planet's wobbly orbit, volcanic activity and impacts by meteorites.
- Carbon dioxide levels in the atmosphere are higher now than they have been for 800,000 years and they're rising rapidly.
- 251 million years ago carbon dioxide levels were 5 times higher than they are now (due to volcanic activity). At that time 85% of life on earth died.
- Carbon dioxide in the atmosphere acts like a blanket and traps heat.
- Scientists have known about global warming for more than a century.
- There's evidence that all the extra carbon is coming from fossil fuels.
- Energy is used to manufacture everything.

### Visuals

- Carbon dioxide timeline.
- Sunspots graphic.

### Key objects

Lava from Mt Vesuvius and Auvergne in France, Meteorite fragments, Trilobite and ammonite fossils (touchable), coral slice, stalactites, tree section (touchable), carbon cycle model, crushed car



## Carbon Gallery

### INTO THE UNKNOWN

The calm climatic conditions of the last 10 000 years have allowed agriculture and civilisation to flourish. But life will be less predictable if we let global warming continue. Somewhere in the climate system are tipping points that could unleash runaway climate change. Climate scientists think we'll pass those points if the average global temperature rises more than 3°C.

### Key messages

- Temperatures will rise.
- Oceans will become more acidic, making life hard for animals with shells.
- Sea levels will rise.
- Weather will become more extreme.

### Audiovisuals and graphics

- A wall-sized projection of the Great Ocean Conveyor shows how an ocean current carries heat from the Equatorial regions to warm the coast of Europe. It demonstrates how oceans affect the climates of distant regions.
- Photos of polar sea ice show how the area has diminished over time.
- An ocean food web demonstrates how the oceans will become more acidic as a result of dissolved carbon dioxide. Shellfish can't build shells in acidic water so they die out.

### Eco fact

Oceans will become more acidic, making life hard for animals with shells.

### Key objects

- A model of Circular Quay under water demonstrates just what a 3°C temperature rise would mean. Oceans expand as they heat, causing sea level rises.
- A model of an Argofloat shows the equipment CSIRO uses to measure temperature and salinity of the world's oceans.
- Seashells (abalones, scallops, oysters, mussels) coral and food web

### Interactives

- An interactive map allows visitors to discover how rainfall and temperatures have changed in Australia over the last century.
- A slide show streams images of wild weather posted by members of the public to the Museum's Flickr website. As the planet heats, there is more heat energy in the atmosphere and ocean. This increases the amount of water in the atmosphere and the strength of waves and wind.



Deploying a robotic Argo ocean profiling float – Alicia Navidad, CSIRO



## Redesigning our world

### REDESIGNING OUR WORLD

We can adapt to new conditions and prevent the extremes of global warming. In many cases this will mean being open to completely new ways of solving problems, but enormous opportunities are available to those who can rise to the challenge. Creativity, innovation, awareness of systems and personal behaviour change will all be essential.

Social and economic structures that make our communities more resilient will help us all to deal with change.

Redesigning our world showcases people and companies who are changing the way we do things. Sydney Food Connect is changing the way food is grown and distributed, the town of Bundanoon no longer sells bottled water, architects are designing energy efficient buildings and scientists are developing new ways to capture energy.

### Key messages

- The changes will improve our lives.
- There are multiple facets involved in design for sustainability.
- Our food choices are the biggest personal activities that affect the planet.
- Economists have found ways to put a price on carbon to reduce carbon emissions.

### Eco fact

Bottling water gives off 1,000 times more greenhouse gases than pumping water to your tap.

### Audiovisuals:

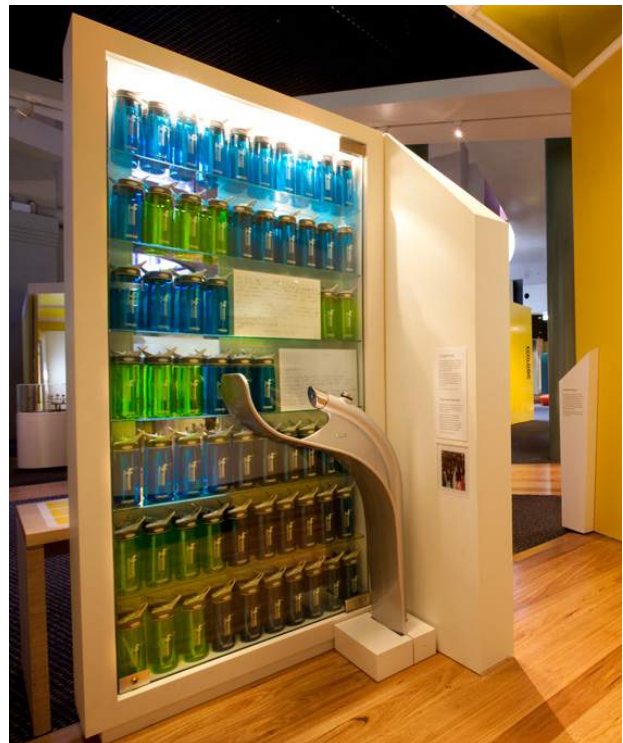
- An animation explains how carbon trading works. Whether it's in the field of finance, management, energy systems, product design or construction there are changes that can be made.

### Visuals

- Large graphic of the carbon and water footprint of various foods.
- Sydney Food Connect graphic diagram.
- Large graphic showing greenhouse gas emissions. Can you keep your emissions below 10 tonnes a year?

### Key objects

Camelback water bottle wall (*below*), water bubbler, wind turbine models, wave turbine model, solar cells, architectural models of the Pixel building, Workplace<sup>6</sup>, a Gabriel Poole home, and a DomeShell home.



## Water Gallery

**CLIMATE CHANGE AND GROWING POPULATION WILL PUT PRESSURE ON WATER SYSTEMS EVERYWHERE.**

In Sydney supplying 4.3 million people with fresh water, and carrying away their wastes, is already a complex task. In a warming world we'll rely more on a variety of water sources, including dams, desalination and recycled wastewater. No matter where it comes from, it's up to us all to make the most of every drop.

**Key messages:**

- We use water to make almost everything.
- Sydney has a complex system for delivering water and removing wastes.
- The system grew in response to drought and population growth. These factors will continue to be the drivers of change.
- Efficient use of water makes the resource go further.
- Water for drinking needs to be cleaned, no matter what the source.
- Sydney's drinking water comes from two sources: dams and desalination.
- Water recycled from wastewater is a valuable source of non-drinking water.

**Eco fact**

Each of us in Sydney uses 309 litres of water a day (down from 506 litres per day in 1991). Bottled water makes no sense economically or ecologically in Sydney.

**Visuals**

- Large graphic shows how the managed water cycle works.
- Graphic panel explains how natural processes are harnessed to clean up waste water.
- Graphic of the water cycle in nature.
- Drinking water graphic panel.
- Vertical garden projection.

**Interactives**

*Water lab*

- Visitors can use a water testing lab to discover how water health is monitored.
- Insects, pH and bacterial indicators are all examined.

*WaterWorx*

- An iPad interactive challenges people to test their own skill at managing the water system: coping with variables such as leaks, droughts, bushfires and pollution.

**Key objects:**

Timber pipe from the Tank Stream, timber and iron pipe, ceramic pipe, recycled water tap, sand and charcoal filter, desalination filter.



## City Living

### CITY LIVING planning for people

Cities are centres of employment and culture that are home to more than half the world's population. It is no surprise that they dominate national and global consumption. A city sucks in vast resources from the surrounding countryside to support its population. It also emits wastes. Every one of us adds to the environmental impact of the city we live in.

Clever design and good urban planning create efficient transport systems and desirable, functional spaces for living, working and playing. In this section you can explore our sustainable home and find out how everyone's urban choices can make a difference.



This large section is divided into two.

### Towards a sustainable house

A large part of this section is a simulation of a sustainable home. Students can view various rooms as well as fittings and furnishings. Models of real homes are also on display.

#### Green ads

- Description: a compilation of television ads encouraging environmental awareness.
- Allow: 1 minute
- Best for: all ages

#### Vermitech – large scale worm farming

- Description: describes industrial-scale farming of worms to manage waste.
- Allow: 2 minutes
- Best for: all ages

### Interactives

#### Light control panel

- Description: change the lighting levels in the kitchen and lounge area from one control point
- Allow: 2 minutes
- Best for: 8+

#### Long hot shower

- Description: calculate the amount of greenhouse gas and what it costs to take a shower using different energy sources.
- Allow: 5 minutes
- Best for: 5+

#### The Mobbs' house

- Description: this is a model of a terrace house in inner Sydney, renovated using sustainable design principles. It shows how the house's energy and water system work.
- Allow: 5 minutes
- Best for: 8+ years

#### Your house (left)

- This new interactive allows visitors to add the items in their home and see the cost of their energy use.

### An image you will see





## Related Powerhouse exhibitions, programs and resources

Your students' learning experience can be further enhanced by combining their visit to EcoLogic with other Museum exhibitions, programs and resources.

### Exhibitions

- **Australian International Design Awards**  
The award winning entries include excellence in designs that help improve the environment.
- **Engineering Excellence**  
This exhibition showcases how Australian engineers are developing innovative solutions for society.
- **Transport**  
This looks at history of transport in Australia and include a section on 'Alternative Transport' which looks at using renewable energy in all modes of transport.
- **Nuclear matters**  
This is a interactive exhibition exploring the complex world of nuclear science, medicine and nuclear power. One interactive allows a person to pedal a stationary bike to generate electrical energy and compare their efforts to coal and gas-fired, nuclear and renewable power sources. Another explores how scientists study ice cores from Antarctica to learn about climate change.

### Tours

The *EcoLogic* tour explores one of the world's hottest topics today: climate change. Discover the science behind global warming and what we can do to prevent it from getting worse. Your group will be led through the exhibition and its exciting interactive displays with the opportunity for robust discussion and exploration of some of the causes and effects of climate change.

Groups: Stages 4-5 (years 7-10). Cost: \$10 per student / \$5 PSP. Duration: 30 minutes. 15-40 per session.

### Unit of work

- Shaping the Future, Stage 4 & 5 Unit of work on EcoLogic for Science and Geography, including the EcoLogic student booklet.  
[http://www.powerhousemuseum.com/exhibitions/ecologic\\_education.php](http://www.powerhousemuseum.com/exhibitions/ecologic_education.php)

### Learning resources for Primary

- Primary Teachers' notes  
[http://www.dmag.com.au/UserFiles/File/105\\_Teachers\\_EcoLogicLR.pdf](http://www.dmag.com.au/UserFiles/File/105_Teachers_EcoLogicLR.pdf)
- Primary student activity sheets  
[http://www.dmag.com.au/UserFiles/File/105\\_Students\\_EcoLogicLR.pdf](http://www.dmag.com.au/UserFiles/File/105_Students_EcoLogicLR.pdf)

### Further readings and resources

- **The Science of Climate Change: Questions and Answers**  
Published by the Australian Academy of Science in 2010, it provides a thorough explanation of the current scientific understanding of climate change, including areas where both consensus and uncertainty exist.
- **Australian Water Education Toolkit**  
This Toolkit at the Department of Sustainability, Environment, Water, Population and Communities website, assists teachers and schools across Australia to access national, state, territory, regional and urban water resources.
- **Department of Climate Change and Energy Efficiency**  
The site has a range of climate change related resources for teachers and students.
- **Bureau of Meteorology**  
It provides observation and information on climate change in Australia.
- **Sydney Water: Education microsite**  
Comprehensive teaching and learning materials for both primary and secondary are available online.



## **EcoLogic: creating a sustainable future**

by Sandra McEwen

*'Sandra McEwen's EcoLogic is a beauty: thoroughly researched, informatively illustrated and packed with the kind of necessary knowledge that can help all of us better understand and take care of our truly unique and wonderful land.'*

Peter Garrett AM

*EcoLogic* is about hopes, fears, imagination and action. It's about redesigning the way we live and use resources to ensure a sustainable future on this planet.

A world-wide push for ecological sustainability is fuelling the next great industrial revolution. What are the major issues for Australia? What are government and industry doing about it? And what can we do to protect resources, care for the environment, the economy, ourselves and tomorrow's children?

The answers can be found in this inspiring publication. Through numerous case studies, *EcoLogic* looks at urban planning issues, the true cost of industry, salinity and soil degradation, water management and environmental activism. It shows how innovative design at every level of domestic, industrial and agricultural life can help us meet our needs while conserving fragile resources.

This book is an essential resource for all those who want to know why action is needed and what can be done. Also recommended for high school students studying Science, Design and Technology, Food Technology, HSIE, Engineering Studies, Geography, History, Agriculture, Earth and Environmental Science, Economics, Geology, Rural Technology, Society and Culture, Legal Studies and Studies in Society.

\$35.95, 112 pages with over 150 images in colour and black & white, 297 x 210 mm, pb, ISBN 1 86317 098 7. Available from Powerhouse Museum Shop or online at [powerhousemuseum.com/publications](http://powerhousemuseum.com/publications). Distributed by: NewSouth Books, tel: (02) 8778 9999, [www.newsouthbooks.com.au](http://www.newsouthbooks.com.au)

Senior Partner

Sydney  
**WATER**

**For more information on the exhibition**  
***EcoLogic: creating a sustainable future,***  
**visit the Powerhouse Museum's website**  
<http://www.powerhousemuseum.com/exhibitions/ecologic.php>

For more information about education support or your booking, contact Bookings at the Powerhouse Museum:  
Telephone — (02) 9217 0222  
Fax — (02) 9217 0622  
Email — [edserv@phm.gov.au](mailto:edserv@phm.gov.au)

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science + design

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