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For Ages 10+



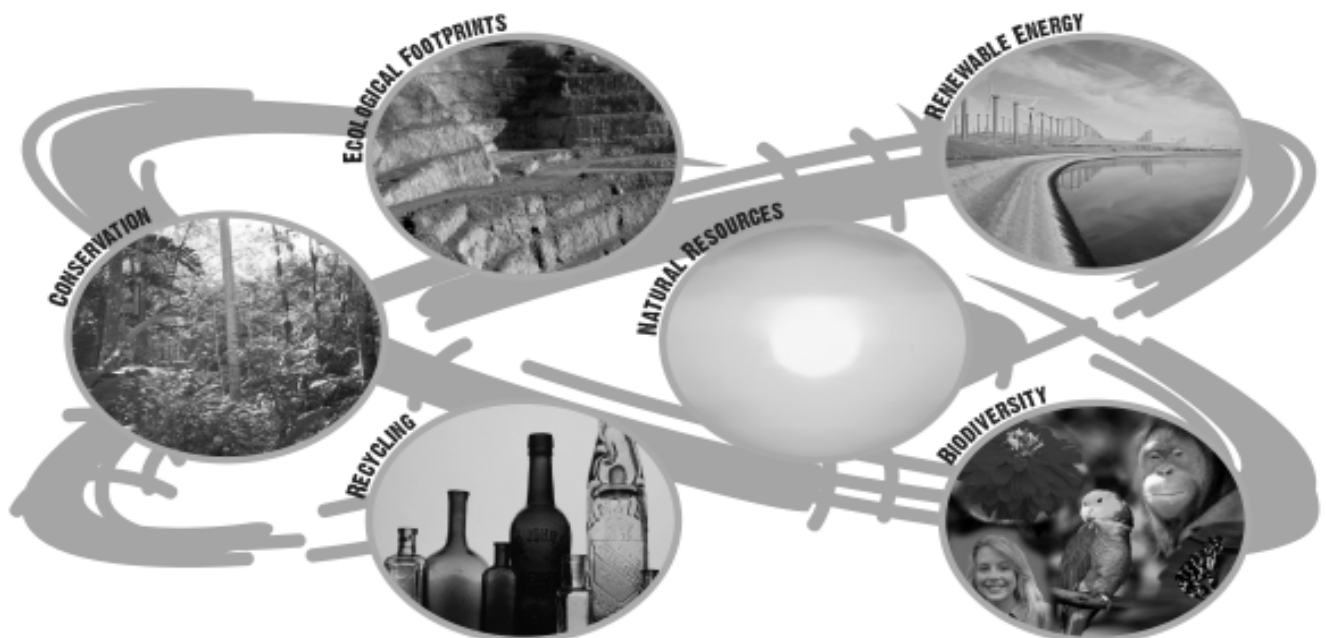
## SAVE THE PLANET

# BOOK

▶ **SCIENCE AND ENVIRONMENT BASED THEMES EXPLORING THE IMPACT OF HUMAN ACTIVITY ON THE ENVIRONMENT.**

# 2

▶ **CONTAINS LESSON OUTLINES, EXTENSIVE BACKGROUND NOTES, EXTENSION IDEAS AND RELEVANT WEBSITES.**



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# Teachers' Notes

The **Save The Planet** series has been designed to encourage students to investigate aspects of our environment which are under threat due to human activities and consumption. By building a framework of environmental terminologies and concepts, the book aims to promote an understanding of the progress that is being made towards creating a sustainable planet. Aspects addressed include natural resource use, renewable energy sources, biodiversity, pollution, recycling and conservation.

The material can be taught as whole units of work in conjunction with the activities in *Save the Planet – Language Themed Activities*, or alternatively, the activities within each unit can be used to complement existing environment based programs.



Each unit contains a 'Science' and a 'HSIE / SOSE / Society and Environment' activity page. The new concepts addressed in each unit have been included as student information texts (background notes), designed to be read by the student and discussed with the class as an introduction to each topic. The activities, in conjunction with the student background notes, aim to complement learning about the unit topic by encouraging students to investigate aspects of their environment in a practical manner, and in some cases to assess the management of the environment of both their local environment and the earth as a whole. The activities aim to have the students employ prior knowledge and apply it to new information they have learnt to make informed decisions about their environment and how its natural resources can be sustained for the benefit of their own and future generations.



The Science and HSIE / SOSE / Society and Environment activity pages are supported by teachers' notes which give comprehensive background information, relevant websites, lesson outlines including guided questioning, discussion points and additional teaching strategies to ensure the students achieve maximum understanding when using the student worksheets. Answers are also included along with additional activities that can be used in conjunction with the student worksheets, or as a basis

for further lessons on the same conceptual understanding.

**ASSESSMENT PROFORMAS** (see pages 6-7): Insert appropriate indicators for each activity and complete for student portfolios. See the Curriculum Links on page 5 for links to indicators and student outcomes.

# Curriculum Links

For the activities in the **Save The Planet** series, a cross-curricular approach is taken and many learning areas are covered. A summary of the key strands from each state is provided with the focal state outcomes listed below. Please note that learning areas and strand headings will vary from state to state and therefore not all suggested strands and outcomes will address the same activities. All activities are aimed at Level 3-4.

Subject Areas / Strands	State Outcomes
<p><b>Science</b></p> <p><b>Working Scientifically (Investigating Scientifically)</b> • Works methodically through a scientific experiment to formulate and investigate predictions, gather data and record outcomes. • Uses scientific understandings to develop responsible behaviours such as recycling materials or being “water-wise”, “energy-wise”. • Argues conclusions on the basis of collected information and personal experience. • Compares ways of solving problems and finding explanations. • Identifies ways science is used responsibly in the community.</p> <p><b>Earth Sciences/ Earth and Beyond</b> • Examine the various sources of energy used by humans and the impact of mining and burning of fossil fuels versus use of renewable energy sources. • illustrates ways that used of the earth’s resources can change the physical environment.</p> <p><b>Energy and Change</b> • Reports on patterns of energy use at home and at school. Investigate the systems in which various forms of energy are transferred. • Compares energy options available in the community.</p> <p><b>Life and Living</b> • Understands how living things depend on the features of the natural and built environment (considers and designs appropriate living requirements for animals and humans). • Maps relationships between living things in a habitat. • Explains why some living things have become extinct and identifies threats to current endangered species.</p>	<p><b>Vic:</b> BS 3.1, 3.2, 4.1, ES 3.1, 3.2, 4.1, PS 3.1, 4.1</p> <p><b>WA:</b> IS3.3, IS3.4, IS4.3, IS4.4 EB3, EB4, EC3, EC4, LL3, LL4</p> <p><b>National:</b> 3.1, 3.2, 3.4, 3.7, 3.9, 3.13, 3.16, 3.18. Level 4 equivalents.</p> <p><b>NSW:</b> BE S3.1, IC S3.2, LT S 3.3, PP S3.4, PS S3.5, ES S3.6, INV S3.7, DM S3.8</p> <p><b>QLD:</b> SS 3.2, 3.3, EB 3.1, 3.2, 3.3, EC 3.2, 3.3, LL 3.1, 3.3, NPM 3.1, 3.2, 3.3</p> <p><b>SA:</b> ES 3.1, 3.2, 4.1, 4.2; EC 3.3, 3.4, 4.3, 4.4, LS 3.5, 3.6, 4.5, 4.6, 3.1, 3.2 3.3, 3.4, 3.5, 3.7, 3.8</p>
<p><b>Society &amp; Environment / SOSE / HSIE</b></p> <p><b>Time, Continuity and Change</b> • Understands why the local community and global environments have changed or are likely to change.</p> <p><b>Place and Space</b> • Considers how humans care for the environment by using “friendly” alternatives. • Investigates how local environments such as the home and school can participate in responsible practices. • Identifies issues that arise when people’s actions affect other living things and places.</p> <p><b>Resources</b> • Understands that alternative resources such as wind, solar and hydro-power are being sought as solutions to the threat of environmental destruction and depletion of fossil fuels.</p> <p><b>Natural Systems</b> • Describe the components of a natural system such as the water system or ecosystem, and considers how humans are influenced by, and can influence this system. • Illustrates the linkages between rights and responsibilities for members of a community.</p> <p><b>Investigation, Communication and Participation</b> • Presents information to explore a key idea. • Frames questions and identifies sources of information.</p>	<p><b>Vic:</b> Time, Cont. and Change 3 (3.2), Natural and Social Systems 3 (3.1, 3.2, 3.3), Place and Space 3 (3.1, 3.2, 3.3, 4.2), Resources 3–4 (3.1, 4.1, 4.3)</p> <p><b>WA:</b> ICP3.2, ICP3.3, ICP3.4, ICP4.3, ICP4.4, PS3.1, PS3.2, PS3.3, PS4.1, PS4.2, PS4.3, R3.2, R3.2, R4.1, R4.2, TCC3.2, TCC3.3, TCC4.2, TCC4.3, NSS3.1, NSS4.1</p> <p><b>National:</b> TCC 3.1b, 3.3, PS 3.4, 3.5, 4.5, 3.6, 4.6, R 3.10, 4.10, 3.12, NSS 3.13, 3.14, ICP 3.16, 3.17</p> <p><b>NSW:</b> ENS3.5, ENS3.6, SSS3.7, SSS3.8</p> <p><b>QLD:</b> TCC 3.1, 3.4, 4.5, PS 3.1, 3.2, 3.4, 3.5, D3.6, 4.1, 4.2, SRP 3.1, 3.5, D3.7, 4.1, 4.5</p> <p><b>SA:</b> Time, Cont, &amp; Change 3.3, Place, Space &amp; Env. 3.4, 3.5, 3.6, Society &amp; Culture 3.9</p>
<p><b>English</b></p> <p><b>Speaking and Listening</b> • Participates in a range of speaking and listening activities such as debates, peer interviews, presentations and role-play.</p> <p><b>Reading / Viewing</b> • Engages in research to locate additional information and word meanings to enhance topic understandings.</p> <p><b>Writing</b> • Expresses understanding of topics in a variety of creative and formal written formats, including stories, debating topics, signwriting, newspaper articles, reports and letters.</p>	<p><b>Vic:</b> SL 3.1, 3.2, 3.4; RE 3.5a &amp; b, 3.8 a &amp; b; WR 3.9, 3.10</p> <p><b>WA:</b> SL 3.1a &amp; b, SL 4.1a &amp; b, 3.2; R 3.1, 3.2, 3.3, 3.4; W 3.1, 3.2, 4.1, 4.2, V 3.2, 4.2</p> <p><b>National:</b> 3.1, 3.2, 3.3, 3.4, 3.8a &amp; b, 3.9</p> <p><b>NSW:</b> TS 3.1, 3.2; RS 3.6, WS 3.9</p> <p><b>QLD:</b> Cu 3.1, 3.2, 3.3; Cr 3.2, 3.3</p> <p><b>SA:</b> 3.1, 3.2, 3.3, 3.4, 3.9, 3.10, 3.11</p>

# Science Assessment

▶ Name: \_\_\_\_\_

Term \_\_\_\_\_ Year \_\_\_\_\_

## Unit : Environmental Sustainability

**Focus:** Exploring the reasons why we have been placing the earth under environmental threat through overuse and mismanagement of natural resources, and addressing issues of responsibility for ensuring a sustainable planet.

Indicators of progress relevant to this work sample:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Understands	Needs further opportunities
Satisfactory	Unsatisfactory

Participation in Science lessons:

Teacher Comments:

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# HSIE / SOSE / S&E Assessment

▶ Name: \_\_\_\_\_

Term \_\_\_\_\_ Year \_\_\_\_\_

## Unit : Environmental Sustainability

**Focus:** Investigating aspects of our environment which are under threat due to human consumption and understanding the progress that is being made towards creating a sustainable planet. Aspects addressed include natural resource use, renewable energy, biodiversity, pollution and recycling and conservation.

Indicators of progress relevant to this work sample:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Understands	Needs further opportunities
Satisfactory	Unsatisfactory

Participation in Society and Environment lessons:

Teacher Comments:

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# Ecological Footprints

## LESSON OUTLINE

**Important:** Hand out the student information text on page 12 to the students prior to completing the student activity sheet. Information contained within this text is required for successful completion of the task.

- Review what is meant by an 'ecological footprint'. Ask the students to predict how big their own footprint might be. Encourage the students to give reasons for their estimates.
- Model how an ecological footprint can be calculated using the equation given on the student worksheet.
- Allow the students to use calculators to find the ecological footprints of a person in each of the countries given in the table in Question 1.
- Compare the footprint sizes of each country based on the calculations made to complete the table. Identify the largest and smallest footprints and encourage the students to suggest reasons why there may be variations between these countries.
- Deduce which country is having the biggest environmental impact and why their impact is so great. Discuss what might happen if there were a billion Australians consuming as much as we are now.
- Allow the students time to complete Question 2.
- Discuss what needs to be done to reduce our environmental impact. As a whole class, brainstorm ideas for reducing the amount of natural resources we are using. Have the students take note of the suggestions in the footprint outline to complete Question 3.
- Discuss how the students think they might be able to reduce the size of their own ecological footprints in practical day-to-day terms.

## RELEVANT WEBSITES

- ▶ [www.lead.org/leadnet/footprint/intro.htm](http://www.lead.org/leadnet/footprint/intro.htm)
- ▶ [www.earthday.net/footprint/index.asp](http://www.earthday.net/footprint/index.asp)
- ▶ [www.nd.edu/~archives/latgramm.htm](http://www.nd.edu/~archives/latgramm.htm) (Latin)  
(from University of Notre Dame ▶ [www.nd.edu/](http://www.nd.edu/))

Additional background information on this topic can be found on page 10.

## ANSWERS

1. (a) 207.1 million hectares; (b) 1000 million hectares; (c) 2997.5 million hectares.
2. Answers will vary; America is having the greatest impact on the environment because of the size of its population. Australia is doing the same amount of damage on a smaller scale because its population is small. People in India consume the least amount of natural resources but because their population is so great, they are making a considerable impact on the environment.
3. Answers will vary; water, land, minerals, air, timber, plants, animals.

## ADDITIONAL ACTIVITIES

- Have students mark an area of 10.9 hectares on a map of the local area to demonstrate the area of land and resources they will use in one year.
- Develop a list of other countries that have a significant impact on the environment. Give reasons why each country should be included on the list.

# Who Can Solve The Problem?

Imagine you are an environmental scientist. You are researching the impact different countries have on their environment. Scientists often need to use mathematical equations to find the results of what they are researching. To work out 'ecological footprints' the equation is:

$$\text{Consumption of natural resources} \times \text{population} = \text{ecological footprint}$$

1 Complete the data table for this research.

	Consumption per person per year	Population	Ecological footprint (per million hectares)
<b>AUSTRALIA</b>	10.9 hectares	19 million	_____ million hectares
<b>INDIA</b>	1 hectare	1000 million	_____ million hectares
<b>AMERICA</b>	10.9 hectares	275 million	_____ million hectares

TABLE 1: Comparison of the 'ecological footprint' of three countries.

2 What are the results of your research?

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*We need to work together if we are going to reduce the amount of natural resources we are currently using, and reduce the size of our 'ecological footprints'.*

3 Brainstorm the natural resources you think you are using which make up your ecological footprint.

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4 Discuss how you think you might be able to reduce the size of your ecological footprint.

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# Ecological Footprints

The concept of the compounding effect of increased population and increased consumerism as having a destructive impact on the environment is not a new one. Back in 1987, a report called "*Our Common Future*" was published under the commission of the Prime Minister of Norway, Ms Gro Brundtland. The report found that the needs of the environment must be considered jointly with development if we are to achieve sustainability. This conclusion was drawn when it was ascertained that central to environmental problems around the world are:

- *Significantly increasing world populations; and*
- *The over-exploitation of resources made possible by powerful technologies.*

So a new approach was needed and the concept of sustainable development started to be understood.

From a humanitarian perspective we are starting to realise that not only do we, as a world community, have a responsibility to care for the environment for intra-generational equity but also inter-generational equity. In other words, a healthy, diverse and productive environment should not only be available to all persons living today, but also all future generations to come.

However, we need to take this a step further because the world is not only for humans but needs to be shared by millions of other life forms for it to function correctly. In Australia, the concept has been expanded to 'ecologically sustainable development' defined in the National Strategy for ESD as "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased".

An interesting point is that of current intra-generational equity when we look in terms of how developed countries live in comparison to undeveloped countries. Some believe that it would be a utopian world if all people (all 6.1 billion of us) could live the same standard of living as in the United States and Australia, for example. However, because of the very high impact per capita on natural resources in these countries, there is simply not enough resources in the world to provide this to all people. In very broad terms it seems that we need some people to have less to enable others to have more.

The question is if we are to truly have equity, how can this be solved? Should the world strive for population decrease, should we decrease the level of natural resources consumption, or should we be focusing on new solutions in sustainability? Maybe it is a combination of all three that will be required.

Websites relevant to this topic can be found on page 8.

## LESSON OUTLINE

**Important:** The student information text (Background Notes) on page 12 should be given to the students prior to completing the following activity sheet. To assist the students in comprehending what they have read, encourage them to take notes or follow the reading with recall-based discussion and questioning.

- Discuss why we would need three worlds if everyone used the resources Australians do.
- Think about and discuss the way students live and how it might be different from other countries.
- Discuss whether or not everyone should live equally. Allow the students to complete Question 1.
- Look at the table in Question 2. Ask the students to write ways each of these resources might be wasted in Australia.
- Give the students an opportunity to feed their answers back to the class. Highlight the wastage that students can take responsibility for and improve on.
- Discuss what is meant by the world having limited resources and how these limited resources can be mismanaged in some countries. Consider what it might be like to live in poverty. Ask the students whether they would be willing to forfeit some of the luxuries of their own lifestyle to help provide a better life for people living in poverty.
- Allow the students time to complete Questions 3, 4 and 5, predicting what they think will happen to our natural resources in the future. Give the students an opportunity to share their ideas.

## ANSWERS

1. Answers will vary.
2. Answers will vary.
3. Answers will vary.
4. By reducing the amount of resources we use, preserving and replenishing renewable resources and not wasting the resources we use.
5. Everyone.

## ADDITIONAL ACTIVITIES

- Develop a class chart showing ways we waste natural resources. Circle the things the students can help prevent happening. Have the students make signs to put around the school to remind others not to waste natural resources.
- Predict what would happen if the world were to run out of natural resources.

# Is One World Enough?

**Not only do we use natural resources – we waste them!**

## THINK & DISCUSS

If everyone in the world used up as much natural resources as each person living in Australia, we would need three worlds! For people in Australia to live the way they do – what must people in other countries have to do without?

① Do you think all people in the world should have the same standard of living?

Yes / No. Why? \_\_\_\_\_

② List three ways we might waste each of the following natural resources.

<b>WATER</b>	<b>FOSSIL FUELS (for electricity)</b>	<b>PLANTS</b>	<b>ANIMALS</b>
• _____ _____	• _____ _____	• _____ _____	• _____ _____
• _____ _____	• _____ _____	• _____ _____	• _____ _____
• _____ _____	• _____ _____	• _____ _____	• _____ _____

Can you solve the problems? We only have one world and its resources are limited. Already, people in some parts of the world live in poverty or cannot survive due to lack of, or mismanagement of, resources.

③ Will the world's natural resources run out? Yes / No

Why do you think this? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



④ How can we make sure there will be natural resources in the future?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

⑤ Who should be responsible for making sure this will happen?

\_\_\_\_\_  
\_\_\_\_\_

# Ecological Footprints

It is no secret that around the world we are witnessing and participating in a range of activities that are having a detrimental effect on our environment.

The way this is happening is through:

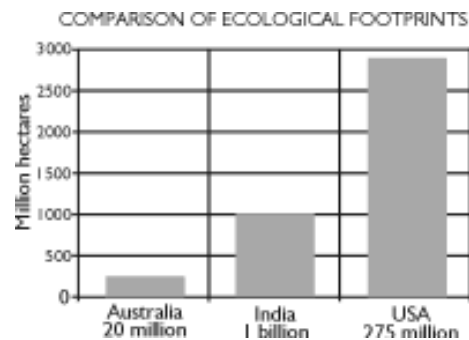
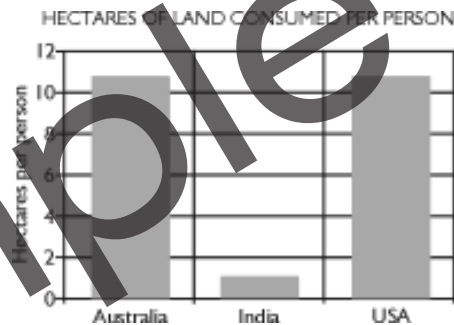
- population growth;
- increasing use of our natural resources;
- destruction of wildlife habitats;
- extinction of plants and animals (loss of biodiversity);
- poverty;
- pollution.

Many experts, such as environmental scientists, ecologists, conservationists and restorationists, are working to solve these environmental problems. However, solving environmental problems is not as easy as simply reducing population growth. All detrimental impacts and their causes need to be addressed together to achieve sustainable living.

For the world to be sustainable, it would mean that all people's basic needs can be satisfied without the depletion of natural resources for current and future generations of humans and all other species.

To understand the compounding effect of environmental damage to the planet, often environmentalists refer to a person's *ecological footprint*. A person living in Australia or the United States of America has a high environmental impact per person because of the amount of natural resources individually being consumed compared to, say, a person living in India.

For example, it takes about 10.9 hectares of land to sustain each person in Australia, as opposed to only one hectare to sustain a person in India. But if you look at the compounding effect of population on the use of natural resources, the impact of India as a country is much greater than Australia because their population is so much higher. (See figure below.)



As the standard of living increases in all countries around the world, so does the pressure on natural resources. If the entire world population of 6.1 billion consumed as much as each Australian, we would require the land area of *three* worlds.

However, all humans should have the same standard of living and this is where we get back to sustainability. Our use of natural resources has to become less wasteful, so that our ecological footprints are considerably reduced. ●

# Natural Resources

## LESSON OUTLINE

**Important:** Hand out the student information text on page 17 to the students prior to completing the student activity sheet. Information contained within this text is required for successful completion of the task.

- Review what is meant by renewable, non-renewable and potentially renewable resources. Discuss each of the resources in the box in Question 1 and allow the students to write each into the most appropriate category.
- Discuss ways the resources in the 'renewable' category are being used. Identify uses for these resources in the students' own homes, whether or not they are being used currently and why they may or may not be used. Have the students complete Question 2.
- Discuss why water and air are not renewable resources. Have the students identify how humans may inadvertently damage these resources.
- Identify why the threats to plant and animal resources might be similar.
- Discuss the impact pollution has on all potentially renewable resources.
- Allow the students time to complete Questions 3 and 4.
- Give the students an opportunity to share their predictions about the future of the planet without non-renewable resources. Make predictions about the changes in landscape, lifestyle and whether or not it would improve the environment for living things.
- Discuss the motivations behind using non-renewable rather than renewable resources to produce energy.
- Have the students rate each type of resource on a scale of one to ten to complete Question 5. Encourage the students to compare their ratings and share the reasons for their rating with a peer.

## RELEVANT WEBSITES

- ▶ [www.nrm.qld.gov.au/education/index2.html](http://www.nrm.qld.gov.au/education/index2.html)
- ▶ [water.usgs.gov/education.html](http://water.usgs.gov/education.html) (Contains trivia game on water basics.)
- ▶ [interactive2.usgs.gov/learningweb/fun/trivia.htm](http://interactive2.usgs.gov/learningweb/fun/trivia.htm)

## ANSWERS

1. Renewable-tides, wind, sun;  
Potentially renewable-water, milk, air, plants, animals, pearls;  
Non-renewable-gas, limestone, mineral sands, oil, coal.
2. (a) Answers will vary; examples include: wind mills, solar power, oyster farming.  
(b) Answers will vary.
3. (a) Pollution, salinity from over harvesting.  
(b) Pollution, too much carbon dioxide from burning fossil fuels.  
(c) Pollution, habitat destruction, land clearing.  
(d) Pollution, poaching, habitat destruction.
4. (a) Answers will vary.  
(b) Because the infrastructure to produce energy from fossil fuels is already in place and therefore cheaper to produce.

## ADDITIONAL ACTIVITIES

- Using a section of the playground, mark a line with one end being 'strongly agree' and the other being 'strongly disagree'. Read out a list of resources one by one and have the students stand along the line to show how they feel about that natural resource being used. Encourage students to give reasons for their choices and to consider the impact their choice would have on the environment.

# Renewable, Non-renewable and Potentially Renewable

Resources with little chance of running out are termed renewable. Resources which cannot be replaced or take a long time to be produced naturally are termed non-renewable. Potentially renewable resources are those which must be used carefully to be sustained.

1 Look at the list of resources below. Decide which are renewable, non-renewable and which are potentially renewable. Write them into the appropriate box.

- limestone
- wind
- plant
- soil
- water
- air
- coal
- animals
- milk
- tides
- mineral sands
- sun
- gas
- pearls

RENEWABLE	POTENTIALLY RENEWABLE	NON-RENEWABLE
<p>2 a) List three ways we are currently using renewable resources.</p> <ul style="list-style-type: none"> <li>• _____</li> <li>• _____</li> <li>• _____</li> </ul> <p>b) Do you use any renewable resources in your home? Yes / No List.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>3 Give a reason why each of the following may not be available to be reused.</p> <p>a) water: _____</p> <p>_____</p> <p>_____</p> <p>b) air: _____</p> <p>_____</p> <p>_____</p> <p>c) plants: _____</p> <p>_____</p> <p>_____</p> <p>d) animals: _____</p> <p>_____</p> <p>_____</p>	<p>4 a) Predict what you think might happen when all non-renewable resources have been used.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>b) Why do you think non-renewable resources are being used rather than always using renewable resources to produce energy?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

5 Rate the use of each type of resource on the 'environmentally friendly' scale.

<p><b>RENEWABLE</b></p> <p>☹️ 1 2 3 4 5 6 7 8 9 10 ☺️</p>	<p><b>POTENTIALLY RENEWABLE</b></p> <p>☹️ 1 2 3 4 5 6 7 8 9 10 ☺️</p>	<p><b>NON-RENEWABLE</b></p> <p>☹️ 1 2 3 4 5 6 7 8 9 10 ☺️</p>
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