

Implementing the Environmental Education Policy in your school



Implementing the Environmental Education Policy in your school



ACKNOWLEDGMENTS

The Department of Education and Training wishes to acknowledge the work of the following in the preparation of this document.

Photographs:	Syd Smith, Professional Support and Curriculum Directorate Public Relations Directorate, NSW Department of Education and Training Dorrroughby Environmental Education Centre Wambangalang Environmental Education Centre
Graphic design:	BIAGDESIGN
Cover design:	Fusebox Design, Campbell ACT
Artwork:	Vilma Cencic and Astra Láci
Research and compilation:	Jenny Dibley, Brewongle Environmental Education Centre
Editing:	Peter Rennie

Implementing the Environmental Education Policy in your school

© 2001 NSW Department of Education and Training
Professional Support and Curriculum Directorate

RESTRICTED WAIVER OF COPYRIGHT

The printed material in this publication is subject to a restricted waiver of copyright to allow the purchaser to make photocopies of the material contained in the publication for use within a school, subject to the conditions below.

1. All copies of the printed material shall be made without alteration or abridgement and must retain acknowledgment of the copyright.
2. The school or college shall not sell, hire or otherwise derive revenue from copies of the material, nor distribute copies of the material for any other purpose.
3. The restricted waiver of copyright is not transferable and may be withdrawn in the case of breach of any of these conditions.

Additional copies may be purchased from:

DET Sales
PO Box 218
Bankstown NSW 2200
Phone (02) 9793 3086
Fax (02) 9793 3242

ISBN 0 7313 81149
SCIS 1058552

Foreword

Environmental education is more than learning about the environment. It is about changing behaviour in such a way that people will act for the environment.

The materials in this document are designed to assist teachers and school leaders to develop school programs in environmental education.

The Environmental Education Policy for Schools aims to guide teachers and principals in this important task. It provides a framework for integrating environmental education across the key learning areas and introduces a positive action plan so schools can develop their own environmental management plan. In this way students will not only learn about the environment, but they will also appreciate that they are part of an institution which is acting for the environment, in partnership with other organisations and individuals.

Implementing the Environmental Education Policy in your school has been designed to reflect the major sections of the policy and presents a wealth of initiatives, ideas and exemplars that have been successful in schools. More importantly, the document provides detailed guidelines on how to link syllabus outcomes with environmental education objectives and addresses current thinking and developments in this dynamic area.

I am confident the successful environmental education programs developed in the last decade will be even more impressive in the years ahead.

Ken Olah

**Acting Director,
Professional Support and Curriculum**



Contents

Foreword	3
1. Introduction	
How you can use this document	7
2. Some background information for teachers	
• Commonly asked questions with answers	8
• The historical development of environmental education	10
• Key environmental understandings and concepts	12
• Current environmental issues	18
3. Developing the school environmental management plan (SEMP)	
• What is a SEMP?	19
• Why should you develop a SEMP?	19
• How do you go about it?	19
• What is an environmental audit?	21
• Why do we audit?	21
• How do we conduct an environmental audit?	22
• What resources do you need?	22
• Proformas for action plans	24
• Proforma for your school	28
4. Teaching environmental education across the curriculum	
• What students should know and be able to do	30
• Programming for environmental education	35
• How to integrate environmental education into the key learning areas	44
• Looking at syllabuses with outcomes specific to the environment	44
• Integrating environmental education into those KLAs without an environmental focus	51
• How to take other opportunities to teach environmental education	53
• Linking the management of resources to the curriculum	56
• Linking the management of school grounds to the curriculum	57
• Primary school activities supporting environmental education	63
• Secondary school activities supporting environmental education	74
5. Management of resources	
• Why should we manage our resources?	81
• How do we go about it?	81
• Sample action plans relating to school management	84
• A case study of a resource management project	89
• How can we manage our energy and its usage in the school?	91
• Strategies to reduce greenhouse gas emissions from electricity	97
• How can we manage materials and products in the school?	100
• How can we manage waste in the school?	105
• How can we manage water in the school?	108

4 Implementing the Environmental Education Policy in your school

6. Management of school grounds	
• Why should we manage our school grounds?	113
• How do we go about it?	113
• Learning opportunities	114
• Sample action plans for the management of school grounds	116
• Projects for school grounds	120
• Managing your school grounds	122
7. Support for environmental education	
• Environmental education centres	142
• Zoo education centres	146
8. Programs that support environmental education in your school	148
9. Organisations that can help schools in their environmental education programs	159
10. Annual environmental events for the school diary	162
11. References	163







1. Introduction

This support document has been developed to assist teachers to implement the mandatory *Environmental Education Policy for Schools*.

The information in the document will assist teachers to deliver environmental education programs using the school environmental management plan as a tool for planning, programming, implementing and assessing.

The development of a school environmental management plan is a new initiative and it has been acknowledged that schools will require guidance on how to formulate such a plan. This document aims to assist schools in this process.

In addition, the document provides background information for teachers, guidelines to integrate environmental education across the curriculum, examples of teaching and learning strategies and information about programs and organisations supporting environmental education.

How you can use this document

The support document is divided into eleven sections:

The first section is an introduction.

The second section, **Some background information for teachers**, provides information on environmental education. This section covers the history of environmental education, current environmental education issues, commonly asked questions with answers and an outline of the key environmental concepts and principles that students need to understand.

The third section, **Developing the school environmental management plan (SEMP)**, will assist in the development of the school environmental management plan. The section emphasises the importance of developing a SEMP and illustrates a step-by-step procedure for the development of a SEMP.

The fourth section, **Teaching environmental education across the curriculum**, outlines the responsibilities of schools for implementing environmental education. It highlights what students should know and be able to do. It explains how environmental education can be integrated across the KLAs. It also includes statements related to stages of student development and how learning can be sequenced.

This section also identifies special events, days and programs that complement the formal curriculum and provides opportunities to involve your whole school staff.

The fifth section, **Management of resources**, recognises the importance of resource management, provides you with details on how to complete an audit and offers you strategies for managing resources.

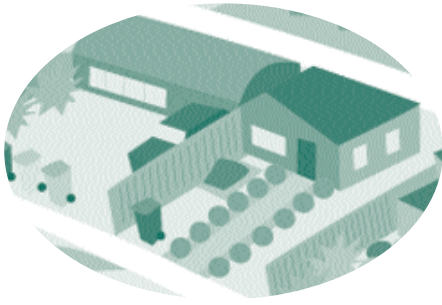
The sixth section, **Management of school grounds**, outlines how to complete an audit. It identifies strategies for managing the school grounds, ideas on how to link school grounds projects to the curriculum and where to go for advice.

The seventh section, **Support for environmental education**, acknowledges the contribution to environmental education of the Department of Education and Training's environmental education centres and zoo education centres.

Section eight, **Programs that support environmental education in your school**, and Section nine, **Organisations that can help schools in their environmental education programs**, provide information on who can assist schools (including government and non-government organisations).

Section ten, **Annual environmental events for the school diary**, lists a number of special days and events that schools may wish to observe during the school year.

Section eleven contains **References**.



2. Some background information for teachers

Commonly asked questions with answers

Q1. How does this policy differ from the 1989 Environmental Education Curriculum Statement K-12?

A. The development of this policy has been influenced by international events, such as the United Nations Earth Summit in 1992. *Agenda 21*, a global initiative drawn up at the summit, provides the policy framework for international action on the environment.

The main difference from the 1989 Statement is that schools are now required to develop a school environmental management plan incorporating the principles of ecologically sustainable development.

The integration of environmental education across the curriculum remains a feature of this policy.

Q2. What are the main requirements of schools in implementing the policy?

A. Schools are required to address the three focus areas:

- Curriculum
- Management of resources
- Management of school grounds.

It is then expected that schools will develop a school environmental management plan (SEMP) which describes their actions for addressing environmental education.

Q3. What is the role of teachers in environmental education?

A. Teachers need not be experts on environmental issues, but they should identify those who are and make use of their expertise.

When implementing environmental education, teachers should ensure that there is a **planned sequence of learning** and that all students are introduced to a range of challenging experiences that encourage them to maintain an active interest in the environment.

Environmental education is best approached as an **across-curriculum strategy**. If environmental education is integrated across the key learning areas in primary and secondary schools, students will learn to care for the environment as part of their normal daily lives.

The teacher's role involves:

- teaching environmental education in those areas of the curriculum which are mandatory
- maximising opportunities to use environmental education as an organiser or theme to teach across the curriculum, including those curriculum areas which do not refer directly to the environment
- maximising opportunities to teach outside the classroom, using the resources of the community and highlighting special events

Q4. Are some subjects or key learning areas likely to support environmental education more than others?

A. Yes. In primary schools the key learning areas of HSIE and Science and Technology include similar outcomes related to environmental education. In secondary schools, for example, syllabuses like Geography, Science, Economics, and Design and Technology include outcomes related to environmental education.

Although these syllabuses have outcomes specific to the environment, opportunities exist to incorporate environmental education into subjects that do not have specific environmental education outcomes. For example the collection and graphic representation of environmental information can support the achievement of some outcomes in the Mathematics Syllabus.

It is important for the school to map where in the curriculum environmental education is being taught. This will ensure that students have the opportunity to develop all knowledge, skills and attitudes relating to environmental education.

Q5. *When am I expected to implement the Environmental Education Policy?*

A. Schools are not expected to implement the new environmental education policy until 2002, but they should use 2001 to prepare for the implementation of the policy.

Q6. *What support will be provided to assist schools to implement this policy?*

A. Teachers from environmental education centres are available to assist schools in the implementation of the policy.

Key teachers in each district will be targeted as support personnel to assist schools.

A training and development package has been distributed to each school, and the Environmental Education Unit in the Professional Support and Curriculum Directorate will coordinate other support services.

Q7. *Where can I find suitable resources for teaching environmental education?*

A. There are numerous teaching resources, many of which have been published by a number of government departments and non-government agencies (e.g. Environment Protection Authority of NSW, Environment Australia, National Parks & Wildlife Service, State Forests of NSW and Department of Land & Water Conservation).

The Professional Support and Curriculum Directorate also provides resources on its own web site: <http://www.curriculumsupport.nsw.edu.au>. The resource list is organised into three categories:

- Topic
- Key Learning Area, and
- Stage.

The Professional Support and Curriculum Directorate of the NSW Department of Education and Training regularly develops support documents.

Q8. *Who should be involved in environmental education?*

A. Everyone can contribute to environmental education, including teachers, students, parents, canteen staff, general assistants, office staff, cleaners, specialists and community groups. Government and non-government agencies are also making their contribution to environmental education, both within schools and across the community in general. A list of some of these groups appears in section 9, on p. 159. Many local councils have environment officers or waste management specialists, while health department employees are often willing to assist schools in their programs.



The historical development of environmental education

The aims and objectives of environmental education have evolved as a result of a number of international, national and state initiatives over the last 40 years. (These are outlined on page 11).

Three of the major international developments were:

- The **Belgrade Charter** (1975) and the **Tbilisi Declaration** (1977), developed under the auspices of the UNESCO and United Nations Environment Program (UNEP), outlined the commonly accepted goals of environmental education.
- The World Conservation Strategy (1980), developed by the International Union for the Conservation of Nature (IUCN) and the World Wide Fund for Nature (WWF), sets clear principles for the place of education in the conservation of nature.
- The United Nations Conference on Environment and Development (UNCED) (1992), known also as the Rio Conference, prepared a framework for international action, known as *Agenda 21*. Chapter 36, entitled *Promoting Education, Awareness and Training*, calls on nations to integrate environmental education at all levels.

It is commonly accepted that there are three dimensions to the implementation of environmental education. These are education **about** the environment, education **in** the environment and education **for** the environment.

Walker, K., & Sharp, H., *Environmental Education Standards for NSW Schools*, Australian Association for Environmental Education, NSW.

In the past, education **about** and **in** the environment was the focus of environmental education. Environmental education was treated as "nature studies" within the area of natural sciences. It was concerned with the development of knowledge about the environment and the acquisition of skills using the environment as the medium. Initiatives in environmental education using this approach tended to avoid controversial issues, resulting in a failure to develop values, problem-solving skills and actions for the environment.



Education about, for and in the environment now involves more emphasis on education for the environment, where the anticipated outcomes involve critical appraisal and active participation by all individuals in environmental issues. This shift encourages the development of attitudes, behaviours and problem-solving skills to build responsible and committed individuals. Students are expected to make decisions for the environment which reflect an understanding of the principles of ecologically sustainable development.

From the 1960s to the 1980s, environmental education organisations were established to promote environmental education. At this time environmental education centres and zoo education centres were established, all strongly supported by the Association of Environmental Education (NSW) and The Gould League of NSW.

In 1989, the NSW Department of Education released its *Environmental Education Curriculum Statement K-12* and, from the time of its launch, it became mandatory for NSW government schools to program for environmental education.

The environmental crisis facing the world was highlighted at the Earth Summit in 1992, where environmental education was seen in the context of ecologically sustainable development. Since the conference national, state and local governments have designed strategies to support the principles of ecologically sustainable development (ESD). These strategies have influenced the direction of environmental education in Australia. The National Greenhouse Strategy requires all government agencies to implement strategies to reduce greenhouse gas emissions, while the National Strategy for Ecologically Sustainable Development requires the incorporation of ESD principles into the management of all government departments.

Environmental education has been supported by many government and non-government organisations over the years. The number of organisations promoting and developing environmental programs has become so large that governments have found it necessary to establish formal structures to coordinate these organisations and their programs. In 1999 the NSW Government established the NSW Council on Environmental Education. That same year, the Federal Government released *Today Shapes Tomorrow*, a discussion paper on environmental education at a national level. This has led to a national committee to investigate the needs of environmental education in all states and territories.

The development of environmental education

International	National	State of New South Wales
<ul style="list-style-type: none"> • 1969. Club of Rome published "Limits of Growth". • 1972. The United Nations General Assembly established World Environment Day • 1975. The Belgrade Charter and the Tbilisi Declaration (1977) developed under the auspices of the UNESCO and United Nations Environment Program (UNEP) outlined specific objectives for the implementation of environmental education. • 1976. UNESCO-UNEP International Environmental Education program commenced. • 1980. The World Conservation Strategy developed by the International Union for the Conservation of Nature (IUCN) and the World Wide Fund for Nature (WWF) set clear principles for the place of education in the conservation of nature. • 1992. The United Nations Conference on Environment and Development (UNCED) held in Rio, known also as the Earth Summit, prepared a framework for international action known as Agenda 21. Chapter 36 entitled "Promoting Education, Awareness and Training", called on nations to integrate environmental education throughout all levels and sectors of society. 	<ul style="list-style-type: none"> • 1970. Australian Academy of Science held a conference entitled: "Education and the Environmental Crisis". • 1979. Australian Association of Environmental Education (AAEE) formed. • 1980. Prof. Bill Stapp (American EE consultant) conducted inservice courses in environmental education awareness around Australia. • 1983. First Environmental Education Unit established by the Commonwealth Department of Home Affairs and the Environment. • 1987. Curriculum Development Centre: National Curriculum in cooperation with the states targeted environmental education and encouraged policy development in all states and territories. • 1990. ACT government strategy on the environment. • 1991. National mapping of environmental education. • 1995. Department of Environment, Sport and Territories and the Australian Association of Environmental Education: National Environmental Education Workshop. • 1999. <i>Today Shapes Tomorrow</i>, a Federal Government discussion paper on Environmental Education. • 2000. Environmental Education for a Sustainable Future: National Action Plan released. National Environmental Education Committee established by Federal Minister for the Environment. 	<ul style="list-style-type: none"> • 1910. Gould League of Bird Lovers established. • 1936. Junior Tree Wardens formed. • 1967. Gould League of Bird Lovers and Junior Tree Wardens combined to form the Gould League of NSW to promote environmental education. Adviser in conservation appointed by Department of Education. • 1972. First field studies centre opened. Association for EE (NSW) formed. • 1974. First Gould League Education Officer appointed by Department of Education. EE resource writing team formed by Department of Education. • 1976. Overview of EE in US investigated by Department of Education representative. • 1977. EE consultant appointed by Department of Education. • 1982. Combined position of EE consultant/Gould League Officer approved by the Department of Education. • 1989. NSW EE Curriculum Statement launched. FSC numbers and functions increased. Professional development of teachers introduced in conjunction with release of the statement. • 1992. Environmental Education Committee (EEC) of Environment Protection Authority established. • 1993. Release of NSW Government Policy: "A New Focus for Environmental Education". • 1994. Ministerial Advisory Council on Environmental Education (MACEE) established by Minister for Education. NSW Board of Studies develops EE principles for curriculum developers. • 1997. Release of NSW Government green paper on EE. • 1999. Establishment of NSW Council on EE and creation of environmental education centres. • 2001 <i>Environmental Education Policy for Schools</i> distributed.

Figure 1

Key environmental understandings and concepts

Gaining an understanding of the environment is essential if students are to develop positive and balanced attitudes towards it. Knowledge of basic environmental concepts equips students with the skills required for active and informed participation in managing the environment.

Students should gain a knowledge of the following key understandings and concepts.

Biodiversity

Biodiversity is the variety of all life forms: the different plants, animals and micro-organisms, their genes and the ecosystems of which they are a part. Australia has one of the widest ranges of biodiversity of any nation, with a large proportion of its species found nowhere else in the world. The major threats to biodiversity are land clearing, loss of native forests, introduced species, the absence of some representative ecosystems in national parks and other reserves and the lack of knowledge about our biodiversity.

The loss of biodiversity is one of our most serious environmental problems. Whether we look at wetlands or saltmarshes, mangroves or bushland, inland creeks or estuaries, the same story emerges. In many cases, the destruction of habitat, the major cause of loss of biodiversity, is continuing at an alarming rate.

Preserving Australia's biodiversity is important for the following reasons:

- *Ecosystem processes*

Biodiversity underpins the processes that make life possible. Healthy ecosystems are necessary for maintaining and regulating atmospheric quality, climate, fresh water, marine productivity, soil formation, cycling of nutrients and waste disposal.

- *Ethics*

No species and no generation have the right to use Earth's resources solely for their own benefit.

- *Aesthetics and culture*

Biodiversity is intrinsic to such amenity values as beauty and tranquillity. Many Australians place a high value on native plants and animals, which contribute to our cultural identity, spiritual enrichment and recreation. Biodiversity is central to the cultures of Aboriginal and Torres Strait Islander peoples.

- *Economic*

Australian plants and animals attract tourists and provide food, medicines, energy and building materials. Australia's biodiversity is a reservoir of resources that remains relatively untapped.

Biogeochemical cycle

The biogeochemical cycle describes the movement of chemical elements in the environment. Within the biogeochemical cycle there are other cycles (e.g. the nutrient cycle). It is called the "nutrient cycle" if the elements concerned are essential to life. The form and quantity of an element vary through the cycles, with amounts in the inorganic reservoir pools usually greater than those in the active pools. Exchange between the components of the system is achieved by physical processes (e.g. weathering) and/or biological processes (e.g. synthesis and decomposition of proteins). Human activities can disrupt these cycles.

Cleaner production

Cleaner production describes a worldwide industry trend towards reduced inputs and waste outputs in the production process. In Australia, the Commonwealth organisation, Environment Australia, has set up a program to demonstrate cleaner production.

Climate change

Climate change is the result of changes in the global atmosphere which are attributed directly or indirectly to human activity. It is distinguished from natural climate variability over comparable time periods

Source: *The United Nations Convention on Climate Change, 1992*

Eco-efficiency

Eco-efficiency is used to describe actions that maximise efficiency and cost savings and minimise environmental impact.

Ecologically sustainable development (ESD)

Ecologically sustainable development is a pattern of activities that meet the needs of the current generation without prejudicing the ability of future generations to meet their needs.

Two main features that distinguish an ecologically sustainable approach to development are identified in the National Strategy for ESD. These are:

- balancing the environmental, economic and social impacts of human activity in order to achieve sustainability;
- the need to take a long-term rather than a short-term view when making decisions and determining actions for sustainability.

Sustainable development requires the maintenance of:

- *Biodiversity*, the variety of all life forms
- *Ecological integrity*, the general health and resilience of natural life-support systems, including the ability to assimilate wastes and withstand stresses, such as climate change and ozone depletion, and
- *Natural capital*, the stock of productive soil, fresh water, forests, clean air, ocean and other renewable resources that underpin the survival, health and prosperity of human communities.

Managing the environment requires an understanding of the following:

- **the inter-related nature of processes in the natural environment;**
- **the interrelationships between human activities and natural processes; and**
- **the sustainable management of the environment.**

Natural processes, such as energy and nutrient cycles, the water cycle and food webs, are interrelated and dependent on the biodiversity of an ecosystem.

Human activity can have an adverse effect on these natural processes, e.g. the clearing of forests results in the destruction of habitats and a subsequent decline in species of flora and fauna.

Adopting sustainable management of the earth's resources can reduce the impact of human activity on the environment.

Figure 2 identifies the key environmental understandings that are required to manage the environment.



Key environmental understandings

The inter-related nature of processes in the natural environment

- All life is dependent on water, soil and air
- All living things are part of a series of cycles
- Biodiversity is essential for healthy, ecologically sustainable development
- Webs of life, flows of energy and cycles of materials are processes of the natural world
- All living things change over time and space and adapt and evolve to varying conditions
- All life on earth is interdependent
- Interdependence operates at four levels: global, regional, local and micro levels
- Flows of energy are ultimately governed by solar radiation.

Sustainable management of the Earth's resources

- Humans can live more sustainably by considering the needs of future generations
- Australia is part of a global environment
- Development can complement nature
- Degraded environments can be rehabilitated
- Appropriate technology can minimise human impact on the environment
- Governments can develop positive policies for the environment
- People can influence decision-makers
- Economics is one aspect of decision-making. Social and environmental factors are equally important.

The inter-relationships between human activities and natural systems

- Human survival depends on a healthy environment
- Humans are responsible for significant disturbances of natural systems
- Population, affluence and technology affect natural systems
- Urbanisation, consumerism and culture can affect natural systems
- Taking an ecocentric perspective as opposed to an anthropocentric approach enables humans to develop broader attitudes.



Figure 2

Ecological footprint

An ecological footprint is a measure of the load imposed on the planet and nature by a given population. It represents the land necessary to sustain levels of all resource consumption. It is an important visual model to help us understand the impact of our lifestyle on the natural environment. The model suggests that the rich world's footprint has quadrupled in the last 100 years. The developing world's footprint is naturally much smaller.

Ecological indicator

An ecological indicator is any organism that is highly responsive to a particular set of environmental conditions and is indicative of a particular environment or set of environmental conditions. For example, lichens may be used as indicators of air pollution and freshwater invertebrates as indicators of water pollution.

Ecosystem

An ecosystem is defined as a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Fundamental concepts include the flow of energy via food chains and food webs, and the cycling of nutrients.

A sustainable ecosystem must have a set of species to carry out the essential cycle of production (plants), consumption (animals) and decomposition (mostly micro-organisms). Many species perform specialist roles in these cycles. For example some act as decomposers of certain substances, and plants adapt to particular habitats and so on. When an ecosystem loses or gains species, the cycles may be disrupted and pressure will be exerted on resources and the ecosystem.

Eco-tourism

Eco-tourism is a particular type of tourism, primarily nature-based, which is conducted in an ecologically sustainable way and involves learning experiences which foster environmental and cultural understanding, appreciation and conservation. In many places throughout the world, an important aspect of eco-tourism is the participation of local communities. By providing a sustainable livelihood, eco-tourism contributes to the conservation of those local communities and their cultures, and to the conservation of biological diversity, which the local communities might otherwise need to exploit in unsustainable ways.

Environment

The environment is the aggregate of all the conditions that influence the life of an individual or population (i.e. all species). The state of the environment ultimately determines the quality and survival of life.

The environment has three major components that interact:

- The natural environment includes soil, water, air, living things and sunlight.
- The built environment includes environments altered by humans.
- The social/cultural environment includes individuals and groups, technology, religion, institutions, economics, aesthetics, demographics and other human activities and values.

Environmental indicators

Physical, chemical, biological or socio-economic measures that can be used to assess natural resources and environmental quality.

Fugitive emissions

In the context of the National Inventory of Greenhouse Gas Emissions, these are greenhouse gases emitted from fuel production, processing, transmission, storage and distribution processes and include emissions from oil and natural gas exploration, venting, flaring as well as the mining of black coal.

Geographic information systems (GIS)

A package of computer programs specially designed to deal with data that are spatially related; a set of tools for collecting, storing, retrieving, manipulating, analysing and supplying mapped data from the real world.



Globalisation

Globalisation refers to the economic and social process whereby global markets and cultures increasingly subsume local markets and cultures.

Globalisation of the economy can be a powerful positive or negative force for sustainability. It is also a powerful force in terms of ideas and pressure on governments. International agreements to reduce metabolic flows and improve livability are setting the global agenda. Australian settlements can adopt appropriate innovations in urban management and technology and use them to promote wealth, quality of life and sustainability.

Greenhouse gas emissions

Human activities are substantially increasing the atmospheric concentrations of a range of greenhouse gases. These include carbon dioxide (CO₂), methane (tropospheric), ozone, nitrous oxide and chlorofluorocarbons (CFCs). Australia produces between one and two percent of global greenhouse emissions that come mainly from fossil fuel burning, land clearing and agriculture.

Under the UN Framework Convention on Climate Change, the OECD countries were committed to stabilising gas emissions at their 1990 levels by the year 2000.

- Australia's greenhouse gas emissions in 1990 were estimated at 390 megatonnes of CO₂; in 1998 the rate was estimated at 455.9 megatonnes and is still increasing.
- Vegetation clearing for agricultural purposes in 1990 was estimated to have contributed about 27% of Australia's total net emissions in CO₂.

Source: National Greenhouse Gas Inventory Committee, 1994

The National Greenhouse Strategy aims to:

- limit net greenhouse gas emissions
- foster knowledge and understanding of greenhouse issues
- lay the foundations for adaptation to climate change.

A positive strategy to reduce greenhouse gas emissions is the requirement for electricity distributors to resource an additional 2% of their supply from renewable resources by 2010 (e.g. solar, wind or hydro).

Heavy metal

Metallic elements with relatively high atomic mass (over 5.0 specific gravity), such as lead, cadmium, arsenic and mercury; generally toxic in relatively low concentrations to plant and animal life.

Kyoto Protocol

The Kyoto Protocol was an international agreement reached in 1997 in Kyoto, Japan extending the commitments of the UN Framework Convention on Climate Change. In particular, it set



targets for future greenhouse gas emissions for each developed country. As a result of the Protocol, Australia had undertaken to limit its overall greenhouse gas emissions to no more than 8% above 1990 levels by 2008-12.

Life cycle analysis

A life cycle analysis is a "cradle-to-grave" analysis of a particular product or material. A life cycle analysis of a product considers both the direct and indirect effects of its manufacture, use and disposal. These effects occur at every stage of the life cycle of the product, from the extraction of raw materials from the ground, through the various processing, manufacturing, fabrication and transportation steps, to final consumption, disposal or recovery for recycling.

Natural capital

This refers to the earth's natural resources and ecological systems that provide vital life support services to society and all living things. These services are of immense economic value; some are literally priceless, since they have no known substitute.

Business practices typically fail to take account of the value of these assets. Their value is rising with their scarcity. As a result, natural capital is being degraded and liquidated by the very wasteful use of resources such as energy, soil, fibre and water.

Natural capitalism recognises the critical interdependency between the production and use of human-made capital and the maintenance and supply of material capital.

Natural capitalism is a new model that involves four major shifts in practices that are vitally interlinked:

- Radically increase the productivity of natural resources. Farsighted companies are developing ways to make natural resources—energy, minerals, water, forests—stretch 5, 10 even 100 times further than they do today.
- Shift to biologically-inspired production models and materials. Natural capitalism seeks not merely to reduce waste, but to eliminate the very concept of waste.
- Move to a "service-and-flow" business model. The business model of traditional manufacturing rests on the sale of goods. In the new model, there is a shift from the sale of goods (for example, light bulbs) to the provision of services (illumination).
- Reinvest in natural capital. Pressures on business to restore, sustain and expand natural capital are mounting as the cost of deteriorating ecosystems rises and the environmental awareness of consumers increases. These pressures can create business opportunities.

Companies that are learning to profit and gain competitive advantage from these four principles are already leading the next industrial revolution. Not only that, their leaders and employees are feeling better about what they do.

Source: P. Hawkins, A. Lovins, L. Hunter Lovins, *Natural Capital*, Rocky Mountains Institute, 1999

Reurbanisation

The redevelopment taking place in an existing city and suburbs rather than on the undeveloped fringe of the city.

Sinks

Sinks are processes or places that remove pollutants or greenhouse gases from the atmosphere (e.g. trees). Often also known as carbon sinks.

Triple bottom line

The triple bottom line essentially says that progress must be measured in three ways: economic, social and environmental. At the end of the year, organisations end up with three bottom-line results, one for each of these, not just a financial scorecard.

While the concept is mostly being discussed with large companies around the world, it can also apply to communities and schools.

Current environmental issues

In 1996 the Federal Government released the report, *State of the Environment, Australia*. It was the first ever independent and comprehensive report on the state of Australia's environment. It was prepared by the State of the Environment Advisory Council.

The report shows that Australia has a beautiful, diverse and unique environment. It finds that some aspects of Australia's environment are in good condition by international standards. Our approach to environmental management has won international recognition in several areas.

Unfortunately, the report also shows that Australia has some serious environmental problems. These need to be tackled with determination if we are to achieve the goal of ecologically sustainable by development.

Source: Ian Low, Chair,
State of the Environment Advisory Council, 1996.

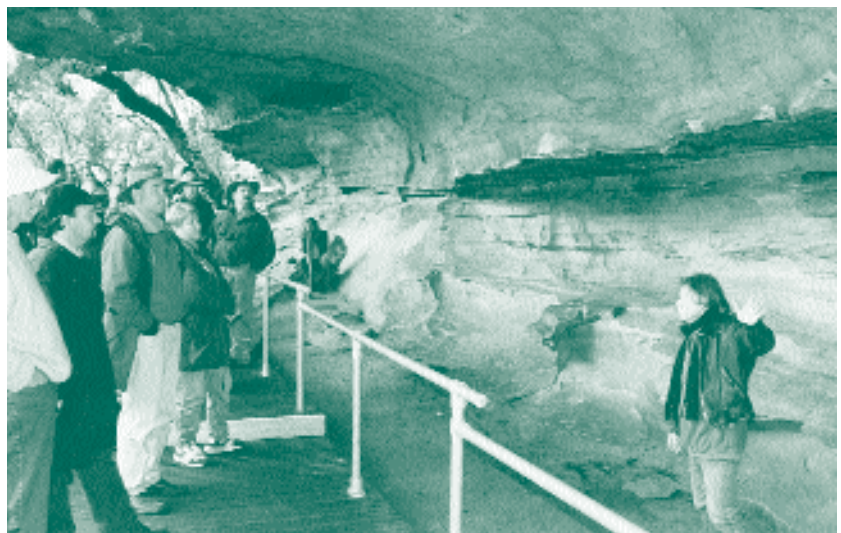
Issues

The report identified the following issues as the most challenging to the achievement of sustainable development:

- the enhanced greenhouse effect
- consumerism
- social justice and equity issues
- the loss of biodiversity and the continued destruction of habitat
- the depletion of river systems and groundwater aquifers, giving rise to algal blooms and declining aquatic ecosystems
- high rates of land clearance and vegetation loss
- poor quality of soils
- land degradation, loss of remnant vegetation and air pollution in cities
- substantial adverse impacts on water quality in the areas of stormwater, sewage and other forms of waste disposal
- invasive plants and animals posing a serious and increasing threat to native ecosystems in rural, urban and marine environments
- rising salinity
- waste management, and
- population.

As environmental educators, teachers have a responsibility to ensure these issues are addressed across key learning areas and in teaching and learning programs. A recognition of the social, economic and environmental implications of these issues at a local, national and global level is essential if students are to understand the principles of ecologically sustainable development.

Students should be given the opportunity to examine these issues in the context of the natural, built, social and cultural environments and, where appropriate, to take action.





3. Developing the school environmental management plan (SEMP)

What is a SEMP?

The Environmental Education Policy For Schools requires schools to develop a school environmental management plan (SEMP). This section of the support document gives guidelines on how a school can design its own school environmental management plan.

This section provides you with strategies for developing your own SEMP and presents a number of tables for conducting an environmental audit and ways to summarise your plan.

ISO 14001 is an international environmental standard that can be adopted at an organisational level. The standard is accepted throughout Australia and is endorsed by most government departments in NSW.

The development of a school environmental management plan provides a significant introduction to a system's approach to environmental management. While schools are not expected to gain ISO14001 accreditation, it is important for them to show that they are efficient environmental managers and are able to practise what they teach in the classroom.

Why should you develop a SEMP?

Developing and implementing a school environmental management plan provides an integrated systems approach for the environmental wellbeing of a school. It also provides the opportunity to raise student awareness of the issues of environmental and sustainable development in the context of acting locally, thinking globally.

Schools with a school environmental management plan can extend environmental management beyond the school's grounds to the home and the wider community.

Schools in New South Wales are required to develop their own school environmental management plan for incorporation into their school plan. The school environmental management plan should be organised into three sections:

- Curriculum
- Management of resources
- Management of school grounds.



How do you go about it?

The most successful school environmental management plans are those where the process of change is:

- **participative**, involving students, staff (including teachers, general assistants, cleaners, office and canteen staff), parents, local environmental groups and government departments
- **wholistic**, employing an integrated approach to environmental management involving the whole site, the whole school community and all aspects of the curriculum
- **sustainable**, in that environmental management becomes an ongoing part of overall school management, with a commitment to continuous improvement by all stakeholders.

The school environmental management plan can achieve its desired objective only if it is incorporated into the curriculum and the whole-school management plan.

How your school goes about developing its school environmental management plan is critically important. The following steps are a useful guide.

Step 1. Set up your school environmental management committee

Form an environmental management committee comprising representatives from the school's administration, teachers, students, canteen staff, general assistants, cleaners and parents.



Step 2: Determine your environmental objectives (e.g. adopt sustainable management practices)



Step 3. Form a subcommittee for each of the following areas:

- Curriculum
- Management of resources, and
- Management of school grounds

The subcommittees:

- conduct an environmental audit
- prepare a draft action plan



Step 4. The subcommittees submit their action plans to the school environmental management committee.



Step 5. The school environmental management committee prioritises and integrates the action plans into one school environmental management plan for the whole school.



Step 6. The committee implements the school environmental management plan



Step 7. The committee evaluates the plan against the *Steps in becoming an environmentally active school* (see page 13 of the *Environmental Education Policy for Schools*).



Step 8. Incorporate the evaluation into the **Annual School Report**



Step 9. Develop priorities for the next SEMP.



What is an environmental audit?

Integral to the development of a school environmental management plan is an environmental audit. The audit involves [a process of] evaluating the school curriculum and measuring and monitoring the use of resources and school grounds. It provides information that enables your school to plan for future improvement in environmental protection.

It is not necessary to conduct an audit every year, but your school may wish to conduct audits as part of normal learning activities in the achievement of curriculum outcomes.

Why do we audit?

The curriculum, management of resources and management of school grounds are integral components of a school's environmental management plan, and all should be subject to an audit. The following table identifies what you can audit in each of the three focus areas.

FOCUS AREA	WHAT YOU CAN AUDIT
CURRICULUM	<ul style="list-style-type: none">• KLAs with outcomes specific to the environment• KLAs that do not have an environmental focus but could have environmental education topics to support achievement of their outcomes• Special environmental events, days and programs
MANAGEMENT OF RESOURCES	<ul style="list-style-type: none">• Electricity and energy• Products and materials• Water• Waste
MANAGEMENT OF SCHOOL GROUNDS	<ul style="list-style-type: none">• Biodiversity• Soil• Noise• Litter• Shade• Human traffic• Visual amenity• Stormwater• Who uses the school grounds?• Buildings

How do we conduct an environmental audit?

There is more than one way to conduct an audit, but the steps outlined below are usually effective and provide useful guidelines.

STEP 1

Pre-audit

- The school environmental management committee assigns goals, tasks and responsibilities to members of each of the subcommittees (i.e. curriculum, management of resources and management of school grounds).
- Each subcommittee:
 - ❖ identifies educational opportunities (e.g. students in the mathematics faculty could be responsible for collecting and graphing data)
 - ❖ makes contact with people who have specific knowledge about auditing (e.g. a local energy supplier may send a member of its staff to assist your school in conducting an energy audit)
 - ❖ publicises the concept of the environmental audit
 - ❖ refers to the progress sheet in this document to record the completion of tasks.

STEP 2

The audit

Each subcommittee:

- obtains all relevant bills or other data and records the dates, the condition of the area being investigated, consumption levels and costs where appropriate
- completes the audit, using the checklists provided in this support document.

STEP 3

Post-audit

Each subcommittee:

- lists the environmental problems identified from the audit
- selects one or two environmental problems to be addressed in this year's school environmental management plan. Where it is not possible to select all the problems, these can be addressed in future school environmental management plans. It is more efficient to address problems that can be managed in the time available than to try to address all the problems at once.
- selects strategies from the lists provided to address the problems
- determines a plan of action and records it on the action plan sheet
- submits the action plan to the school environmental management committee.

The environmental management committee integrates and prioritises the action plans and develops a SEMP.

What resources do you need?

To assist your school in the development of a school environmental management plan, you may wish to refer to and use a number of checklists and proformas that are reproduced on the following pages.

1. Audit checklists (see pages 92-96, 100-102, 105-106, 109-111, 123-139).

The checklists make the collection of data a simple process. There are separate checklists for the curriculum, management of resources and management of school grounds.

Students, with the assistance of staff members, can complete the checklists for management of resources and the management of school grounds. The checklists can be incorporated into teaching programs. Teaching staff should complete the curriculum checklist.

2. Progress sheet for each subcommittee (see page 24)

The sheet lists the processes to be completed by each subcommittee and enables them to keep a record of their progress.

3. A proforma for an action plan (see page 25)

The action plan records the action to be taken by each of your subcommittees after the audit has been completed. Each of your subcommittees is encouraged to record:

- the environmental problems to be addressed in the school environmental management plan
- the performance indicators
- the actions (who is responsible for each part of the plan's implementation)
- the time frame
- the costs
- the links to the curriculum.

(For examples of completed action plans, see pages 84-87, 116-119)

The subcommittees will need to refer to the lists of strategies and environmental education programs when completing the action plan.

Action plans for the management of resources and school grounds have an additional column to show their links with the curriculum.

4. School environmental management plan: Checklist of key questions on page 26

The School Environmental Management Committee will need to consider the questions when developing the school environmental management plan.

5. A sample of a school environmental management plan (see page 27).

6. A proforma of a school environmental management plan for you to reproduce (see pages 28-29).

7. A list of strategies to manage resources and the school grounds (see pages 97-99, 103-104, 107,112 and 140-141)

The list of strategies identify the most appropriate ways for your school to manage its resources and school grounds in conjunction with the requirements of Board syllabuses and how these might be linked to the achievement of syllabus outcomes and the objectives of the *Environmental Education Policy for Schools*.

8. Information on how to integrate environmental education into the KLAs (refer to Section 4)

Section 4 identifies ways you can integrate environmental education into all KLAs. The section explains what students are expected to know, gives examples of teaching and learning strategies, and provides information about special environmental events, days and programs. Secondary schools have been issued with separate key learning area statements for each of the faculties and departments in the school.

9. Environmental education programs and organisations to support your school (refer to Sections 8 and 9)

Environmental education programs to assist your school have been developed by government and non-government organisations. Many programs integrate the curriculum into the management of resources and the management of school grounds.

10. Steps in becoming an environmentally active school (refer to page 20 of the *Environmental Education Policy for Schools*)

Your school can use the framework on page 20 of the *Environmental Education Policy for Schools* as a starting point to assess where you stand in terms of planning and implementing your school environmental management plan.

Proformas for action plans

Progress sheet for the audit of curriculum, resources and school grounds

Tick the box when the task is completed

Focus area	Audit completed (date)	Issues identified from the audit	Issues selected for the action plan	Management strategies identified	Action plan completed	Action plan submitted to the school environmental management committee
<i>Curriculum</i> <ul style="list-style-type: none"> • KLAs with specific environmental outcomes • KLAs without an environmental focus • Special events, days, programs 						
<i>Resources</i> <ul style="list-style-type: none"> • Electricity • Water • Materials & products • Waste • Other 						
<i>School grounds</i> <ul style="list-style-type: none"> • Biodiversity • Soil • Noise • Shade • Human traffic • Visual amenity • Stormwater • Litter • Buildings • Who uses the school grounds? 						

This table demonstrates one method for recording and implementing a checklist in your school.

The following table can be used for each of your school's subcommittees, one each for curriculum, management of resources and management of school grounds.

Proforma for an action plan

ISSUE: _____ GOAL: _____ STRATEGY: _____						CURRICULUM INTEGRATION:	
Performance indicators	Actions to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken



School environmental management plan Checklist of key questions

Your school environmental management committee should consider the following when developing the school environmental management plan:

Have you:

<ul style="list-style-type: none"> • identified the relevant environmental objectives for the school environmental management plan? 	✓
<ul style="list-style-type: none"> • incorporated the principles of ecologically sustainable development into the plan? 	
<ul style="list-style-type: none"> • integrated environmental education into the focus areas of curriculum, management of resources and management of school grounds? 	
<ul style="list-style-type: none"> • been made aware of the key environmental laws and policies that affect the environmental management of your school? 	
<ul style="list-style-type: none"> • involved the whole school community and members of the local community in the formulation of the school environmental management plan? 	
<ul style="list-style-type: none"> • considered the triple bottom line: balancing economic, environmental and social factors? 	
<ul style="list-style-type: none"> • highlighted best practice in the management of resources and school grounds? 	
<ul style="list-style-type: none"> • communicated with organisations to assist your school to achieve its environmental objectives? 	
<ul style="list-style-type: none"> • incorporated action plans for the management of your resources and school grounds, and the incorporation of environmental education into the curriculum? 	
<ul style="list-style-type: none"> • identified environmental events, days and programs to enhance your school's environmental education program? 	
<ul style="list-style-type: none"> • included a statement of intent? 	
<ul style="list-style-type: none"> • considered how you will measure and report your progress? 	
<ul style="list-style-type: none"> • included activities to extend desirable behavioural changes at your school into the home and local community? 	

A sample of a school environmental management plan

School: Enviro Public School

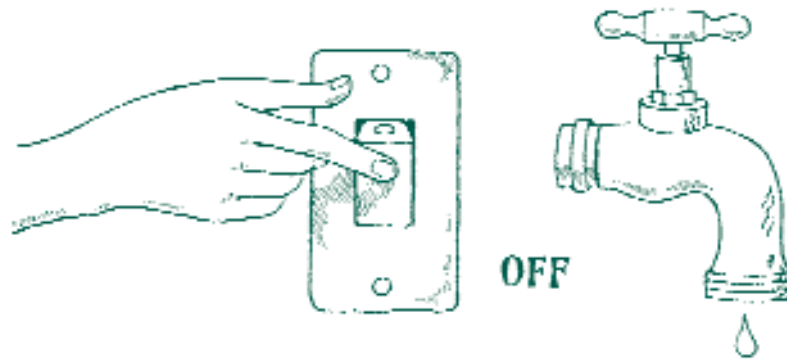
<p>Situation: The School is situated near Sackville North. It was established on its present site in 1876. It is located on the Hawkesbury River and nestled among small areas of remnant bushland and encroaching urban development.</p>	
<p>Statement of intent: The school community will promote the principles of ecologically sustainable development, and the school environment will be managed according to these principles.</p>	
<p>Issues: These are the environmental problems identified from the audits and surveys</p>	<p>Curriculum: There are no environmental education links to the key learning areas and there is a lack of participation by the school in special environmental events.</p> <p>Management of resources: Electricity over-consumption, high-energy appliances used, and no commitment to conserve energy by staff.</p> <ul style="list-style-type: none"> • <i>Products and materials:</i> School uses toxic chemicals and has few recyclable products. • <i>Waste:</i> Too much litter, particularly plastics, in the school. No policy on disposal methods. • <i>Water:</i> Over-consumption due to leaking taps. <p>Management of school grounds: Lack of biodiversity, little revegetation taking place, vandalism a problem, stormwater run-off into the Hawkesbury River.</p>
<p>Action plans</p>	<p>The following problems will be addressed in this year's plan:</p> <p>Curriculum: Lack of participation in special environmental events</p> <p>Management of resources: Over-use of electricity</p> <p>Management of school grounds: Lack of biodiversity.</p> <p>Action plans have been completed, and will be implemented, for each focus area.</p>
<p>Minimum standards</p>	<p>Minimum standards for:</p> <p>Curriculum: Whole-school participation in a special environmental event</p> <p>Resources: Reduce electricity consumption by 40%</p> <p>School grounds: Increase vegetation cover by 10%.</p>
<p>Monitoring and evaluation</p>	<p>Progress will be monitored against the framework: "Steps in becoming an environmentally active school". This process will determine how effectively environmental education is being taught.</p>
<p>Reporting</p>	<p>The school will report on its progress in terms of the environmental management plan in its annual report.</p>
<p>Future directions</p>	<p>The school will continue to monitor progress. Other environmental problems identified in the audits will be addressed in next year's SEMP.</p>

Proforma for your school

School: _____

<p>Situation: School is situated near _____</p> <p>It was established _____</p> <p>Statement of intent: _____</p>	
<p>Issues (problems identified from the audits)</p>	<p>Curriculum:</p> <p>Management of resources:</p> <ul style="list-style-type: none"> • • • <p>Management of school grounds:</p>
<p>Action plans</p>	<p>The following problems will be addressed in this year's plan:</p> <p>Curriculum:</p> <p>Management of resources:</p> <p>Management of school grounds:</p> <p>Action plans have been completed, and will be implemented, for each focus area.</p>
<p>Minimum standards</p>	<p>Minimum standards for:</p> <p>Curriculum:</p> <p>Resources:</p> <p>School grounds:</p>

Monitoring and evaluation	Progress will be monitored against the framework: "Stages in becoming an environmentally active school". This process will determine how effectively environmental education is being taught.
Reporting	The school will report on the progress of the environmental management plan in its annual report.
Future directions	The school will continue to monitor its progress. Other environmental problems identified in the audits will be addressed in next year's SEMP.





4. Teaching environmental education through the curriculum

Syllabuses (should be) environmentally sensitive and lead to an appreciation of the complexity and fragility of the Australian and global physical environment and encourage rational, informed and sensitive consideration of its use.

Board of Studies, *Statement of Values*, 1996

This section addresses the issue of integrating environmental education across the curriculum. Separate sections have been developed for Stages 4 to 6 and will be distributed to high school teachers as separate key learning area booklets. However examples relating to the secondary curriculum are also in this section.

The ability to act for the environment relies on the acquisition of skills to identify, interpret and communicate environmental problems and to find and implement solutions. Our teaching must provide students with these skills. In this way students:

- will employ these skills to explore the world around them
- identify features of the local environment, and
- recognise that action is required to maintain and improve their local environment.

How successful we are at producing environmentally aware students is dependent upon our ability to deliver environmental education programs effectively through the school curriculum.

To maximise environmental education opportunities, teachers should recognise the educational benefits of outdoor experiences for students. Participation in hands-on outdoor activities is essential and should be incorporated into teaching and learning activities. The outdoor environment enables students to appreciate the environment in which they live. It develops a sense of belonging to a community that has its own unique natural and built features.

What students should know and be able to do

Teachers should ensure that students are given opportunities to participate in programs that are innovative and help achieve the objectives of the environmental education policy. It is important that the learning experiences provided are appropriate to the individual needs and abilities of students.

The following statements about stages of development for students give teachers an overall description of student achievement in environmental education that would normally be expected at the end of that stage. Each statement describes the opportunities and experiences that students should have within each stage. Teachers can use these to help plan curriculum experiences.



Stage statements

Early Stage 1	Stage 1
<p>Through learning experiences in KLAs, students have opportunities to employ all their senses to explore the world around them. They should identify features of the local environment and recognise that the sun, air, water and soil are essential to life.</p> <p>Students should identify living and non-living things and become aware of the needs of all living things.</p> <p>They should identify and use different forms of technology to explore the environment (e.g. magnifiers, observation cubes, identification charts and dipnets).</p> <p>Students need to identify the ways in which the environment influences their daily lives.</p> <p>They should use language associated with the environment. They should utilise oral, written and artistic skills to communicate information about the environment.</p> <p>Students should become aware of environmental problems and participate in activities that reflect responsible management of the school's resources.</p>	<p>Students who have achieved Stage 1 should be able to identify the different ways in which people interact with their environment. They should recognise how environments change over time and sequence these changes and hypothesise about future changes. They need to recognise Aboriginal peoples' special relationship with the land. To acquire this information, students should explore the local environment, examine photographs and communicate with others.</p> <p>Students should recognise the difference between natural and built environments and be able to describe these differences in spoken and written texts. They need to understand that humans are part of the environment and are capable of modifying the environment.</p> <p>They should express feelings for particular environments and explain why they have these feelings.</p> <p>Students should identify the resources used in the school, recognise the environmental problems associated with the use of resources and participate in activities and adopt behaviours that modify the impact of the use of these resources on the environment.</p> <p>Students should collect data about environmental issues, represent the data pictorially and interpret the results with teacher guidance.</p> <p>Students should recognise that information about the environment comes from a variety of sources, including the internet, magazines, other people, videos and books. They should identify special places and features in the environment</p> <p>Students should use computer technology to construct texts about the environment.</p>



Stage 2	Stage 3
<p>Students should investigate the local environment to help them understand how living things interact and the interdependence of all living things.</p> <p>Students should be able to understand some natural processes in the environment (e.g. the water cycle).</p> <p>Students should be aware of and appreciate traditional and contemporary Aboriginal lifestyles and the relationship of Aboriginal people to the land. They should understand the impact of European settlement on Aboriginal culture.</p> <p>Students should recognise different viewpoints about major historic events.</p> <p>They should explore the features of different types of spoken, written and visual texts to communicate information about the environment. They should employ talking and listening skills to discuss environmental issues and give a short oral presentation on an environmental topic.</p> <p>Students should recognise how to identify environmental problems and recognise them in the school environment.</p> <p>Students need to appreciate the value of conserving the environment and employing sustainable management practices.</p> <p>They should develop and implement a simple plan to address an environmental problem in the school (e.g. recycling waste). They should recognise that individuals can have a positive impact on the quality of the school grounds.</p> <p>Students should develop the skills needed to represent key features of the school on a map. They can describe the relative positions of locations on the map.</p> <p>Students should recognise the need to employ people to protect the environment and appreciate the contribution which these people make to preserving the environment for future generations.</p>	<p>Students should understand the inter-related nature of processes in the natural environment. They should understand ecosystems and recognise the natural processes dependent on biodiversity (e.g. energy cycles, food webs).</p> <p>Students should identify environmental problems in the local area from media reports or personal observations or discussions with other people. They need to recognise environmental decision-making that occurs at community, state and federal levels.</p> <p>Students should understand the different ways in which environmental issues are communicated and have the skills to design and implement a long-term plan to improve a local environment.</p> <p>Students should recognise that resources are finite. They should critically evaluate the use of resources in Australia.</p> <p>Students should be able to make decisions involving conflicting interests (e.g. economic, social, environmental and ethical).</p> <p>Students should be able to understand such issues as the enhanced greenhouse effect and declining biodiversity. They should be able to develop, read and interpret data about these issues in a variety of simple presentations and make judgements based on such information.</p> <p>Students should be able to understand Australia's contribution to global environmental issues.</p>

Stage 4

Students should be able to identify different types of human communities, their interaction within the environment and the impact of their activities on the environment.

Students should identify the global distribution of ecosystems and describe the natural processes that occur in ecosystems. They should have developed skills to investigate ecosystems. They should be able to describe the features of living things and identify the factors affecting the survival of organisms in an ecosystem. They need to understand the principles of ESD and the need to protect and conserve global environments. Students should recognise the importance of maintaining biodiversity.

Students should identify resources used by humans and understand the terms *renewable* and *non-renewable*. They should be able to describe the economic, social and environmental implications of using technology.

Students need to explore a range of global environmental issues and use a variety of text types and oral forms to communicate these issues to others. They should identify different approaches to the management of issues.

They should recognise the difference between needs and wants. They should appreciate the actions of individuals and groups (global, national and local) to improve the environment.

Students should be able to explain the global patterns of poverty and wealth. They should be able to describe the impact of developed and developing countries on the environment.

They should respect different viewpoints and be honest and fair in dealing with others.

They should recognise the need for responsible decision-making at all government levels.

Stage 5

Students should be able to assess the impact of human activity on natural processes. They should recognise the consequences for the environment of human use of resources. They should recognise the need to promote conservation and preservation of the environment. They should identify and appreciate people who actively preserve and conserve the environment.

Students should develop skills to evaluate methods of conserving, protecting and maintaining Earth's resources.

Students need to identify the unique characteristics of Australia. They should describe the diverse physical and human environments (built, social and cultural).

Students need to be able to describe the negative impact of various technologies on the environment. They should be able to explain the reasons for using renewable resources. They should use a variety of written and oral forms to communicate information about the impact of technology on the environment. They should use information and reports to describe the impact of urban growth and exploitation of resources.

Students need to demonstrate a commitment to the sustainable use of resources.

Students should understand traditional and contemporary methods of land use management. They should identify the environmental factors that contribute to the community's sense of identity and describe the spatial and ecological impacts of changes.

They need to explore a possible course of action aimed at solving these issues. They should explore a range of environmental issues in Australia and use their skills to investigate and communicate local environmental issues.

Stage 6

Students should be able to comprehend the background and implications of contemporary economic issues in the environment. They should understand economic issues in the Australian economy and the management of the environment. They should recognise the role of the community, politics and market forces in environmental decision-making.

Students should understand the principles of ESD and the triple bottom line (i.e. the social, economic and environmental impact of human activity).

Students should demonstrate an understanding of Aboriginal peoples' relationship with land and water and the impact of British colonisation on these resources.

Students should conduct fieldwork and identify, collect and record geographical data from a variety of primary sources. They should be able to synthesise data and evaluate their fieldwork activity.

Students should investigate biophysical processes and issues. They should understand that a knowledge of biophysical processes contributes to the sustainable management of the environment. Students evaluate various environmental management strategies in terms of ecological sustainability.

Students should have an understanding of ecosystems and be able to explain the factors that place ecosystems at risk. They should understand the reasons for the need to protect ecosystems. Students should explain the changing nature, spatial patterns and interaction of ecosystems, urban places and economic activity. They need to evaluate the impacts of, and responses of people to, environmental change. Students should describe and locate resources available in the Australian environment and evaluate the impact on the environment of the use of resources.

They should explain and evaluate the impact of industries, such as food manufacture, on the social and physical environment.

Students should analyse the representations of data about the environment in order to make inferences, predictions and conclusions. They should be able to communicate ideas and information about the environment.



Programming for environmental education

KLAs with mandatory environmental outcomes

In secondary education, many subjects in the KLAs of HSIE, TAS and Science are ideal for the integration of environmental education, as the environment is the focus of many teaching units in these syllabuses. These KLAs have mandatory outcomes specific to the environment.

In primary education, the KLAs of HSIE and Science and Technology provide opportunities for achieving the objectives of environmental education as students work to achieve syllabus outcomes.

The environmental education objectives are:

Curriculum objectives

Students will develop:

- 1. knowledge and understandings about:**
 - the nature and function of ecosystems and how they are interrelated (K1)
 - the impact of people on environments (K2)
 - the role of the community, politics and market forces in environmental decision-making (K3)
 - the principles of ecologically sustainable development (K4), and
 - career opportunities associated with the environment (K5)

- 2. skills in:**
 - applying technical skills within an environmental context (S1)
 - identifying and assessing environmental problems (S2)
 - communicating environmental problems to others (S3)
 - resolving environmental problems (S4)
 - adopting behaviours and practices that protect the environment (S5)
 - evaluating the success of their actions (S6)

- 3. Values and attitudes relating to:**
 - a respect for life on Earth (V1)
 - an appreciation of their cultural heritage (V2), and
 - a commitment to act for the environment by supporting long-term solutions to environmental problems (V3).

Objectives for the management of resources

Schools will:

- take a **whole-school approach** to policy development to include such environmental aspects as purchasing, energy monitoring, water consumption and waste disposal
- employ **best practice** in resource management, and
- identify **learning opportunities** for students resulting from resource management practices.

Objectives for the management of school grounds

Schools will:

- manage school grounds in accordance with the principles of **ecologically sustainable development**
- develop school grounds as part of the overall school plan
- identify learning opportunities for students resulting from the management of school grounds.

To assist teachers in programming for environmental education, outcomes specific to the environment have been identified from the Science & Technology Syllabus Stages 1 to 3, and Human Society and Its Environment Syllabus, Stages 1 to 3. Mandatory outcomes for the HSIE, TAS, and Science key learning areas, Stages 4 to 6, are published in a separate document for secondary teachers.

Teachers can incorporate meaningful environmental education activities in their KLA programs by observing the objectives of environmental education and, at the same time, achieving specific syllabus outcomes. The following activities for the primary curriculum illustrate how this can be achieved. The activities focus on outcomes from HSIE and Science and Technology.



Links between syllabus outcomes and environmental education objectives

Science and Technology

Early stage 1

Outcomes	Environmental education objectives	Activities
A student:		
<ul style="list-style-type: none"> identifies ways in which living things are different and have different needs 	*K1	Playground observations of mini-creatures, their habitat, life cycles, food source. Develop a chart showing differences of each living thing.
<ul style="list-style-type: none"> explores and identifies ways the environment influences our daily lives 	S1	Record the weather. Illustrate how we respond to changes (e.g. the transport we use or the clothes we wear).
<ul style="list-style-type: none"> investigates our surroundings by observing, questioning, exploring and reporting 	S1	Examine a local ecosystem. Identify the features of the ecosystem (e.g. trees, water). <i>Why is each feature important to the ecosystem?</i>
<ul style="list-style-type: none"> shows informed commitment to improving the quality of society and the environment through Science and Technology activities. 	K4 S5	Complete a litter survey. Sort the litter into categories. Find out where it comes from and where it goes. Discuss and implement strategies to reduce litter.

Human Society and Its Environment

Outcomes	Environmental education objectives	Activities
A student:		
<ul style="list-style-type: none"> describes events or retells stories that demonstrate his/her own heritage and the heritage of others 	S1	Make up stories about a building in the area, who lived in it and how people worked and lived in earlier times.
<ul style="list-style-type: none"> gathers information about natural and built environments and communicates some of the ways in which students interact with and can care for these environments. 	S1	Prepare a collage illustrating special natural and built features in the local area. Discuss ways to conserve these special sites.

*K1 and other objectives are explained in full on page 35

Science and Technology

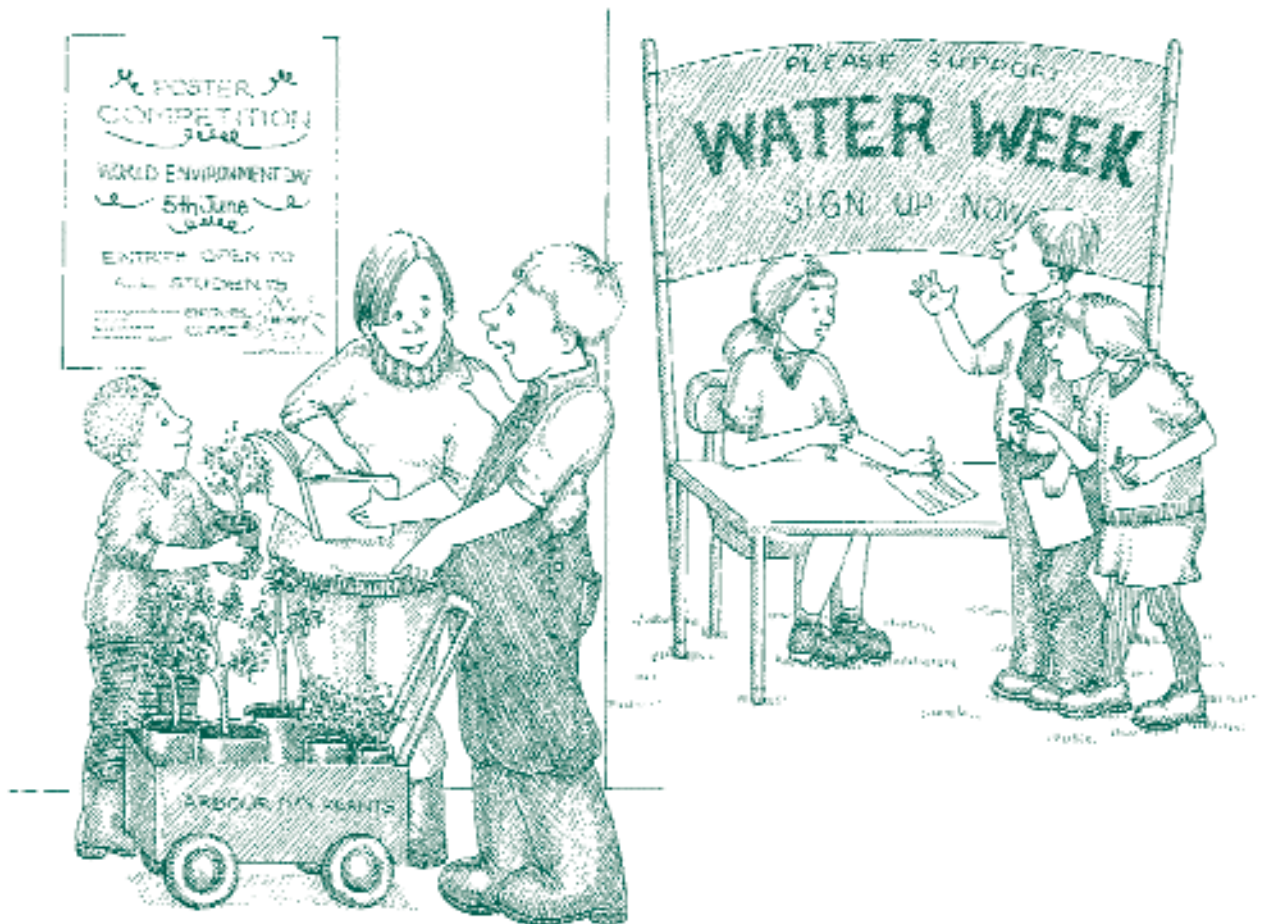
Stage 1

Outcomes	Environmental education objectives	Activities
<p>A student:</p> <ul style="list-style-type: none"> creates, modifies or models built environments to suit the needs of users identifies and describes ways in which living things grow and change grows, makes or processes some products, using a range of techniques and materials identifies and describes ways in which people and other living things depend on the Earth and its environment conducts guided investigations by observing, questioning, predicting, collecting and recording data, and suggesting possible explanations develops and implements own design ideas in response to an investigation of needs and wants. selects and uses a range of equipment, computer-based technology, materials and other resources to undertake an investigation or design task 	<p>*S1</p> <p>K1</p> <p>S1</p> <p>S3</p> <p>S2</p> <p>S1</p> <p>S4</p>	<p>Students plan and build models of bridges and a housing estate. <i>What impact will these have on the environment? How could they be designed to reduce the impact on the environment?</i></p> <p>Students record the life cycle of a frog and a caterpillar.</p> <p>Students place bean seeds or sprouts in dry soil, watered soil and water-logged soil. They record what happens and suggest reasons for the differences.</p> <p>Students note all the things we need to stay alive: fresh air, clean water, healthy food etc. Record what would happen if these necessities became degraded or contaminated.</p> <p>Students complete a playground survey or explore local bushland. They record the levels of biodiversity in the area, name and number each of the species observed and give an explanation as to why they are there.</p> <p>Prepare a wish list on how you would like to redesign your school grounds. Draw a mind map and tell how this would improve the school environment. Work with a partner and prepare a joint plan.</p> <p>Students use books and computers to identify endangered species that live in the local area and examine ways to protect them.</p>

*See page 35 for explanation of these objectives

Human Society and its Environment
Stage 1

Outcomes	Environmental education objectives	Activities
<ul style="list-style-type: none"> compares and contrasts natural and built features in the local area and the ways in which people interact with these features 	K2	Students list the natural and built features in and near the school. <i>How do we use these areas? List all the built items that came from the natural environment (e.g. brick). How could we modify our behaviour to limit our impact?</i>
<ul style="list-style-type: none"> demonstrates an understanding of the relationship between environments and people 	K2	List all the natural items we need in order to survive. How do we ensure they will continue to be there for future generations?



Science and Technology
Stage 2

Outcomes	Environmental education objectives	Activities
<p>A student:</p> <ul style="list-style-type: none"> creates, models and evaluates built environments reflecting consideration of functional and aesthetic factors identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment identifies various forms and sources of energy and devises systems that use energy conducts investigations by observing, questioning, predicting, testing, collecting, recording and analysing data and drawing conclusions develops, implements and evaluates ideas using drawings, models and prototypes at appropriate stages of the design process 	<p>*S1</p> <p>K1</p> <p>S4</p> <p>S1</p> <p>S1</p>	<p>Students sketch school buildings and label features such as natural lighting, position in relation to the sun, eaves, construction material of buildings, space and size. <i>Is the building energy-efficient?</i></p> <p>Students prepare a life cycle of an insect or mammal and discuss how the animal is part of a food chain.</p> <p>Students list all the forms and sources of energy in the school. Record who uses the energy. <i>How can we save energy?</i></p> <p>Students map biodiversity in the school grounds or an area close by. They make a judgement on why there is more biodiversity in some places than in others. <i>How can we increase biodiversity?</i></p> <p>Students design a sanctuary in their local area, taking into account native flora and fauna, landscape and accessibility for safe viewing by people.</p>

*See page 35 for explanation of these objectives

Human Society and Its Environment Stage 2

Outcomes	Environmental education objectives	Activities
<p>A student:</p> <ul style="list-style-type: none"> describes events and actions related to the British colonisation of Australia and assesses changes and consequences explains changes in the community and family life and evaluates the effects of these on different individuals, groups and environments describes places in the local area and other parts of Australia and explains their significance describes people's interactions with environments and identifies responsible ways of interacting with environments describes how and why people and technologies interact to meet needs and explains the effects of these interactions on people and the environment investigates rights, responsibilities and decision-making processes in the school and community and demonstrates how participation can contribute to the quality of school and community life. 	<p>K2</p> <p>K2</p> <p>K1</p> <p>S5</p> <p>K3 K2 S1</p> <p>K3 S4 S7 V3</p>	<p>Students compare the way the Aboriginal people used their local environment before British colonisation and the way European civilisation has used it since. <i>What problems has this created? What are we doing to resolve these problems?</i></p> <p>Students discuss and summarise how changes over time have affected our environment and how these changes have affected us. Examples could be water, soil, air, cities and technology.</p> <p>Students identify local and national significant sites. <i>Why are these sites special?</i></p> <p>Students discuss major environmental projects in Australia which are attempting to redress the mistakes of the past (e.g. EPA projects, Rivercare, Murray Darling Basin Commission).</p> <p>Students research how technology has made our lives easier but at the same time has introduced problems (e.g. packaging and the scarcity of landfill sites; energy from coal and the enhanced greenhouse effect).</p> <p>Invite an officer from the local council or shire to visit the school to discuss recycling, health regulations, stormwater laws, tree preservation etc. <i>What would the school environment be like if these regulations, aims etc. did not exist?</i></p>

Science and Technology

Stage 3

Outcomes	Environmental education objectives	Activities
<p>A student:</p> <ul style="list-style-type: none"> creates and evaluates built environments demonstrating consideration of sustainability and aesthetic, cultural, safety and functional issues identifies, describes and evaluates the interactions between living things and their effects on the environment evaluates, selects and uses a range of equipment and computer-based technology, materials and other resources to meet the requirements and constraints of investigation and design tasks creates and evaluates products and services, demonstrating consideration of sustainability, aesthetic, cultural, safety and functional issues demonstrates confidence in own ability and willingness to make and implement decisions when investigating, designing, making and using technology 	<p>*K4</p> <p>K1 K2</p> <p>S1</p> <p>S1</p> <p>S1</p>	<p>Students design a school block that uses minimal energy use. The design should include the aspect, natural lighting, positioning of blinds, spaces, insulation, building materials and outdoor features, such as gardens and trees.</p> <p>Students list endangered species and the reasons for their plight, including predators. <i>List the introduced fauna and flora, their impact on the environment and suggest feasible ways to lessen their impact.</i></p> <p>Use computers to monitor energy use in the school. Examine ways to reduce energy use.</p> <p>Students prepare a grocery shelf that stocks only sustainable products. <i>Consider avoiding toxic materials and non-recyclable wrappings. Prepare a recycling policy for your school.</i></p> <p><i>Prepare a design for school grounds or a plan for a local park which takes into account run-off, litter minimisation, aesthetic appearance, routes for foot traffic and shade areas.</i></p>

*See page 35 for explanation of these objectives

Human Society and Its Environment Stage 3

Outcomes	Environmental education objectives	Activities
<p>A student:</p> <ul style="list-style-type: none"> explains the significance of particular people, groups, places, actions and events in the past in developing Australian identities and heritage examines how cultures change through interactions with other cultures and the environment demonstrates an understanding of the interconnected nature of Australian and global environments and how individuals and groups can act in an ecologically responsible manner explains how various beliefs and practices influence the ways in which people interact with, change and value their environment describes how Australian people, systems and communities are globally interconnected and recognises global responsibilities. 	<p>V2</p> <p>V2</p> <p>K1 K4 S4</p> <p>K3</p> <p>K3 V3</p>	<p>Discuss the impact of introduced species to the Australian environment, e.g.:</p> <ul style="list-style-type: none"> fox and cat: prey on native fauna cane toad: predator on native fauna privet: invades native flora areas carp: invades native fish habitat rabbit: destroys pastureland. <p><i>Why were they introduced into Australia?</i></p> <p>Discuss how early British settlers had to change their lifestyle to cope with the Australian environment (e.g. house designs, clothing, farming techniques etc). <i>Has Aboriginal culture had an influence on European culture?</i></p> <p>Discuss Australia's link with global environmental bodies and how this has led to more responsible ecological practices, e.g.</p> <ul style="list-style-type: none"> UNESCO and OECD projects Kyoto Protocol Agenda 21. <p>Compare how farming practices based on culture, religion and beliefs in various countries have led to different attitudes to the environment (e.g. compare a wheat farmer [monoculture] in Australia with a farmer in Peru growing a variety of potatoes [permaculture] with Aboriginal people's original use of the land).</p> <p>Research global plans to reduce greenhouse gas emissions, ozone depletion, ocean pollution and the issue of river systems running through more than one state or country.</p>

How to integrate environmental education into the key learning areas

The task of integrating environmental education is part of a broader one of ensuring that learning throughout the school has coherence, sequence, and balance.

Linking environmental education with current syllabuses is possible because all syllabuses have some outcomes that provide opportunities for achieving the objectives of environmental education.

The method depicted below demonstrates one process for integrating environmental education into your existing curriculum programs.

Step 1 Consider opportunities for incorporating environmental education into a key learning area or more than one key learning area

Consider a teaching/learning activity or unit of work suitable for incorporating an environmental education perspective. This can be done by selecting the environmental education objective to be achieved.



Step 2 Indicators

Consider how some of the syllabus outcomes in the key learning area can be achieved by using an environmental education perspective and by identifying possible indicators of achievement.



Step 3 Teaching and learning strategies

Select activities that will assist students to achieve the outcome(s).



Step 4 Implementation

Implement, monitor, and evaluate the program.

Looking at syllabuses with outcomes specific to the environment

An example of integrating environmental education into a unit of work

The following example illustrates how environmental education can be integrated into English and HSIE. The unit is for Stage 3 students and focuses on the built environment. The theme, reducing greenhouse gas emissions, addresses outcomes from the HSIE and English syllabuses. It also addresses the curriculum objectives for environmental education.



Stage 3: Overview of the unit, *Built environments*

Topic: Reducing greenhouse gas emissions

KEY LEARNING AREAS	DESCRIPTION
HSIE English	The unit focuses on the enhanced greenhouse effect and how to reduce greenhouse gas emissions by reducing electricity use in the school

Focus	Activities	KLA outcomes	Indicators	Environmental education objective
<ul style="list-style-type: none"> Introduce the concept of the enhanced greenhouse effect. Pose an investigation by students. 	<p>Teacher-led discussion about the enhanced greenhouse effect and greenhouse gas emissions.</p> <p>Students research the causes and effects of increased greenhouse gas emissions and identify global "hot spots" for greenhouse gas emissions.</p> <p>Investigation: How can we think globally, act locally?</p>	<p>HSIE SSS3.7</p> <p>Describes how Australian people, systems and communities are globally interconnected and recognises global responsibilities</p>	<p>Explains how electricity use needs to be assessed to determine its global environmental impact.</p> <p>Makes statements about global responsibilities (e.g. responsibilities of consumers of electricity and care of the planet).</p>	<p>S2 Identifying and assessing environmental problems</p> <p>K2 Understands the impact of people on environments</p>
<ul style="list-style-type: none"> Investigate electricity use in the school. Invite a guest speaker. 	<p>Design a survey to determine how electricity is used in the school. Graph electricity usage in the school. Examine past electricity bills.</p> <p>Invite a guest speaker from the local energy supplier. Prepare questions for the guest speaker including how people managed without electricity in the past.</p>	<p>HSIE ENS 3.6</p> <p>Explains how various beliefs and practices influence the ways in which people interact with change and value their environment.</p>	<p>Examines how cultural, historical, economic and political factors can influence levels of people's consumption of electricity.</p> <p>Identifies the different view-points that may be held by groups or individuals about the use of electricity.</p> <p>Evaluates alternative views about the use of electricity in the school.</p>	<p>K2 Understands the impact of people on environments</p> <p>S1 Applying technical skills within an environmental context</p> <p>S2 Identifying and assessing environmental problems</p>

Focus	Activities	KLA outcomes	Indicators	Environmental education objective
<ul style="list-style-type: none"> Develop strategies to reduce electricity use. 	<p>Produce an electricity savings plan and present it to the principal.</p>	<p>HSIE ENS 3.5 Demonstrates an understanding of how Australian and global environments are interconnected and how individuals and groups can act in an ecologically responsible manner.</p>	<p>Explains the effects of excessive electricity consumption on the environment, evaluates the negative aspects of this behaviour over time.</p> <p>Evaluates a variety of ways of addressing excessive electricity consumption in Australia and other countries.</p> <p>Participates in the maintenance or improvement of energy consumption (e.g. produces an electricity savings plan and discusses its implementation with the school community).</p>	<p>K4 Understanding the principles of ecologically sustainable development</p> <p>S3 Communicating environmental problems to others</p> <p>S5 Adopting behaviours and practices that protect the environment</p>
<ul style="list-style-type: none"> Implement the savings plan. Conduct an evaluation. 	<p>Discuss the implementation of the plan with the relevant people (e.g. administrative staff, students etc.)</p> <p>Present the plan to the P&C Association. Implement the plan.</p> <p>Design charts promoting energy-saving strategies and place them around the school.</p> <p>Examine electricity bills to determine the success level of implementing the strategies.</p>	<p>ENGLISH TS3.1 Communicates effectively for a range of purposes and with a variety of audiences to express well-developed, well-organised ideas dealing with more challenging topics</p>	<p>Gives extended procedures with accurate directions.</p> <p>Attempts to persuade others to a point of view or action, presenting a few reasons.</p>	<p>S3 Communicating environmental problems to others</p> <p>S6 Evaluating the success of their actions</p>

Stage 3 unit: *Built environments: Greenhouse gases*

This section provides details of activities that support the teaching of this unit on reducing greenhouse emissions.

Reducing greenhouse gas emissions

Causes of the enhanced greenhouse effect

Effects of the enhanced greenhouse effect

Short-term

Long-term

1. Introduction to greenhouse gas emissions

- The teacher will lead a discussion about greenhouse gas emissions and the enhanced greenhouse effect.
- Using books, resources etc., students research to find the causes and effects of the enhanced greenhouse effect.

The class creates a series of charts entitled *Causes of the enhanced greenhouse effect* and *Effects of the enhanced greenhouse effect*. (This chart should include information on the short- and long-term effects of the enhanced greenhouse gas emissions.)





- On a map of the world, the class colours in the world "hot spots" for greenhouse gas emissions.
- Beside the map, create a chart entitled *Sources of greenhouse gas emissions*. Students list the contributors to greenhouse gas emissions in these countries and the activities that give rise to these emissions.

Pose the question: How can we think globally, act locally in terms of greenhouse gas emissions?

Sources of greenhouse gas emissions

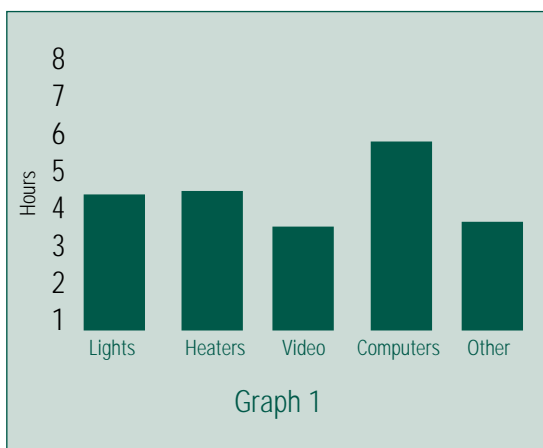
Country

Contributors

Why?

Survey

- How long are lights on each day?
1, 2, 3, 4, 5, 6, 7 hours?
- Is it necessary for the lights to be on all this time?
- Does the photocopier have an energy saver?
- Do the appliances have an energy rating?



Questions for speaker

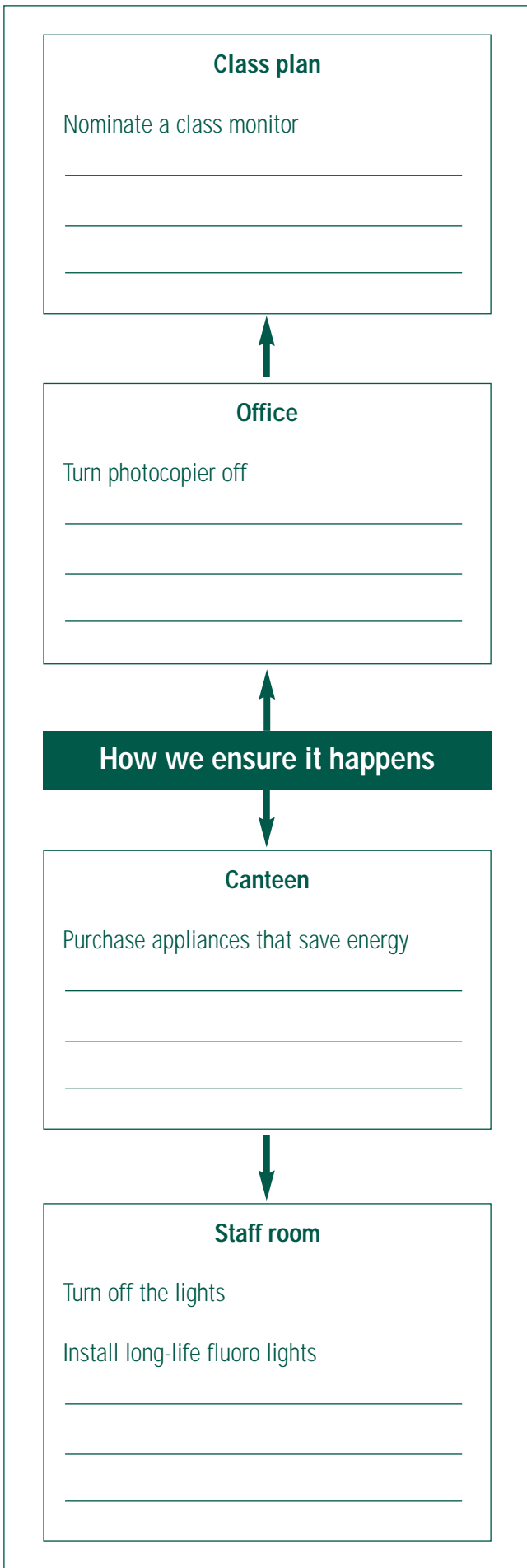
How will we know if we have reduced electricity use?

2. Investigation of the use of electricity in the school: Guest speaker

- In groups, students devise a survey of energy use in the canteen, office, staffroom, library and classrooms to determine electricity consumption. Students need to take into account the electrical appliances located in these areas (e.g. photocopiers, dishwashers, ovens etc.).

Students could spend time in these areas monitoring energy use. Ask classes to record how long the following are left on: lights, computers, heaters, air conditioner, CD player, video, photocopier etc. Graph the use of energy for the canteen, office, staffroom, library and each classroom in terms of time. (Graph 1).

- Discuss the reasons for differences in energy consumption and how it might be reduced in each location.
- Invite a guest speaker from the local energy supplier.
- Students prepare questions for the speaker prior to the visit.
- Ask the guest speaker to demonstrate how to read the electrical meter and to examine where the school is using electricity. Ask the speaker to suggest ways to reduce usage.
- Examine the school's electricity bills for the past twelve months. *Does electricity consumption vary during the year? Why?* Convert the total kWh to greenhouse gas emissions (1kg = 1kWh).
- Discuss with teachers, students, the principal, office staff, canteen workers, general assistant etc. if it is possible to reduce electricity use.
- Do a second graph of each location showing what it could look like (e.g. if lights were turned off at recess).
- Aggregate the potential energy and cost savings.



3. Strategies to reduce electricity usage

- In groups, students devise a savings plan for the school, office, canteen, staffroom, classrooms (e.g. each class nominates a light monitor).
- After devising the plans, invite the principal to the class to explain the plan and get approval for its implementation. Students should discuss with the principal how the energy cost savings could be spent on school improvements.

4. Implementation of the plan

- Visit each of the nominated areas and discuss implementing the plan with the relevant people.
- Design charts to be placed around the school encouraging people to adopt the strategies.
- Make a presentation of the plan to the P & C and school council. *If we save money we can...*
- Divide the students into groups. Each group is responsible for following up results in each of the nominated areas.

Finally, await the next school bill to judge the success of the reduction strategies. Check reductions in usage, costs and greenhouse gas emissions.



Integrating environmental education into those KLAs without an environmental focus

Although syllabuses within some KLAs do not have outcomes specific to the environment, opportunities do exist to link environmental education objectives to them. The KLAs of Creative Arts, Languages, Mathematics, English and PDHPE do not have outcomes that address environmental issues directly, but they are still essential for the delivery of environmental education programs. The following table identifies how these KLAs can contribute to environmental education.

KLA	Contribution to environmental education
Creative Arts	Expressing feelings and attitudes about the environment
Mathematics	Collecting, recording and interpreting data about the environment
English	Recording information, communicating ideas and feelings about the environment, listening to others, gathering information
Languages (in HSIE)	Researching environmental issues in other cultures; communicating these issues in the target language
PDHPE	Analysing the impact of environmental issues on human health

Teachers should ensure that students participate in environmental activities that address outcomes in these KLAs. Teachers can design their own activities or select examples from the teaching and learning section of this document.

The following is an example of environmental education activities that address outcomes in the Mathematics Syllabus. The mathematics activity is for Stage 3 students and can be used as a link with resource management.

Title of unit	<i>Recycling paper in our school</i>	KLA	Mathematics, Stage 3
Outcome	Recognises and represents common fractions, decimals and percentages		
Environmental education objectives	<ul style="list-style-type: none"> Schools will employ best practice in resource management and identify learning opportunities for students resulting from practices in resource management Knowledge and understandings about the principles of ecologically sustainable development. 		
Activities	<ul style="list-style-type: none"> Schools commence a recycling program for paper, plastics, cans and bottles. Each classroom is allocated a paper recycling bin and a box for plastics, cans and bottles. At regular intervals, the items are collected from classrooms and transferred to a central place in the school, where they are to be collected by an external contractor. Each class weighs its paper, cans, plastics and bottles individually and records the weights and date. 		

CLASS 5G ROOM 12				
Date	Weight of paper	Weight of cans	Weight of plastics	Weight of bottles
5 March	32kg	5kg	17kg	21kg
10 March				
15 March				
20 March				

Activities (cont.)

- At the end of each term, students find the sum of the weights of each item for the whole school and record them for the school's information.
- Each class records its total weights for each of the items and then calculates what fractions of the school's total weight flow its items make up.
- Each class then calculates its decimal and percentage contribution to the school's total waste flow.

As an extension, students can prepare bar graphs and pie graphs for each item, each term and over the whole year.

By analysing the items on a term basis, students can answer the following questions:

- Which class contributes the highest percentage of the school's total recyclable waste? Why?
- Which class contributes the highest percentage of paper, cans, plastics and bottles?
- Is there a large percentage variation in items between classes? Why?
- Calculate the average weight of recyclable items per student in the school or in each classroom over a term or a year.
- Compare the total weights over the four terms. Which term contributed the highest annual weight of recyclable materials? What percentage or fraction of the annual total was it? Can you think of any reasons for this?
- Research the possibility of reducing the weight of waste in the school.

TERM	Weight of paper	Weight of cans	Weight of plastics	Weight of bottles	Total weight	% of annual weight
1						
2						
3						
4						
Annual totals						

In small schools, students may weigh their waste items individually and assess their contribution to the waste stream on an individual basis.

How to take other opportunities to teach environmental education

It is important for teachers to recognise teaching and learning opportunities that arise from special events, days and programs, such as World Environment Day, and incorporate these into the curriculum.

Special environmental events, days and programs

Focusing on the environment not only projects a positive image of the school's commitment to the environment but also provides the stimulus for creative environmental activities.

Many organisations outside the Department of Education and Training contribute to these events and have developed resources to complement the formal curriculum. Some of these resources are a collaborative effort between various organisations and the Department (e.g. Murder Under the Microscope involves the Department of Land and Water Conservation and the Department, including OTEN).

Schools can initiate their own special environmental events, days or programs focusing on a theme relevant to the school (e.g. the launch of a new electricity reduction plan or the opening of a new "green canteen" in the school). They can also take advantage of events celebrated by government and non-government organisations at a state, national and international level. Major annual events commemorating the environment are listed on page 162 and include Arbor Day, Water Week, World Environment Day and Wattle Day.

To maximise the environmental education opportunities that these events and days offer, schools can employ the expertise of environmental education organisations, such as the Gould League of NSW Inc.

Special programs

Schools can participate in local and statewide programs such as Streamwatch, Murder Under the Microscope, the Greenhouse Action Program, SCRAP or Learnscapes. Although programs like Streamwatch are specific to particular KLAs or stages of student development, others, such as the Learnscapes program, encourage whole-school participation. These programs integrate environmental education into all the KLAs, feature activities that target specific outcomes and encourage action for the environment. Participation in these programs should be in the context of "think globally, act locally" and incorporate a global perspective. For example, the investigation of a local waterway provides the opportunity to discuss the global decline in water quality and issues associated with catchment management, such as salinity, turbidity, exotic species, ecological indicators, toxic chemicals and blue-green algae.

Section 8 of this support document has detailed information on special programs, designed specifically for schools. The programs link environmental education objectives with outcomes from Board syllabuses.

The local environment

Many **government and non-government organisations** are committed to environmental education, and schools can take advantage of programs developed by these groups. The programs encourage students to investigate the local environment, develop positive attitudes towards it and actively participate in its preservation.

Some municipal and shire councils have initiated unique and exciting environmental education programs intended to create an environmentally and socially sustainable community. Programs are sometimes offered to help students learn about the natural and cultural heritage of the area and participate in council environmental projects. Some of these projects can include:

- Environment Week for schools
- school grounds projects
- a teacher inservice
- special festivals
- shopping centre displays
- school workshops
- Earth Works courses
- a tour of the local river or catchment, and
- a community council forum.

Some local councils employ an environmental education officer who visits schools to present lessons relevant to the curriculum. Topics presented may include water pollution, rubbish recycling, stormwater and estuarine ecosystems.

Teachers can **explore the Internet** for environmental education initiatives that may be suitable for their school. For example, the "Walking School Bus", implemented in Canada and Denmark, is a program designed to reduce unnecessary traffic around schools and could be adapted to NSW schools. It began with parents who were concerned about:

- the amount of pollution coming from cars which were making unnecessary trips to school;
- the fitness of their children; and
- the safety of their children travelling to and from school.

One of the greatest obstacles to walking or riding a bike to school is the issue of safety. Parents often don't want their children to walk or ride unsupervised and find it difficult to accompany them every day. However, if parents thought their children were part of an organised group, picking up others along the way with adult supervision, they might reconsider.

If you would like to find out more about this program, look up the web site:

www.goforgreen.ca/asrts

or contact the Community Education Unit, EPA, Sydney.

The walking school bus is an example of an activity that not only enhances the local environment but also supports the school curriculum.

The school environment

The design and implementation of the school environmental management plan (SEMP) provides scope for whole-school environmental initiatives that can be linked to the curriculum. A school environmental management plan will be effective only if it is incorporated into the curriculum. The design and implementation of the school environmental management plan is predominantly student-centred and should be seen as a resource to assist teachers when programming. It is also a great learning experience for students.



In **secondary schools**, it is essential that all faculties contribute to the implementation of the environmental management plan. The table below illustrates the important contribution that each faculty can make to a school environmental management plan, as well as the auditing process and the development and implementation of the plan.

Subject	Contribution to the SEMP
Mathematics	Collecting data for the audit
English	Compiling an information report on the results of the audit
HSIE	Analysing different types of management plans and designing a final management plan
Science	Analysing the most appropriate and sustainable technology for the school
Creative Arts	Creating artworks that convey messages encouraging everyone to participate in the plan's implementation
TAS	Designing a pathway system that improves the flow of human traffic through the school
PDHPE	Identifying environmental practices in the school that may impact on human health; recommending alternative practices
Languages	Identifying environmental practices in different cultures

The information gathered from these activities can be passed on to the school's environmental management committee, which can use the information to design and monitor the progress of the current environmental management plan and prepare for the next plan.

An example of what a large comprehensive high school can do is set out below.

Some of the contributions that can be made by each faculty in the school to the SEMP are provided here. At the same time, the plan's links to the curriculum are demonstrated.

TAS	<ul style="list-style-type: none"> • Making a useful item from discarded products in Year 10 Design and Technology • Recycling old "wearables" in Years 9 and 10 Textiles • Investigating the packaging industry in Year 9 Food Technology
Science	<ul style="list-style-type: none"> • Streamwatch • Water monitoring • Study of local catchment as an ecosystem • Monitoring of wattage of household appliances and the individual's effect on the environment when using electricity • Appropriate use of chemicals and disposal of waste
Mathematics	<ul style="list-style-type: none"> • Auditing solid waste • Applying Streamwatch results • Scale drawing activity using plans for a proposed controversial development • Monitoring electricity • Setting up of paper recycling system
Creative Arts	<ul style="list-style-type: none"> • Using recycled materials • Dance routines with environmental themes for public occasions • Using paint in tubes instead of pots so that there is less waste • Sealing darkroom benches so that chemicals are not absorbed • Recycling silver in darkroom settling tank • Using recycled "materials" in drama
Languages	<ul style="list-style-type: none"> • Employing environmental slogans in French and German
English	<ul style="list-style-type: none"> • Using texts with an environmental theme or which stimulate discussion and contemplation on our place in the environment
HSIE	<ul style="list-style-type: none"> • Studying a mini research unit on the local area, <i>Human impact on environment</i> in Stage 5 Geography • Studying <i>Retail Operations</i> in Stage 6 <i>Environmental Impact Study of Retail Centres</i> • Studying a student environmental action program with a link to Streamwatch in <i>Geography Stages 4-5</i> • Studying <i>Environmental Law</i> in Stage 6 Legal Studies • Analysing environmental issues in contemporary Australia in Stage 5 History • Studying implications of overseas trade and uranium mining in the 80s and 90s as one of the focus areas in Stage 6 Modern History.
PDHPE	<ul style="list-style-type: none"> • The effect of the environment on health and nutrition.

Linking the management of resources to the curriculum

Through the management of resources, schools can explore current strategies, environmental challenges and management tools, such as cleaner production, cradle-to-grave production, greenhouse gas emissions, climate change, environmental cost accounting, consumerism, renewable energy and waste generation and disposal.

A wide range of programs support the sustainable management of resources in schools. The programs complement the outcomes of most syllabuses and encourage active participation in caring for the environment.

These programs may be produced by such organisations as:

- SCRAP,
- the Hunter Catchment Trust's Oz GREEN,
- environmental education and zoo education centres,
- the Keep Australia Beautiful Council, and
- the NSW Gould League Inc.

relate directly to the environmental education objectives supporting the management of resources.

An example of a project that incorporates the principles of ecologically sustainable development and achieves the environmental education objectives of the Environmental Education Policy for Schools is the establishment of a "green canteen".

Many schools target the canteen, in particular the problems associated with waste generation and disposal, when implementing resource management strategies. Several schools have adopted the principles of the Green Canteen, promoted by the Manly Environment Centre and supported by the NSW Environment Protection Authority.

The development of a green canteen provides excellent opportunities to incorporate resource management into the curriculum. Examples are provided in the following table.

KLA ACTIVITY	
Mathematics	Conduct an audit of the waste generated from the canteen; count the number of packaged items sold. Graph and interpret the results.
English	Write a report on the impact on the environment of packaging generated from the canteen to emphasise the need to streamline the school's waste minimisation strategies.
HSIE	Examine procedures for creating a green canteen. Determine the most appropriate strategies for the school and produce a plan for a green canteen. Give an oral presentation of the plan to representatives from the school community.
Science	Select four types of packaging and illustrate their life cycle, from production to decomposition (cradle to grave). Determine the amount of energy required to produce each item. Examine different types of packaging. Identify the most environmentally friendly forms of packaging. Ask: <i>Are these suitable for the canteen?</i> Draw up a list of items suitable for sale in a green canteen.
PDHPE	Examine the nutritional value of items sold in the canteen. Find information on nutritious food that has minimal or no packaging and that could be sold in the canteen. Cost each item and produce a list of suitable items.
Creative Arts	Design advertising material promoting the green canteen.

Linking the management of school grounds to the curriculum

Special programs for school grounds give teachers the opportunity to incorporate environmental issues, such as lack of biodiversity, exotic species, stormwater, land degradation, noise and water pollution, into the curriculum.

Organisations such as Landcare, the Society for Australian Plants, the Australian National Botanic Gardens, State Forests of NSW and the Royal Botanic Gardens are actively involved in preserving and restoring the Australian environment. These organisations offer a range of services to schools. Detailed information about these organisations can be found in Section 8 of this document.

Environmental education centres offer a range of programs supporting the management of school grounds. Centre staff can assist in the design of school grounds for educational purposes. More information on these centres can be found in Section 7 of this document.

The Department of Education and Training, in cooperation with the School Learnscapes Trust, has piloted a program targeting the sustainable management of school grounds. The program is integrated into the formal curriculum and addresses outcomes from Board syllabuses. The Learnscape program was developed in accordance with the objectives of environmental education.

What are the features of a Learnscape program?

Learnscapes are spaces and places in and near schools that provide a forum for hands-on learning experiences relating to environmental education.

An example of a Learnscape program

Teven-Tintenbar Primary School, near Lismore, initiated a Learnscape project to enhance the school's languages program. The project features a small-scale version of a South-East Asian rice-growing farm and was planned as an example of sustainable intensive agriculture combining language and culture.

It is an example of including environmental education into a selected languages topic, a unit on "The Rice Growing Cycle", developed at the school. In this unit, language and cultural aspects of Indonesia are presented in the context of the rice cycle. The communicative functions, language structures and language learning experience suggested in the unit, can be integrated around the topic of the rice cycle.

The program was planned as the focus for the introduction of languages learning (Bahasa Indonesia) into the school curriculum, with the aim of integrating other key learning areas, such as Science and Technology, HSIE and Creative Arts. The project also made use of the school grounds and involved students in outdoor activities, an essential component of environmental education.

The "stages" of the rice-growing cycle then became the focus for developing learning activities. Links with other KLAs and the Learnscape program were forged. In partnership, students, staff and parents used problem-solving skills to build the resource.

The rice farm

The South-East Asian Rice Farm consists of three terraced rice paddies, a gravity-fed irrigation system, a shelter hut, a shadehouse for raising seedlings, a landscaped garden with tropical plants, such as bamboo, taro and palms, a pond and small stream for frogs, lizards, insects etc, a scarecrow, signs in Indonesian and Japanese and so on. Further extensions, such as an outdoor classroom and a number of linked learnscapes, have since been added.

This demonstration model is fully operated by the students, with assistance from parents and teachers. The working of the farm follows similar farming practices and growing cycles as in South-East Asia, i.e. raising seedlings, preparing the ground manually, transplanting seedlings, harvesting, threshing, selling or cooking of the rice (with seed being saved for the cycle to continue). With 3 rice paddies, more than one class can be involved at the same time, at varying stages of the rice-growing cycle. As the cycle progresses, the appropriate language and cultural aspects of life in South-East Asia are drawn into the learning, with an environmental perspective.

A practical project such as this gives students the opportunity to put what they are learning into practice. The program has a predicted life span of perhaps five years, with at least two complete (overlapping) rice-growing cycles per year.

The unit of work

The process involved in designing the unit was:

- The content or topic was selected.
- Outcomes that match the stage and the topic or focus question were chosen.
- Indicators that demonstrate student achievement of the outcome were listed and learning activities were designed to achieve the outcome.
- Resources were identified and, at the same time, plans for making new resources were made.
- Finally, assessment procedures were developed.

For assessment, students were presented with a list of expectations, which they could monitor themselves as the unit progressed.

The school is involved in an **exchange program** with a group of five schools in Vietnam. Similar to Teven-Tintenbar School, these five schools are concentrating on developing their playgrounds and re-establishing trees and native vegetation in their grounds.



Curriculum planning sheets

The following proformas may help you in your curriculum planning.

An audit of environmental education and the curriculum

Schools should conduct an audit of the curriculum to determine where environmental education is being implemented and to identify opportunities for further implementation.

Are we already integrating environmental education?

Complete the following table to determine where environmental education is being integrated into KLAs with outcomes specific to the environment.

KLA:	
Mandatory outcomes from syllabuses that address environmental education	Environmental activities that address the outcome

- Are there other mandatory outcomes where environmental education can be integrated?

- List these outcomes and suggest environmental activities to support them.

Are we integrating environmental education into KLAs that do not have an environmental focus?

Some KLAs do not have outcomes that address the environment directly (e.g. Mathematics, Languages, English, PDHPE). However, there are opportunities to incorporate environmental education into these KLAs. For example, completing a pictogram of the type of litter in the school is relevant to achieving outcomes in the Mathematics Syllabus.

Your school may already be doing this. Fill in the sheet to determine where your school is integrating environmental education into these KLAs.

KLA:	
Outcomes where environmental education is being addressed	Environmental activities being conducted

- Are there other outcomes where environmental education can be integrated?

- Make a list of the outcomes and environmental activities to support them.

Teaching and learning strategies

The processes used in teaching and learning about the global environment are crucial to the development of a value system that will provide students with the knowledge, skills and attitudes necessary for global citizenship. This involves being able to work with others, solve conflicts non-violently, recognise and counter injustice and bias, and take action to ensure a sustainable world.

While content is important, environmental education is looking at long-term values and changes in people's attitudes and behaviours.

Think Global,
Curriculum Corporation, Carlton Vic, 1999, p.25

Activities

These activities address current environmental issues such as enhanced greenhouse gas emissions, endangered species, the life cycle of products, urban expansion, feral animals, the loss of biodiversity, transport and over-consumption of the Earth's resources.

While the activities explore environmental issues at a school level, they also focus on issues at a local, national and global level in the natural, built, social and cultural environments.

At school level, some of the activities target the management of resources and school grounds. These activities should be incorporated into a planned sequence of teaching and learning activities that address the social, economic and environmental consequences of human activities. They should encourage students to adopt behaviours and attitudes that are necessary for the sustainable management of the Earth's resources.

Activities are part of a total curriculum plan. They should not be implemented in isolation or unconnected to the achievement of targeted outcomes.

It is essential that secondary teachers check the Stage 3 activities, as many of them can be extended to be made suitable for secondary students. Primary teachers should check the activities for Stages 4 and 5 and modify them to suit their students.

Primary school activities supporting environmental education

Your thoughts

Suitable for students in Early Stage 1 & Stages 1, 2, 3

In a sharing circle, arrange a selection of pictures. The pictures present negative and positive aspects of the environment (e.g. a clean beach or rubbish in the bush).

Ask students to choose a picture and tell the group their reason for choosing it.

Place the pictures back in the circle. Have students select pictures that make them feel good, make them feel concerned and select some that they know something about or some about which they want to know more. Again, have students tell the rest of the group the reasons for their selection. If they choose a picture representing a negative aspect of the environment, ask them to suggest ways to remedy the situation.

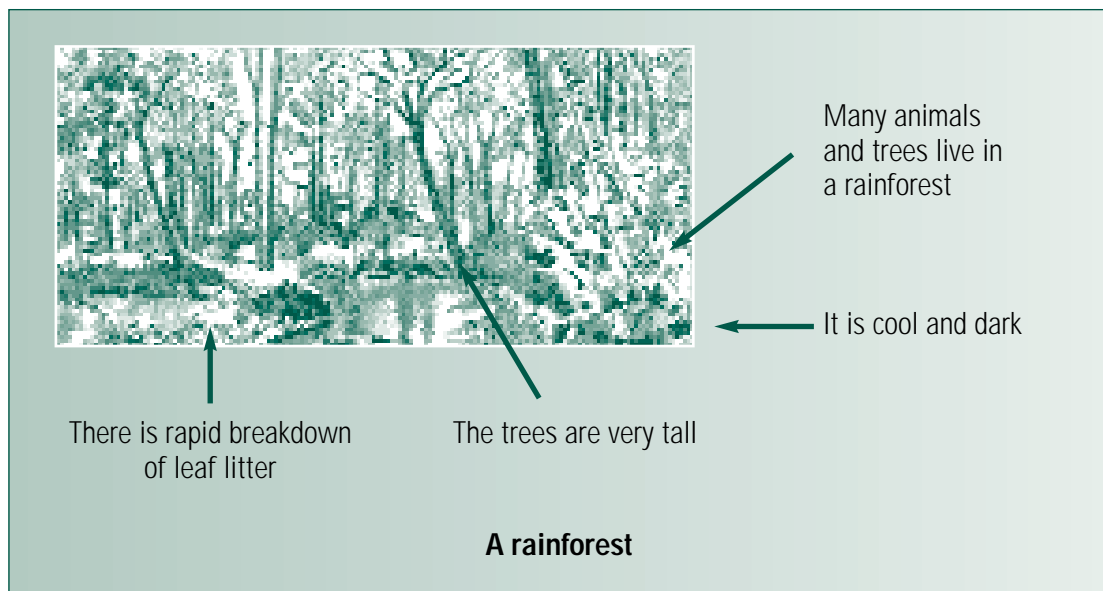
Thinking differently

Suitable for students in Early Stage 1 & Stages 1, 2, 3

Select a topic with an environmental theme (e.g. a rainforest, a river, waste, etc).

Draw a mind map of what students know about the topic. Discuss why people know different things about the same subject.

This activity can be undertaken at the start of a unit of work about the environment and repeated after the unit has been completed.



Textures

Suitable for students in Early Stage 1 & Stages 1, 2, 3

Students explore textures with a partner. Each student takes a rubbing of different textures in the environment. Neither partner is to see where the other partner does the rubbings. Once completed, they give the rubbings to their partner who has to find and identify the source of the rubbings. Once located, the student feels the source of the rubbings and describes or makes a list of words describing how each feels (e.g. rough, smooth etc.)

Students can also explore textures by going on a "texture search". Words describing particular tactile qualities (e.g. *rough*, *smooth*, or *dry*) are written on cards that are distributed to the students. A pictograph can be created listing the tactile qualities and items found. *What is the dominant texture in the environment explored?*

Trails

Suitable for students in Early Stage 1 & Stages 1, 2, 3

Students design a series of trails around the school. These could be different kinds of trails such as a trail you can take and always be able to touch a plant or see the sky or walk on soil.

The students should begin by going out and finding their trails. They need to note down all the places they want to include in their trails and draw a map showing the features.

A habitat for mini-creatures

Suitable for students in Early Stage 1 & Stages 1, 2, 3

In groups, students place a small piece of carpet or old blanket on a grassy area. Ensure the pieces are not disturbed for a week. During the week create a class chart with the title "What is an insect?"

Return to the carpet and lift it up. Identify the creatures present using an identification chart. Tally the number of creatures. If possible, place the creatures in observation cubes and note their features such as size, colour, wings/no wings.

Ask the students to count the number of insects. Record the results. Make a list of all the insects and non-insects.

Discuss why the creatures were found under the carpet or rug and list the needs of the creatures (e.g. protection, a cool area). *Are there other habitats in the local area suitable for these creatures?* A pile of composting vegetation, for example, will often attract centipedes, millipedes and slaters. Find an area in the local environment and record the number of insects and non-insects.

Recreate the microhabitats as a display in the classroom. Draw and cut out the creatures, label them and sort them into the appropriate microhabitat. Annotate each creature with a written statement indicating why it lives in the microhabitat.

Older students can display the percentage of insects and non-insects found in each microhabitat and discuss the results.

Dance

Suitable for students in Early Stage 1 & Stages 1, 2, 3

This activity is designed to explore natural textures through dance and language.

Students collect objects with an interesting texture from around the school. The objects may include feathers, bark or a stone. (Do not collect anything that is living and do not encourage students to strip bark from trees!)

Ask students to find words that describe what their object feels like (e.g. scratchy, rough, prickly, soft.)

Explore different ways of saying these words and improvise a series of movements to go with each word.

Ask students to chant the word in a way that complements the movement.

Ensure students return the objects to where they found them.

Sounds

Suitable for students in Stage 1

Take the students for a walk in the school grounds. Ask them to listen to all the different noises they can hear (e.g. cars, sirens, trucks, birds, children playing, wind in the trees). Ask them what graphic shape would best represent each sound (e.g. a particular bird may be represented by ▲▲▲▲▲▲▲▲). Repeat the activity in different environments (e.g. a classroom, the school canteen or a natural area). Compare the sounds and graphic representations.

Make musical instruments from "clean waste" (e.g. different sized bottles make a different sound when struck with a stick). Create a soundscape using these instruments. Use the symbols the students have devised to make a graphic score of their composition.

Race for waste

Suitable for students in Stage 1

Prior to the activity, the teacher collects clean waste. Select items that can or cannot be recycled.

Divide the class into four teams. Give each student a pair of gloves. Place two hoops ten metres in front of each team. One hoop is labelled "Recyclable" the other "Non-recyclable". A pile of clean waste is placed at the front of each line. Students select an item, run and place it into the appropriate hoop, relay style. Discuss the items in each pile. Count the items in the hoops to determine the most common items. *How does the school dispose of the items? Do the items affect the environment when they decompose? Why is it important to buy products that can be recycled?* Discuss better ways in which the school could dispose of the items.

Litter walk

Suitable for students in Stages 1, 2

This activity can be conducted in the bush or around the school.

Prior to the activity, place litter around the bush or school. Do not make the litter too conspicuous. (In some schools it may not be necessary to place litter around the school; there may be enough litter in the school grounds already.)

Discuss the problem of litter with the students.

Take the students on a walk to look for the litter. Students record the litter they find or take a mental note. They do this without telling the other students what they have seen.

At the end of the walk, students are invited to tell the rest of the class about the litter they saw.

Discuss the types of litter, the impact of each on the environment and the different rates of decomposition.

Students suggest the appropriate way to dispose of the items.

Earth symbol

Suitable for students in Stages 1, 2, 3

Each student spends a short time designing a symbol for a healthy Earth. The students then form pairs and discuss each other's design. The pair then work to produce a combined design that may incorporate ideas from both individual designs. Two pairs form a group of four and the process is repeated. Two groups of four form a group of eight and the process is again repeated. All groups of eight join as a whole class and the process is repeated for the last time. The result is one design into which all students have had input. The students discuss the final design and use it to create a mural.



Colours

Suitable for students in Stages 1, 2, 3

This activity is designed for students to explore different environments using vision.

The activity requires a set of colour cards. (These can be old sample cards of paint colour, cut into squares.)

Before starting this activity, ask students the colours they associate with the environment to be explored. Give three colour cards to each pair of students.

The students explore the environment and collect items that are the same colour as their card.

Discuss the colours found in the environment. *Are there more colours than expected?* Recreate the colours in an artwork or create a graph showing the colours and number of items found for each colour. *Are some colours more dominant in a particular environment?*

Tune in

Suitable for students in Stages 1, 2, 3

Students can use their sense of hearing to explore different environments.

Give each student a sheet of A4 paper, something to lean on and a pencil. Students draw an "x" in the centre of the page. The x represents the student. Students find a place to sit on their own in the chosen environment. In complete silence students record the sounds they hear and where they heard them. The sound can be recorded as a picture or word, a large picture or word for a loud sound, a small picture or word for a soft sound.

When completed, students have a sound map of the area.

On the back of the A4 sheet, students draw two columns, one headed "natural", the other "unnatural". Students list their sounds accordingly. Discuss the sounds. *Were there more natural or unnatural sounds?*

Complete sound maps in a variety of environments (e.g. the bush, school or home). Graph the results to determine the most frequent sound. Also determine if there are more natural or unnatural sounds.

Discuss the sounds you would expect to hear in a city, on the beach or in a rainforest.

Musical environments

Suitable for students in Stages 1, 2, 3

Take the students for a walk around the school grounds or local area and ask them to observe different landscapes.

Draw the outlines of the landscapes on paper.

For example:



Back in the classroom, have the students use their outlines as a form of musical notation and represent them as sounds using a variety of musical instruments. Discuss the sounds created.

Display the outlines and ask students to play a "musical notation". Students guess which landscape the music represents.

Transport systems

Suitable for students in Stage 2 of Languages

Investigate the ecological sustainability of transport systems.

Examine which transport systems are used in the country being studied.

List them on a chart; students find or draw pictures to accompany them. Identify the form of energy used by each system. *What raw materials do these forms of energy use? From where do these raw materials come? Do they cause pollution?*

Evaluate each system in terms of its ecological sustainability.

Students write and act short role-plays in the target language, saying how they will get to school today and why they have chosen that mode of transport.



Pollution bingo

Suitable for students in Stages 2, 3

A game to help students learn and review words related to pollution.

Students can make their own sheets. Rule up an A4 sheet into squares and write "pollution" words in each square (e.g. smog).

To play, a definition is read and students have to find the appropriate word on their bingo sheet and cover.

The first person who gets a full row across, down, or diagonally, wins. There are many variations on the bingo theme, including energy saving bingo, recycling bingo or environmental maths bingo.

Managing waste

Suitable for students in Stages 2, 3

Discuss with students the various types of pollution that a modern society generates and the problems associated with this waste.

Select various items of waste and create a flow chart showing what happens to the items once they are thrown away (e.g. a paper bag, aluminum can, non-recyclable plastic container).

Display the flow charts in two groups. One group should represent items that have a detrimental effect on the environment as they decompose, the other, those that have minimal impact. Discuss the results. Design and implement a waste management plan that addresses those that have the problem of waste disposal.

Mini trails

Suitable for students in Stages 2, 3

This activity encourages students to complete a detailed examination of a small proportion of an environment.

Groups of students require a 6-metre length of string, observation cubes, hand magnifiers, a dentist's mirror (if available), pegs, small square cards to write on and an invertebrate identification chart.

The string is stretched out in a particular environment, such as a bush location. The group walks along the string looking for items of interest. They also look above the string. The students highlight the items using the equipment available (e.g. a magnifier can be placed over some lichen, the dentist's mirror under the edge of a rock, a note pointing to a spider web above, an insect identified and carefully placed in an observation cube).

When the trail is complete, each group nominates a leader. The rest of the group moves to another group's mini trail. The leader stays at the original trail and points out the features to the visiting groups.

After examining all trails, students research a life cycle for one of the invertebrates identified.

Animal drama

Suitable for students in Stages 2, 3

Select an endangered animal and the animals that threaten it. Produce a docu-drama about its life or history.

The play could be performed at the school assembly to raise money for an endangered animals program.

Zoos can provide contact numbers for programs.

A guided tour

Suitable for students in Stages 2, 3

Students are invited to make brochures to show visitors around the school.

Ask them if they have ever visited a National Park and if they were offered a choice of walks (e.g. an Aboriginal food walk, a walk to a waterfall or a nocturnal walk).

Students bring in samples of brochures for special sites. Discuss the information in the brochures. Examine the use of language and how the information is presented. Talk to the students about taking notes. Take the class on a walk around the school grounds. Stop at regular intervals and discuss what they can see. Ask them to make notes at each point.

Make a brochure featuring a variety of walks around the school (e.g. an "historic walk", a "green walk" or a "fragrant walk").

When the brochures are complete, invite the students to take other students on the walks. Parents and other staff members may also be interested in doing the walks.

If students have difficulty finding an interesting walk, this may be an incentive to design special areas in the school grounds.

Habitat card game

Suitable for students in Stages 2, 3

Give each student six pieces of cardboard, each the size of a playing card. On the cards, students draw something that contributes to the destruction of habitats (e.g. a rabbit, a goat or a bulldozer) and write the name of the threat on the card. (They are not to tell others what they draw.)

In groups of five, the students put their cards together, shuffle and play snap (snap the same threats).

The game could also be played with the themes: causes of greenhouse gas emissions, unsustainable practices etc.

The perfect recycling system

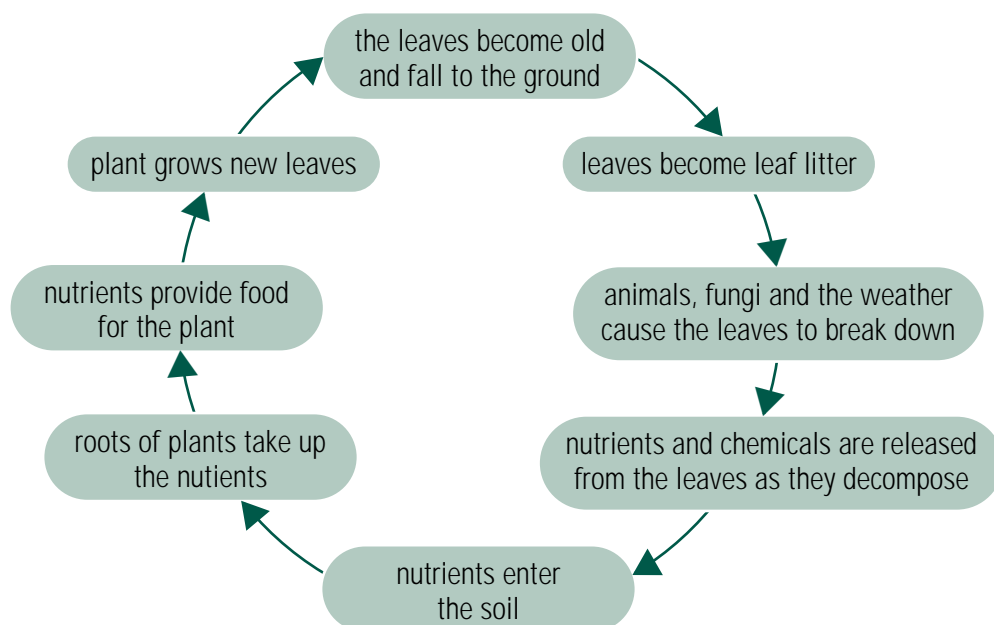
Suitable for students in Stages 2, 3

Locate an area of undisturbed leaf litter. Analyse the leaf litter on top and slowly examine the various layers down to soil level. Then examine the contents of the soil using trowels and sieves.

If students find anything living in the leaf litter or soil, place in an observation cube for closer examination.

Discuss what happens to the leaves, bark and seeds in the leaf litter. *How does the leaf litter break down? Where do the leaves go?*

Flow chart of what happens to leaf litter



Discuss with students why this is the "perfect recycling system".

Headliners

Suitable for students in Stage 3

Ask students to write headlines about incidents "not likely to happen", e.g.

- National Parks to be logged
- Wilderness organisations want sections of the Blue Mountains for landfills.

Discuss why each headline is unlikely. What conditions would have to occur before the headlines would be probable? Are any of these conditions likely to happen in the future?

As a variation, ask students to study editorials and cartoons and discuss their purpose and value as a form of communication. Then ask students to draw humorous cartoons about a local environmental issue.

What a waste!

Suitable for students in Stage 3

From this statement, determine the following:

- *How many bins has each individual filled in a lifetime? (Multiply the person's age by 80.)*
- *How many bins has each family filled in the past 10 years?*
- *How could the number of bins filled by each family be significantly reduced?*
- *How many trees have been cut down for the class, the whole school, and the local community?*
- *What could we do to reduce the number of trees being cut down?*

In one year each person throws away about 80 bins of garbage!

Each year about two trees are cut down to satisfy the paper requirements of each person in Australia.

Endangered animals

Suitable for students in Stage 3

Students research an "endangered animal program" for an Australian native animal (e.g. conservation of the green and golden bell frog). The research should examine threats to the animal, breeding programs, returning animals to the bush, and strategies to protect the animals from extinction. The students should examine the people involved in protecting the animals.

Students role-play TV interviews with the people involved in preserving the animal (e.g. scientists, community groups, and planners). Students take on the role of interviewers and experts. "Interviewers" prepare a list of questions. "Experts" need to understand the issue so they are not caught out not knowing the answers.

Travelling together

Suitable for students in Stage 3

This activity will help schools who want to start a "walking school bus". Information on the walking school bus is on p. 54.

- Photocopy and enlarge a map of the streets around the school from a street directory.
- Assemble the class at the front of the school. The whole group should walk together as a group in one direction for 10 minutes. Mark the location (10) to which the group walked on the enlarged copy of the map.
- The whole group should then continue walking together as a group in the same direction for a further 5 minutes. Mark the location (15) to which the group walked on the enlarged copy of the map.
- Place the arm of a compass on the centre of the school on the map. Place the pencil tip of the compass on location (10). Use this distance as the radius of a circle. Draw a circle around the school. This is the "10-minute zone".
- Again place the arm of the compass on the centre of the school. Place the pencil tip of the compass on location (15). Draw a circle around the school. This is the "15-minute zone".

- Everyone in the class should mark the location of their home on the map. *How many people live in the 10-minute zone? Do all of these people walk or ride to school? How many live in the 15-minute zone and are driven to school?*
- *Discuss possible routes and meeting places where the bus stops for passengers on a "walking school bus". Which parents might be the "bus driver?"*

Invite your parents and the parents from other classes to a meeting to find out more about a "walking school bus".

Detective work

Suitable for students in Stage 3

Take the students on a walk in the school grounds. Ask students to look for five objects that could make interesting photos or drawings. In groups, students photograph or draw a small part of each object (e.g. an unusual brick in a building or a section of a plaque.)

Students give their drawings or developed photos to another group, who are required to find the objects.

When the objects are identified, the students are required to research and list the materials used to produce these items. *Are the items made from renewable or non-renewable resources? Is a large amount of electricity or other forms of energy required for the production of the items? Is there an alternative item that has less impact on the environment during its manufacture?*

School history

Suitable for students in Stage 3

Take the students on an investigation of the school buildings and grounds to see what evidence they can find of the history of the school.

Examine additions to the school buildings, remains of bushland, large rocks, old plaques, incinerators, chimneys or old sewerage inspection holes. The school may have been named after a feature of the environment no longer in existence or after a notable individual or organisation.

Write a history of the school.

As an extension, students may wish to record the history of the site before it was a school and prior to European settlement.

Life cycle of a product

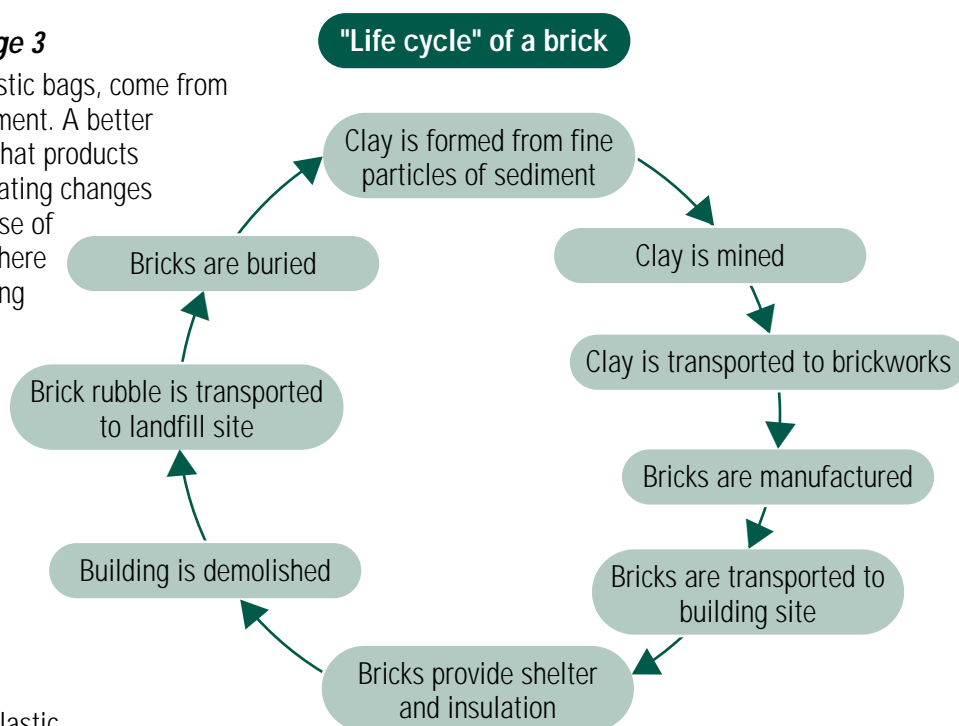
Suitable for students in Stage 3

All products, from bricks to plastic bags, come from resources found in the environment. A better understanding of the changes that products undergo is possible by investigating changes during their manufacture and use of the final product. The diagram here demonstrates the changes during the manufacture of a brick.

(i) Ask students to write or comment on the effect on the environment at each stage of the "life cycle" of a brick.

(ii) Draw the "life cycle" of:

- a paper cup
- a rubber ball
- a compact disc
- a dinner plate
- a chocolate wrapped in plastic.



Each life cycle should include information about the following:

- *What forms of energy are used and when?*
- *What impact does the energy use have on the environment?*
- *Where do the resources to make the product come from? Are these renewable or non-renewable resources?*
- *What are the advantages and disadvantages of alternative products?*

Compare the life cycles of products produced from natural/unnatural materials (e.g. a paper cup and a styrofoam cup). *Which product has the least impact on the environment during its life cycle?*

Secondary activities supporting environmental education

Transport

Suitable for students in Stage 4

In this activity, students examine transport emissions and the strategies that can be employed to reduce these emission levels.

Students calculate how much CO₂ their family car releases on a trip to school, the shops, the cinema, visiting friends and relatives. Combine the results for the whole class. Repeat the activity using a bus (releases 120 grams) and train (150 grams) as the form of transport. Discuss the results.

List strategies employed to reduce transport-related CO₂ emissions. Write each strategy on a small individual piece of cardboard. Mix up the pieces of cardboard and cover. Invite students to select one of the strategies and suggest how the strategy could be implemented in the local area.

A private car releases about 210 grams of CO₂ per kilometre!

Greenhouse gas emissions

Suitable for students in Stage 4

- How much greenhouse gas will one computer generate in one hour?
- Determine the amount of greenhouse gases released by all the computers in the school in a day, a week, and a year.
- Students calculate the amount of greenhouse gases produced each year from computers in their homes.
- Develop strategies to reduce the amount of greenhouse gases released from computers. To do this, students may need to research the amount of greenhouse gases released from different types of computers (e.g. a laptop or desktop computer).

"Twenty computers generate about 2.5 kilograms of greenhouse gases every hour they are on."

The water cycle

Suitable for students in Stage 4

This activity introduces students to their role in the water cycle. It begins with an action most familiar to students. "I am a person who turns on the tap to get a drink". Each student then plays a role, proceeding backwards through the cycle from pipes to a pumping station, a water treatment plant, on to a river and eventually to rain clouds, and the sun. Each component states what it does (e.g. "I am the water treatment plant that purifies the water of bacteria and other dangerous organisms").

The cycle can be repeated, beginning with "I am the person who flushed the toilet" or "I am the person that tipped the oil down the sink".

Passport to paradise

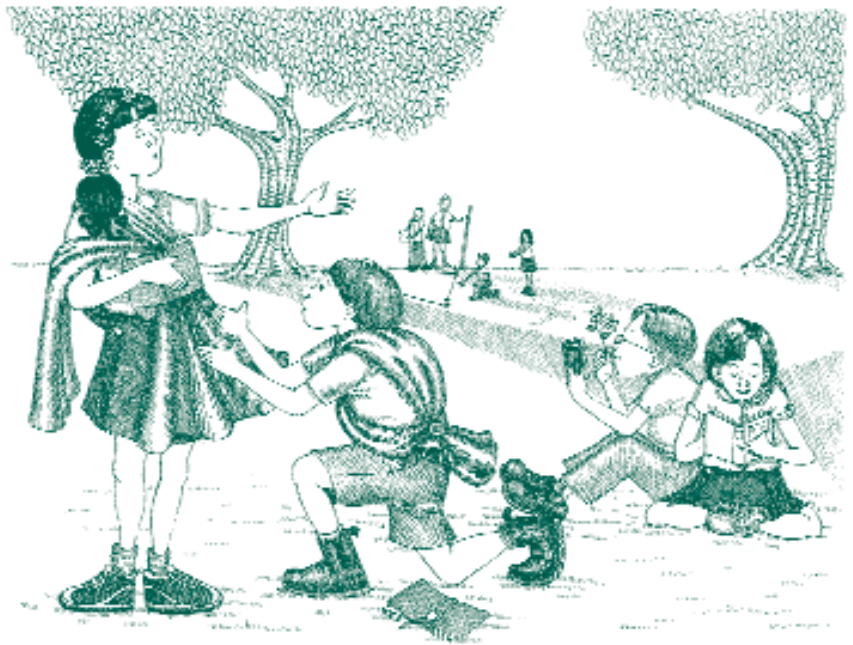
Suitable for students in Stage 4

Many exotic plants and animals have entered Australia. Their introduction has had devastating consequences for native species (e.g. foxes and feral goats have been responsible for the dramatic decline in the number of yellow-footed rock wallabies in western New South Wales).

Students research some of the plants and animals introduced into Australia and design a passport for each. On the passport, include a picture of the plant or animal, country of origin, physical description and reason for entering Australia (e.g. foxes were imported so people could go fox hunting).

Draw up an "itinerary" for the plant or animal from the day it entered Australia to the present day (e.g. it might have entered on a ship in the First Fleet, escaped into the bush and found a bird to eat).

After completing the itinerary, students are assigned to the position of "deportation or eradication officers" and are required to devise strategies to eradicate the exotic species.



The sustainable building

Suitable for Stage 4 students

Assign the students to the role of "sustainability officers".

In groups, students research the features of a sustainable building. This could include the design, the building materials or the fixtures.

Each group creates a large drawing of a building with sustainable features. The groups give an oral presentation to the class and justify the sustainable features incorporated into their building.

The class determines the most sustainable building.

Design a class chart entitled "Why design a sustainable building?" List sustainable practices and the benefits of each. One example is listed here.

Sustainable practice	Benefits
Insulate the building	Reduces the amount of greenhouse gas emissions released because less heating and cooling are required.

Discuss the advantages of having sustainable buildings at the school.

To extend the activity, prepare a class presentation on the advantages of sustainable buildings and give it to the principal. The presentation could include taking an existing building in the school and redesigning it as a sustainable structure. Compare the running costs of the building before and after its redesign.

Secondary school activities supporting environmental education

Imagination

Suitable for students in Stages 4, 5

During this activity, groups work together to create an imaginary nation. Each group must create an imaginary state or area that will become part of the big **IMAGINATION**.

To do this, each group will:

- collect a state from their teacher and give it a name
- choose names and locations for at least three cities or towns
- choose one city to be its capital
- on the state, draw all the roads, bodies of water, farmland, mines, railways, ports and national parks
- put in the sewerage farms, rubbish tips, factory areas, power stations, timber mills and water supplies
- consider special places of interest, such as parks, zoos, lookouts or historical sites
- plan a tour of the state. Make a list of places where you would stop. *What is important about each place?* Publish this as a tourist guide.

Having completed the state, let the group decide who will colour it, write and design the tourist brochure, and present the brochure and the state plan to the class.

When all members of the group have finished their maps, choose one member to meet with other group representatives to put the states together to make one big **IMAGINATION**. Cooperate with classmates to decide on a name for the nation and perhaps design a flag. Display your national map on a wall or floor space. Groups take the members of the class on a tour of the state using the tourist brochure. Ask if the activities in one state affect the environment in the adjacent states.

As a variation, students may develop a state that uses only sustainable practices.

Causes and effects

Suitable for students in Stages 4, 5

It is important for students to understand the effects of human activity on the environment. The following activity shows the causes and effects of activities in a catchment.

Land use activities can cause many changes to the catchment. The effects of these changes can sometimes alter natural processes and have negative effects upon the catchment.

On the table list some possible negative effects of human land use activities upon catchments. For example a table, as depicted below, might be developed.

Negative effects of human land use activities				
Increased soil erosion	More frequent flooding	More turbid water	Litter in water	Excess nutrient in waterways
Loss of habitats	Death of native plants	Death of native animals	Introduced plants	Introduced animals
Increased algae in waterways	Foul-smelling water	Reduced visual amenity	Sound pollution	Loss of our natural heritage

Ask the students to complete the following table to show cause-and-effect relationships. One suggested response has already been included.

Causes	Effects
Concrete surface	Increased runoff → increased turbidity → death of aquatic life
Clearing forests	Water table rises → salts reach the soil surface → salinity
Use of fertilisers	Fertilisers enter waterways → increase nutrients → blue-green algae
Use of detergents	Detergents enter waterways → increase nutrients → blue-green algae
Littering	Litter enters waterways → kills wildlife
Trail bikes in natural areas	Destroy vegetation → soil compaction and erosion
Sewage in waterways	Increased nutrients → blue-green algae

Brainstorm the effects of urban development and design a cause-and-effect web for urban development in your catchment.

Needs versus wants: Life raft

Suitable for students in Stages 4, 5

Present the following scenario to the students:

You are on a cruise through the South Pacific to Tahiti when your boat starts to take water. You find yourself in a life raft with other people (your group) and the following items:

3 cases of canned food	6 blankets
5 cans of drinking water	CD player
20-metre coil of rope	machete/jungle knife
canvas tarpaulin	1 case of soft drink
compass	Mona Lisa (original)
sextant	3 oars
maps	shark repellent
flashlight	chemical toilet
signal flares	bottle of vitamins
first aid kit	box of yellow dye
box of eating utensils	2 cases of dehydrated food
fishing equipment	2 cases of powdered milk
6 life preservers	1 rifle and ammunition
box of matches (waterproofed)	the "Hope" diamond

You have to throw overboard 20 of these items. Which twenty will you throw?

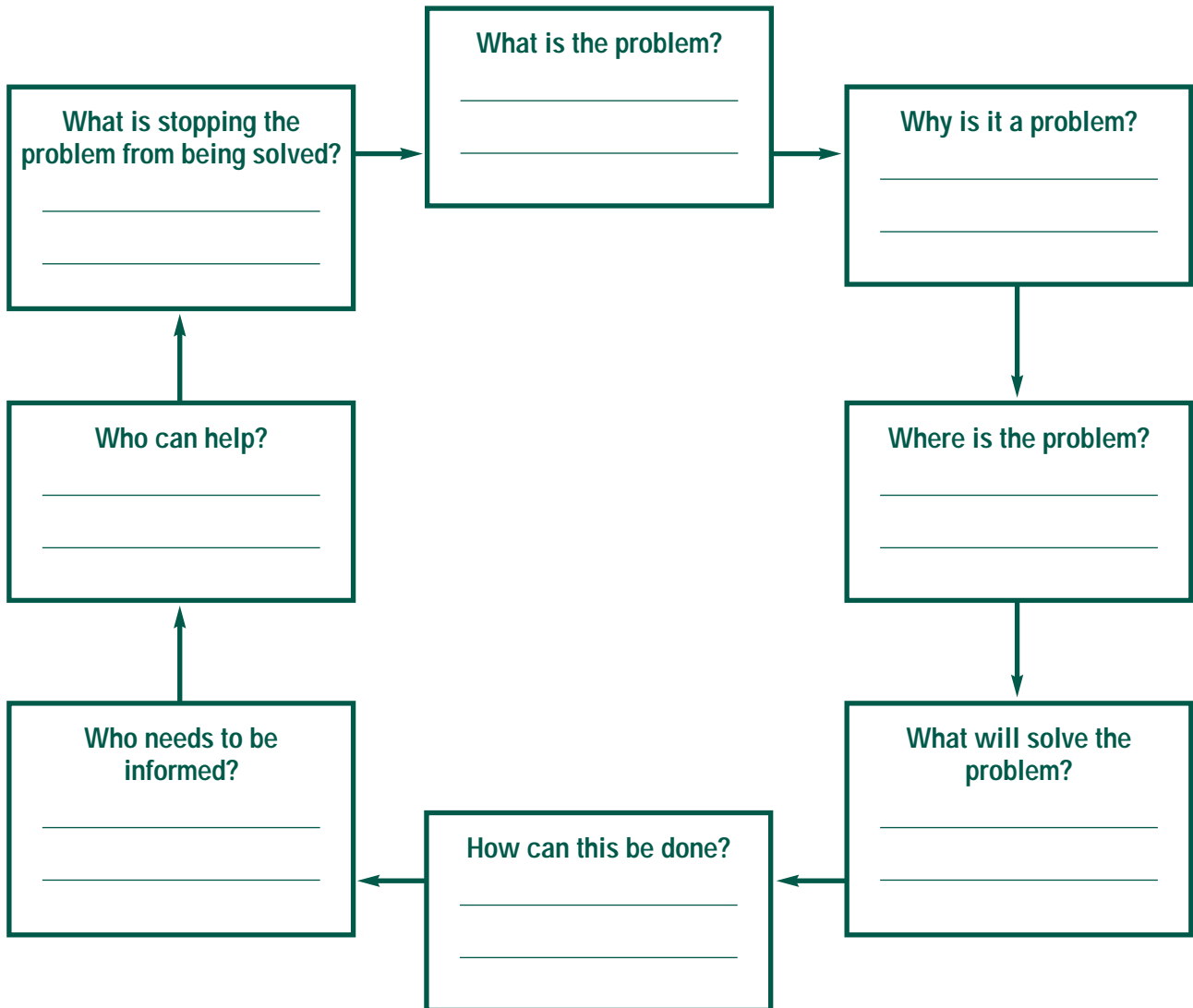
Ask students which of the items are needs and which are wants, and which ones they would select under the circumstances.

Discuss why particular items were selected. *Why were certain items discarded?* Discuss the difference between needs and wants. List the needs and wants of a person living in a developing country and a developed country. *Which person has the most negative impact on the environment? Why?*

The solution cycle

Suitable for students in Stages 4, 5

Investigate the process for solving problems. Start at "What is the problem?" and then answer the questions, moving on to each one in a clockwise direction. When you arrive at "What is stopping the problem from being solved?", think carefully. If nothing is stopping you from solving the problem, then the solution cycle is complete. If something is stopping you, then repeat the cycle until an answer to the problem is found.

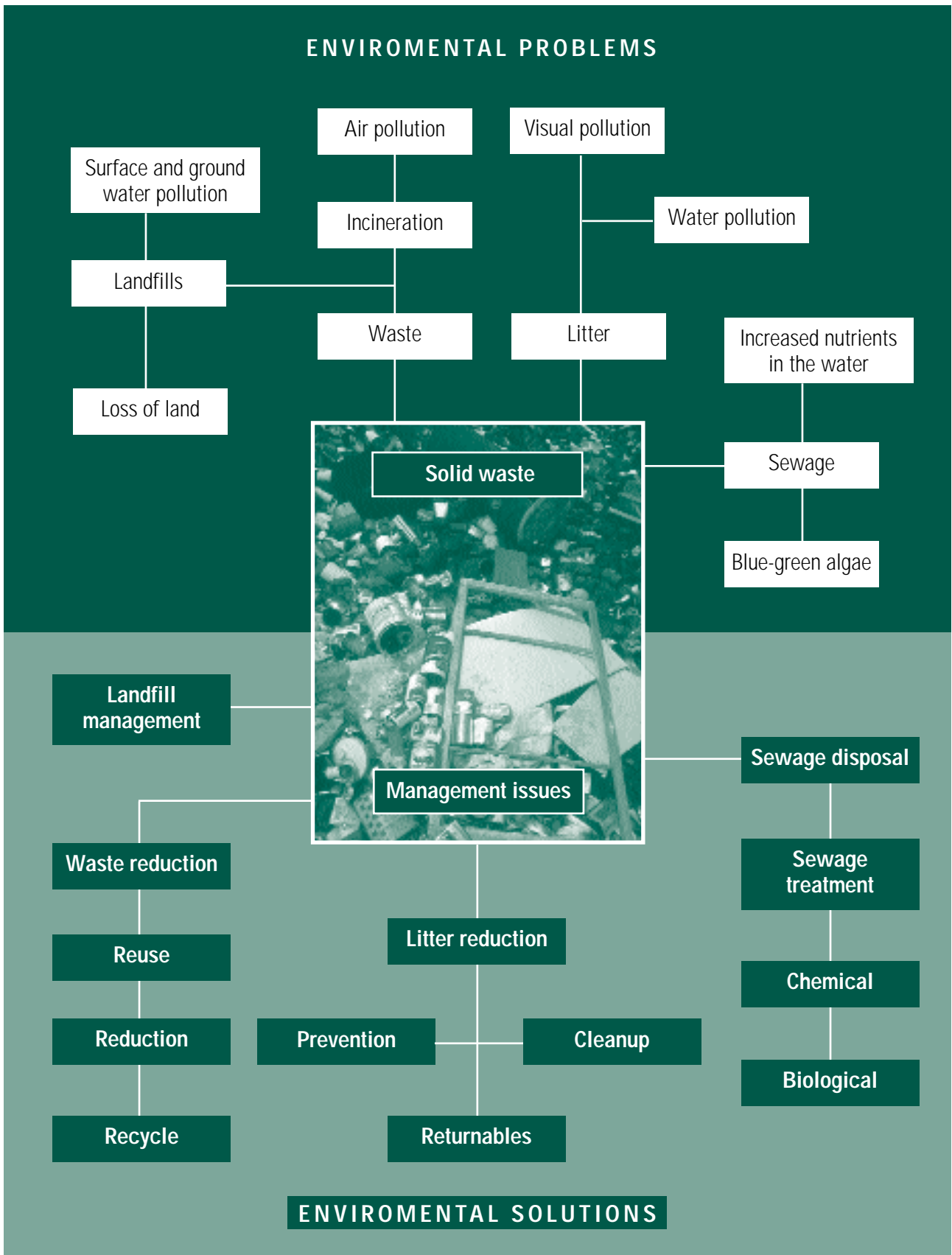


When you have solved the problem, list ways in which you could stop this from happening again.

Issue webbing

Suitable for students in Stages 4, 5

Students plot a series of branches from a single environmental issue. The objective is to show the environmental problems arising from the issue and then to identify solutions to each problem relating to the issue.



Want to be a phenologist?

Suitable for students in Stages 4, 5

Phenologists concern themselves with the changes and movement of animals and plants in relation to changes in the weather (e.g. Aboriginal people in Northern Australia know when the wet season occurs and when certain bush foods are available).

This information can be recorded on a phenology flow chart. Here is an example of a phenology flowchart for the NSW coast:

Warm spring weather → figs start to ripen on native fig trees along the east coast of Australia → the Koel cuckoo arrives from Asia around October to feed on the figs → the female cuckoo lays eggs → the cuckoo returns north in the Autumn of the following year.

Ask students to draw phenology flow charts for the local area. Illustrate, discuss and display the charts. Swap the charts with students from a neighbouring school or from a school in another part of Australia.

Invite an Aboriginal person to discuss how the Aboriginal people monitored the climate, plants and animals in the local environment in the past. *What were the advantages of having this knowledge?*

Challenging ideas

Suitable for students in Stages 4, 5

This activity involves students in making observations and value judgements about the environment.

At one end of the classroom, place a piece of paper with "strongly agree" written on it. At the other end of the room, place a piece of paper with "strongly disagree" written on it. Present students with a statement about the environment (e.g. *cars are the main cause of air pollution*).

Students respond by standing on a selected point on the continuum between the two pieces of paper, depending on whether they agree, disagree or are undecided. If, for example, they were undecided, they would stand in the middle or somewhere in between.

Other statements may include:

- Increased greenhouse gas emissions could have a negative effect on the world's environment.
- Riding bikes is more environmentally friendly than driving cars.
- Businesses that produce air pollution should be fined.

Discuss the reasons for the students' choices.

Values scales can be used to assess attitudes before and after a unit of work to detect changes to students' attitudes.

Acid rain

Suitable for students in Stages 4, 5

On a map of the world, students mark in the acid rain "hot spots". Beside the map draw a line to each of the hot spots and write the causes of acid rain in that area. In many cases, the cause of the acid rain may be many kilometres away.

Acid rain does occur in Australia, although it is not considered a major problem.

Working in groups, students make an acid solution by mixing one part water with one part vinegar.

Over several weeks the students water some plants with the solution and other plants with water. Students measure the plants weekly and record observations.

Students record the procedures involved in conducting the experiment and write a report on the results. Discuss what can be done to minimise the impact of acid rain.

Collect rainwater and test the acidity level using litmus paper. *If there is acid present, where do you think it is coming from?*

Going solar

Suitable for students in Stages 4, 5

Australia is a leader in the development of solar panels, and the Australian climate is ideal for solar power.

Present students with the following scenario:

You have been given the job of a retraining officer. Your job is to retrain people who work in the coal industry so they can be employed in the solar power industry.

Produce a plan to do this. You will need to know the existing jobs in the coal and solar energy industries. What will you retrain the people to do? How will you do it? Present your plan to the rest of the class.

Lost civilisations

Suitable for students in Stages 4, 5, 6

Civilisations come and go. Some people attribute the decline of various civilisations to the misuse of natural resources. These civilisations are not to be condemned for this outcome, as many were unaware of the environmental consequences of their actions.

The Sumerian civilisation lived in what was known as the Fertile Crescent. However, by the end of their civilisation, about 2000 years after it had begun (2000 BC), the area was no longer fertile. The soil of the plains was originally fertile, the climate was dry and agriculture depended on irrigation. Temple records indicate that the soils began to turn to salt about 2500 BC. Archaeologists and environmental scientists have strong evidence to suggest that over-irrigation had caused a gradual salinisation effect on the soils. By 2000 BC the area was abandoned. Today it is a desert.

Locate information on other civilisations that may have declined because of inappropriate use of natural resources. List the civilisations, the natural resources which they consumed and how the consumption may have impacted on the environment.

Take on the role of an environmental officer who was alive at the time of these civilisations. Design an environmental action plan that may have saved the civilisations.

Are there areas in the world today that employ similar environmental practices? Hypothesise about the outcome of the continued use of these practices on the livelihood of the people who live in these environments.

Losing electricity

Suitable for students in Stages 4, 5, 6

The production of electricity and its transmission to households generally result in a loss of electricity on the way.

Examine the electricity produced from renewable and non-renewable resources to determine which form of electricity is the more efficient in terms of electricity loss during production and transmission.

Draw a flow chart illustrating the flow of electricity from the point of production to the householder. Include all the processes involved and subsequent loss of electricity.

Which form of electricity production is the more efficient?

The environmental quiz show

Suitable for students in Stages 4, 5, 6

The class nominates five environmental issues of concern (e.g. salinity, deforestation, declining biodiversity, blue-green algae and over-use of natural resources).

Divide the class into five groups and allocate one issue to each group. Each group devises a list of 20 questions about the issue. The questions focus on:

- *What is the problem?*
- *What is the cause?*
- *How can it be fixed?*

The group researches the issue and compiles the list of questions and answers.

To prepare for the quiz, students should familiarise themselves with all the environmental issues.

To conduct the quiz, one group asks each group five questions and keeps a score. Each group in turn puts its questions to the other groups. Tally the scores for all the rounds to get a final score.





5. Management of resources

Why should we manage our resources?

The effective management of resources in a school helps students understand the interplay between what they use, what they consume and how efficient they are in their approach to the use of resources: water, energy, materials and products (consumer goods).

By adopting environmentally sound practices in resource management, there will be significant savings in ongoing maintenance costs and the school will have the opportunity to model sustainable minimisation strategies to the local community.

Source: Keep Australia Beautiful, *School Environmental Audit*

A major concern in large organisations is the consumption of resources such as electricity, water, products and materials. In NSW, many industries and businesses are committed to the sustainable and cost-effective management of resources. This has been achieved by the implementation of an environmental resource management system.

The sustainable management of resources in a school can be achieved by the implementation of a comprehensive environmental management plan. An effective plan can resolve many problems associated with resource use. For example, buying products with minimal or no packaging will reduce the amount of waste to be managed in the school; purchasing non-toxic materials avoids the problem of their disposal and other issues arising from safety in their handling and storage.

Schools should be aware of national initiatives, such as the National Strategy for Ecologically Sustainable Development (NSES) and National Greenhouse Strategy (NGS), when developing their school environmental management plan. Incorporation of the elements of ecologically sustainable development identified in the NSES is essential in a management plan.

These elements are:

- balancing the environmental, economic and social impacts of human activity so as to achieve sustainability
- the need to take a long-term rather than a short-term view when making decisions and determining actions for sustainability.

The National Greenhouse Strategy requires government departments in all states and territories to reduce greenhouse gas emissions. The sustainable management of resources, such as electricity, water, waste products and materials, can contribute to this reduction.

Resource management objectives identified in the *Environmental Education Policy for Schools* should be incorporated into a school environmental management plan (SEMP).

How do we go about it?

The management of resources requires a commitment from the whole school community, including students, staff, the general assistant, canteen staff and administrative staff.

The contribution of each person needs to be clearly defined and time allocated to explain his or her role.

Students can take on a prominent role in the implementation of the management strategies. Monitors can be appointed to:

- produce a list for each person on the staff, clearly outlining what the person is expected to do (the list can be humorous and decorative)
- label, colour-code and distribute recycling boxes

- make signs encouraging people to turn off lights, and
- collect full recycling boxes.

These tasks should be considered a privilege and students rewarded for their efforts.

The introduction of management strategies should not be seen as a burden.

There are outside organisations to help schools achieve sustainable management strategies (e.g. SCRAP and the Greenhouse Action Program). They have the expertise to demonstrate the processes involved and suggest the most appropriate strategies for your school and they have the skills to educate and enthuse your staff and students.

Schools are required to develop an action plan for the management of resources as part of their SEMP. The plan should incorporate the environmental education objectives for resource management. The objectives for the management of resources are:

- take a whole-school approach to policy development to include such environmental aspects as purchasing, energy monitoring, water consumption and waste disposal
- employ best practice in the management of resources, and
- identify learning opportunities for students resulting from practices in the management of resources.

There are several procedures that your school needs to complete before it can develop an action plan.

The subcommittee is responsible for the completion of these procedures. These include:

- Audit the use of resources – electricity, water, products, materials and waste.
- Record the data on the checklists provided in this section.
- Monitor progress on the progress sheet.
- Identify the problems to be addressed in the SEMP.
- Complete an action plan sheet (refer to the list of strategies in this section and programs that support environmental education in Section 8.)
- Give the action plan to the school environmental management committee.

Examples of action plans to reduce litter in a primary school and reduce electricity use in a secondary school are illustrated on pages 84 to 87. The plans indicate how the curriculum can be incorporated into the management of resources.

Learning opportunities

Teachers can incorporate the audit, design and implementation of the management plan into the formal curriculum.

Teachers should ensure that students have the opportunity to participate in stimulating activities during these processes.

The audit

Students can:

- participate in the audit, collect and record the data
- graph the data recorded on the electricity bill and examine seasonal variations in electricity usage
- produce an information report on water usage in the school
- draw a flow chart to show where water goes after it leaves the tap. They can repeat the activity, showing the movement of a chemical which has been tipped down the sink

Designing the action plan

Students can:

- scan the Internet, review magazines and interview experts to determine the most appropriate strategies for the school
- examine other environmental plans for ideas that can be incorporated into the SEMP
- design a questionnaire to determine what the school community would like to include in the plan.

Implementing the SEMP within the school

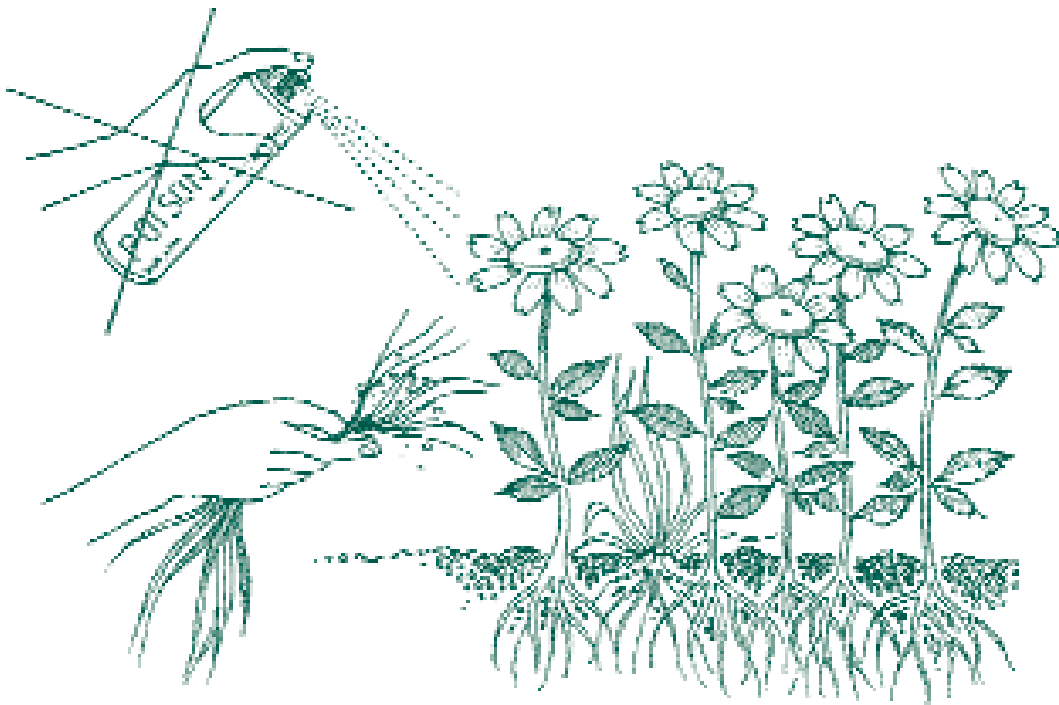
Students can:

- sort litter into recycling bins
- monitor electricity usage
- bring a packaging-free lunch to school.

Extending the SEMP beyond the school

Students can:

- design a web page on how to conduct a waste audit, including strategies to reduce waste, and place it on the school's web site
- challenge a local school to reduce greenhouse gas emissions
- erect a display featuring the management plan and give an oral presentation to the P&C and ancillary staff, outlining the procedures involved in its implementation
- write a low-impact shopping list and place it on the fridge at home and encourage students and their families to refer to it before they go shopping.



Sample action plans relating to management of resources

An example of a primary school's action plan to reduce litter

ISSUE: Too much littering in the school and not enough recycling GOAL: To reduce waste by 60% STRATEGY: The installation of a recycling system and changes in purchasing practices						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
Less packaging in the canteen	Formation of a Litter Management Team (LMT) with a coordinator		School environmental management committee	Term 2		HSIE	Record the litter hot spots on a map of the school
	Make a list of items with minimal or no packaging to sell in the canteen		Canteen staff, students and teacher	Term 2			Examine and list items that have minimal or no packaging, that can be recycled and are suitable for sale in a canteen. Combine this list with a canteen staff list and pass on to the Litter Management Team (LMT).
	The canteen to sell mainly items with minimal or no packaging		Canteen staff	Term 2			
Increased understanding of waste management	Advice from SCRAP on how to establish a recycling system for the school		Litter Management Team, SCRAP	Term 2		Science & Technology	Examine the decomposition rates of different types of packaging from the canteen. <i>Which packaging has the least impact on the environment?</i>
More litter is recycled	Place bins in litter hot spots. Bins for: <ul style="list-style-type: none"> • plastic & glass bottles • paper • aluminium cans • all other waste 		Teachers, students	Term 3	\$30	HSIE	Find information on the Internet, in magazines etc. about different recycling systems. Discuss with SCRAP team.
	Design and erect signs encouraging everyone to recycle.		LMT, students	Term 3			Creative Arts
More whole-school involvement	Design and implement a reward scheme for people who recycle			Term 3			

ISSUE: Too much littering in the school and not enough recycling GOAL: To reduce waste by 60% STRATEGY: The installation of a recycling system and changes in purchasing practices						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
Less litter in the school						Creative Arts	Design eye-catching signs, encouraging students to recycle litter.
	Complete an audit of litter in the school					Mathematics	Display the data collected from the products and materials and waste audits in a prominent area of the school Record and graph the amount of litter in the high litter areas after the new strategies have been implemented. Display the results against the previous results.
	All school, staff and students complete a questionnaire		Co-ordinator	Term 4		English	Design a questionnaire for the LMT to determine the effectiveness of the recycling system and the new products sold in the canteen. Have students and staff complete the questionnaire. Write a report on the information gathered from the questionnaire.

Sample action plan:

An example of a secondary school's action plan to reduce electricity

ISSUE: High electricity consumption GOAL: To reduce electricity use by 40% STRATEGY: The introduction of energy-efficient practices						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
More involvement from the whole school community and local community	Formation and meeting of Electricity Management Team (EMT)		Principal, teachers	Term 1		Mathematics	Graph and display the results of the electricity audit in a prominent area of the school. Record and graph electricity readings after the new strategies have been implemented
	Challenge local schools to reduce greenhouse gases The competing schools send their energy use to the school each week. Place results on the school's web site		Students & teachers	Term 2		Science HSIE	Examine and list the energy-saving devices suitable for use in the school. Give the list to the EMT. Examine the school's electricity bills for the past 10 quarters. <i>Are there notable variations?</i> <i>Has new technology had an impact on electricity consumption?</i>
	Display the school's electricity bills for the past two years in a prominent area of the school		Teachers and maths students	Term 2		TAS	Examine the features of an energy-efficient building, Design an energy-efficient classroom.
Greater understanding of energy efficiency	Appoint students as electricity monitors		EMT	Term 2		PDHPE	Examine the impact of increased greenhouse gas emissions on human health.
	Electricity reduction strategies promoted to the whole school staff		EMT	Term 2		English	List strategies to make the school more energy-efficient. Pass this information on to the EMT.
	Meetings held with staff to promote the electricity reduction strategies and the roles and responsibilities of each staff member.		EMT	Term 2		Creative Arts	Design eye-catching posters and stickers promoting the electricity reduction strategies. Give these to the EMT.

ISSUE: High electricity consumption GOAL: To reduce electricity use by 40% STRATEGY: The introduction of energy-efficient practices						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
Less electricity consumed	Implement the electricity reduction strategies. These are to: <ul style="list-style-type: none"> • place timers on photocopiers • erect signs reminding people to turn off lights • purchase energy-saving devices recommended by the Science students • introduce a reward system • check the school's purchasing policy to ensure all electrical items purchased are energy-efficient • turn off photocopiers and computers when not in use (energy savers also use energy) • place timers or sensors on lights • replace incandescent globes as they fail, with long-life fluoros • use solar power for outdoor lighting 		EMT Students and teachers Purchasing officer, Science students EMT Purchasing officer All staff and students Electrician General assistant Principal	Term 2	\$300		
			EMT	Term 4			
			P&C, EMT				
			EMT	Term 4			
	Compare results with local schools to determine which school achieved the greatest reduction of greenhouse gases		EMT	Term 4		Mathematics	Record the data from local schools. Identify the school with the greatest reductions.



A case study of a resource management project

This case study demonstrates the wholistic approach taken to resource management by a city secondary school.

Mackellar Girls High School

Mackellar Girls High School, a comprehensive school in Sydney, is concerned with the sustainable management of resources that come into the school.

The school identified waste management as a major problem requiring immediate attention. Recognising the value of using external skills and knowledge, the school employed the services of Keep Australia Beautiful and SCRAP (School Communities Recycling All Paper) to help resolve this problem.

The school first conducted an environmental audit.

The audit

- In 1994 the school trialled the *Schools Environmental Audit* published by Keep Australia Beautiful. The audit concentrated on electricity and water.
- With the support of SCRAP, the school completed a solid waste audit with a Year 10 intermediate maths class. The students were involved in all aspects of the planning and implementation of the audit. The results were analysed using a spreadsheet.
- The information from the audits was useful in planning strategies for solid waste.

Recycling

Recycling was considered the most appropriate strategy for managing the waste.

Inkjet cartridges

The school has signed a contract with SCRAP/RETONE and receives payment for recycling inkjet cartridges. The used cartridges are placed in a labelled box in the photocopy room and picked up by SCRAP when it is full. RETONE then pays the school. This is an effective way of raising funds for the school, as the refunds are substantial.

Paper

The school has recycled paper with SCRAP for several years.

Each classroom or office has a special box for "mixed paper". Two Year 8 students are on messenger duty each day, and one of their tasks is to collect paper for recycling from one block and deposit mixed paper into a skip located near the canteen. Cardboard from the canteen goes directly to the skip. Visy empties the skip fortnightly.

The cost of a skip for paper is cheaper than a skip for general waste, so the school is actually paying less to get rid of it. Offices, staffrooms, the library and photocopy rooms also have special boxes for "whites" and paper that can be reused. White paper is collected in white bags. When these are full, staff leave them outside the door for collection by the head cleaner, who replaces the bag. SCRAP does a regular pick-up of the full bags.

The school receives benefits from SCRAP, such as buying recycled goods at a discount or employing SCRAP personnel (at a reduced rate) to conduct a recycling day at the school. The value of discounts is determined by how much the school recycles.

Plastic

In the canteen, two baskets for collecting plastic hang from a wall. Both PET and HDPE plastics are collected. To encourage recycling, students write their name on the plastic container and the SRC gives canteen vouchers to the students whose plastic bottles are drawn out of the basket. Once a week, non-scripture volunteers (with parental permission) transfer the bottles into large bales adjacent to the canteen. This takes about 10 minutes. Bottles from the canteen are placed directly into the large bales. Parent volunteers take the bales to a recycling depot in a trailer.

The decision to employ the services of the Keep Australia Beautiful Council and SCRAP was the school's approach to waste management. The programs developed by these organisations target outcomes in many KLAS. The school has been able to maximise the learning opportunities that have arisen from the management of solid wastes and has incorporated these into its curriculum.

Managing resources

The following resources are covered in this section:

- electricity
- water
- products and materials
- waste.

For each resource the following items are included:

- audit checklists
- a list of management strategies.

The pro-formas for action plans are located in Section 3 of this document.



How can we manage our energy and its usage in the school?

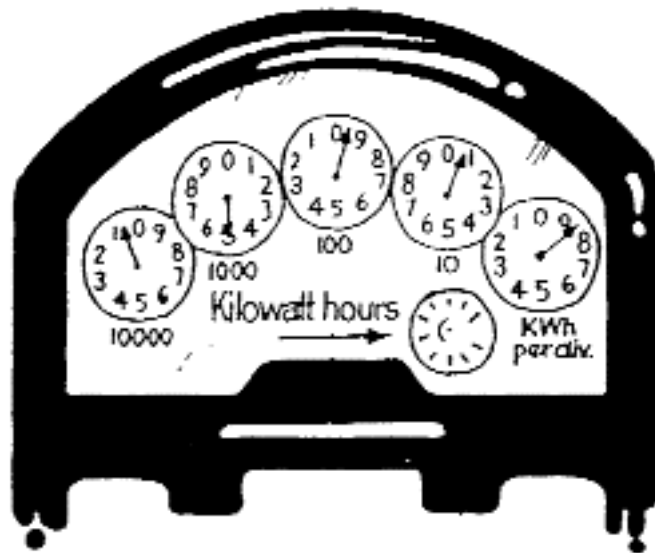
How you can conduct an electricity audit

How to read energy meters

Look at the following diagrams to learn how to read your meters. To read the dials, stand directly in front of the meter and read the dials from left to right. Write down each number as you go. There may be a sixth dial to measure in one-tenths of a kilowatt hour. Ignore this when reading the meter for your survey.

Clock-type electricity meters

On clock meters, if the dial is between two numbers, write down the lower number. If a dial appears to be exactly on a number, check the dial to the right. If this dial has not passed zero, write the lower number. For example, on the 1000 kWh dial, you can tell that the number 5 has not been reached because on the dial to the right, the 100 kWh dial, the hand has not moved past zero. Thus the reading here is 04908 (four thousand, nine hundred and eight kilowatt hours).



Digital meters

On digital meters, just read the numbers from left to right. The reading is 934 kilowatt hours.



Electricity profile

- Obtain the school's electricity bills for the previous year.
- Record the following information

	1st quarter	2nd quarter	3rd quarter	Final quarter	Yearly total
Total use	kWh				
1 kwh = 1 kg of greenhouse gases	kg				
Total cost					
No. of billing days					

Using this information, calculate the following:

	1st quarter	2nd quarter	3rd quarter	Final quarter	Yearly total
Daily use	kWh				
1 kwh = 1 kg of greenhouse gases	kg				
Personal daily use					
Greenhouse gas emissions					
Daily cost					
Personal daily cost					

How to measure present electricity usage

1. Locate your meters. If these are dial types, note that adjoining dials move in the opposite direction. Read the smallest units i.e. the 1/10 kWh first.
2. Overnight reading

Reading at end of school day	_____ kWh
Reading at start of the next school day	_____ kWh
Overnight consumption (second reading minus first reading)	_____ kWh
Greenhouse gas (kg) total kWh x 1	_____ kg

Where is the electricity used at night (e.g. alarms, security lights)? Cleaners, general assistants and canteen staff may assist in this part of the exercise.

_____	_____
_____	_____
_____	_____
_____	_____

3. Weekly reading

Reading (working days)	_____ kWh
Calculate weekly usage	_____ kWh
Greenhouse gas (kg) total kWh x 1	_____ kg

- Keep a book to record all meter readings.

Where is electricity used in the school?

- List the appliances and points of energy use.

Classrooms	Offices	Canteen	Library	Computer room	School hall	Outdoors	Other
(e.g. computers)	(e.g. photo-copiers)	(e.g. warming oven)	(e.g. computers, photocopiers)	(e.g. 15 computers)	(e.g. 6 wall heaters)	(e.g. public address system)	(e.g. alarm and security system)

- List the electricity-saving appliances and devices in the school (e.g. light sensors, low-energy-rating white goods.)

Using electricity efficiently

Use the information you have gathered to complete the following:

Location	Appliance or item using electricity	Hours of use	Comments	Ideas for reducing use
Classroom 1	(e.g. lights)	7	(e.g. left on during lunch).	Electricity monitoring team carries out random spot checks.
	(e.g. video)	4	(e.g. left on all day).	Use timers, put a sign on them.
	(e.g. heater/cooler)	3 7 7	(e.g. room too hot or too cold).	Turn thermostat down or up, install insulation tape to stop draughts.
Library	(e.g. lights)		(e.g. left on all day).	Use long-lasting fluoros.
	(e.g. photocopier)		(e.g. energy saver, not used, left on).	Turn it off when not in use.
Classroom 2				
Assembly hall				
Canteen				

Results of electricity audit

Having completed your audit, you are now in a position to answer some important questions. These can be raised at a meeting of the relevant subcommittee.

1. During which quarter of the year are greenhouse gas emissions the highest? _____
Why is this so? _____

2. How could greenhouse gas emissions be reduced for this quarter? _____

3. Is more electricity used on a particular day of the week? _____
If so, why? _____
4. Suggest ways to reduce electricity use on this day. _____

5. Which two areas of the school have the most appliances and points of energy?

6. List the appliances in these two areas:
_____ :
7. Why do these areas have the most appliances and points of energy? _____

8. Suggest ways to reduce electricity use in each of these two areas: _____

9. Which appliances in the school use the most electricity? _____

10. Could electricity use be reduced at night time? _____ If so, how? _____

11. What aspects of electricity use need to be addressed in your school's SEMP? _____

12. Select strategies to reduce electricity using the information pages entitled, *Strategies to reduce greenhouse gas emissions from electricity*. Incorporate the strategies into the action plan.

Strategies to reduce greenhouse gas emissions from electricity

As a signatory to the Kyoto Protocol to the United Nations Framework Convention on Climate Change, Australia had undertaken to limit its overall greenhouse gas emissions to no more than 8% above 1990 levels by 2008-12.

The goal of the NSW Department of Education and Training is to still reduce the total energy consumption of school buildings by:

- 15% of the 1995 level by 2001
- 25% of the 1995 level by 2005.

Schools can make a positive contribution to this goal by implementing energy reduction strategies. Teachers should ensure that students participate in activities that will develop attitudes, behaviours and problem-solving skills that reflect the principles of ecologically sustainable development.

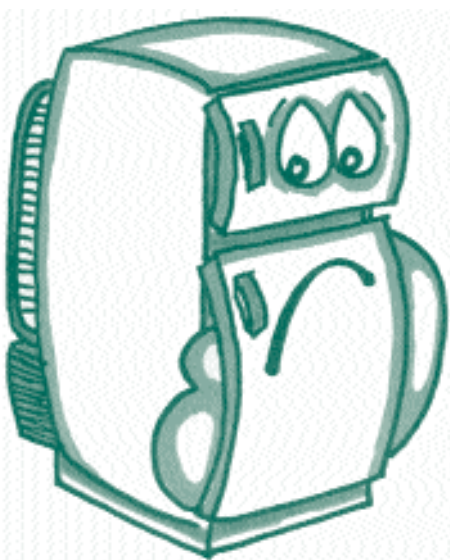
To recognise the importance of reducing greenhouse gases, students need to be able to quantify these gases. The main greenhouse gas, carbon dioxide, is colourless and odourless, so it can't be seen or smelt. However, like all gases, it can be weighed.

The Victorian Environmental Protection Authority has created the following diagrams to illustrate the quantity of carbon dioxide being released into the atmosphere.



A tonne of carbon dioxide occupies the same space as a family home

Source: Environment Protection Authority, Victoria.



A kilogram of carbon dioxide occupies the same space as a large family fridge.

Source: Environment Protection Authority, Victoria.

What can you do?

Here is a range of strategies you could adopt to reduce electricity use. Select the most appropriate for your school.

Outdoor environment

- Plant deciduous trees. They give shade in summer and let light through in winter.
- Plant wind breaks, particularly on the south side.

Buildings

- An unshaded 1.5-square-metre window in direct summer sun transmits as much heat as a single-bar radiator. Shading (with shadecloth, external blinds or plants) can reduce this by 80%.
- Seal up the gaps around doors and windows. Door "snakes" are excellent in summer and winter.
- Use skylights for natural heating and lighting.
- Ensure that lights near windows have a separate switch, so they can be switched off while others are on.
- Insulate walls and ceilings.
- Take advantage of natural heating. Windows that face north will let the winter sun into rooms.
- In rooms with high ceilings, use ceiling fans on low setting to recirculate warm air from the ceiling in winter.
- Insulating hot water pipes and fittings saves a kilogram of greenhouse gas every ten operating hours.
- By converting from oil heating to natural gas, you can reduce greenhouse gas emissions by 20%.
- Using evaporative coolers in dry climates instead of refrigerated air conditioners reduces greenhouse gas emissions by up to 90%.
- A change of one degree can reduce heating and cooling greenhouse gas emissions by 10 to 20%.
- By fitting an AAA-rated, water-efficient showerhead, you will reduce greenhouse gas emissions by about half a tonne each year.
- Install renewable energy systems to provide electricity (e.g. solar cells). Make the system's grid interactive so you can sell power back to the energy supplier.

Lighting

- Compact fluorescent globes use less energy than ordinary light globes.
- Some people believe that leaving fluorescent lights on saves energy and money. It doesn't.
- Replace old-style 40-watt fluorescent tubes (40mm diameter) with thinner (26mm) 36-watt tubes.
- Every 100 watts of lights (for example, two standard fluorescent tubes) generates a kilogram of greenhouse gas every eight hours; that's up to a tonne every year.
- Replacing incandescent globes with compact fluorescent lamps will reduce greenhouse gas emissions by 80%.
- Appoint light monitors. Use positive incentives and reward achievements.

Appliances

- Instead of using air conditioning, open the classroom early in the morning to let the cool air in. Close the classroom mid-morning to keep the cool air in and the hot air out.
- Before turning on the heater, put on extra clothes.
- Place refrigerators in a cool spot, not next to the oven or in the sun.
- Turn off small hot water heaters on Friday afternoon. Turn off larger hot water heaters during the holidays. If this is not possible, install timers on the heaters.
- Wash clothes in cold water.
- Use the solar powered clothes-dryer (the clothes line). A clothes-dryer can produce 2-3 kg of greenhouse gases per use.

- Buy appliances that use less energy. Depending on the size you choose, buying a 5-star fridge instead of a 3-star can save 200 kg of greenhouse gas emissions each year.
- Set the thermostat at the lowest comfortable temperature in winter (18-20°C).
- Switch off unused equipment or fit timer controls. The screensaver feature on a computer does not reduce greenhouse gas emissions. Computers are not actually being used for about 90% of the time that they are turned on. Switch off the computer instead. Switching off modern computers doesn't damage them.
- Twenty computers generate about 2.5 kilograms of greenhouse gas every hour they are on.
- Turn off refrigerators on weekends and holidays if they contain non-perishable items, such as soft drinks.
- Switch off lights in display refrigerators overnight.
- A refrigerator that has been turned off saves more than 50 kg of greenhouse gas per unit in a fortnight.
- If a refrigerator is one degree too cold, greenhouse gas emissions can increase by 5-10%.
- At the end of term, pack perishable goods into as few refrigerators as possible and turn off the empty ones.
- Use ovens and cookers as little as possible. Microwave ovens and gas cookers are low cost.
- A modern laptop computer can reduce electricity demand by up to 90% compared with an old-fashioned desktop.
- Inkjet printers and inkjet facsimile machines produce the same image quality as laser equivalents at comparable speed and yet use only 1 or 2% as much electricity.
- Don't leave security lighting on all night. Install movement-sensitive lights that switch themselves on if someone is passing by them.



Quantity of materials and products

As part of the school audit, it is useful to record the quantity of various products used in your school.

Product	Quantity per year	Quantity per term (10 weeks)	Quantity per student
Paper			
Glass			
Metal			
Wood			
Plastics			
Chemicals			
Food			

- What is the most commonly used product?


- How could the consumption of this product be reduced?

- Suggest ways to reduce the consumption of each product.

Environmental impact of materials and products

Once you know what materials and products are being consumed in your school, you can reduce the impact they are having on the environment. You can:

- research the environmental impact of each product used in your school from "the cradle to the grave" i.e. the life cycle of the product. See the definition of life cycle analysis on page 17 (e.g. environmental understandings and concepts)
- rank the products in your school from the least to the most environmentally damaging. Record the impact of each product on the environment and suggest a safer alternative.

	Product	Impact on environment	Safer alternative	Cost?
Most environmentally damaging 	(e.g. paint for buildings)	Strong fumes, air pollution	Non-toxic paint	
Least environmentally damaging				

Strategies to manage materials and products

Issues related to purchasing products

To improve environmental performance, the NSW Government's *Draft Procurement Guidelines* requires institutions to implement the principles of ecologically sustainable development when they procure their products and materials.

Environmental specifications to consider

Schools should consider the following when purchasing materials and products:

- *Does the manufacture of the item have a detrimental impact on the environment? What materials are used in its manufacture? Are the materials renewable or non-renewable?*
- *What is the life cycle of the product? Can it be recycled? Does it take a long time to decompose? Does its decomposition have a negative effect on the environment?*
- *How much packaging does it have?*
- *Is it energy-efficient?*
- *Is there a safer or more effective alternative?*

Check product information from material safety data sheets, manufacturers, product labels and other information sources (e.g. occupational health and safety advisers, unions, waste boards, consumers, environment and professional organisations and the Internet).

Resources

Schools can refer to the following publications when making purchases:

- *Waste Reduction and Purchasing Policy: A Guide for Agencies* issued by the Environment Protection Authority (EPA), and
- The NSW Government's *Energy Management Policy*
- *Toxic Playgrounds*, Total Environment Centre.

What can you do?

Select the most appropriate strategies for your school.

With your knowledge of life cycle analysis and having done an audit of your school's products and materials, you are now in a position to consider changes and improvements. Following are some suggestions:

Buildings

- Buy furniture made from recycled plastic rather than steel.
- Select low-emission flooring, such as solid wood or linoleum.
- Avoid materials that will give off gas pollutants, such as carpets and particle board.
- Buy paints derived from plant and mineral ingredients rather than petro-chemicals.
- Avoid foam insulation made from HCFCs; use cellulose fibre insulation or aluminium foil sarking.
- Principals could consider the following strategies for managing construction and demolition waste, where appropriate:
 - ❖ investigate purchasing products with recycled content (e.g. road base), industrial by-products (e.g. fly ash) or procured from environmentally friendly sources (e.g. plantation timber)
 - ❖ investigate the recyclability of the material at the end of its life (for example PVC piping cannot be recycled, whereas polyethylene piping can be)
 - ❖ look at the design in terms of its long term for construction function, rather than demolition, which could lead to the reuse of the materials involved

- ❖ employ an authorised contractor who will use the material for producing goods for sale and not for landfill
- ❖ investigate whether the resource has standardised measurements to make its use more efficient (minimise offcuts etc.)
- ❖ minimise site clearing practices
- ❖ investigate reusing existing materials, such as timber, metals, masonry and topsoil
- ❖ liaise with suppliers about returning containers, drums, bags, boxes, wrapping and general packaging for reuse or recycling
- ❖ balance the amount of soil that is cut away with the amount to be used as fill elsewhere in excavation projects
- ❖ remove specifications in tenders that unnecessarily discourage the use of recycled materials
- ❖ shred vegetative material and return it to the gardens.

Toxic chemicals

- Avoid purchasing toxic chemicals; buy natural products (e.g. organic fertilisers and pesticides).
- Avoid products with solvents (e.g. use water-based paints).
- Purchase toys that do not contain PVC or heavy metals.
- Avoid metal enamels, powdered paints and dyes.

Appliances

- Buy a front-loading washing machine.
- Consider the purchase of digital multi-functional machines, combination fax/printer/photocopiers.
- Purchase office equipment capable of using recycled toner cartridges.

General

- Select items made from recycled paper (e.g. post-it notes, files, dividers, envelopes).
- Select unscented markers and glues.
- Avoid spray paints, airbrushes, fixatives and other aerosols.
- Choose low-allergy sunscreen.
- Avoid food items that contain preservatives, colourings and artificial flavourings.
- Buy crayons and dustless chalk.
- Select water-based paints (e.g. bio paints, acrylics and watercolours) and vegetable food dyes.
- Do not order large quantities of publications to save money. Savings can be lost through the cost of long-term storage and the need to replace out-of-date publications, thereby creating the problem of more material for disposal.
- Renew the school's purchasing policy and ensure only environmentally friendly products are purchased.

How can we manage waste in the school?

Below is a proforma to assist you in conducting a waste audit. The audit focuses on rooms in the school. A litter audit can be found in Section 6, *Management of school grounds*.

A waste audit

List the waste generated in the following areas.

Classrooms	Offices	Staff rooms	Library/ computer room	Canteen	Items brought to school by students	Workshed	Other

- Identify the areas where most waste is generated.

Classroom waste audit

After conducting a school waste audit, members of each class can analyse the waste generated in their room.

Using the information from the "Waste Audit" sheet, list the waste generated from classrooms. Analyse and then record if the waste can be recycled or reused and suggest ways to manage the waste. Use the list of "Strategies to reduce waste" on page 107 for ideas.

Waste generated	Present method of disposal	Can it be reused/recycled?	Management strategy
(e.g. batteries paper)		x ✓	Buy rechargeable batteries Use both sides, recycle, use for mulch

Where relevant, arrange for your school to complete an audit sheet for the library, the offices, the computer room, the canteen, the workshed, the staff room and any other areas where waste is generated.

Strategies to reduce waste

Australia is the second highest producer of waste per capita after the USA, sending 18 million tonnes to landfill per annum. This is equivalent to one tonne for every person and would be enough to cover all of the state of Victoria to a depth of 10cm.

What can you do?

There are many things schools can do to reduce waste.

A general guide to waste management can be found in the publication: *Waste Education: Focusing on our future: strategic directions and priorities for waste education in NSW* (EPA, NSW, Sydney, 2000).

Select the most appropriate strategies for your school

Office, SRC, P&C, canteen

- Put up a school notice board or send messages by e-mail. This usually saves circulating paper and having your class disturbed.
- Use Internet publishing, where practicable, for external publications.
- Set printers and photocopiers to double-sided printing where the function is available.
- Use overhead projectors, PowerPoint presentations and whiteboards in meetings to reduce the amount of paper handed out.
- Investigate purchasing telephone directories on CD-ROM or accessing them through the Internet.
- Re-use and recycle consumables such as toner cartridges, printer ribbons, paper, plastic and metals.
- Re-use envelopes, packaging, boxes and writing paper. Several environmental education centres in NSW have not purchased envelopes in over fifteen years! New copying paper costs more than \$2,000 per tonne. Paper-saving strategies can save a school thousands of dollars each year.
- Reduce the stock and variety of stationery available.
- Sell sorted waste materials to recyclers.
- Develop a school purchasing policy.
- Investigate electronic ordering.
- Set up recycling bins indoors and outdoors, providing each staff member with a small recycling box.
- Sell in the canteen items that come in their own packaging (e.g. apples).

Classroom

- Do the first edit of draft documents on computer screens rather than on hard copy.
- Make notepads from waste paper printed on one side.
- Use second-hand materials from local homes and from businesses, and the Reverse Garbage truck for art and craft materials.

Staffroom

- Replace paper cups with ceramic mugs.
- Use clean tea towels instead of paper towels.
- Avoid disposable plates and cutlery.

Students

- Encourage students to bring handkerchiefs to school instead of tissues.
- Encourage students to bring lunch in a re-useable lunch box and drink in a re-useable drink bottle.

SCRAP, established in 1990, specialises in waste avoidance and minimisation. It offers services to schools and other organisations.

By June 2000, SCRAP had recycled over 25,500 tonnes of paper. This has saved:

- 76,500 cubic metres of landfill
- 331,500 trees
- 810,390 kilolitres of water
- 63,750 barrels of oil, and
- 103,550 megawatts of energy.

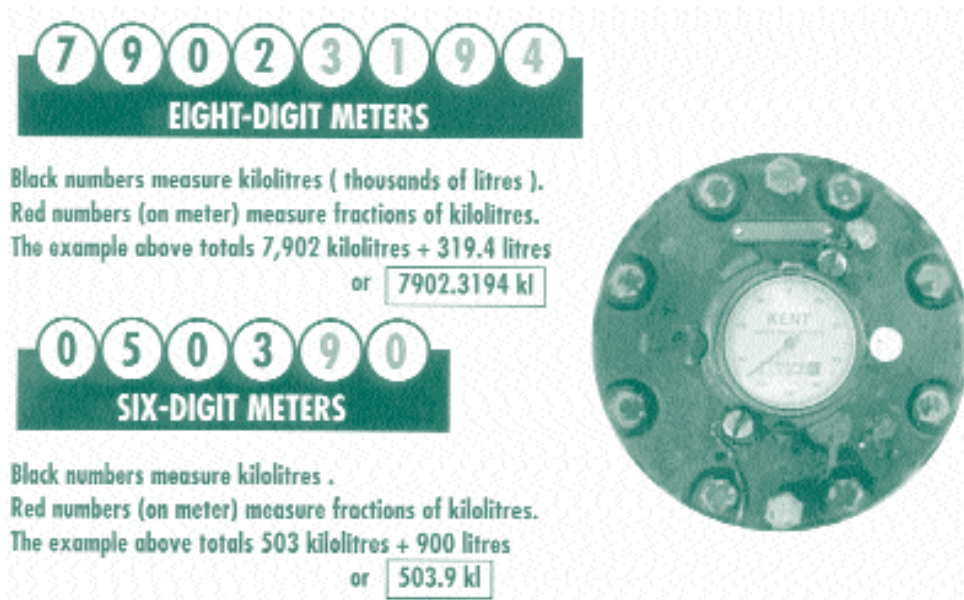
How can we manage water in the school?

A water audit

Water use in schools is one area where large amounts of money can be saved. At the same time, sustainable practices will assist in conserving water. This section deals with conducting a school water audit.

The first step is to ascertain how much water is consumed in the school; this involves reading the water meter.

1. How to read your water meter



Source: Keep Australia Beautiful, *School Environmental Audit* (1998)

2. To determine the amount of water used at the school, complete the following table. Try to read the water meter at the same time each day.

Week 1

Monday	Tuesday	Wednesday	Thursday	Friday
Time: Reading: _____ kL	Time: Reading: _____ kL	Time: Reading: _____ kL	Time: Reading: _____ kL	Time: Reading: _____ kL

Total water used in one week: _____ kL

Week 2

Monday	Tuesday	Wednesday	Thursday	Friday
Time: Reading: _____ kL	Time: Reading: _____ kL	Time: Reading: _____ kL	Time: Reading: _____ kL	Time: Reading: _____ kL

- Total water used: _____ kL
- On which day is most water consumed? _____

Are there any leaking pipes?

- Ensure that all taps and water outlets in the school are turned off at the end of the day.
- Take a water reading at the end of the day. Note the time and date.
- Do a reading early the next morning before the water outlets are open. Note the time.

If water has been used, try to find where it is leaking. Can it be stopped?

List the water-saving devices in the school (e.g. tap heads removed when not in use).

What goes down the drain

As well as water coming into the school, it is also important to analyse the amount of water that the school disposes of through stormwater and sewerage.

- Make a list of substances poured down the sinks located inside buildings.

Classrooms/ specialist rooms (e.g. darkrooms)	Staffrooms	Canteen	Workshed	Office	Toilets and basins

- Use this information to complete "Are we polluting the water?" on the following page.

Are we polluting the water?

- Write the name of each substance poured down the sink. Determine its impact on the environment. Suggest a safer method of disposal and an alternative substance that has less impact on the environment.

Location	Substance	Impact on environment	Safer method of disposal	Safer alternative product

- On which day is most water consumed? _____ Why? _____

- Which substance has the most negative impact on the environment? _____

- Where does this substance enter the drain? _____
- How can the substance be avoided? _____
- List the problems with water usage in the school: _____

- Suggest ways to overcome these problems: _____

Strategies to reduce water use

In 1997, Sydney Water and the Department of Education and Training undertook a research project that explored the attitudes and knowledge of school students on water-related matters. Data were collected from 2524 students attending 24 schools across Sydney. Approximately three-quarters of the students agreed that people should use less water and be educated to do so.

Source: Sydney Water, School Children's Views on Water Conservation and Related Environmental Matters (1998)

What can you do?

Select the most appropriate strategies for your school.

General

- Install taps that turn themselves off.
- Remove tap heads when not in use.
- Install a water tank, if permitted.
- Read the water meter and have competitions with other schools for the greatest percentage reduction in usage.
- Wash items (e.g. paint brushes) in containers, not under running taps. Pour the water over the gardens.
- To maintain water quality, dispose of chemicals, paints, oils, detergents and plastics through council services, not through the stormwater or sewer system.
- Elect water monitors.
- Have students design signage for areas of high water use.
- Install water-conserving toilets, showerheads and faucet aerators.
- Reduce the volume of water used in toilet cisterns. Flat, plastic drink bottles filled with water are more appropriate than bricks. (Bricks can damage mechanisms when you put them in the cistern.)

Grounds

- Mulch gardens. Do not use pine chips or plastic.
- Avoid over-watering school grounds.
- Grow trees as windbreaks, to stop erosion and for shade.
- When planning new lawns or replanting damaged areas, use indigenous species which need less water and grow more slowly.
- Create a no-dig garden.



6. Management of school grounds

Why should we manage our school grounds?

Developing and putting in place management strategies for your school grounds are very effective ways of implementing environmental education, providing a curriculum initiative as well as a means of achieving environmental best practice within the community.

Schools are microcosms of the outside world, and many of the environmental problems found in a school are similar to those found in communities and private homes. Problems can be associated with the following:

- surfaces that are too hard
- parking areas
- excessive noise
- student seating which is inadequate
- sports areas that are inadequate
- excessive litter
- excessive traffic flow
- loss of habitat
- pathways and human traffic poorly planned
- lack of shade
- degraded bushland
- lack of biodiversity
- poor aesthetics of school grounds
- areas that are too wet.

Issues for consideration

The complexity of the issues surrounding the use of school grounds should be considered when staff members are developing a school environmental management plan.

- Students spend over a quarter of their school time in the outdoor area of the school.
- School grounds as outdoor environments have become increasingly important to children in modern society.
- The design and management of school grounds convey messages to children that influence their attitude and behaviour.
- Children receive these messages from a range of indicators which define the cultural context of the environment.
- It is within the power of those who manage schools to determine the quality of their school grounds.
- School grounds can affect staff, parents and the wider community.

How do we go about it?

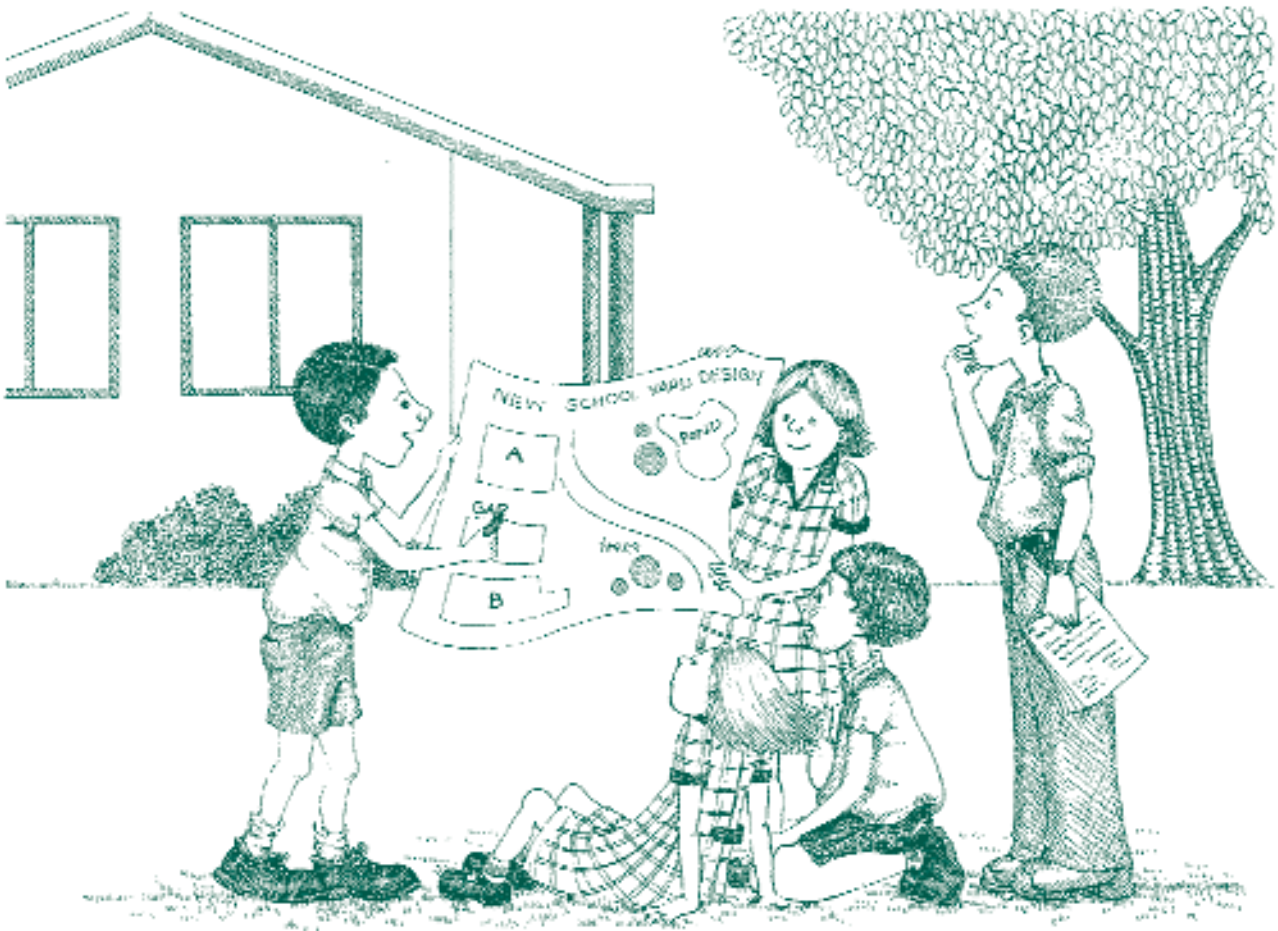
Schools are required to develop an action plan for the management of school grounds as part of their school environmental management plan. The plan should incorporate the environmental education objectives for resource management. These are:

- to manage school grounds in accordance with the principles of ecologically sustainable development
- to develop school grounds as part of the overall school plan
- to identify learning opportunities for students resulting from the management of school grounds.

To manage school grounds effectively teachers should ensure that students are actively involved in the design and implementation of strategies that will achieve sustainable management.

The subcommittee for school grounds should undertake the following:

- carry out an audit of school grounds
- record the data on the checklists provided
- monitor progress on the progress sheet



- identify the environmental problems to be addressed in the SEMP
- complete an action plan sheet (refer to the list of strategies in this section and programs that support environmental education in Section 8)
- give the action plan to the school environmental management committee.

Learning opportunities

The audit for the management of school grounds is student-centred, and teachers should identify the learning opportunities that arise from the process. In conducting the audit, students participate in activities that develop their investigative and interpretative skills. For example the audit contains activities that involve students in:

- collecting data and recording the data on the audit checklists
- writing an information report on the biodiversity found in the school grounds
- identifying how biodiversity can be increased
- writing the procedure for constructing simple humane traps to catch small creatures
- finding prescribed information about noise levels and determining if levels around the school are acceptable
- surveying students, school staff, parents and community members to determine attitudes to the school grounds.

Developing the action plan involves students in:

- finding information on sustainable management practices suitable for the school grounds
- conducting a survey of the school community to determine how members would like to see the school grounds improved. In this activity the school votes for the most popular suggestions. The results are then graphed and a discussion on the feasibility of each suggestion follows. A requirement of each suggestion is that it can be used as a learning site.

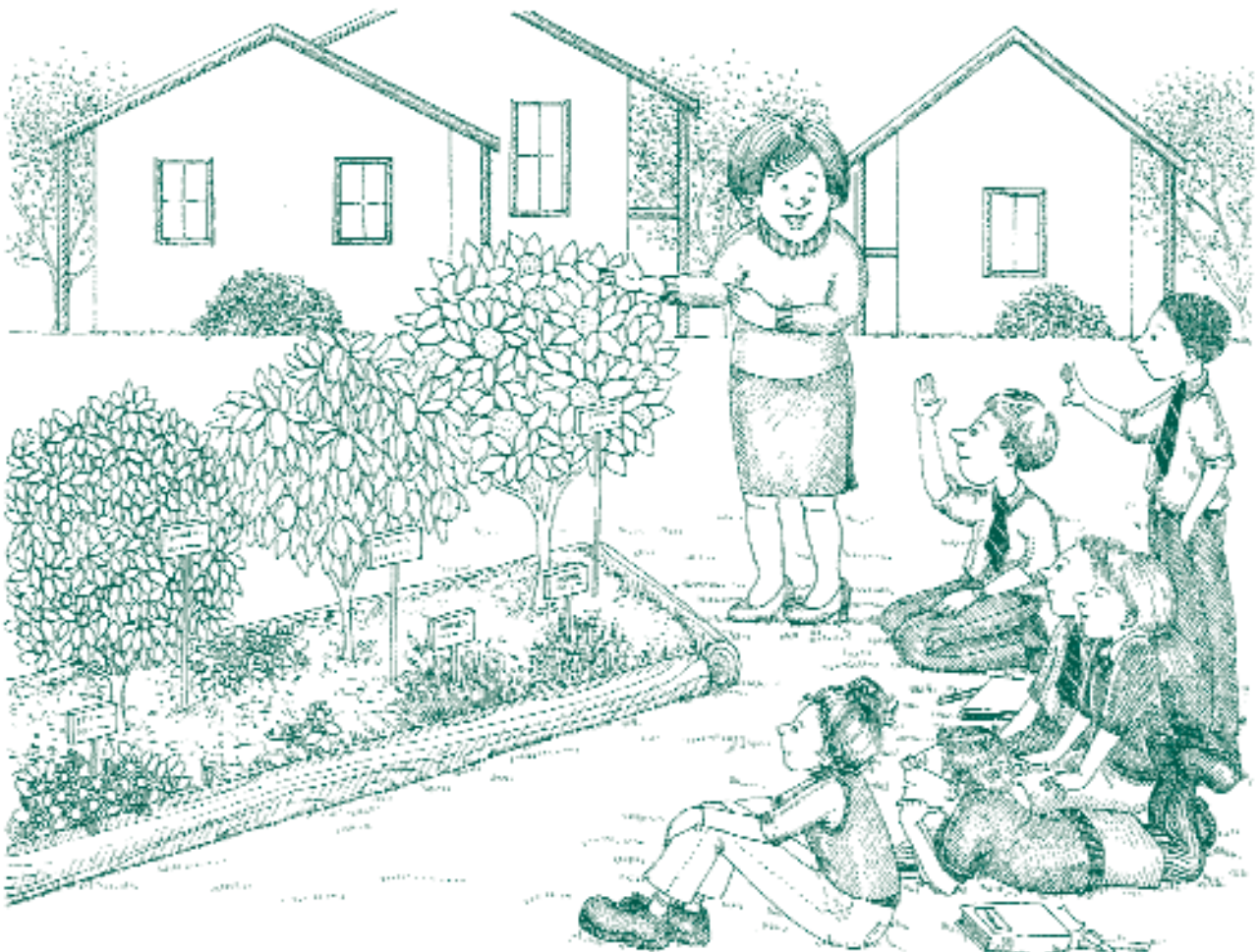
Implementing the School Environmental Management Plan within the school involves students in:

- sending an e-mail to each class outlining the plan and proposing the role of each class in the implementation of the plan
- producing a weekly newsletter during implementation of the plan to highlight achievements and identify the tasks to be completed by each class or individual for the next week. School community members are also encouraged to contribute to the newsletter. Students are asked to include photos and place the newsletter on the school web site.

Implementing the School Environmental Management Plan beyond the school involves students in:

- videoing their project and sending it to a children's television program.
- writing a report featuring the plan and submitting it to the local newspaper. Photos of students actively doing something positive for the school grounds should be included.
- writing the procedures for designing a bird-attracting garden. This can be placed on the school web site.
- placing a display at the local library, council or shopping centre.

Sample action plans for primary and secondary schools are illustrated overleaf. The primary action plan is to attract birds into the school grounds. The secondary action plan targets an unattractive school entrance and the lack of biodiversity. The action plans demonstrate how the curriculum can be incorporated into the management of school grounds.



Sample action plans for the management of school grounds:

An example of a primary school's action plan to attract native birds

ISSUE: Absence of native birds in the school grounds GOAL: To increase the number of native birds in the school grounds STRATEGY: The restoration of habitat						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
Community participation and cooperation	Formation of a School Grounds Management Committee (SGMC)		The School Environmental Management Committee (SEMC)	Term 1		HSIE	Visit an area of local bushland and complete the following: <ul style="list-style-type: none"> • a bird count • description of the birds • a record of the behaviour of each bird • examination of ecosystems: record the species of plants, soil types etc., and all the things necessary for the birds to survive. After the visit, list the features that could be replicated in the school grounds. Give this information to the SGMC.
	Determine the most suitable plants to attract birds and where to place them.		Students, teachers, Landcare	Term 1			
	Notify school neighbours of the plan to attract native birds to the school		Principal	Term 2			
Greater student and community involvement	Invite the neighbours to a student presentation of the plan		SGMC, students	Term 2		English	Write to the neighbours informing them of the plan; invite them to a meeting.
	Suggest ways the neighbours could assist (e.g. keep cats in at night)		SGMC, students	Term 2			
	Prepare area for planting		Teacher, general assistant, students P&C	Term 2		Mathematics	Determine the size of the area to be planted; record the size of selected plants. <i>How many plants are required to fit in the selected area?</i> Pass this information to the SGMC.

ISSUE: Absence of native birds in the school grounds GOAL: To increase the number of native birds in the school grounds STRATEGY: The restoration of habitat						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
Increased habitat	Purchase plants to attract birds (e.g. red flowers, dense and prickly)		Teachers, general assistant, P&C	Term 2	\$250	Creative Arts	Produce a pamphlet informing people why it is not appropriate to feed wildlife. Decorate and print copies for each student in the school. Place the information on the school's web site.
	Plant in clumps to protect birds		Students, general assistant, teachers, P&C	Term 2			
	Maintain and monitor plants		General assistant, students	Ongoing		Science & Technology	Examine the designs of bird boxes. Construct bird boxes using recycled materials. Discuss with the SGMC suitable sites to locate the boxes and set them in place.
	Examine and select the most appropriate bird box designs		Stage 3 students, teachers	Term 2			
	Construct bird boxes		Stage 3 students and teachers	Term 2	Recycled materials \$200	English	Make large posters featuring birds and display around the school. Have each bird saying why the school grounds are important to it.
	Place bird boxes in appropriate sites		Stage 3 students and teacher	Term 3			
Monitor the number of birds that use the bird boxes		Teachers, students, general assistant	Term 4				
More native birds in the school grounds	Complete a bird count and compare the results with the biodiversity audit		Teachers, students	Term 4		Mathematics	Do a bird count at the end of the year and compare it with the results from the audit. The variation could be seasonal. It will be necessary to do counts next year.

Sample action plan:

An example of a secondary school's action plan to increase biodiversity and beautify school grounds

ISSUE: Lack of biodiversity and unattractive school grounds GOAL: To increase biodiversity and beautify school grounds STRATEGY: Landscaping of school grounds to beautify them and increase biodiversity						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
Greater involvement of each faculty	Meeting of students, a teacher representative from each faculty, the general assistant and community members (School Grounds Management Team)		School Environmental Management Committee (SEMC)	Term 1		Mathematics	Complete a biodiversity audit after the implementation of the plan. Compare the audit with the original audit.
	Determine the contribution of each faculty to achieving the goal		School Grounds Management Team (SGMT)	Term 1		Science, Technological and Applied Studies	Explore an ecosystem (e.g. local bushland). Participate in fieldwork activities to identify the flora and fauna, soil type, pH, aspect and type of plant community. Complete a vegetation quadrat to determine the dominant species.
	Display the results of the biodiversity audit in a prominent area of the school		SGMT	Term 1			Compile the information into a report.
	Identify sites for planting and record them on a school map		Students, staff and local experts	Term 1		Creative Arts	List ways the ecosystem can be recreated in the school grounds. Pass this information on to the SGMT.
Greater understanding of biodiversity	Identify plants that attract animals; include indigenous species where possible. Use the Science students' report as a guide		SGMT, local experts, Landcare representatives, students and staff	Term 1		HSIE	Record images of the local bushland on video, a digital camera or as an artwork. The SGMT may be interested in displaying the images.
	Draw a design of the areas to be planted and seek support from a landscape architect. Use the information gathered by the HSIE students. Present the plan to a mathematics class to calculate the cost of implementation		SGMT, local experts including a landscape architect	Term 1			Search the Internet and magazines; contact local experts and Landcare groups for ideas on how to recreate the bushland ecosystem in the school grounds.
							Examine plans to manage school grounds. Determine the most appropriate plan for the school and share this information with the SGMT.

ISSUE: Lack of biodiversity and unattractive school grounds GOAL: To increase biodiversity and beautify school grounds STRATEGY: Landscaping of school grounds to beautify them and increase biodiversity						CURRICULUM INTEGRATION:	
Performance indicators	Action to be taken	Action checklist (tick)	Who is responsible?	When will it be completed?	Cost	Relevant KLA	Teaching and learning strategies to be undertaken
More plants and animals in the school grounds	Formulate maintenance plan. Students from the English faculty can assist		P&C	Term 2		Mathematics	Assist the SGMT by calculating the cost of implementing the school grounds management plan.
	Plant and landscape the selected sites		SGMT, teachers, local experts, general assistant and students	Term 2	Plants \$300 Mulch \$150	English	Write up the maintenance plan for the areas to be planted in collaboration with the SGMT. Include the names of people responsible for each task.
	Count the number of plants and animals in the school grounds. Compare the results with the biodiversity audit		Students & teachers	Term 4			Design a questionnaire for the SGMT to canvass opinions about the new plantings.
Improvement in the school's appearance	Design and complete a questionnaire to canvass opinions about the changes.		SGMT, students & teachers from the English faculty	Term 4			Write a report on the results.



Projects for school grounds

It is important that the project undertaken is a feasible one. The maintenance required should be realistically evaluated in terms of labour, materials and money prior to commencement of the project.

Source: C. Koettig, *Greening Your School*, Department of Education and Training, 1990, p.23.

Schools can undertake a range of projects that are cost-effective and within the physical capabilities of students and that can serve as a valuable teaching and learning resource.

The development and implementation of the project should be incorporated into the school curriculum and the school environmental management plan. Where appropriate, integrate the project across all KLAs. This will ensure the project is not dependent on one person and will continue if any of the staff leave the school.

Projects could include the establishment of the following:

- permaculture gardens
- "greenhouse gas reduction gardens" (e.g. planting suitable deciduous trees near windows)
- an Aboriginal studies area
- a pond or wetland
- silt traps
- a "prickly" garden, away from play areas, where small birds can nest
- bush regeneration sites
- attractive recycling areas
- screens, windbreaks or sound barriers created by plantings
- sites that attract birds (birds are attracted to red flowers)
- sensory gardens and trails
- an outdoor classroom seating area
- designated pathways
- a sundial
- a garden of indigenous plants.



The completed project as a learning site

Many of the completed projects provide opportunities for students to participate in cross-curricular activities and achieve the objectives of environmental education. Curriculum implementation can occur at two stages: (i) project design and development, and (ii) when the final product is used as a curriculum resource.

The following table shows how a completed project can support the achievement of syllabus outcomes across a range of KLAs.

Project: School pond

How the project supports the achievements of syllabus outcomes

KLA	Activity	Environmental education objective
Science & Technology	<ul style="list-style-type: none"> • Identify the creatures in the pond. • Record the natural processes that occur in and around the pond e.g. life cycles, food chains, the water cycle. • Discuss the water quality, using water creatures as biological indicators. 	<p>Students:</p> <ul style="list-style-type: none"> • understand the nature and function of ecosystems and how they are interrelated • are able to apply technical skills within an environmental context.
HSIE	<ul style="list-style-type: none"> • Record evidence of human activity in and around the pond. What is the impact of the activity on the environment? • Draw a cause-and-effect chart showing the impact of pollutants on the pond. • Examine ways to manage the pond. • Produce and implement a plan for long-term management of the pond. 	<p>Students:</p> <ul style="list-style-type: none"> • understand the impact of people on environments • are able to identify and assess environmental problems • are committed to act for the environment by supporting long-term solutions to environmental problems • are able to resolve environmental problems • are able to evaluate the success of their actions.
Mathematics	<ul style="list-style-type: none"> • Count the number of species identified in the pond. • Record the number of individuals for each species. • Record the information on a graph. Use the information to determine the dominant species. 	<p>Students:</p> <ul style="list-style-type: none"> • are able to apply technical skills within an environmental context.
English	<ul style="list-style-type: none"> • Collate the information collected at the pond. • Write an information report about the pond. The report should include information about the creatures and water quality. • Draw a flow chart describing the water cycle. 	<p>Students:</p> <ul style="list-style-type: none"> • understand the nature and function of ecosystems and how they are interrelated.
Creative & Practical Arts	<ul style="list-style-type: none"> • Design a web page featuring the class findings about the pond. • Place the web page on the school's web site. 	<p>Students:</p> <ul style="list-style-type: none"> • are able to communicate environmental problems to others.
PDHPE	<ul style="list-style-type: none"> • Discuss the importance of clean water to living creatures. 	<p>Students:</p> <ul style="list-style-type: none"> • respect all life on Earth.

Managing your school grounds

The following items are included in this section

- An audit checklist for:
 - biodiversity
 - noise
 - soil
 - school grounds
 - who uses the school grounds?
 - school buildings
 - shade
 - traffic (human)
 - stormwater
 - litter
- a list of management strategies

The progress sheet and action plan sheet are located in Section 3, *Developing the school environmental management plan*.



Biodiversity

An audit of biodiversity

Ideally, school grounds should be rich in biodiversity. This section provides you with ideas on undertaking a biodiversity audit.

Birds

Complete a bird count in the school grounds. Allocate groups of students to different areas of the school. Do three counts: early in the morning, in the middle of the day and at the end of the day.

Where possible, identify the bird and count how many specimens of each. Determine if the birds are native or introduced species. Record how they are using the school grounds.

Bird	Tally	Native or introduced?	How were they using the school grounds?
(e.g. Noisy miner)	1111	Native	Getting nectar out of the grevilleas

- What is the total number of birds? _____ Can you see nesting sites? _____
- How many native birds? _____ How many introduced birds? _____
- Why do you think birds are attracted to the school grounds? _____

- List strategies to encourage more native birds into the school grounds

Mini-creatures

It is important to examine the mini-creatures that live in the school grounds, as these creatures are food for larger animals.

Using magnifiers, identification charts and observation clues, examine the mini-creatures that live in the school grounds. Although some creatures cannot be seen, there is evidence of their presence. Include these on the list (e.g. if you see a spider's web, record *spider* on your list). Take care when moving logs or disturbing leaves, and put everything back in its place when you have finished.

Select three sites to do this.

Site 1 Location: _____

Mini-creature	Where found?	How does it use the school grounds?
(e.g. worm)	Under a log	Feeds on decaying leaf litter

- How many mini-creatures were found? _____
- What conditions do they like? _____
- How can you attract more of these creatures into the school grounds?

Other creatures in the school

There are many creatures in the school grounds that come out only at night.

To find out what they are, it is necessary to set up some "traps". The creatures will not be hurt in these traps, but you must ensure they are released in the same spot where they were captured, after you have recorded them on your audit sheet.

Pitfall traps:

- Dig a hole in the ground.
- Place a container in the hole and ensure the top of the container is flush with the soil level.
- Make a raised roof to go over the container, in case it rains overnight. Four rocks and a lid are ideal.

If the school has a sandpit, smooth the sand, place some food in the middle and check for footprints the next day.

Record your information on the following chart:

Name	No. of specimens	Why are they attracted to the school grounds?

- Are there scratch marks on the trunks of trees? _____
- Name some creatures that could have made these marks: _____

- List the creatures that have a negative impact on the school grounds.

Flora

The type of flora will influence the animals that are attracted to the school grounds.

On a map of the school, draw the plants located in the school grounds. Note if the plant is a tree, shrub or ground cover.

- How many trees in the school grounds are over 30m in height _____. Are they healthy (look at the tree's crown for clues)? _____. If not, why? _____.

- Do they provide shade? _____ Are there shrubs and ground covers? _____
- Tally the number of shrubs and ground covers. Record if they are native, bird-attracting (with flowers and dense foliage), a source of bush foods or fragrant.

Name	Native	Number of specimens	Bird-attracting	Bush foods	Fragrant
(e.g. grevillea)	Yes	1111	Yes	Yes	Yes

- Do the trees create enough shade? _____
- Is there enough vegetation to attract animals to the school grounds? _____
- Suggest ways to increase vegetation and attract more animals:

Noise

An audit of noise

You can complete sound maps at several locations within the school grounds (e.g. in the centre of the grounds or near the school boundaries). Each student requires a map of the school. Students find somewhere to sit in one of the chosen locations and then record the sounds they hear on the map.

To record the sounds, students can write the name or draw a picture of whatever is making the sound, using large letters or pictures for a loud sound, small for a soft sound. Record this on the map, showing the direction the sound came from. Students are required to sit in silence for five minutes to complete the map.

How many sounds were heard? _____

Fill in the record sheet and list the sounds heard:

_____	_____
_____	_____
_____	_____

Record if they were natural or unnatural sounds:

Natural	Unnatural
(e.g. birds)	(e.g. cars)

- Were there more natural or unnatural sounds? _____ Why is this so?

- What was the loudest sound? _____
- Note the sounds you like or dislike:

Like	Dislike

- How could you reduce or eradicate unpleasant or loud sounds? _____

Soil

An audit of soil

Walk around the school to see if there is any damaged soil. Mark the sites on a map.

There are three signs to look for:

- where the topsoil has been washed away and the remaining soil is bare and compact or simply rock and subsoil
- weed-infested soil: this indicates disturbed soil. Most weeds don't hold the soil together well because they are shallow-rooted
- a bare patch of ground with a white crust around it. This indicates soil salinity, which is the result of too many trees being cut down and replaced with shallow-rooted plants followed by over-watering.

Complete the following:

Location	Cause of damage to the soil	How can we fix the problem?

- Pour water onto some of the compacted, bare soil. What happens to the water? _____

Repeat the process on an area of grass. What happens to the water? _____

How do you think bare, compacted soil could affect the health of a plant?

Remedy: _____

- Determine the area of damaged soil.

School grounds

An audit of the visual amenity of the school grounds

Complete the table below to determine how you feel about the built and natural environments of the school site.

Area/building	Ranking 1: pleasant 5: unpleasant	If you like it, why?	If you dislike it, why?
(e.g. bitumen playground)	5		Too hard, very hot in summer

Combine the class results. List the areas and buildings and record the number of responses to each.

Area/building	Number of people who liked	Number of people who disliked
(e.g. playground)		

- Which are the four most liked areas in your school grounds?

- Which are the four most disliked areas?

- List the features that determine why particular areas are liked (e.g. attractive plants).

- List the features that determine why an area is disliked (e.g. too shaded and cold in winter).

- Suggest ways to improve the disliked areas.

Shade

The amount of shade in the school grounds will influence the types of animals and plants that live in the grounds. Shade is important to people using the school grounds, particularly because of the high incidence of skin cancer in Australia.

The amount of shade in the school will change throughout the day and year.

Select four sites in the school. Draw an outline of the shadow shapes with chalk or string early in the morning. Leave the outlines in place and repeat the activity at recess, lunchtime and just before school finishes.

Record the changing shadows on a map of the school. Ensure that the time of each shadow shape and the season are recorded. It is also necessary to record where the shadows would be at other times of the year. Therefore, schools can calculate this or repeat the activity at another time of the year as well. Shadows are usually longer in winter because the sun is lower in the sky. The southern side of objects has more shade than the northern side because of the sun's position in the sky.

- Record areas that are shaded all day:

- What plants are growing in these areas? _____

- Record the creatures living in these areas: _____

- Is the soil damp? _____ If so, are there signs of soil damage? _____

What is the damage? _____

- Is a lot of energy required in winter to heat the buildings in these areas? _____

- Record the areas that have no shade during the day: _____

- List the plants growing in these areas:

• Is a lot of energy required to cool buildings in these areas during summer? _____

How could the school address this problem? _____

• Record the creatures living in the exposed conditions: _____

• Describe the condition of the soil: _____

• Are there more creatures living in the shaded or exposed areas? _____

Why? _____

• People living on the east coast of Australia, particularly north of Wollongong, can expect to burn in the winter sun after only 20 minutes' exposure!

Is there enough shade in the school to protect students in the winter and summer months? _____.

Suggest ways to overcome this problem:

Traffic

An audit of human traffic

Pathways, routes and traffic streams that are most commonly used tend to affect the condition of school grounds. This activity will show if students use the traditional paths or take short cuts.

Allocate certain pathways to groups of students to monitor the movement of people. Monitor movements of people:

- as they arrive at school
- during recess
- at lunchtime, and
- at the end of the school day.

Location of path: _____

Morning

Record the number of people who:

Keep on the path	Don't keep on the path
Total:	Total:

Recess

Keep on the path	Don't keep on the path
Total:	Total:

Stormwater

An audit of stormwater

The drains and gutters in schools are designed to divert the natural flow of stormwater so that it does not flow where it is not wanted. The stormwater in a school often picks up pollution, such as litter, soil, twigs and leaves. These are washed into the local creek or river, causing pollution.

What goes down the drain?

Make a list of substances and items that enter the sinks and drains located outdoors.

Location	Substance or item	Where does it go?

Use the information to complete "Are we polluting the water?" on the following page.

Are we polluting the water?

Write the name of each substance or item that enters the sink or drain. Determine its impact on the environment, and suggest a more appropriate method of disposal. Suggest an alternative substance, where appropriate, that has less impact on the environment.

Substance	Impact on environment	Safer method of disposal	Safer alternative product

- Which substance or item has the most negative impact on the environment?

How can it be avoided? _____

- List the problems with stormwater management in the school.

- Suggest ways to overcome these problems _____

Strategies to manage school grounds

Once you have completed your audit of the grounds, you now have data and information for developing strategies to manage them. This section provides you with some management strategies. Depending on your local situation, select those strategies that suit you the best.

What can we do?

Biodiversity

The following strategies are designed to attract more native fauna to the school grounds.

- Plant native vegetation.
- Select shrubs that are dense and prickly; plant these in the middle of gardens, as they provide excellent nesting sites for small birds.
- Plant callistemons (bottlebrushes) and grevilleas that have red and yellow flowers, as these attract native birds.
- Plant eucalypts that provide shelter for possums and may attract parrots.
- Plant rough-barked trees that provide shelter for mini-creatures.
- Spread a layer of leaf litter which will attract worms and other creatures that feed on decaying matter. These will be a food source for larger animals.
- Set aside special areas where biodiversity is not disturbed during breaks in the day.
- Encourage neighbours to keep their cats in at night.
- Avoid using chemicals in the school grounds. Many beneficial insect predators, such as lady beetles, wasps and praying mantis, live in the school grounds.
- Create nesting sites for native birds. A useful guide is *The Nestbox Book*, published by the Gould League of Victoria.

Soil

Soils can become compact and bare from people continually walking over them. The soil can become so hard that water can no longer penetrate and plants can die.

The following strategies can prevent soil damage:

- Fence off areas to prevent people walking on them.
- Loosen the soil and mix in compost (this will improve water penetration).
- When the soil has improved, plant with vegetation.
- Plant deep-rooted native trees and shrubs.
- Use mulch on gardens to prevent the soil drying out; do not use pine bark chips, as these deplete the soil of nitrogen. Mulch that contains thick pieces of wood takes a long time to break down and releases only small amounts of nutrients.
- Select leaf mulches, as these return nutrients to the soil while they break down.
- Avoid over-watering.
- Turn damaged areas into gardens.

Consider the issue of the soil being damaged from people taking short cuts. *Is it appropriate to turn the area into a path and replant the original path?*

Stormwater

Local waterways can become polluted from stormwater. School students can reduce water pollution by:

- collecting litter from the gutter, while using gloves, and sorting it into the correct bin
- picking up litter blowing around the school grounds
- picking up animal droppings and depositing them in an appropriate place
- using leaf mulch on the garden

- avoiding commercial fertilisers and toxic substances
- sweeping up leaves and twigs that have blown into the gutter and placing them in the garden, and
- stencilling all the stormwater drains with educational messages advising people where the water goes and how the drain is part of a local catchment.

Shade

The level of shade in a school can have a significant impact on energy consumption. Remember, the cheapest air conditioner is a tree!

- Plant deciduous trees in areas where shade is required in summer and light is required in winter.
- Avoid planting shade trees on the southern side of buildings.
- Construct a large shade-cloth area.

Noise

The level of noise in a school can impact on students' concentration. The following strategies can reduce noise levels:

- Plant a row of thick shrubs to reduce the impact of noise around the boundary of your school.
- Construct a barrier from recycled material and beautify it with plants or paint a mural on it. Invite a local artist or craftsman to assist.

Litter

Litter can make school grounds look unattractive and will influence people's attitudes towards the school.

Schools can reduce litter in the school grounds by:

- ensuring that bins are located in strategic locations
- reducing the amount of packaging entering the school
- encouraging students to bring a reusable lunchbox and drink bottle to school
- changing the items sold in the canteen (e.g. Do items have too much packaging?)





7. Support for environmental education

Environmental education centres (EECs)

The NSW Department of Education and Training has 23 EECs (formerly known as field studies centres), spread throughout the State. In addition, there are two zoo education centres, one located at Mosman (Taronga) and the other at Dubbo (Western Plains). Each centre covers a wide range of environments, from urban to wilderness, from coastal to inland and from rainforests to rangelands.

Functions of the centres

Staff from these centres serve students and schools in a variety of ways:

- They provide fieldwork experiences for students K-12, in support of all key learning areas.
- They liaise with government and non-government agencies to develop programs involving schools and local communities.
- They provide advice and assistance to schools in setting up environmental education projects.
- They develop training and development courses for teachers and school communities.
- They develop materials and programs that have application, both on and off the centre sites.
- They help school communities incorporate the *Environmental Education Policy for Schools* into their programming and management practices.
- They visit schools to assist teachers with classroom activities relating to environmental education.
- They advise school communities about using their local area for fieldwork venues.
- They assist schools to develop their school grounds for educational purposes.
- They inform school communities about particular environmental programs and activities, such as Landcare, Streamwatch or Learnsapes.
- They assist schools in the organisation of special environmental events.
- They assist universities with regard to environmental education in teacher training courses.
- They provide a focus for community education in environmental issues.



Environmental education and zoo education centres managed by the NSW Department of Education and Training

Name and address of centre	Location Telephone no. Fax no.	Name and address of centre	Location Telephone no. Fax no.
AWABAKAL C/- Dudley Public School Boundary St Dudley 2290	Dudley Tel: (02) 4955 8673 Fax: (02) 4942 6097	PENRITH LAKES Castlereagh Rd Cranebrook 2750	Penrith Tel: (02) 4730 3630 Fax: (02) 4730 3662
BOTANY BAY Botany Bay National Park Kurnell 2231	Kurnell Tel: (02) 9668 8431 Fax (02) 9668 8523	RED HILL PO Box 185 Gulgong 2852	Gulgong Tel: (02) 6374 2558 Fax: (02) 6374 2560
BOURNDA Bournda National Park via Kalaru 2550	Kalaru Tel: (02) 6494 5009 Fax: (02) 6494 5011	RIVERINA PO Box S146 Wagga Wagga 2650	Wagga Wagga Tel: (02) 6931 5039 Fax: (02) 6931 5084
BREWONGLE Sackville Rd Sackville North 2756	Sackville Tel: (02) 4579 1136 Fax. (02) 4579 1072	ROYAL NATIONAL PARK PO Box 44 Sutherland 2232	Audley Tel: (02) 9542 1951 Fax: (02) 9545 4830
CAMDEN PARK PO Box 684 Camden 2570	Camden Tel: (02) 4636 6313 Fax: (02) 4636 6342	RUMBALARA Donnison Rd Gosford 2250	Gosford Tel: (02) 4324 7200 Fax: (02) 4323 7451
CASCADE PO Box 206 Dorrigo 2453	Dorrigo Tel: (02) 6657 4188 Fax: (02) 6657 4117	TARONGA ZOO EDUCATION CENTRE PO Box 20 Mosman 2088	Mosman Tel: (02) 9969 2455 Fax: (02) 9978 4508
DORROUGHBY Mullumbimby Rd Dorroughby 2480	via Lismore Tel: (02) 6689 5286 Fax: (02) 6689 5042	THALGARRAH Rockvale Rd Armidale 2350	Armidale Tel: (02) 6775 1736 Fax: (02) 6775 1681
FIELD OF MARS PO Box 2082 Boronia Park 2111	Ryde Tel: (02) 9816 1298 Fax: (02) 9816 3279	The WETLANDS Sandgate Rd Shortland	Shortland Tel: (02) 4955 8673 Fax: (02) 4950 0497
GEORGES RIVER Chipping Norton Public School Central Ave Chipping Norton 2170	Chipping Norton Tel: (02) 9755 3189 Fax: (02) 9755 3190	WAMBANGALANG Obley Rd Dubbo 2830	Dubbo Tel: (02) 6887 7209 Fax: (02) 6887 7237
GIBBERAGONG PO Box 3276 Asquith 2077	Bobbin Head Tel: (02) 9457 8245 Fax: (02) 9457 8182	WARRUMBUNGL NATIONAL PARK PO Box 280 Coonabarabran 2357	Coonabarabran Tel: (02) 6825 4302 Fax: (02) 6825 4304
LONGNECK LAGOON Whitmore Rd Riverstone 2765	Windsor Tel: (02) 4573 6323 Fax: (02) 4573 6534	WESTERN PLAINS ZOO EDUCATION CENTRE PO Box 831 Dubbo 2830	Dubbo Tel: (02) 6882 5888 Fax: (02) 6884 4530
MT KEMBLA PO Box A124 Shellharbour 2529	Wollongong Tel: (02) 4276 3519 Fax: (02) 4276 3048	WOOGLEMAI PO Box 78 Oakdale 2570	Oakdale Tel: (02) 4680 9483 Fax: (02) 4680 9486
OBSERVATORY HILL PO Box 43 Millers Point 2000	Sydney Tel: (02) 9247 7321 Fax: (02) 9247 4787		

Location of environmental education and zoo education centres



Professional Support and Curriculum Directorate provided by environmental education centres

Environmental education centres were set up primarily to support school-based programs. They now provide first-hand field experiences for students in a variety of locations. However, from their beginnings over a quarter of a century ago, they have evolved to be much more than merely excursion venues.

There are opportunities to incorporate environmental education within the syllabuses for every key learning area, from Kindergarten to Year 12. Many senior curriculum documents have mandatory fieldwork components, and there are specific syllabus units at both primary and secondary level which suggest ways of incorporating fieldwork. Each centre can help schools with this work.

Providing environmental education programs direct to students is the main focus for the Department's environmental education centres. Each centre offers a unique setting where a combination of venue, resources and experienced staff makes it easy for teachers to organise fieldwork and environmental education activities for their students.

No matter where a school is located, in most cases there is an environmental education centre close enough to provide programs and support for environmental education. Teachers can choose to visit centres that may offer a specific opportunity to run a particular program. For example the K-6 Human Society and Its Environment Syllabus suggests units on *Gold, Global Environments: Rainforests* and *State and National Parks*. Many centres have programs tailor-made to fulfil the outcomes of these units.

Whilst a number of programs offered by environmental education centres are concerned with the key learning areas of Science and Technology and Human Society and its Environment, the centres are able to ensure that programs are truly cross-curricular in nature. All programs incorporate aspects of the literacy strategy. For example, collecting information, report writing, oral communication of instructions and information, writing procedures, and using experiences in the field for narratives, poetry or drama can all be part of a program that may originally have been intended to satisfy the outcomes of a science unit of work.

Programs in numeracy, Aboriginal studies and PDHPE

Many field programs involve numeracy. Extrapolating and manipulating quantitative data gathered in the field, measuring, graphing and designing are purposeful and meaningful activities that satisfy numeracy outcomes across all stages.

Most centres are able to offer programs in Aboriginal Studies. Many centres have access to Aboriginal sites and Aboriginal educators to deliver programs.

Programs in personal development, health and physical education are featured at many centres. Most programs involve students actively working in a healthy environment. Some centres offer rope courses and other fitness-oriented activities. Others have canoes, bicycles or offer bush walking and orienteering. Some centres can provide special courses that accredit participants in such areas as first aid and canoe instruction. Environmental education centres have become popular venues for special programs, such as peer support, student representative council camps, and orientation days for Year 11 students. Accreditation for students in such schemes as the Duke of Edinburgh's Award is also undertaken in some centres.

Creative arts programs

The creative arts are well catered for in all centres. The environment can be the inspiration for art and craft activities and sometimes the source of material for these activities. Drama and music can be influenced by first-hand experiences or simply provide the most appropriate backdrop to a performance.

Resources supplied by environmental education centres

All centres have adopted ecologically sustainable practices. Students have the opportunity to examine waste management systems (composting, wormeries, recycling), renewable energy systems, energy-saving appliances, water reduction strategies and gardens designed to reduce energy use.

The centres have a wide range of field equipment. Microscopes, macro lenses, water and soil testing kits, global positioning systems, weather stations, solar panels, compasses, data-loggers, photographic and audio equipment, extensive libraries of resource material, maps, CDs, videos etc. may be part of the extensive list of equipment that a centre has available for visiting teachers and students to use. Because of their specialised nature,

environmental education centres are able to make sure this equipment is used in a relevant and meaningful manner to enhance fieldwork. All centres have access to the Internet and a range of excellent computing facilities.

Staff in environmental education centres

The staff of environmental education centres are experienced in working with students from Kindergarten to Year 12. They are also able to work with the full range of students encountered in the public education system regardless of background, ability or disability. The staff of these centres are trained in first aid and emergency procedures to ensure that your visit to a centre is a safe and enjoyable one.

Special celebrations

Centres organise, or are an ideal venue for, special focus days and events such as Wattle Day, Clean Up Australia Day and Heritage Week. Centres organise and run competitions, such as the Department's annual Envirothon for Year 11 students. The list is limited only by the collective imagination of the students and teachers and the staff of the centres.

There is no doubt that environmental education centres play a significant role in satisfying the cognitive aspects of many units of work across all KLAs. However it is by direct interaction with the environment that attitudes and values can truly be changed and developed. No amount of classroom work can match the experiences gained when a student smells, sees and touches the wonders of a rainforest. Sitting by an inland stream and watching a dragonfly dipping in the water to lay its eggs, or seeing a whale breach close inshore, or simply witnessing the passing parade on a busy city street are also valuable experiences. Perceptions gained from first-hand experiences form the foundations of an enriched learning environment, and it is these, above all, that EECs can offer students who take part in their programs.

Zoo education centres

Zoos are sensory places. Students, teachers and parents can see them, sense them and then have the skills to save them.

When you visit the zoos you hear, see and smell wildlife. In the zoo classroom, students can encounter live animals face to face. Trained teachers at the zoos can offer students a wildly different learning experience, one that can act as a stimulus for further learning.

Zoo educators at Taronga and Western Plains Zoos address environmental education across the curriculum through a variety of stimulating educational programs. Zoo education supports schools by designing the zoo excursion or zoo lesson around curriculum outcomes. The zoos also provide written resources to support learning, such as specific zoo kits for each of the key learning areas, as well as general information kits and zoo-based fact sheets for assistance with school projects.

Zoo lessons allow students to get up close and personal with live animals. The zoo education centres house a variety of mammals, birds, reptiles, frogs and insects that form the basis of all lessons offered.

Besides lessons and zoo excursions, your zoo education centres offer special programs. These programs target specific outcomes and are aimed at specific key learning areas, such as Creative Arts or Science and Technology, or at mandatory policies such as Literacy, Aboriginal Education and Vocational Education. While all zoo education programs support the objectives of environmental education, the programs that best relate to, and assist in, the achievement outcomes in Board syllabuses are:

- **Frog Focus** (Botany). This is a community conservation education program to release and monitor the endangered green and golden bell frog. This is the first time in Australia that school students have been involved in the recovery of an endangered frog. This model could be applied to any species or environment.
- **ASX Frog Focus**. This national education program is an interactive CD-ROM that gives teachers a wholistic approach to studying frogs with their students. The CD-ROM has activities, curriculum links for each of the different States, in-depth information about frogs and details about how we can all be involved in frog conservation. For more information visit the web site at www.asxfrogfocus.com. The CD-ROM is available from Taronga Zoo Education Centre.



- **Zoosnooz.** Students can sleep at the zoo and take a zoo visit to new heights! Students see the zoo at night, sleep in the zoo classrooms, meet live animals up close, go behind the scenes and assist the zoos in saving endangered species. This program is available at both Western Plains Zoo and Taronga Zoo.
- **Zoomobile.** Taronga's outreach program offers two programs to schools unable to visit the zoos for financial, cultural, health or distance reasons. The Zoomobile officer takes live animals to your school to complement your classroom activities across all key learning areas from K-12. *The Animals of the Dreaming* program combines interesting aspects of Australia, native animals and Dreaming stories presented by an Aboriginal elder.
- **Professional development days** for teachers are also offered by the zoo education centres. These focus on specific aspects of the curriculum and on how to use the zoos to stimulate students' learning.

Complimentary pre-excursion visits for teachers are also available at both zoos but must be booked through the education centres.

All zoo educators in New South Wales are qualified teachers and are employed by the Department of Education and Training, the Catholic Education Office or the Zoological Parks Board of NSW. Taronga Zoo library is available to teachers to assist with animal information to support either classroom activities or their zoo excursion.

Web site address: Taronga Zoo & Western Plains Zoo: www.zoo.nsw.gov.au

Information on each environmental education & zoo education centre can be found at the following web site:

www.curriculumsupport.nsw.edu.au/EnviroEd



8. Programs that support environmental education in your school

There are many innovative programs and projects providing teachers with opportunities to implement environmental education in an exciting and relevant way.

These programs have been developed to meet the requirements of an environmental process “which develops awareness, knowledge and understanding of the environment, positive and balanced attitudes towards it and skills which will enable students to participate in improving the quality of the environment.”

Source: Board of Studies, *Environmental Perspectives*, 1996

The services provided by these organisations complement the achievement of outcomes in syllabuses of the NSW Board of Studies and incorporate cross-curriculum perspectives, such as Aboriginal education.

Many of the programs address environmental issues at a local level and promote action for the environment. The Streamwatch program developed by Sydney Water encourages students to become actively involved in monitoring their local waterways and implementing strategies to maintain or improve water quality. Catchment Management Committees have produced support materials to extend this management to entire catchments.

The programs and projects encourage community participation, integrate activities with the curriculum, and promote action for the school and local environment.



AirWatch is an exciting program for primary and secondary schools, where students can become air pollution watchdogs in their local

area. Through collaborative and inquiry-based learning, students will learn about air pollution, its causes and solutions for its reduction.

Through active involvement in sampling and analysing their local air quality, students are able to understand local and global air quality issues, and are encouraged to become actively involved in finding solutions to air quality problems.

Air Watch provides:

- background information on air quality and related issues
- monitoring equipment to assess local air quality
- Internet database and chat facilities, and
- activities and exercises covering a range of air pollution issues.

Schools in the National AirWatch program can participate at two data collection levels. All data collected can be entered into the national database via the AirWatch home page.

Students measure Visual Air Quality (VAQ) to determine daily visibility. As objects are viewed at a distance, how clearly they are seen will depend on the quality of the air in between.

To obtain an understanding of why air quality can vary from day to day, students measure meteorological conditions using a sophisticated weather station.

A manual, which is available to teachers and students, covers such topics as:

- pollutants and their sources
- the effects of weather on pollution
- how haze forms
- smog and its effects
- the effects of wood heaters
- cars and pollution
- how individuals can help improve air quality.

Reference

National Air Watch facilitator

EPA Victoria

40 City Road

Southbank VIC 3006

Telephone (03) 9695 2709

Fax (03) 9695 2780

Web site: www.airwatch.org.au



The Australian Greenhouse Office (AGO) is the world's first government agency dedicated to reducing greenhouse gas emissions.

The Office coordinates domestic policy on climate change, implements Commonwealth programs and provides a central point of

contact for key interest groups.

The Commonwealth Government has guaranteed almost \$1 billion over five years to fund programs on climate change.

Global warming presents challenges for the way we live and work. Addressing this will require changes for industry, governments at all levels and the community at large. It will require careful consideration of the best, most effective, and most economical means of reducing Australia's contribution to the greenhouse gas problem.

The Australian Greenhouse Office encourages the involvement of all Australians in the challenge to reduce greenhouse gas emissions. Working with industry and the community is important to achieving our mission.

For further information about the Australian Greenhouse Office, e-mail: communications@greenhouse.gov.au

Environmental youth councils

Environmental Youth Councils are groups of young people who meet regularly:

- to participate in environmental projects for their local area, including Landcare projects to rehabilitate wetlands, restore degraded bushland or revegetate landscapes
- to increase awareness and education on environmental issues
- to encourage young people to take action and care for the environment
- to organise Enviro Youth Forums
- to present youth perspectives to adults and decision makers, and
- to have fun whilst making a difference.

Youth Councils organise forums. The forums empower young people to devise and implement strategies to improve the ecological health of the environment.

Enviro youth forums help young people:

- to become actively involved in improving the local environment
- to develop social, communication and problem-solving skills
- to learn how to address environmental degradation problems

- to understand how change happens in society.

The forums focus on the environmental problems in the local area. They provide young people with an opportunity:

- to learn practical skills in the environmental field
- to share information and to work together to find solutions
- to meet like-minded people and get involved in local environmental projects
- to join the local Environmental Youth Council.

Reference

Maitland Environmental Youth Council

PO Box 392

East Maitland NSW 2323

Telephone (02) 4934 9838

Fax (02) 4934 8469



Red Hill Environmental Education Centre

PO Box 185

Gulgong NSW 2852

Telephone (02) 6374 2558

Fax (02) 6374 2560



Envirothon is an annual fieldwork competition for Year 11 students, organised by the 23 environmental education centres of the Department of Education &

Training, the Environmental Education Unit and the National Parks and Wildlife Service.

Independent markers assess fieldwork tasks set for students. Each school in the competition is represented by four Year 11 students, who work as a team using all their problem-solving and sensory awareness skills. Creative thinking and sharing a common interest in the environment are essential.

After completing the tasks, each team is asked to address a local environmental management issue based on what they have learned from the activities completed.

Winners in each district compete in a final challenge against other district winners. Prizes are then awarded to the most successful team from the winning school.

Details of the program are included on the Department's web site and through notices to principals of high schools.

Reference

Web site: www.curriculumsupport.nsw.edu.au

Do a search for "envirothon" or contact the nearest environmental education centre of the Department of Education and Training for further details.



Every Drop Counts

In January 2001 Sydney Water launched an initiative known as **Every Drop Counts**. It is designed to help their customers within Sydney, the Illawarra and Blue Mountains to save water, money and the environment.

Every Drop Counts in Schools is a program aimed at increasing student awareness of how precious water is and what schools, and their communities, can do to conserve it. The program comprises teaching materials that are clearly linked to the curriculum and a hands-on water conservation activity to be carried out at the school. This program is initially aimed at Stages 2-3 students and will be delivered in conjunction with Streamwatch.

Every Drop Counts in Schools is due to be released in early 2002.

Reference

Water Conservation and Recycling Team

Sydney Water Corporation

PO Box A53

Sydney South NSW 1232

Telephone (02) 9350 5082

Fax (02) 9350 5942

Web site: www.sydneywater.com.au

E-mail: everydropcounts@sydneywater.com.au

Every Drop Counts is a key element of WaterPlan 21, Sydney Water's long-term strategy for sustainable water and waste water management.



Friday Schools Clean Up Day

Clean Up Australia Day is an annual event, usually taking place on the first Sunday in March.

Friday Schools Clean Up Day is a significant part of the campaign and takes place on the Friday before Clean Up Australia Day. Schools are also invited to nominate a group of students to take part in the Sunday Clean Up Australia Day.

Activities on the day may vary from cleaning up school grounds, recycling rubbish and completing the Rubbish Report Survey for the Clean Up Australia Council. (The survey helps identify changes in consumer behaviour and environmental awareness.)

Restoring and protecting the school grounds and its environs are vital for the education of students and help to ensure that the environment is protected for the future.

Clean Up Australia also asks schools to undertake a Rubbish Report Survey and submit it to their head office. A poster competition is also held.

Reference

Clean Up Australia Ltd

18 Bridge Rd

Glebe NSW 2037

Telephone (02) 9552 6177

Fax (02) 9552 4468

Web site: www.cleanup.com.au



GLOBE project

The GLOBE Program is an environmental education program currently undertaken by 88 countries around the world.

It links students, teachers and

the scientific community in an effort to learn more about the global environment.

The GLOBE Program involves students at both primary and secondary levels in a continuing program of scientific environmental measurements. The areas of investigation include:

- atmosphere
- hydrology
- soils
- land cover/biology study.

GLOBE students transmit their measurements to a global data processing facility via the Internet. This information is then processed and sent back to the students across the world as vivid graphical environmental images.

This allows students to be actively involved in global environmental studies, increasing their environmental knowledge and understanding. It also provides an opportunity to create links with other schools, both in Australia and overseas.

The GLOBE Program provides teachers with a comprehensive resource manual containing measurement procedures and learning activities for all year levels, access to state-of-the-art visualisation technology, as well as ongoing professional development opportunities for teachers.

GLOBE Australia is a collaborative project between the Australian and US governments. The Program is jointly funded through the Department of the Environment and Heritage and the Department of Education, Training and Youth Affairs. CSIRO Education coordinates the

program that is currently implemented in over 300 Australian schools.

Reference

GLOBE Australia
CSIRO Education
PO Box 225
Dickson ACT 2602
Telephone (02) 6276 6291
Fax (02) 6276 6641

Web site:

<http://www.environment.gov.au/net/ausglobe.html>
or contact the GLOBE Australia Project Officer:



Since 1910 the **Gould League of NSW Inc.** has been assisting students and teachers in the teaching of environmental education throughout the State.

The Gould League continues to provide this assistance today. The League can provide face-to-face support for individual schools through the services of an education officer. The officer provides environmental education programs and projects at a negotiated fee.

These programs and projects could include:

- infusing an environmental emphasis into the key learning areas
- developing resources
- using school grounds to teach environmental education
- developing environmental areas in the school
- carrying out environmental problem-solving and investigations of the local area
- conducting a staff development day or inservice course
- assisting individual teachers throughout a school day
- conducting school assemblies
- providing assistance in the implementation of the Environmental Education Policy for Schools
- conducting programs with specific themes (e.g. recycling and min-creatures).

The Gould League conducts an annual Project Environment competition for students from Kindergarten to Year 12. Each year a specific environmental theme is investigated. Students are encouraged to use a variety of skills during their investigations, such as photography, music, art, writing research etc.

The League also sponsors a special award in Art Express, the annual exhibition of outstanding artworks by NSW HSC students.

Reference

Gould League of NSW Inc.
PO Box 16
Gladesville NSW 2111
E-mail: GouldL@ozemail.com.au.
Telephone (02) 9817 5621
Fax (02) 9817 5471



The Greenhouse Action Program (GAP)

is a community-based, climate change program. Developed by the Hawkesbury Nepean Catchment Management Trust, GAP aims to raise awareness of greenhouse issues through educa-

tion and to facilitate active greenhouse reduction initiatives within schools and the community. The program focuses primarily on linking schools and community groups with local, State and Commonwealth Government initiatives.

The key objectives of the program are:

- to bring about community understanding and involvement in the issues relating to the greenhouse effect
- to increase community understanding of actions that address the greenhouse effect and those associated with natural resource management and general environmental issues
- to facilitate the mass planting of locally sourced seedlings by the community to absorb carbon dioxide from the atmosphere and hence help reduce the enhanced greenhouse effect
- to facilitate the ongoing maintenance of the carbon sinks, as needed, through continued involvement of the community and local government
- to provide education on energy and greenhouse awareness through school-based curriculum activities and on-site energy audits.

Schools in the GAP implement the program by a variety of methods:

- through environment clubs
- through student representative councils
- by individual classes or whole school grades
- by a whole school over a set period.

Schools are targeted at a local government level, where the council has shown support for the Greenhouse Action Program or where schools themselves have expressed interest in the program.

Reference

Greenhouse Action Program
C/- SCRAP

Holsworthy High School
Huon Crescent
Holsworthy NSW 2173
Telephone (02) 9825 1062
Fax (02) 9825 6972
Web site: www.greenhouseaction.org



Landcare. In March 2000, there were approximately 1500 Landcare groups in rural NSW and over 500 urban Landcare and bushcare groups in Sydney. The five main issues confronting rural Landcare

groups in NSW are:

- weed control
- soil erosion by water
- revegetation
- stream bank erosion, and
- decline of remnant vegetation.

Dryland salinity is a major concern for Landcare groups in over 35 percent of the State's area.

Schools work cooperatively with Landcare groups, carrying out such activities as raising seedlings, restoring eroded areas, revegetating farms, breeding dung beetles as a method of fly control, making educational videos and developing nature reserves for educational research. There are also many school Landcare groups operating in NSW.

The NSW Department of Land and Water Conservation (DLWC) assists Landcare groups with funding and other support. The DLWC has produced a booklet entitled *Landcare and Schools* to encourage schools to become involved in Landcare activities. It is available by contacting the DWLC Landcare Support Team.

Reference

Landcare Support Team
Department of Land & Water Conservation
23-33 Bridge St
(GPO Box 39)
Sydney NSW 2001
Telephone (02) 9228 6506
Web site: www.landcare.nsw.gov.au



Murder under the Microscope is a competition open to all students in Years 5 to 8.

Murder under the Microscope is a joint initiative of the Department of Land and Water Conservation (DLWC) and the Open Training and

Education Network (OTEN). It involves student detective groups investigating potential environmental "victims" and "crime" sites over a three-week period each year via satellite and Internet broadcasts. Clues are beamed into the classroom via four satellites, SBS TV and Internet broadcasts. The first part of the competition culminates in teams posting an accusation on the web site following the final day's broadcast. The first school to identify the environmental villain is the winner. The second part of the competition entails groups submitting a catchment management plan to address the problems raised by the scenario. Groups are judged in two categories: primary and secondary. The plans may be submitted in any form. Previous entries have included PowerPoint presentations, board games, web sites, videos and role-play, songs, poems, pictures and written reports. The winners in both the primary and secondary categories are the Murder under the Microscope Eco Planners.

Schools must register to be part of the competition and, on acceptance, are provided with a badge ID that serves as a password to participate in the game. The game is held once every year. Teachers are provided with a handbook that outlines the rules and details of the game.

Reference

Open Training and Education Network
51 Wentworth Rd
Strathfield NSW 2135
Telephone (02) 9715 8000
Fax (02) 9715 8111
Web site: www.microscope.ozeducate.com.au



The NSW National Parks & Wildlife Service. *The Discovery Educational Walks, Talks and Tours*

program is an environmental education program that aims to foster appreciation for and an understanding of nature, Aboriginal cultural heritage and historic heritage. It encourages involvement in conservation across New South Wales. The program is conducted from 19 regional locations across the State.

A wide range of themes relating to the conservation of nature and our cultural heritage form the basis of activities in the program. These include biodiversity, threatened species, Share the Dreaming (Aboriginal heritage), historic heritage, woodlands and wilderness, water, pest and fire management. Programs are conducted during school holidays and in school term. Tailored programs are available on request from regional offices.

Information Centre

The Centre provides a range of information products and services for teachers and students. Staff can advise on the current range of publications, either free or for sale: posters, books, plans of management, maps, park brochures and guide books, teachers' kits, species management reports, animal fact sheets, wilderness information and general information on the conservation of nature and our cultural heritage.

Library

The Library maintains a specialised collection relating to nature conservation and conservation of Aboriginal cultural heritage and historic heritage. It also contains a comprehensive range of unpublished public documents relating to conservation management by the NPWS. Teachers and senior students will find the library most useful, as it also provides a service to general and specialist staff of the NPWS.

The NPWS Library staff offer:

- assistance with searches of the library database
- Internet access
- CD-ROM and on-line literature searches
- bibliographies on key conservation themes, and
- inter-library loans or photocopies on a fee-for-service basis.

Reference

NPWS Library

Level 7

43 Bridge St

Hurstville 2220

Open Monday to Friday 9am–5pm

NSW National Parks and Wildlife Service

National Parks Centre

George St

The Rocks NSW 2000

Telephone 1300 361 967

Web site: www.npws.nsw.gov.au

E-mail: info@npws.nsw.gov.au



Oz GREEN is a non-profit organisation that produces action-based environmental education programs to promote informed community participation in the care of the world's waters and the development of ecologically sustainable ways of living. Oz GREEN staff are professional

environmental educators and their programs are hands-on, action-based and can be incorporated into many of the new curricula including:

- HSIE
- Science, Stages 4 to 6

- Earth and Environmental Science, Stage 6, and Geography, Stages 4 to 6.

Planning for pollution prevention at school

When working with Oz GREEN to develop a pollution prevention plan, the whole school community gets involved in looking at the connection between the stormwater system in the school and the local waterways.

Taking action: "Kids, companies and creeks"

Oz GREEN's *Kids, companies and creeks* projects involve schools in working cooperatively with local government, industry and the community to take action to protect local waterways. Oz GREEN has organised KCC projects with more than 100 schools and many companies in catchments of the Sydney region.

Global citizens, global links: "Our Place"

Our Place is an interactive education program that uses the Internet to link schools in Australia to each other and to young people on major river systems throughout the world. The project is an initiative of Oz GREEN, supported by the Murray-Darling Basin Commission. Through "Our Place", schools can: investigate the local environment; use the Internet to share their experiences with schools from more than 20 countries; learn about the global environment through first-hand accounts from other young people; and contribute to a more caring and peaceful world.

Water quality testing kits

A new low-cost water quality monitoring kit is available through Oz GREEN. The kit contains equipment and chemicals to analyse water quality.

The chemicals used in the kit are all non-toxic.

Reference

Oz GREEN

PO Box 1378

Dee Why NSW 2099

Telephone (02) 9971 4098

Fax (02) 9981 4956

Web site: www.ozgreen.org.au



Royal Botanic Gardens, Sydney

Botanic gardens are places that promote knowledge and appreciation of plants and their critical role in the sustainability of our natural and urban environments. There is a network of botanic gardens across New South Wales.

The Community Education Service of the Royal Botanic Gardens, Sydney, Mount Annan Botanic Garden and Mount Tomah Botanic Garden offers a range of programs

to support schools with the management and educational use of their groups.

School garden advisory service

Established in 1992, this service provides advice to schools on the management of their grounds. Consultant horticulturists can visit your school for a range of activities, including planning school gardens, preparing a job list for a parents' working bee, and providing advice on the maintenance of trees and other plants in your grounds. A moderate fee is charged for this service.

School gardening clubs

The Royal Botanic Gardens of Sydney support and encourage school gardening clubs by providing training and advice to established groups of students caring for their school grounds.

Hands-on horticulture

As part of the Gardens' school lesson program, students of all ages have access to the expertise of horticulturists, landscape architects and botanists. Groups are encouraged to use the Gardens for educational activities, such as identifying local bush food plants or simply appreciating the beauty of a well-managed landscape. Under the watchful eye of Gardens horticultural staff, students can be involved in activities ranging from practising basic horticultural skills to problem-solving activities associated with the management of landscapes.

Other programs include: Growing Plants (Stage 1 students), Managing Landscapes (Stages 2 and 3 students), Learnscapes your landscape (Stages 4-5) and Plants for Senior Science (Stage 6 Science students).

Community Education Service staff lead each group, and classroom teachers are supplied with background information and worksheets. Sessions run for 1.5 hours for a small cost. There is also a small fee for purchase of plant material required by the school.

The Botanic Gardens specialise in the following topics and themes that are relevant to environmental education programs in schools:

- Growing Australian plants
- Aboriginal plant use
- Plants and the environment
- Habitat study e.g. (rainforests, wetlands etc.)
- Plant adaptation
- Horticulture
- Plant classification and identification
- Rare and threatened species.

Reference

For bookings and inquiries phone your closest botanic garden:

Royal Botanic Gardens, Sydney
Mrs Macquaries Rd
Sydney 2000
Telephone (02) 9231 8134
Web site: www.rbgsyd.nsw.gov.au
Mt Annan Botanic Garden
Mt Annan Drive
Mt Annan 2567
Telephone (02) 4634 7930
Mt Tomah Botanic Garden
Bells Line of Road
Mt Tomah via Bilpin 2758
Telephone (02) 4567 3015



The School Learnscapes Trust

The School Learnscapes Trust is a non-profit organisation dedicated to assisting schools through a program that promotes environmental values and awareness through the development of school grounds.

What is a Learnscape?

A Learnscape is a landscape designed for learning. Student-focused, the concept involves whole school communities creating a learning environment. A Learnscape feature, whether it is a recycling area, frog pond or solar-powered outdoor lighting, is not a Learnscape in itself. The collaborative process within which the feature is created, and the plans for how it will be maintained and used for learning once it is created, make the feature a Learnscape.

The School Learnscapes Trust can help schools by providing:

- advice on the optimum use of existing sites and resources
- professional design services for school grounds projects, large or small
- assistance with project funding and access to funding sources
- support for collaborative planning of integrated school-based programs and units of work.

Schools can subscribe to the Trust and receive the following benefits:

- a quarterly newsletter with the latest information and learnscaping ideas
- access to up-to-date resource material
- access to local and overseas information networks
- free advice on project design, funding and implementation.

Reference

The School Learnscapes Trust
PO Box 40
Maclean NSW 2463
Telephone (02) 6646 1844 or 6645 4439
Fax (02) 6646 3663
E-mail: helent@nor.com.au
Web site: www.learnscapes.org.au



SCRAP is a non-profit company that provides services to schools and other educational, government and non-profit organisations in the area of waste avoidance and minimisation.

Through its various programs it now services over 2000 organisations, including more than 1300 schools across NSW and the ACT. SCRAP works with its program members and membership is free.

SCRAP has been in existence since 1990, for the first seven years as an unincorporated body, and since August 1997 as a company limited by guarantee (non-profit). Its board of directors consists of teachers and office-bearers from government and private school systems, including two representatives from the NSW Department of Education and Training. SCRAP has obtained tax deductibility status through the Federal Government and is an ISO 14001 certified company for environmental management.

SCRAP offers a broad range of programs including:

- Paper recycling. Skip bin systems, bale systems and separate white paper collections are provided across much of NSW and the ACT.
- Green waste reduction. The "If you didn't eat your greens" program has created successful food and garden waste reduction systems (composting and worm farming) in around 50 schools over the past three years.
- Solid waste auditing. This was pioneered by SCRAP in 1994. By 2000 over 50 schools had been audited. The activity is student-centred and hands-on.
- Toner cartridge recycling. Cash rebates are given for members' used toner cartridges.
- Green buys discounts. This includes the environmentally friendly purchasing of paper products, curriculum materials and much more. Members receive discounts according to their level of waste reduction or commitment to purchasing in bulk.
- Avoid-Reduce-Reuse. A whole-school plan is devised and students and staff take action to green their school across the full range of resource management issues.
- SCRAP's Newsletter is provided free to all members each quarter, with results of their achievements.

Green Buys updates, curriculum and management ideas, the Waste Reducer of the Term Award and Froggies annual awards, KidsBits ideas and competitions are all included as news items.

Reference

SCRAP Ltd
C/- Holsworthy High School
Huron Crescent
Holsworthy NSW 2173
Telephone (02) 9825 1062
Fax (02) 9825 6972
Web site: www.ncnsw.org.au/member/scrap
E-mail: eescrap@ozemail.com.au



SEDA NSW was established to reduce the levels of greenhouse gas emissions. SEDA's role is to raise awareness of energy-efficient and renewable energy solutions.

SEDA and the Department of Education and Training have a joint commitment to reduce energy consumption in the operation of Departmental facilities. The educational materials are designed to clarify the issues in relation to energy and energy management.

Three separate SEDA teaching resources that illustrate the environment and the economic benefits making valuable use of our natural resources through sustainable energy options are:

- The *Energy Times* for primary school students
- *Energy Information Files* for secondary school students, and
- The *Solar in schools* program.

Solar in schools is an innovative program for K-12 students. The teaching resource provides information on solar power to enable teachers to illustrate responsible electricity generation and consumption related to greenhouse gases and global climate change.

This teaching resource can be complemented by the *Solar Explorer Kit* (approx. \$A1000), comprising a 12-24DC volt power source for use in and around the classroom, with accompanying lights and meters for use in curriculum-based investigations.

Participating schools are also invited to apply for cash rebates of up to 50 percent for installing integrated solar power systems in buildings and school grounds.

For information on the *Solar in schools* program, contact SEDA on (02) 9249 6100.

SEDA's Energy Smart Information Centre, located at the Sydney Building Information Centre, is the key

education arm and distribution point for SEDAs information packs.

Reference

Energy Smart Information Centre
Elizabeth St.
Surry Hills NSW 2010
Open 9am – 5pm
Telephone 1300 363 768
Fax (02) 8303 0566
E-mail: esci@sbic.com.au



Smogbusters Way to School aims to involve primary schools in Smogbusters activity. The program includes learning materials, ideas and information regarding how schools can reduce their contribution to the enhanced

greenhouse effect by simply changing the way students and teachers commute to school.

The aim of Smogbusters is to work with the community to improve urban air quality by encouraging the use of more environmentally friendly forms of transport, such as walking, cycling, bus, train and tram. It offers information and ideas for practical action by teachers, students and parents.

Materials available to schools through the program include a kit, containing:

- Teachers' and Parents' Manual
- Activities manual for students
- two posters
- board game.

Students agree to walk and cycle to school (or share a car, if that is the only form of transport available). At the end of the day, the amount of vehicle kilometres travelled (VKT) can be added up and compared with the travel usage on an ordinary school day, and the reduction in VKT converted into the amount of pollution saved.

Smogbusters is a joint initiative of the Conservation Council and the Federal Government through the Natural Heritage Trust.

Reference

NSW Smogbusters Project Officer
Nature Conservation Council
Level 15
362 Kent St
Sydney NSW 2000
Telephone (02) 9279 2944
Fax (02) 9279 2499
E-mail: smogbusters@nccnsw.org.au



State Forests of NSW is an organisation concerned with the management of forests in NSW for a range of values. These values include biodiversity, timber, forest health, soil and water quality, forests as carbon sinks, community benefits and cultural heritage.

State Forests of NSW offers field study opportunities in forests in Sydney, on the Central Coast and around the Newcastle area. These sites provide:

- an environmental education focus on forest management
- access to harvesting sites, regeneration sites and plantations
- access to a variety of forest types, including wet and dry sclerophyll and rainforest types
- Forests Activity Book, a book of blackline masters for upper primary and lower secondary.

State Forests of NSW also provides:

- an extensive range of publications, such as Forest Facts sheets, available free on request
- a quarterly magazine called the *Bush Telegraph* (free subscription)
- free Forests Facts and blackline master activity sheets.
- activity programs K-12 relevant to Board Syllabuses.

Teachers and other environmental educators have the opportunity of participating in free bus trips, which are conducted to both native forests and pine plantations. These trips allow teachers to see at first hand current forest management practices being utilised.

Reference

State Forests of NSW
Cumberland State Forest
95 Castle Hill Road
West Pennant Hills NSW 2125
Telephone (02) 9871 3377
Fax (02) 9872 7142
Web site: www.forest.nsw.gov.au
Information Centre: 1300 655 687

Hunter Region
464 Hunter St
Newcastle West NSW 2302
Telephone (02) 4927 0977
Fax (02) 4927 8030



Streamwatch is an education and action program on water quality for schools and their communities.

The program encourages cooperation between community groups, schools, local government, catchment management committees and catchment trusts, government agencies and non-government organisations. It aims to ensure that everyone plays a role in keeping our waterways clean and healthy.

Streamwatch empowers participants to take responsibility for their own small, yet important, part of the planet and to initiate change.

Sydney Water supports Streamwatch, in cooperation with the Hawkesbury-Nepean Catchment Management Trust and the Upper Parramatta Catchment Trust in the Sydney metropolitan area. The Sydney Catchment Authority also supports Streamwatch in the Sydney area. The Department of Land & Water Conservation and the Hunter Catchment Management Trust support Streamwatch in regional New South Wales.

The Streamwatch network consists of primary schools, secondary schools, community groups and councils, catchment management committees, catchment management trusts, government agencies, businesses, industry and non-government organisations.

Participants are trained to use test kits to measure water quality, to determine how safe the water is and to identify sources of pollution.

Primary schools are also encouraged to form Streamwatch groups and participate in appropriate activities.

Reference

Schools can obtain their specific sub-catchment map from:

Land Information Centre
Department of Land and Water Conservation
PO Box 143
Bathurst NSW 2795
Telephone (02) 6332 8200
Fax (02) 6331 8095

Aerial photographs, landsat images and topographic maps may be obtained from:

Sydney Map Shop
Department of Land and Water Conservation
23-33 Bridge St
Sydney NSW 2000
Telephone (02) 9228 6310
Fax (02) 9221 5980

For more information, go to the following web site:
<http://www.streamwatch.org.au>

Major contacts for the Sydney Metropolitan area and Wollongong:
Sydney Water
Telephone (02) 9350 5393

For regional areas:
Department of Land and Water Conservation
Telephone (02) 9228 6571



Visy recycling

Visy is actively involved in recycling paper for organisations throughout NSW. It also supports schools in the management of paper waste.

Recycling services

Visy Recycling provides schools with complete recycling services for paper, cardboard, plastic bottles, cartons, aluminium and steel cans. (Services vary in metropolitan and regional areas.)

Excursions & site tours

Visy is developing a range of excursion opportunities for schools to learn about the science and technology of recycling. Education centres will be established at a number of their materials recovery facilities where students can view the sorting of kerbside recyclables and learn how Visy recycles them into new products.

Outreach programs

The education officer at Visy can provide schools with support in implementing the school environmental management plan as part of the school's environmental management policy.

Visy can offer education kits, professional development for teachers and student programs.

Reference

The Education Officer
Visy Recycling
150-160 McCredie Rd
Smithfield 2164
Telephone 1300 368 479
Fax (02) 9794 3195



Waste watchers

This program has been supporting community waste education in NSW primary schools since 1995 and educates over 14,000 students on an annual basis. This program has been developed over the years, allowing it to be tailored to support issues related to the Waste Minimisation Act, the prescribed school curriculum, current global and local issues and sponsors.

The program is usually sponsored in each locality by the relevant local government body.

The program addresses a variety of issues within environmental education, such as:

- waste avoidance
- "smart shopping"
- sorting and disposal of waste
- composting and worm farming
- what is recycled where I live?
- dumping and litter
- what other countries do with their waste
- storm water
- reduction in contamination of bins
- managing our school.

The mobile programs employ a trained teacher who will conduct a 4-hour session in a central location near your school. The programs are presented to 120 students each day. Sessions are discussion-based, and hands-on activities are conducted to support the learning in the session.

Students are empowered to educate their families about what happens where they live and take charge of the practices in their homes.

Resources

KAB provides two resources to support education within schools. These are:

- The School Environmental Audit Guide (SEA) (1997 2nd Edition) allowing students to audit energy and water use
- Green Projects (1998): 10 units based on waste issues, teachers' notes (Years 3-6).

School Environment Awards

Keep Australia Beautiful also conducts annual School Environment Awards within the Tidy Towns and Metro Pride Programs.

Reference

Keep Australia Beautiful
97 Wigram St
Parramatta NSW 2150
Telephone (02) 9633 3380
Fax (02) 9633 4402
Web site: www.kabnsw.org.au

Sydney Catchment Authority

The SCA helps schools in the metropolitan area with water quality analysis and educational programs.

PO Box 21
Warragamba NSW 2752
Telephone (02) 4720 0344
Fax (02) 4720 0389
Web site: www.sca.nsw.gov.au



Waterwatch Australia is a national education and action program in environmental awareness that aims for healthy waterways. More than 50,000 people are involved in the program across Australia which is now acknowledged as one of Australia's more successful grassroots initiatives in environmental education. Waterwatch focuses on monitoring water quality as a tool to involve schools and the community in land and water management at the catchment level. The philosophy behind Waterwatch is that everything that happens in our catchment is reflected in our water.

Waterwatch education programs

By participating in hands-on environmental monitoring of their local waterways, students gain an understanding of environmental and catchment issues, develop skills in the scientific measurement of water quality, and become involved in protecting and repairing degraded waterways.

Through Waterwatch, students in NSW can:

- scientifically monitor their local waterways
- assist the community to resolve water quality problems
- participate in the NSW Water Bug Survey, an activity where students take a snapshot of macro-invertebrates (or water bugs) in their waterways. The number and variety of bugs found indicate the "health" of the waterway.

Reference

To learn more about Waterwatch or to get in touch with a regional Waterwatch coordinator, please contact:

NSW Waterwatch Facilitator
Department of Land & Water Conservation
PO Box 39
Sydney NSW 2001
Telephone (02) 9228 6571
Fax (02) 9228 6464
Web site: www.dlwc.nsw.gov.au





9. Organisations that can help schools in their environmental education programs

NSW has an extensive network of government and non-government organisations that support environmental education.

The list below was correct at the time of printing. The current list with relevant updates is on the following web site: www.curriculumsupport.nsw.edu.au/EnviroEd

Teachers should note that many of the following contacts do not have resources to deal directly with students. Many of the contacts have branches in rural areas and large centres outside Sydney. Schools should augment this list with their own local contacts and network. Most of the organisations have Internet sites.

Aboriginal Land Council, NSW	(02) 9689 4444
Animal Welfare League	(02) 9606 9333
Architects, The Royal Australian Institute of	(02) 6273 1548
Australian Conservation Foundation	(02) 9247 4285
Australian Museum	(02) 9320 6000
Australian Trust for Conservation Volunteers	(02) 9564 1244
Bicentennial Park	(02) 9763 1844
Bushcare	(02) 9585 6517
Bush Fire Services, Department of	(02) 9684 4411
Calmseley Hill, Fairfield City Farm	(02) 9823 3222
Cancer Council, NSW	(02) 9334 1900
Clean Air 2000	1800 678 784
Clean Up Australia	(02) 9552 1677
Coastal Environment Centre	(02) 9970 6905
Community Aid Abroad	1800 034 034
CSIRO	1300 363 400
Dinosaur Club	(08) 9427 2700
Environment Protection Authority, NSW	131 555
Environment Australia (formerly DEST)	(02) 9325 5570
Environmental Trusts	1800 803 772
Farming for the Future	(02) 6360 8251
Featherdale Wildlife Park	(02) 9622 1644
Friends of the Earth	(02) 9283 2004
Frogwatch Helpline	0414 24 9 728
Global Energy Solutions Pty Ltd	(07) 3379 1459
Gould League of NSW	(02) 9817 5621

Greenhouse Action Program	(02) 4577 4243
Green Office Program	(02) 9385 4914
Greenpeace Australia	(02) 9211 4066
Greening Australia	(02) 9560 9144
Historic Houses Trust of NSW	(02) 9931 5205
James Joyce Foundation	(02) 9332 3649
Keep Australia Beautiful (NSW)	(02) 9633 3380
Land & Water Conservation, Department of (Sydney office)	(02) 9228 6111
Land & Water Conservation, Department of (Parramatta)	(02) 9895 6211
Landcare	(02) 9228 6297
Landcare Australia	(02) 9412 1040
Local Government Association	(02) 9242 4000
Manly Environment Centre	(02) 9976 2842
Marine and Coastal Community Network	(02) 9566 4025
Minerals Council of NSW	(02) 9267 6488
Mineral Resources, NSW Department of	(02) 9901 8888
Murder under the Microscope	(02) 9350 5393
Murray-Darling Basin Commission	(02) 6279 0100
Museum in a Box	(02) 9320 6288
Museum on the Road	(02) 9320 6288
National Aborigines and Islanders Day Observance Committee	(02) 9286 1528
National Parks and Wildlife Service, NSW	(02) 9585 6444
National Trust of NSW	(02) 9258 0123
Office of Youth Affairs	(02) 9228 6571
NSW Waterwatch	(02) 9266 8238
Oz GREEN (Global Rivers Environmental Education Network)	(02) 9984 8917
Planet Ark	(02) 9319 5288
Powerhouse Museum	(02) 9217 0111
Reverse Garbage	(02) 9569 3132
Rivercare	(02) 9895 7029
Royal Agricultural Society	(02) 9331 9111
Royal Australasian Ornithologists Union (RAOU)	(02) 9252 1409
Royal Botanic Gardens, Sydney	(02) 9231 8134
Seaweed	(02) 9555 9959
School Communities Recycling All Paper (SCRAP)	(02) 9825 1062
School Learnscapes Trust, The	(02) 6646 1844
Society For Growing Australian Plants	(02) 9528 2683
Society for Responsible Design	(02) 4564 0721

State Forests of NSW	1300 655 687
Streamwatch (Sydney)	(02) 9350 5393
Streamwatch (State)	(02) 9228 6571
Solarch	(02) 9311 7136
Sutherland Environment Centre	(02) 9545 3077
Sydney Cove Authority	(02) 9255 1700
Sydney Rainforest Action Group	(02) 9261 2104
Sydney Water	(02) 9350 5393
Taronga Zoo Education Service	(02) 9969 2455
Threatened Species Network	(02) 9241 1438
Total Catchment Management	(02) 9288 6163
Total Environment Centre	(02) 9299 5599
UNICEF Australia	(02) 9290 2099
United Nations Information Centre	(02) 9283 1144
Waterwise	(02) 9228 6475
Western Plains Zoo Education Service	(02) 6882 5888
Wilderness Society	(02) 9552 2355
WIRES (Wildlife Information and Rescue Service Inc)	(02) 9975 1633
Women's Environmental Education Centre	(02) 9810 1130
World Wildlife Fund For Nature	(02) 9247 6300

For an alternative list of natural resources, maps and other information go to the following web site
www.canri.nsw.gov.au

Schools can access the web sites for many of these organisations.
 Type in the following address to view the resources site for the Professional Support and Curriculum Directorate:
www.curriculumsupport.nsw.edu.au/enviroed

The NSW Environment Protection Authority has produced a variety of teaching aids over the years, including materials on waste management, stormwater education and airwatch.
 Each year the EPA provides funds to schools for environmental projects through its Environmental Trusts.
www.epa.nsw.gov.au

The Manly Environment Centre is situated in a large shopfront in Manly's CBD. The centre displays thousands of resources including teacher resource kits, videos, brochures, activity sheets, posters, stickers, State of the Environment Reports and State and Federal policies.

The address is
 41 Belgrave St
 Manly 2093.
 Telephone (02) 9976 2842.
www.mec.org.au



10. Annual environmental events for the school diary

MARCH	<p>Gould League Month Landcare Month Clean Up Australia Day World Forestry Day World Water Day World Meteorological Day Seaweed Autumn Water Bug Survey</p>
APRIL	<p>Heritage Week "Interiors" World Health Day Closing date for Environmental Trusts Grants World No Tobacco Day Murder under the Microscope</p>
JUNE	<p>World Environment Day</p>
JULY	<p>National Aborigines' and Torres Strait Islanders' Week National Farm Safety Week Arbor Day Arbor Week</p>
SEPTEMBER	<p>Biodiversity Month Endangered Species Day Wattle Day (1 September) Keep Australia Beautiful Week National Parks Awareness Week Education Week</p>
OCTOBER	<p>Spring Water Bug Survey Bird Month World Animal Day World Habitat Day Fire Awareness Week National Water Week National Bird Week United Nations Day (24 October) World Development Information Day (24 October)</p>
NOVEMBER	<p>International Week of Science and Peace National Waste Busters Day Skin Cancer Awareness Week Frog Week</p>
DECEMBER	<p>Ocean Care Day</p>



11. References

- Brans, J.A., & Wood, D., 1993, *Environmental Education in the Schools*, Peace Corps, Washington D.C.
- Department of Environment, Sport and Territories, 1995, *Report of the National Environmental Education Workshop*, Canberra
- Department of Environment, Sport and Territories, 1996, *State of the Environment Australia*, Canberra
- Department of School Education, 1989, *Environmental Education Curriculum Statement K-12*, Sydney
- Department of School Education, 1993, *A New Focus on Environmental Education*, Sydney
- Department of the Environment and Heritage, 1999, *Today Shapes Tomorrow: Environmental Education for a Sustainable Future: A Discussion Paper*, Canberra
- Environment Protection Authority, 1994, *School Greenhouse Saver*, Environment Protection Authority, Victoria
- Environment Protection Authority, 1996, *A New Approach to Environmental Education in NSW: A NSW Government Green Paper*, Chatswood
- Fien, J., 1992, *Education for the Environment: Critical Curriculum Theorising and Environmental Education*, Deakin University Press, Melbourne
- Gould League of NSW Inc., *Caring for Your Catchment*, Sydney
- Gould League of NSW Inc., *Environmental Audits*, Sydney
- Gould League of NSW Inc., *How to Save the Bush*, Sydney
- Hawken, P., Lovins A., Lovins, L., 2000, *Natural Capitalism*, Rocky Mountain Institute, Snowmass
- Immig, J., 2000, *The Toxic Playground*, Total Environment Centre Inc., Sydney
- Keats, J., 1993, *Environmental Education Professional Development Modules*, Gould League of NSW Inc, Sydney
- Keep Australia Beautiful Council, 1998, *School Environmental Audit*, Sydney
- Koettig, C., & Cooper, K., 1990, *Greening Your School*, Metropolitan North Region, Department of School Education, Sydney
- National Parks and Wildlife Foundation, 1996, *Save Yellow Foot*, National Parks and Wildlife Foundation, Sydney
- NSW Department of Education and Training, 1996, *The Environmental Schools Project*, Curriculum Support Directorate, Sydney
- NSW Department of Education and Training, 1998, *Eco Schools Program: 1998 Update*, Curriculum Support Directorate, Sydney
- NSW Department of Education and Training, 1998, *Environmental Education Centres Policy Statement*, Curriculum Support Directorate, Sydney
- NSW Department of Education and Training, 1998, *Hands on Learnsapes CD-ROM*, Curriculum Support Directorate, Sydney
- NSW Department of Education and Training, 1998, *Best Practice in Environmental Education in NSW Schools*, Curriculum Support Directorate, Sydney
- NSW Environment Protection Authority, 1999, *NSW Waste Education – Strategic Directions 2000-2002*, NSW

Protection of the Environment Administration Amendment (Environmental Education) Act 1998, Sydney

Reid-Nguyen, R., 1999, *Think Global – Global Perspectives in Lower Primary Classroom*, Curriculum Corporation, Carlton

Stapp, W.B & Stapp, G.L., 1983, *A summary of environmental education in Australia*, Newsletter of the Association for Environmental Education, Sydney, No. 12, pp.4-6.

United Nations Conference on Environment and Development, 1992, *Agenda 21*, Zurich

UNESCO United Nations Environment Program, 1978, *Intergovernmental Conference on Environmental Education, Tbilisi, USSR, Final Report*, Paris

Walker, K., 1995, *Improving the Teaching and Learning of Environmental Education in the NSW Primary School Curriculum: A Problem-based Approach*, Unpublished Ph.D. thesis, University of Technology, Sydney