Curriculum Visions

Caring for our Environment

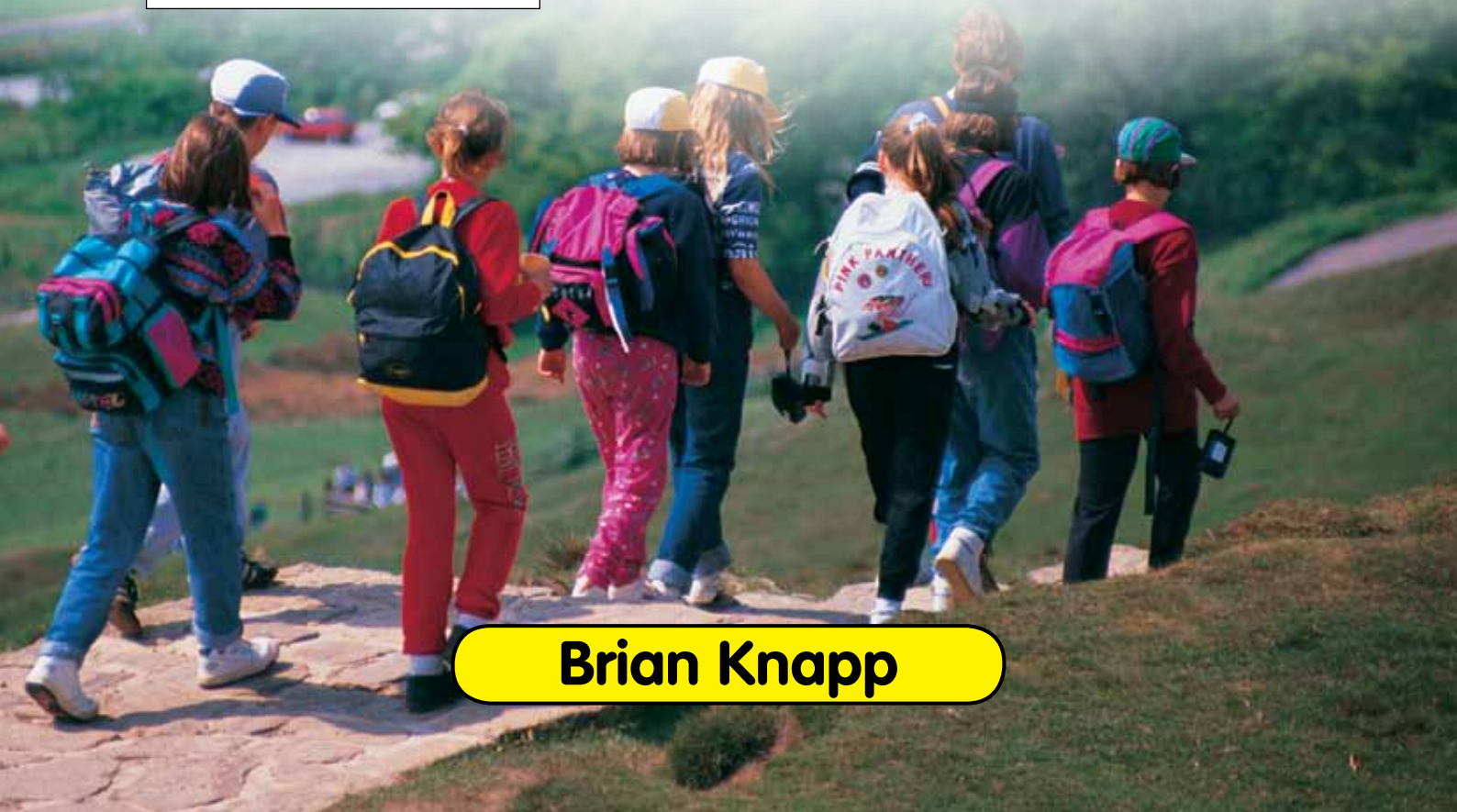
Key to interactive features
Press on Teacher's Guide title above to go straight to Contents page.
Click on any item in the Contents to go to that page.
You will also find yellow arrows throughout that allow you to:

- 1A go to worksheet
- go back to previous page
- go forward to next page
- C go back to contents
- I go back to information for that topic

Teacher's Resources

Multimedia resources can be found at the 'Learning Centre':

www.CurriculumVisions.com



Brian Knapp

Curriculum Visions

A CVP Teacher's Resources
Interactive PDF

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Author
Brian Knapp, BSc, PhD

Senior Designer
Adele Humphries, BA, PGCE

Editors
Lisa Magloff, MA, and Gillian Gatehouse

Illustrations
David Woodroffe

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Contents

Features a major section of activities on recycling of all kinds; from pages 74 to 101.

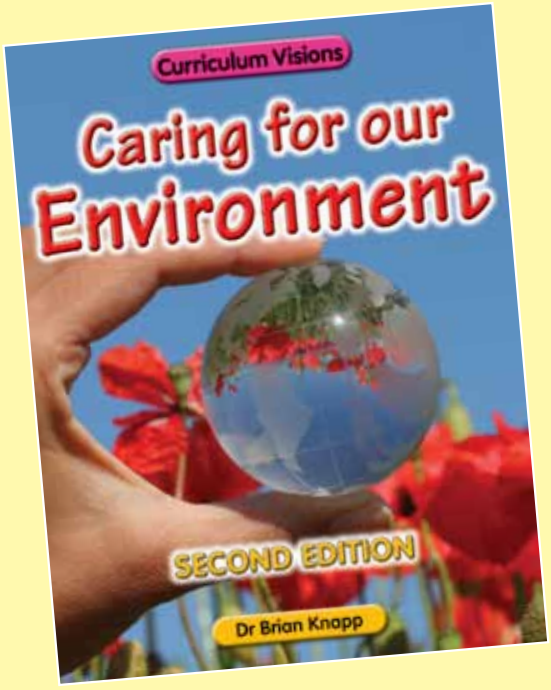
Section 1: Resources

Welcome to the Teacher's Resources for 'Caring for our Environment' Second Edition.

The Caring for our Environment resources we provide are in a number of media:

1

The 48 page Curriculum Visions 'Caring for our Environment' Second Edition.



2

The Caring for our Environment PosterCard Portfolio – key photographs and illustrations on two folded, double-sided and laminated sheets.

3

You can buy the supersaver pack that contains 1 copy of each book and PosterCard Portfolio, and the Teacher's resources (what you are reading).

4

Our Learning Centre at
www.curriculumvisions.com
has almost everything you need to teach your primary curriculum in one convenient Virtual Learning Environment.

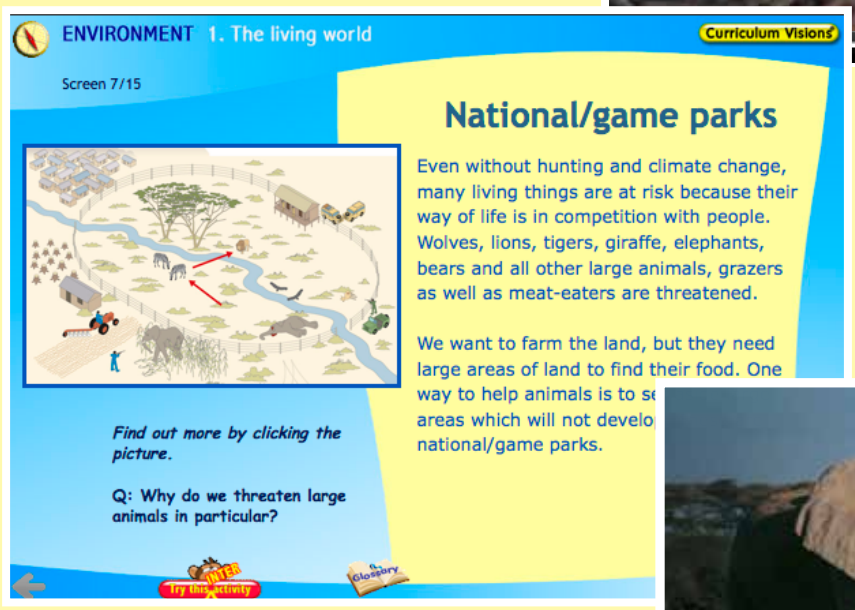
You can use support videos, e-books, picture and video galleries, plus additional Creative Topic books, graphic books called Storyboards, and workbooks. Together they cover all major curriculum areas.

All topics are easily accessible, and there is a built-in context search across all media.

You can also use our printed student books online as part of your subscription to the Learning Centre. There page-turning versions of every printed Curriculum Visions book for use on your whiteboard.

▼ The Environment home screen

▲ 'Classroom cinema' video



▲ Web site page

▶ Web site caption

Please note: screens are subject to change from those shown here.

Matching the curriculum

The Caring for our Environment resources provide the foundation for you and your students to investigate different ways of thinking about important aspects of our environment, how we harm it and how we might conserve it. This is discussed from the point of view of the living things, but also in terms of our energy needs and the way we use the Earth's inorganic resources. As a result, the pack supports a wide variety of aspects in the curriculum allowing teachers to bring the subjects together as a single cross-curricula topic.

While covering the subject matter of the curriculum, the Caring for our Environment resources also facilitate the development and use of a range of skills through the worksheets in this guide.

This pack also encourages students to consider their own attitudes and values, and those of other people, to the world around them.

Learning objectives

The following learning objectives have been addressed:

- **How are living things connected as part of a food chain or food web?**
- **How might we disturb these natural chains through our actions?**
- **How can we be more sympathetic in our actions towards other living things?**
- **How can we enhance the conditions for other living things as well as enhancing the environment for ourselves and not interfering with our need to use the land for food?**
- **Why is it necessary to have packaging?**
- **How can we minimise the waste we create?**
- **How can we use environmentally friendly products?**
- **How do we waste energy?**
- **How can we use less energy without reducing the quality of our lives?**
- **How do we pollute water?**
- **How do we clean water?**
- **How do we cause air pollution?**
- **How can we minimise our impact on the air?**

Links with science

There are many opportunities to link this material with science throughout the curriculum, for example, in a discussion of the environment, in areas concerned with materials, in energy and in changing states.

Links with geography

There are many opportunities to link this material with geography, because the nature of the environment has many spatial aspects. The location of places of special scientific interest can be considered, the distribution of water, the way air currents carry pollution from one place to another, the impact of pollution on coasts, the impact of pollution on rivers, the water cycle and so on.

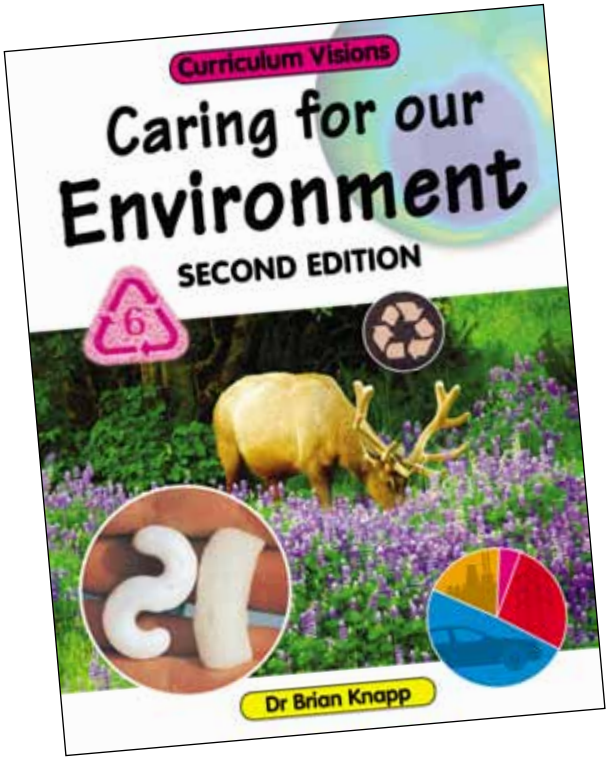
Linked resources

Section 2: Caring for our Environment explained

Although the student book – *Caring for our Environment* – is clear and simple, a great deal of care and thought has been given to the structure and the content of each double-page spread. The worksheets in section 3 of this Teacher's Guide also link directly to the pages in the student book.

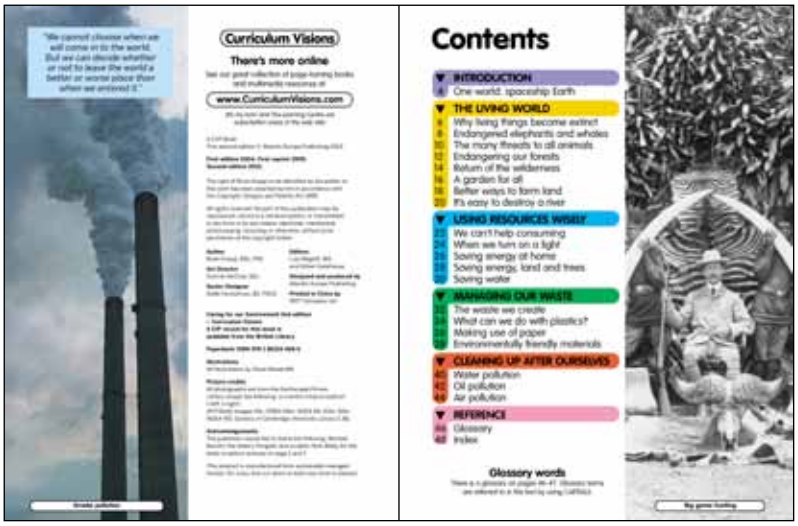
It is possible to use *Caring for our Environment*, and section 3 of the Teacher's Guide, without reading this section, but we would strongly recommend that you take a short time to familiarise yourself with the construction of the student book.

Caring for our Environment begins with an introduction to the role of humans and the impact that we have on the planet. This is followed by sections on the living world and ways that it is damaged by human activity. We then look at ways in which we can use resources wisely and manage our waste. Finally we look at different types of pollution and how they can be reduced.



▲ **The *Caring for our Environment* 2nd Edition title page.**

Contents



The book is organised into chapters and subdivided into double-page spreads. Chapters are shown on the contents page and are colour-coded. Matching coloured headers run across each spread. The concept is paralleled by the pages on the web site.

Each spread has a heading, below which is a sentence that sets the scene and draws out the most important theme of the spread. The main text of the page then follows in straightforward, easy-to-follow, double column format.

Words highlighted in **BOLD CAPITALS** in the student book are defined in the glossary on pages 46–47. The majority are technical words important to the subject, but some are simply difficult words.

The glossary definitions help to reinforce the meaning of a word that may be slightly ambiguous if taken out of context. Many technical words used by geographers and scientists are also used in everyday situations where they may have a different meaning.

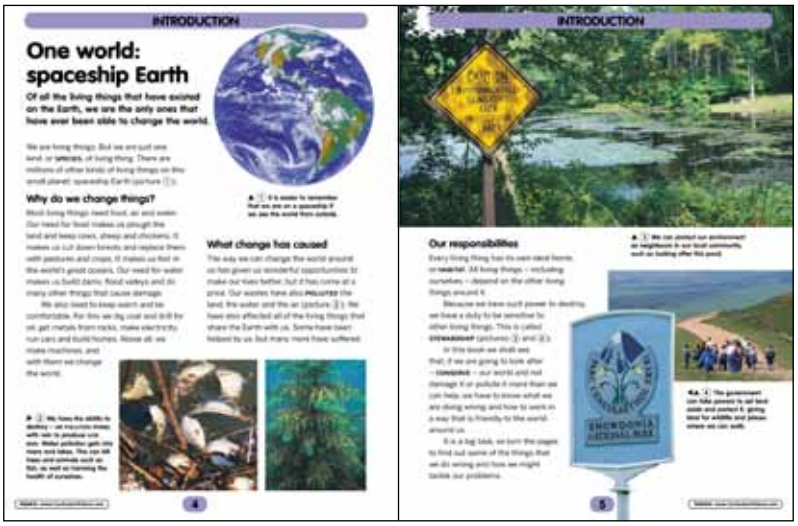
The glossary words are highlighted on the first page where they are encountered. They may be highlighted again on subsequent pages if they are regarded as particularly important to that page or spread.

Please note that some pictures have been especially chosen from various parts of the world. Thus, one spread may have examples from the UK, the next may be from America and the next from Asia. In this way, students will automatically be exposed to a number of contrasting environments, both at home and abroad.

Introduction

Spread 1 (pages 4-5)

One world: spaceship Earth



This spread is about providing the understanding needed for environmental awareness. It explains that we – like all living things – need food, air and water. It also makes the point that living things occur together, not in isolation. When we look at a simple example, such as a pond, we can see this clearly. There are many other similar situations. For more on this topic see *Living Things in their Environment* book in the *Curriculum Visions* series.

Many living things are invisible to the naked eye. In a pond it is algae. Algae happen to be the vital base for many aquatic food chains. So students must not assume that they only need to care for the things they can see. It is better to understand how communities work and then find out that there is a need for unseen as well as seen species. You could extend this idea further using other living things that we do not see – even quite large ones. This can also be tied to a discussion of how we must train ourselves to observe – a key science skill. Thus, for example, many students may not notice insects because their attention is not focused on them, but they are important members of a community nonetheless.

Living things that share the same environment make up communities. Humans are not shown in this picture because we do not live in the pond. But we certainly affect the things that do.

Chapter 1: The living world

This chapter shows how easy it is for animals and plants to be made extinct or endangered and how relatively simple it is to make these dire consequences less likely.

Spread 2 (pages 6–7)

Why living things become extinct

In this spread we move ground somewhat to think about the survival of species. Of those species that have become extinct, students are probably most familiar with the dinosaurs and the dodo. The fate of both are contrasted here.

The extinction of the dinosaurs was the result of natural, albeit catastrophic, events that changed their habitat and made their life impossible. We cannot do much about this type of extinction and it simply has to be accepted. But it does not happen very often.

Extinction due to the effects of people is now the most widespread form of extinction and it is certainly something we can alter.

The dodo is an interesting example because it shows how a species, living perfectly happily in a niche environment, can be made extinct through human actions. In this case, shooting was not the main cause. Rather it was the introduction of animals that destroyed the nests, eggs and young of the dodo.

The dodo was a curious bird and so it is memorable. However, it is not alone. Species have been made extinct by changes in their habitats and also by hunting. Foxes, for example, were hunted to extinction by the 19th century in Britain and had to be reintroduced (but not for their own benefit, simply for more hunting).

So this spread is a warning about the dire consequences of our actions. The next spread deals with living things that still survive – but only just.

Spread 3 (pages 8–9)

Endangered elephants and whales

3

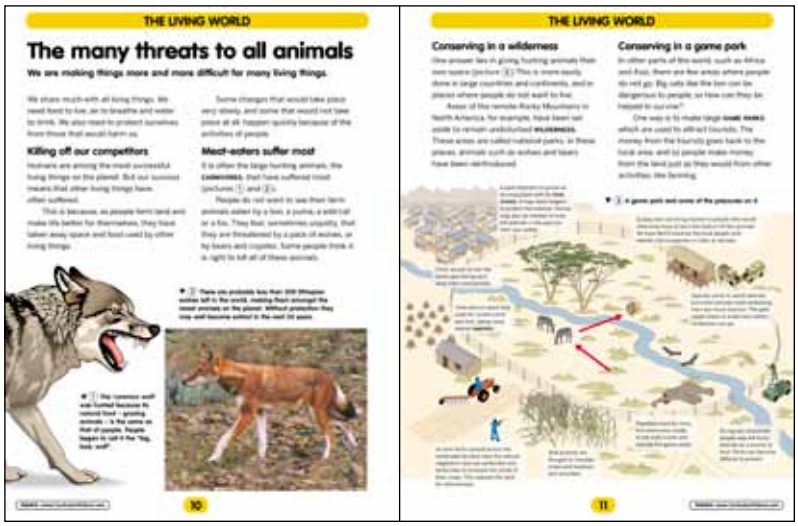
The dodo is extinct. So are many other animals and plants. We can do nothing about this now. But many more animals are now hunted without thought and we can do something about that. Students are introduced to the complex problem of how to care for such animals through two of the most recognisable endangered species, the elephant and the whale.

Students will be able to collect lots of pictures and stories about these mammals. What they have in common is size and vulnerability. In neither case do people need to kill them. Students will readily be able to identify this point from the products that are taken.

This would be a good moment to discuss the whole nature of selfishness and respect for other living things. You might also discuss the difference between treating other living things as resources, and the fact that they are alive and deserve to survive and be treated well because they are living. You may then want to extend the concept to the treatment of farm animals.

Spread 4 (pages 10–11)

The many threats to all animals



This spread extends the concept of endangered animals to the whole of the wild animal community.

Students will have seen the particular cases of elephants and whales and so will be in a position to discuss other animals – both those they know about and the majority they do not.

There are three things to look at: how we destroy habitats on which animals depend, how we set about killing animals because they are inconvenient to us (so-called pests) and how we destroy animals because they have things that we greedily want.

It might be worth while showing students a book of the animals and plants of a continent using a library book. As you flick through the pages, it will become clear to students that any area contains a vast array of wildlife, much of which they had no idea of.

This introduces all kinds of ideas that can be discussed, such as food chains and food webs and how altering life for one species may have large knock-on effects that were unforeseen and unknown.

Some students will also see that food chains are not only independent, but are cross-linked to other food chains called food webs. The fact that we can eat chickens, cows and corn illustrates this idea.

But not all animals are so adaptable. To illustrate this, it may be worth showing a chain and removing a link. This indicates what happens when the food chain is broken by, for example, our killing off all of one species. The species above may well die out. Species below may not have natural checks and so they may overwhelm those parallel to themselves in any food web. In this way they can disrupt other food chains.

We are trying to show that living things do not live in a simplistic world, but in a complex world, and that it is never completely clear what will happen if our actions destroy any one species.

The many pressures on wildlife and people are shown in the diagram on the right hand page. Students can make up alternatives for local farm areas if they wish.

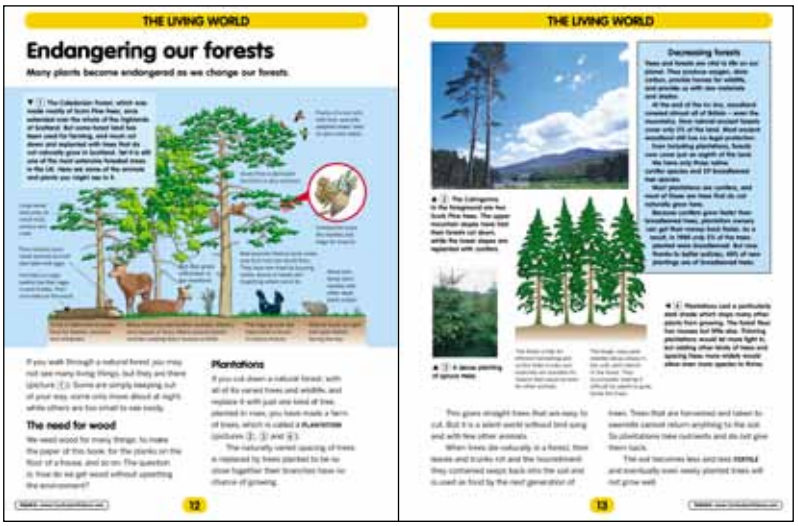
There are numerous examples of endangered species to choose from, but on this spread we consider the Ethiopian wolf, of which only about 500 remain.

The wolf is an example of a predator that kills domesticated animals. We have to decide whether, in certain areas, we are prepared to let wild predators survive.

This is probably a difficult topic to deal with because of the emotive issues that are aroused. It may be best simply to contain the discussion to stewardship, balanced communities and so on. The concept of setting aside land for animals to use (wilderness areas like national parks) is discussed later in the book.

Spread 5 (pages 12–13)

Endangering our forests



This spread follows on from the themes of nature communities and the effect we may have on them by looking at plants, specifically forests.

Again, trees are large plants and so their presence or absence is more easily noticed. They are also used as a crop and so students can see them growing wild, being 'farmed' in plantations and used decoratively in gardens, along roadsides and hedgerows and in parks.

Plants are at the bottom of all food chains and so changes in their numbers have a major impact on all animal life.

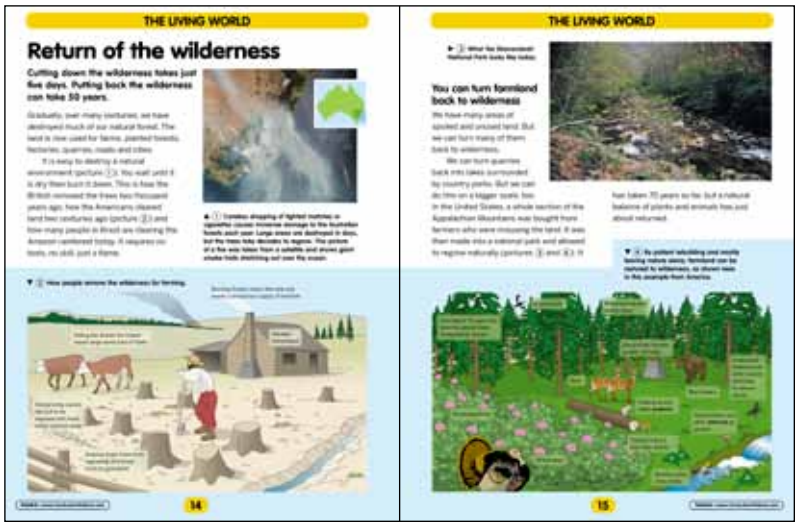
The nature of food chains and webs can be inferred by discussing the wildlife that would exist in a forest. The example shown is a Scottish forest populated by native conifers. Students can examine the plant and animal species shown and consider how each depends on the forest. They could also think about the life cycle of a tree, how long it takes to grow and the conditions that might make seeding possible.

On the opposite page are examples of plantations. Students could compare the two diagrams to see how close planting can deprive much wildlife of a habitat. Close planted plantations are dark and the trees support very few animals.

Finally, students can consider how trees become endangered as a result of being removed for farmland and for plantations, and they can think about how planting schemes can be developed which encourage native tree species rather than imported ones, as well as how variety planting and selective cutting gives a healthier environment without any loss of timber resource.

Spread 6 (pages 14–15)

Return of the wilderness



This fascinating spread provides lots of opportunities for students to think about how they could reconstruct a wilderness.

To begin with, they are told that it takes a very short time to cut down a forest, but a long time for it to regrow. Next they need to consider whether they should help regrowth or whether they should simply allow the area to regrow naturally.

The main development of the spread takes place on the right hand page, where there is the suggestion that we can turn selected areas back into wilderness. Examples of land suitable for wilderness include old mines, quarries and gravel pits.

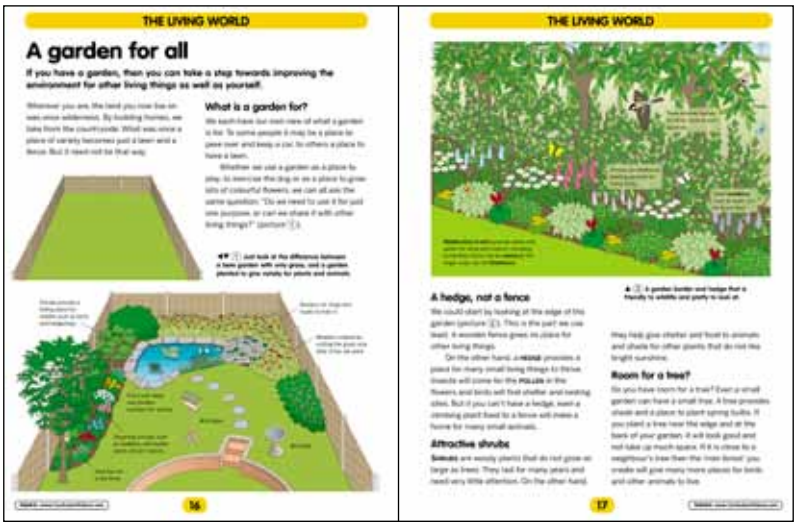
You may like to have pre-prepared some background information of how much your own local authority has done on creating country parks or otherwise turning areas that have been abandoned into more ecologically friendly ones.

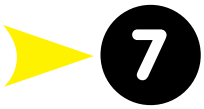
There is always the pressure to make the land available for a variety of uses, and students can discuss how humans and wildlife can live together in a small area.

Finally, it is important to see how it is vital to take large enough areas of land to make into wilderness. This is because the species higher up the food chain need larger areas to thrive. The key is patience, for what we want is a natural balance, not a parkland.

Spread 7 (pages 16–17)

A garden for all





It may have seemed to students that we are dealing with things on such a large scale that they are beyond their influence. This spread is designed to show that this is not the case and that conservation and environmental improvement can occur on every scale. To do this, we have used the example of a garden.

Students should be aware that this garden is designed to look pretty and also to be attractive to a variety of wildlife by providing ground cover, water and so on. It could be made better still by using 'soft' hedging of living plants such as beech, but as many gardens have fences, we have produced a plan within this context.

You can extend the idea of providing habitats on a small scale with hedgerows. The purpose of examining hedgerows and their conservation is: to notice that parts of the landscape are configured entirely by people; to learn why the extent of hedgerows has increased, dramatically decreased and then stabilised; and to learn that hedgerows are a useful habitat for smaller creatures and plants. Many houses and parks also have hedges, and so work can be done on these in town as well as in the countryside.

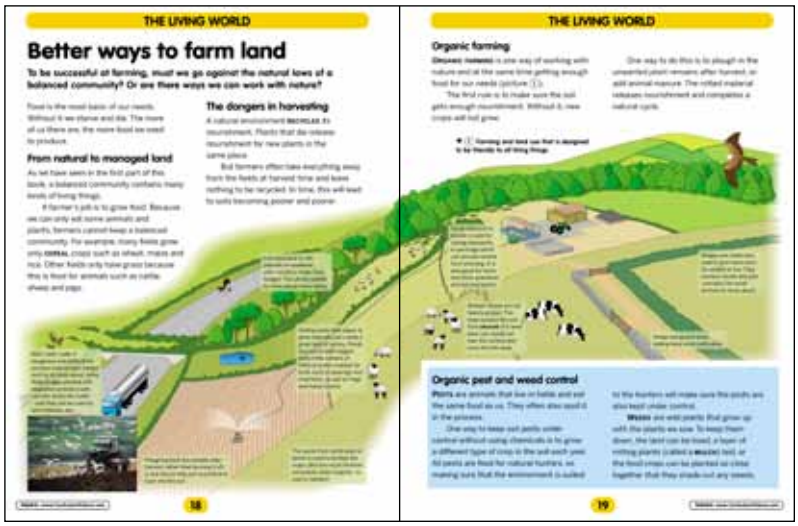
A hedgerow is, of course, entirely artificial in so far as it can only exist because of continued cutting. They are linear features and have little depth. This makes them unsuitable as a home for larger animals. But at the same time they can link up larger areas of woodland and act as an easier way for species to spread between woodlands.

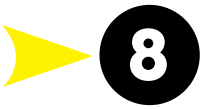
If hedges are removed, then the links between these large woodland areas are broken and the woodlands become islands that may be too small for many species to thrive.

Students can be encouraged to look at their local hedges, at what variety in habitats there are, and if different kinds of management can improve the habitats. For example, leaving grasses to grow close to hedges until after grass seeds have set rather than mowing them, increases the amount of food available for birds and small animals.

Spread 8 (pages 18-19)

Better ways to farm land





Much of the countryside is under farmland, and so a considerable amount of wildlife conservation lies in the hands of farmers. This spread covers some of the most simple concepts but there is a lot more that can be done.

Students could investigate alternative ways of farming the land through organisations such as the Soil Association. They can also be introduced to the idea of making sure that as much wildlife is preserved on the land as possible without incurring any penalty for the farmer. The thick, soil-filled walls used to separate fields in Devon and Cornwall are ideal examples. The soil provides a place for wildflowers to grow and a home for small burrowing animals.

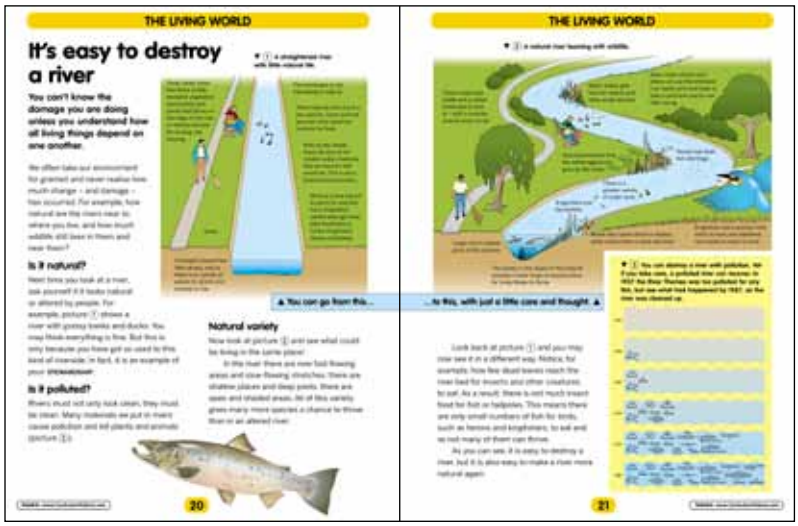
On all farms hedges could be allowed to grow a little deeper so that they are not spindly and windswept, but offer shelter.

The use of natural farming techniques such as composting and reduced uses of pesticides are other avenues that can be explored.

The large diagram gives students an opportunity to look around the countryside and see what has been done. See if the children have ever noticed, for example, a wildlife bridge over a motorway.

Spread 9 (pages 20–21)

It's easy to destroy a river



9A

9B

Just as it is easy to destroy a forest, so it is easy to ruin any natural environment. Students need to keep this idea firmly at the top of their minds, always asking: "If we do this, what might it harm or damage?" On this spread, we use the example of a river to bring this point home.

There are good reasons for dredging rivers in order to reduce flooding and improve navigation. But the result of this activity is to wreck a diverse habitat and replace it with a much more impoverished one. There is usually an alternative as well. For example, rainwater does not have to be put in drains and shot into rivers, making them more liable to flood. Instead it can be directed to soakaways, which are a much more natural way to deal with the problem. As a result, rivers do not need to be altered. The cost of soakaways is also less than drainage and dredging. And it is good for wildlife.

By now students will have a basic understanding of how one species relates to another in terms of food. Some students will see that there are not only single food chains, but also cross-linked food chains called food webs. It may be worth showing a food chain and removing a link. This indicates what happens when the food chain is broken by, for example, our killing off all of one species. Species above may well die out. Species below may not have natural checks and so they may overwhelm those parallel to themselves in any food web. In this way they can disrupt other food chains.

The example of the river that has been engineered shows this well. Students will quickly see that the life of the kingfisher hangs on whether we remove its habitat and its food, or leave them alone.

This moves us on to the goal of stewardship. But we will only get to that goal through scientific knowledge and human consent.

The final diagram on the page shows how it is possible to reverse bad trends, if time is given. The example shown is that we can increase the diversity of the species in the River Thames.

Chapter 2: Using resources wisely

This chapter looks at ways in which we use resources such as energy and water, and how we might make better use of them. This is important for saving money and also for the environment because energy consumption causes more greenhouse emissions as well as acid rain and other harmful air pollutants.

In this part of the book we are concerned with how to save the energy that is supplied to our homes, not with the various ways of producing it, whose technical arrangements are outside the scope of this age group of students.

Spread 10 (pages 22–23)

We can't help consuming

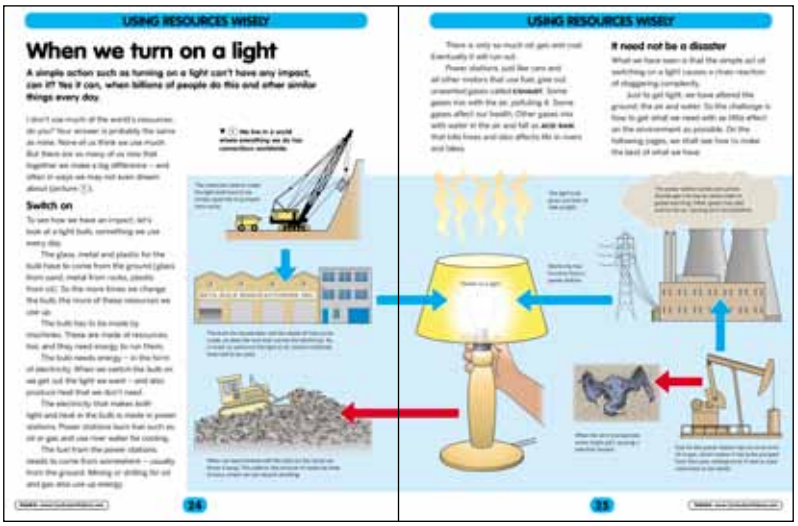
We are naturally consumers. The whole of our economy depends on it. Some people might take the view that consuming is bad for us, but the more constructive view would be to take it as a fact of life and then see what we can do about it. This is the conservation aspect addressed in this book.

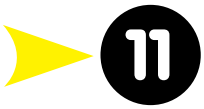
The spread shows not only packaging of goods that we might buy in a store, but also a house, showing how we consume materials from the environment both to build the house and to maintain it. In this context we take consumption to include energy, water and other utilities. This widens the context from simply looking at what we buy in shops.

As it is unreasonable to expect all of our goods to go into minimalist packaging, we can help to balance the use of attractive packaging by making sensible choices about reusing the packaging.

Spread 11 (pages 24-25)

When we turn on a light





Just as we saw earlier that altering one aspect of a food chain caused changes elsewhere, this spread aims to help students to see that a simple action such as switching on a light causes a chain reaction well beyond what they might have expected.

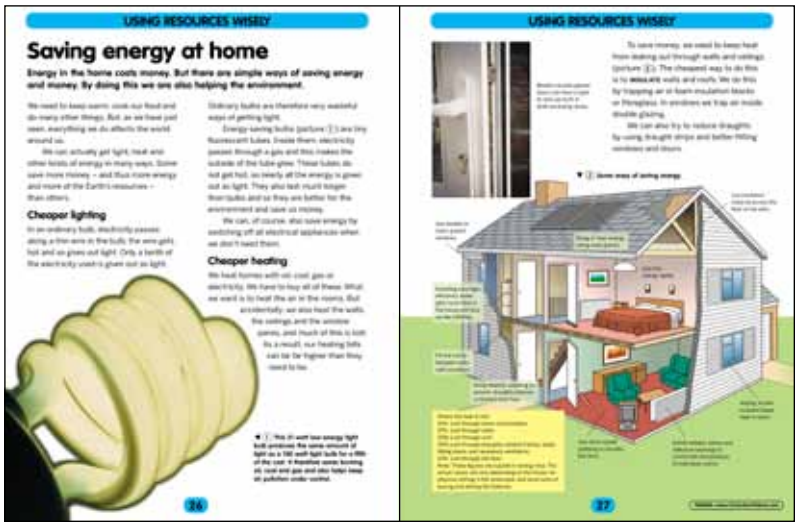
The point to focus on is that a light is a physical entity as well as something that converts one form of energy (electricity) to other forms (light and heat). To use a light requires that the power company have laid a vast network of cable using aluminium, copper and plastic, that a factory has made the light bulb, and so on.

You may want students to try to add to the links in the diagram, or to begin another diagram for another energy resource, such as a gas fire.

When dealing with energy there is also a great opportunity to talk about how producing energy creates pollution that adds to acid rain and global warming. This is discussed further in the book on pages 44 and 45.

Spread 12 (pages 26-27)

Saving energy at home



12

The theme of energy conservation is complex. We have touched on it in the previous spread with respect to energy saving light bulbs, and here we concentrate on a wider aspect that students can easily understand, the theme of saving energy in the home.

The need for conservation of energy can be seen through the amount of energy required to heat a home. In this spread each of the main kinds of energy loss are discussed. You may want to combine this with a discussion of the methods of heat transfer: conduction, convection and radiation.

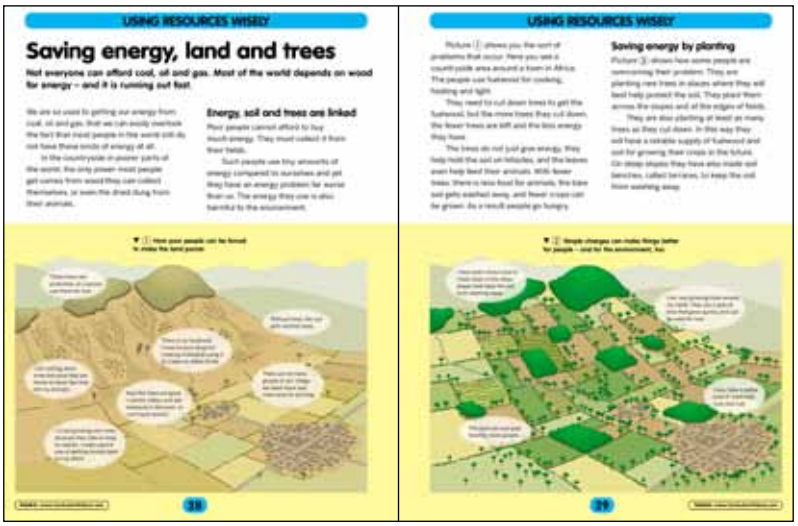
Students are asked to consider light bulbs in terms of how much of the energy they use actually produces light as opposed to heat. Cool bulbs are much more efficient than hot ones.

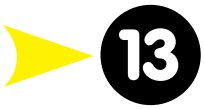
Much of the information in this spread is in the form of applications. These have been organised around a diagram of a house so that they are easy to see and discuss.

Students should look at and discuss the nature of insulation and the fact that air is used as an insulator, provided it can be kept still. Insulation material is just a means of trapping air at low cost. Double glazing is the same.

Spread 13 (pages 28–29)

Saving energy, land and trees





This is the last topic in the chapter on energy but it is a vital one. It moves students away from thinking about their own use of energy to the use of energy in the developing world and the countryside.

By studying this spread, students can see that different people have different priorities, and also different abilities to buy what they want or need.

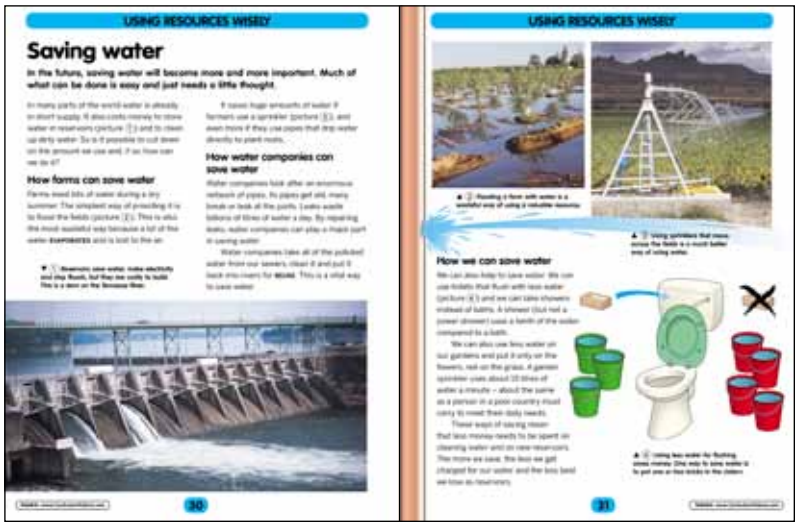
At the same time, students can appreciate how, when people try to meet their needs, the environment can so easily suffer.

This might be a good opportunity to talk for a while about the nature of the developing world, what the word means and some of the implications. Students need to know, for example, that in the developing world, most people depend directly on the land, and so they can easily overwork it or deplete forest resources, especially in countries where people cannot afford to buy fuel.

The diagrams show how simple measures can be introduced to cut down on forest loss and add more fuelwood to the environment while at the same time reduce soil erosion. This latter point is not important in much of the UK, but it is very important in places that receive torrential thunderstorms during a wet season, and where the slopes are steep.

Spread 14 (pages 30–31)

Saving water



Water is often taken for granted, but it is one of our most precious resources. Supplying clean drinking water, and cleaning water we have used are also expensive.

Students are introduced to different water users. They learn that in most parts of the world, people are not the biggest users of water. Rather, it is irrigation for fields and factories that use the most water. The proportion of water used for drinking, however, changes with the degree of development of a society. In the UK, domestic water consumption is relatively high because the need for irrigation is much lower because of a humid climate and more reliable rainfall than in many other countries.

In countries where farmers use large amounts of water, conservation is about getting water to the plants as efficiently as possible, and this means preventing evaporation losses. A number of methods for doing this are discussed, but paradoxically, the more water that is saved, the higher the cost of applying it. That is, it costs less to flood a field than to fit it with the perforated plastic tubes needed to drip water directly to plant roots. This is why flooding is still the most widespread system, both in developed and in developing countries.

Domestic water use is far more complex than irrigation supply because not only does the water have to be clean, but it also has to be supplied via a phenomenally complex network of pipes. The main problems here are the leaks that occur in old pipes and the inefficient ways we use water in the home.

In homes, most water is used in baths (instead of showers) and large capacity toilets. Students could suggest ways to reduce these uses and thus save money.

Chapter 3: Managing our waste

This chapter begins a new theme based on the treatment of waste. It can be connected to the previous section because the amount of waste we do not recycle has effects on the consumption of resources and energy. Waste also causes pollution and some of this finds its way into rivers, lakes, seas and hedgerows as unsightly rubbish; more of the Earth's resources have to be used, and so more of the ground has to be quarried, mined and so on.

As we start this section of the book, students are shown that there are many sensible reasons why goods we buy are packaged. It is important that they get a balanced perspective on the reasons for packaging. They should also understand that not only are goods protected by packaging, but the packaging helps to sell the goods. Ask them, for example, if they would be more attracted to buy something in a brown bag or something in a colourful box with photographs. The theme is thus more on the responsible disposal of the waste we create.

Spread 15 (pages 32–33)

The waste we create

15A
15B
15C
15D
15E
15F
15G
15H
15I

Students are often aware of waste in the form of packaging, and so this is where we start. But they may also have a very simplistic view, thinking that all packaging is unnecessary. This spread begins by explaining why, for many articles, packaging is vital. Even the empty space around an article is often vital. Some students may ask why a smaller packet cannot be used and the answer to this is that the outer packaging is often used to take knocks that might damage the interior product if it was packed against the outside of the packaging.

Packaging is different depending on the nature of the product and this, too, is introduced. Packaging also makes handling easier and allows a more efficient use of shop shelf space.

So we do end up with a lot of packaging. It is not waste until we have extracted the contents. But it is bulky (for the reasons stated above) and unless it is disposed of thoughtfully and with a view to recycling, it can become a drain on the Earth's resources, adding extra costs in terms of energy and resources.

Unfortunately, from a recycling point of view, waste is also made of a large number of different materials. If these materials are mixed up they are often hard to separate. So either we spend a few seconds sorting it out and disposing of it into separate containers before it gets mixed, or we have to accept that we have to pay the council to dispose of it. This harms the environment (via landfill and incineration) as well as harming the pocketbook. So the key idea is for students to understand that it is in their own interests to sort.

This section can be associated with many aspects of materials in the science course.

The spread points out that we cannot recycle many wastes ourselves. It may be worth pointing out kinds of waste that we can recycle ourselves, for example, food peelings can be recycled via a compost heap, and comparing these to wastes such as sewage that are recycled for us by the sewage works (see later in the book).

This need to recycle applies not just to homes, but also to offices and factories. In fact, because of their organised nature, offices are often better at recycling. In our office, for example, all cardboard packaging on incoming goods is cut into strips and reused as filler for our outgoing books. All used paper is shredded and used in a similar manner. We also only use paper in our books and cartons that is either recycled or comes from sustainably managed forests. Very little waste leaves this office, but the effort we use in recycling is actually small. You may care to invite students to do a school or home audit to see how they are doing.

Spread 16 (pages 34–35)

What can we do with plastics?

16A

16B

This spread confronts what some people think of as the scourge of packaging: plastic.

In fact, plastic is used for a number of very good reasons. However, it is among the more difficult wastes to deal with.

This spread illustrates how plastics endure by asking students to consider what makes up the majority of flotsam on a beach.

Students might also be asked how the flotsam got there. There is a tendency to blame the material rather than the thoughtlessness of the people who allowed the material to be discarded into the environment.

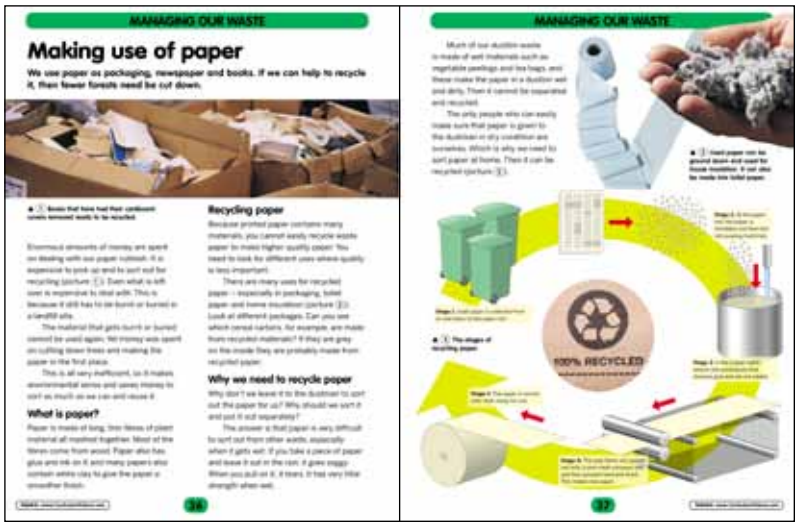
When students study materials, they should become aware that there are two kinds of plastic – thermosets and thermoplastics. Thermosets are quite hard to recycle and reuse for their original purpose because they are hard and will not melt. But they can be ground up and then reused, as the examples on the page illustrate. Thermoplastics can be melted down and reused. But because there are several groups of plastics, we do have to take the trouble to sort them if they are to be reused to the best advantage.

Although many councils have not made much progress in collecting different kinds of plastic, the potential for sorting them and reusing them is now in place.

On this spread students are introduced to the recycling labels.

Spread 17 (pages 36–37)

Making use of paper



17C

17D

This spread deals with an element of waste that many students have some experience of: waste paper and cardboard. This is mainly as newsprint and packaging.

The spread shows that used paper and card is a mixture of many items, such as clay filler, glue and ink. It also shows that paper is made of meshed fibres.

Just like with plastic, it is usually cheaper and easier to turn waste paper into new, low grade paper than it is to try to use it for high grade paper. This is because the energy and chemical cost of getting the dye and clay from paper is high.

Students may think that recycled newspapers have to be made into fresh newspapers. However, as the spread shows, there are many other uses all around us, for example as toilet tissue and packaging.

Paper is a very good example of a material that can be almost entirely recycled if we keep it separate from other materials. Once mixed up, it is very hard to deal with and then it will probably go to a landfill site. This shows the scientific reasons why we should do the sorting in our homes rather than expecting the council to sort our rubbish.

Spread 18 (pages 38–39)

Environmentally friendly materials

There has been a lot of progress in removing some harmful materials from the environment. Taking lead out of petrol, removing mercury from batteries and so on, all help on an industrial scale.

In this spread we consider an alternative way of dealing with waste – making packaging and other materials out of easily degradable materials.

One of the most successful of these is the pellets used in packaging. They were originally made from expanded polystyrene. But they can also be made from foamed starch. The starch will behave in the same way as the polystyrene if it is kept dry. But as soon as it gets wet, say for example if a package becomes broken and the contents are carried across the land by the wind, then it will decompose within days.

Plastic cloches only need to last a few weeks so these, too, can be made of starch-based products. Disposable cartons, such as burger packs, can also be made of the same materials.

At the moment, such materials are not as widely used as they might be, but they are available and students could investigate more where they are found.

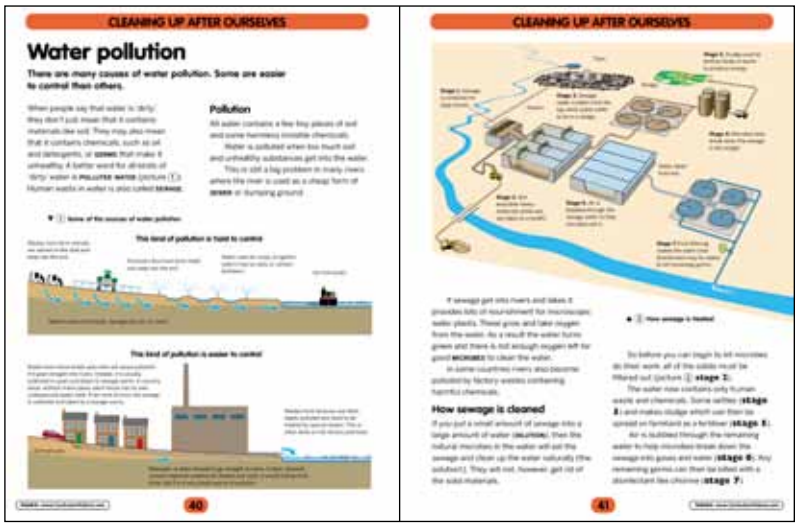
Chapter 4: Cleaning up after ourselves

The concept of pollution has, in one form, been discussed previously under the heading of solid waste – rubbish. But this is a very different problem from pollution of the water cycle.

It may be helpful to remind students of the water cycle at this stage, so they can see that groundwater, rivers, oceans and water vapour and rain can all be polluted by our activities. This chapter shows some aspects of the problem.

Spread 19 (pages 40–41)

Water pollution



In this spread students find out about the different sources of water pollution.

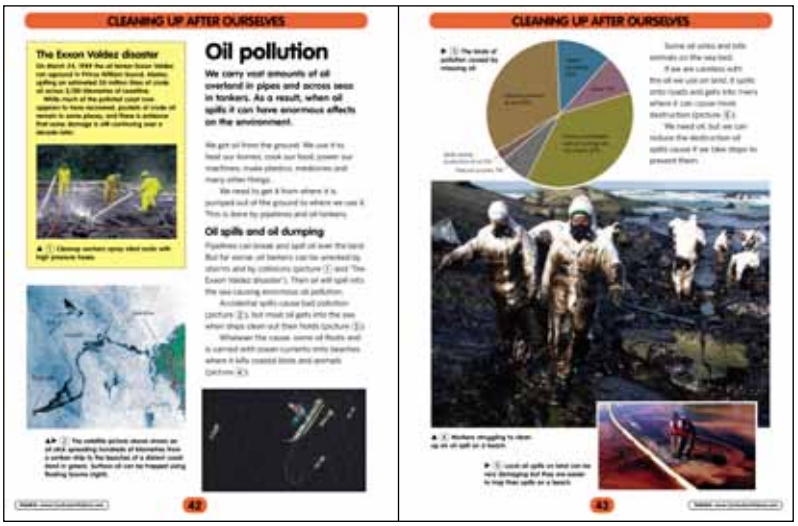
Students should first see that there are three kinds of water pollution: solid waste, liquid waste (chemical) and biological waste.

The diagram shows how waste can be created from homes, factories and farms. Notice that some pollution is direct pollution, for example chemical spill from a factory into a river. Although serious, this is in fact the easiest to deal with because it comes from a single source. Much more difficult to deal with because it enters the soil and groundwater and gets to the river in a very diffuse way, is farm waste, for example, fertilisers, pesticides and animal slurry.

The spread then goes on to consider the waste that we create and how it is dealt with in a sewage works. Note that much more detail on this topic is found in the companion *Curriculum Visions* book, *The Water Book*.

Spread 20 (pages 42–43)

Oil pollution



20A

20B

20C

Oil pollution and oil spills are perceived as a special threat and hazard because the amounts of oil released can seem dramatic.

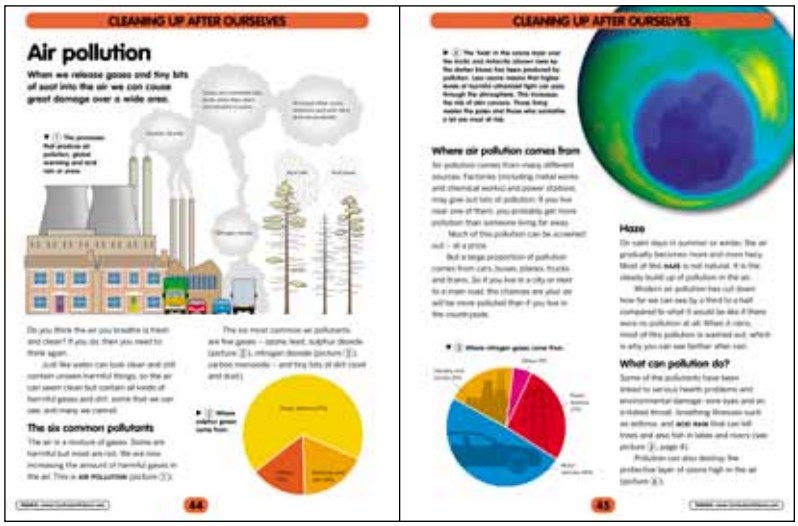
In fact, the pie chart shows that tanker accidents are not the main cause of this problem, but it is normal day-to-day poor handling of oil, such as by flushing tanks of oil ships or poor handling at petrol stations, which causes the most spills.

You might care to get students to redraw the chart from a pie chart into a bar chart to help focus on this.

The pictures on the left show the passage of an oil slick approaching the Spanish coast. The pictures on the right give vivid insights into the nature of the oil, and the difficulty of its disposal. You may wish to ask students to put themselves in the role of the people they see in the pictures.

Spread 21 (pages 44–45)

Air pollution



21

Air pollution is a serious problem in many ways. Some students may have experiences of asthma and other complaints directly produced by air pollutants. It may, however, be worth distinguishing between naturally occurring small objects in the air, such as the pollen grains that cause hay fever, and the materials put into the air by human activity.

The key things that students should know is that the six common air pollutants are ozone, lead, sulphur dioxide, nitrogen dioxide, carbon monoxide and tiny bits of soot and dust.

Most air pollution is produced by some form of burning. In the developing world it may be the burning of rainforests before cultivation, in developed places it will most likely by due to vehicle exhausts, power stations and heating or air conditioning systems.

Here again, some students might suggest that we ban all forms of burning, but as this is unrealistic, it might be best to direct the discussion to ways of reducing pollution, such as sharing cars on the school run rather than each child coming to school individually.

Air pollution affects not only our lives, but also those of other living things through the effects of acid rain. Carbon dioxide is also causing climate change, while the destruction of the ozone layer is causing increased risk of skin cancer. As a result, there is a tendency for the whole subject to appear miserable. This can be counteracted by talking about the small things we can do, on the principle that every little helps.

Reference

The last three pages of the book contain the glossary and the index.

Glossary (pages 46–47)

The entries in the glossary are listed in alphabetical order. The short definitions are given in simple language for the context in which they are used. They are, therefore, not necessarily the same as definitions given in an encyclopedia or dictionary.

Where necessary, more breadth is given to a definition (to make it encompass other meanings, or make the definition more general).

Index (page 48)


Index

A comprehensive index allows specific subjects to be found.

The index can be used to encourage research skills.

Section 3: Photocopiable worksheets

Introduction

The photocopiable worksheets in this *Teacher's Guide* have been designed to be a fast and efficient way of working through the study of the *Caring for our Environment* book.

It is intended that you photocopy each worksheet and distribute the photocopies for students to complete. The questions are on all the worksheets.

At the head of each worksheet are the relevant pages of the *Caring for our Environment* book. 'See pages 8 and 9 of Caring for our Environment', means that the answers to all of the questions can be found by using pages 8 and 9 of the student book. 'Based on pages 8 and 9 of Caring for our Environment' means that the worksheet is more of a practical activity based on the subject in the student book.

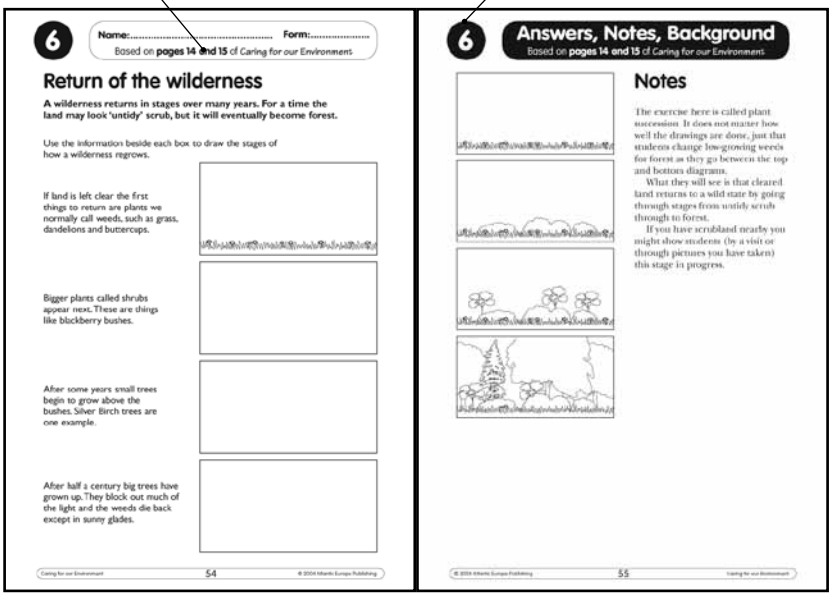
Each worksheet has been given a unique number, which is in a circle at the top of the page. If there is more than one worksheet per spread of the student book, then they are labelled **A**, **B**, etc.

The answers, if appropriate, face each worksheet. Here you will also find additional information that may help in class discussion.

Note that the first sheets contain simple diagrams that can be used for making up your own worksheets.

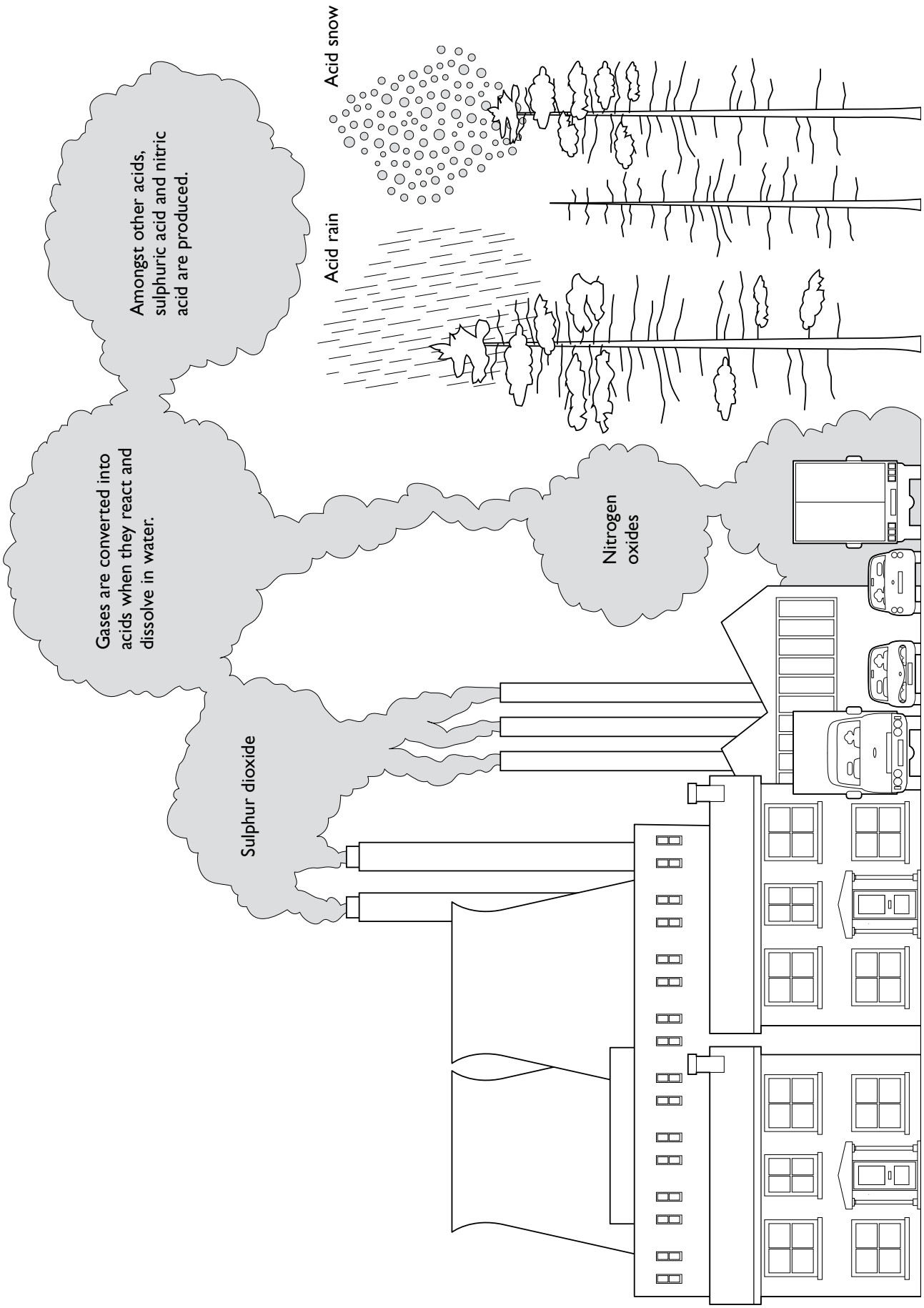
Refers to the page numbers in the student book to which the worksheets relate.

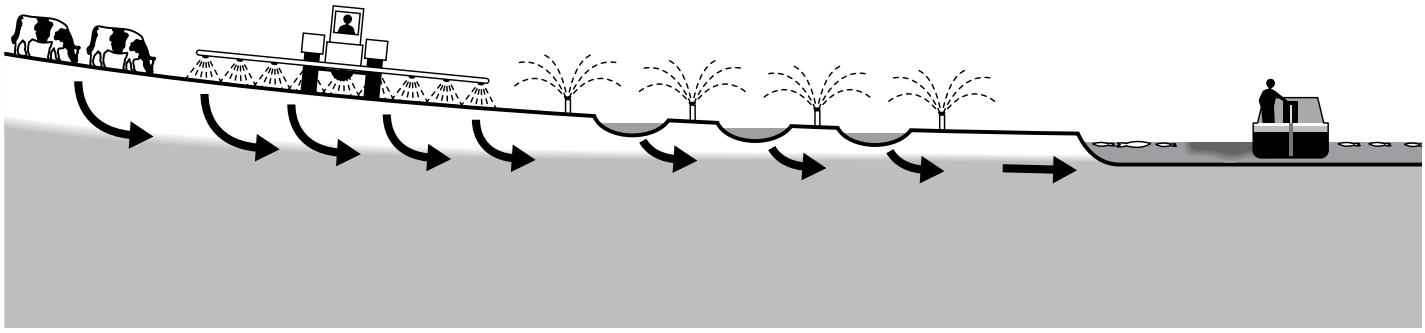
Worksheet number – may be labelled A, B, C, etc.

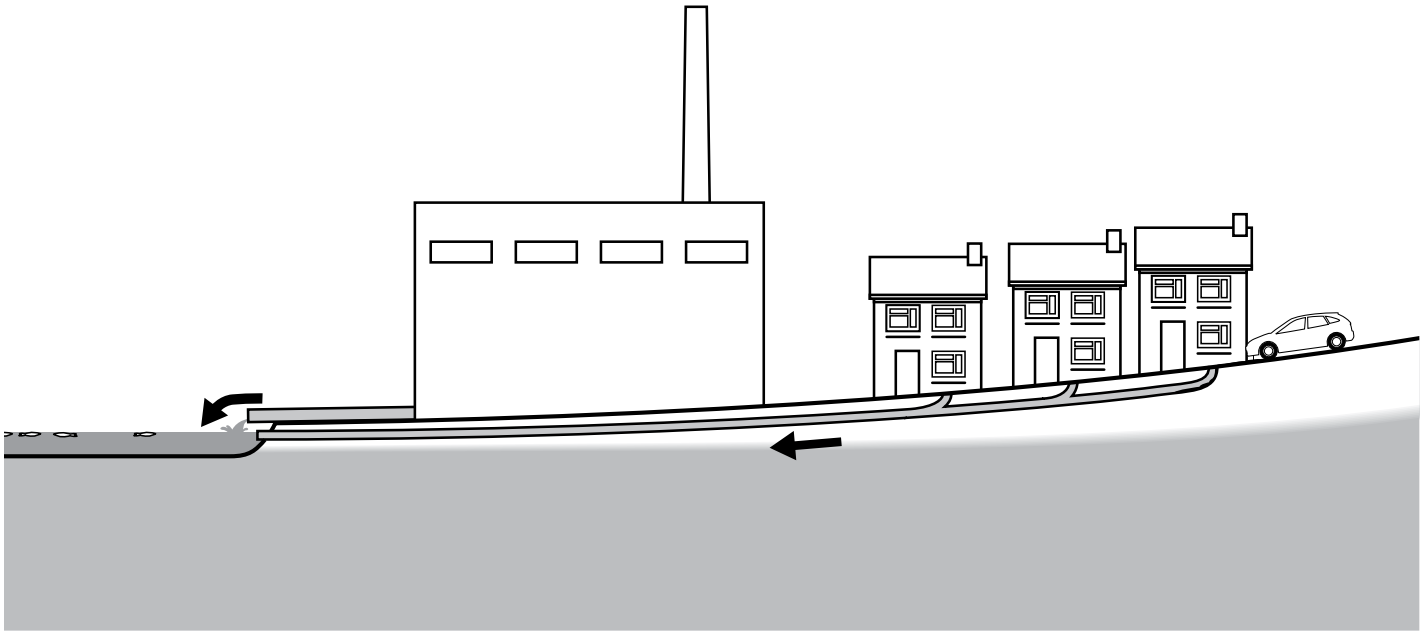


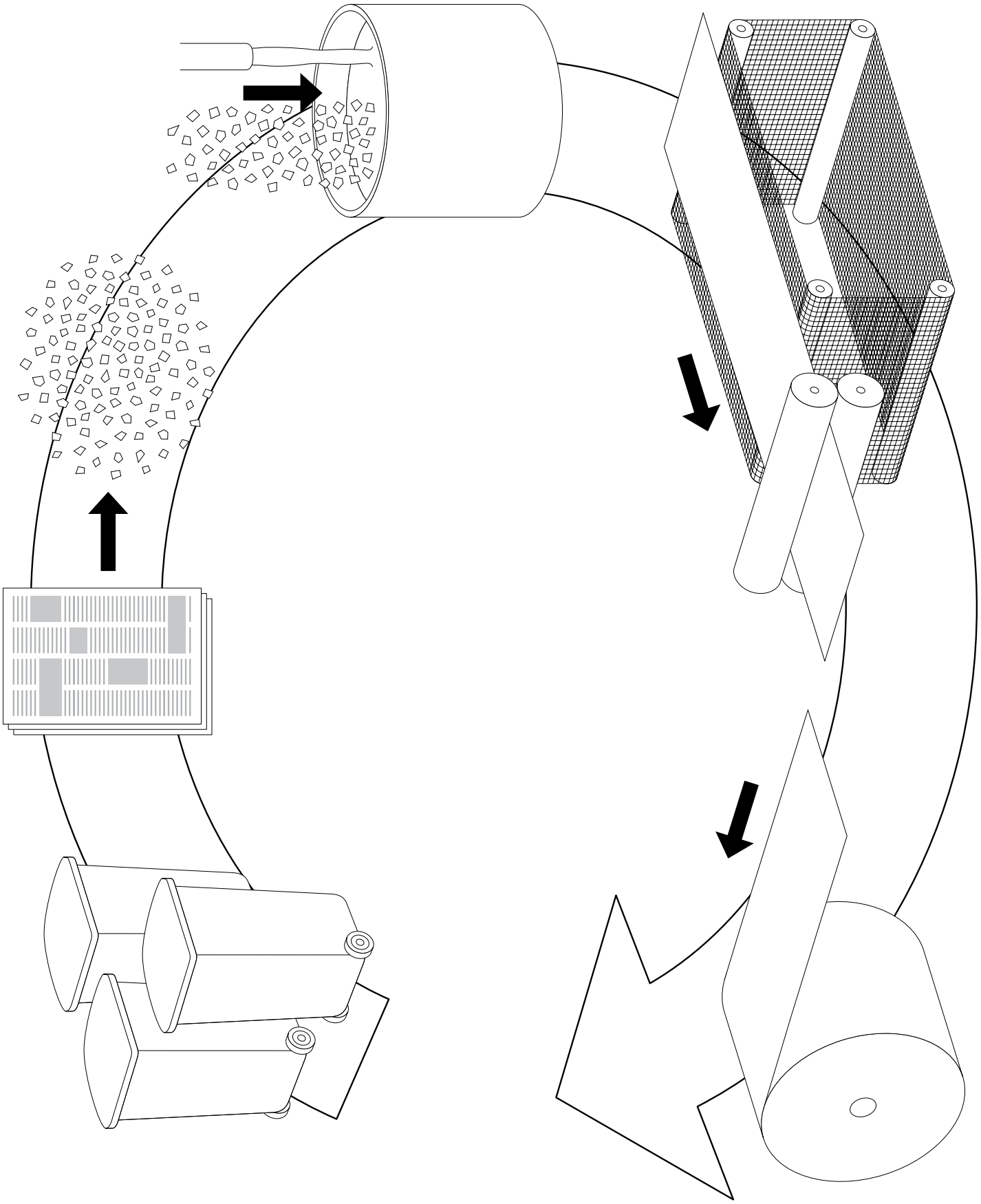
The left-hand page is to photocopy and hand out to pupils.

The right-hand page provides the answers and teacher's notes.


Acid snow
Acid rain
Amongst other acids, sulphuric acid and nitric acid are produced.
Gases are converted into acids when they react and dissolve in water.
Nitrogen oxides
Sulphur dioxide







LDPE

HDPE

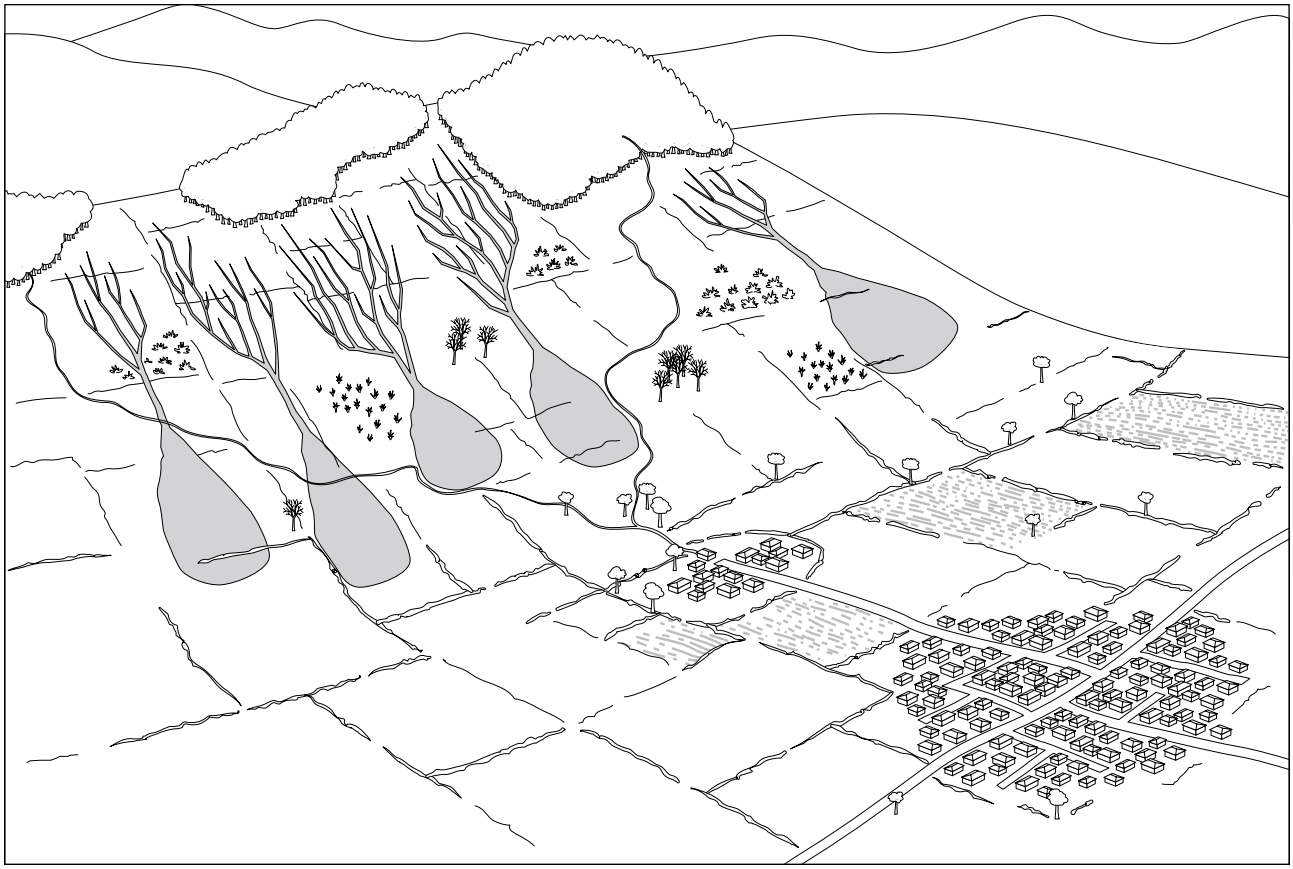
PETE

OTHER

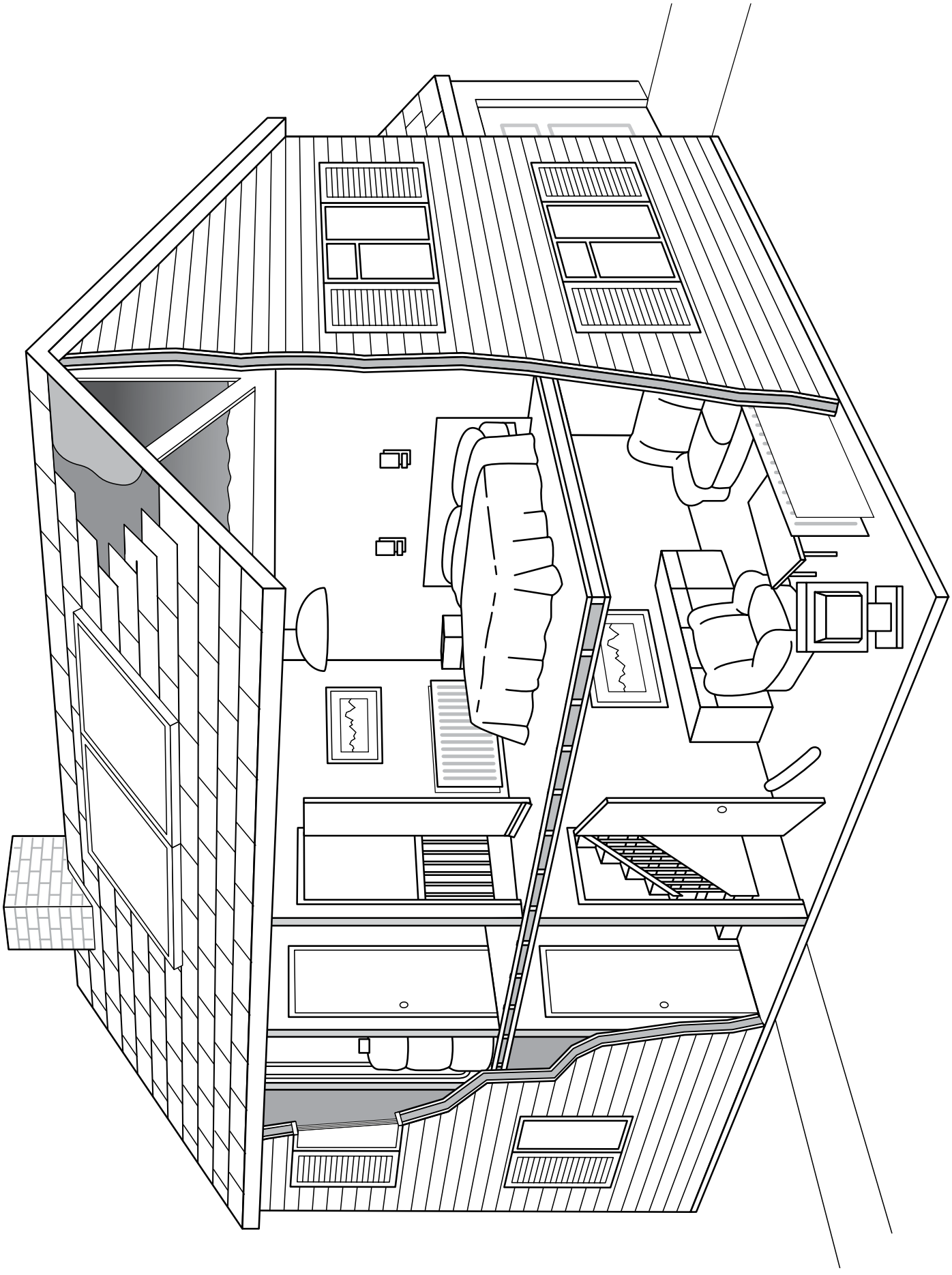
PP

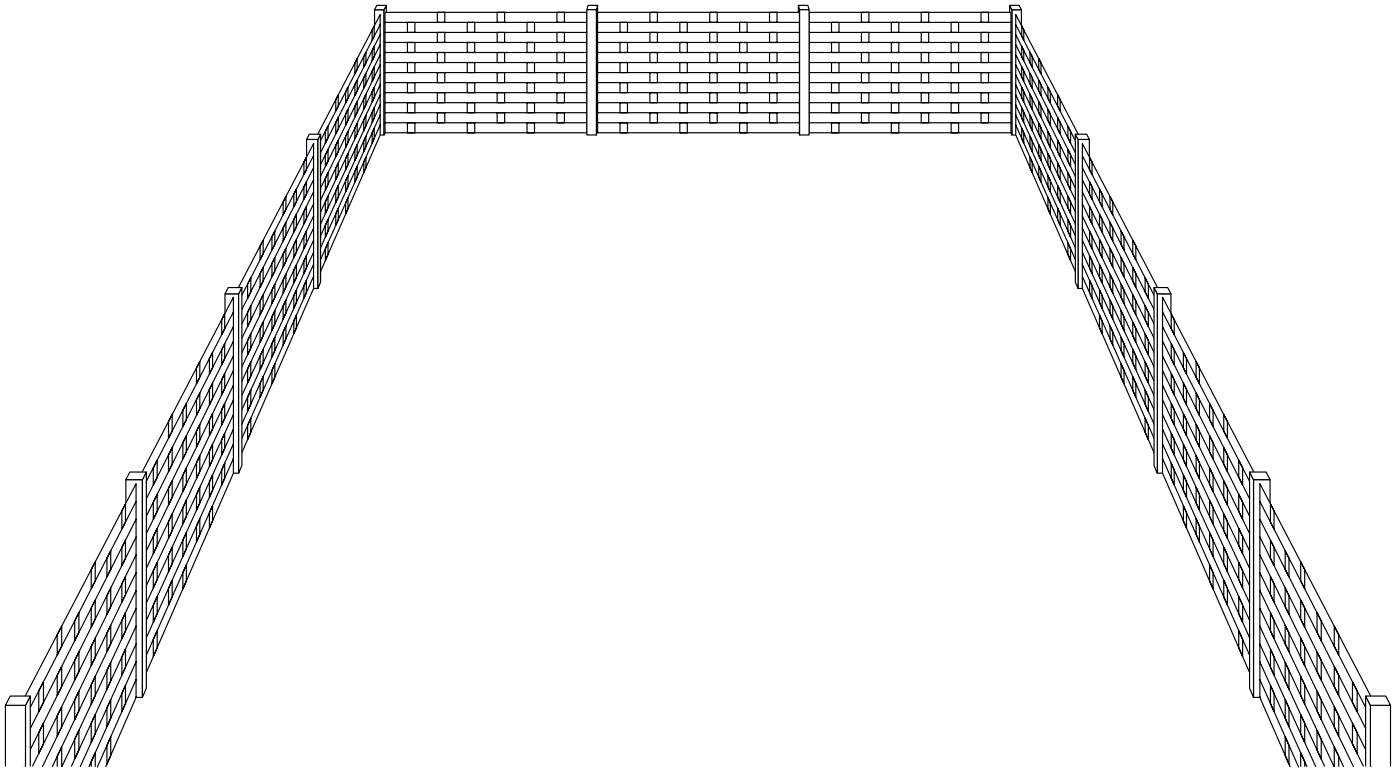
V

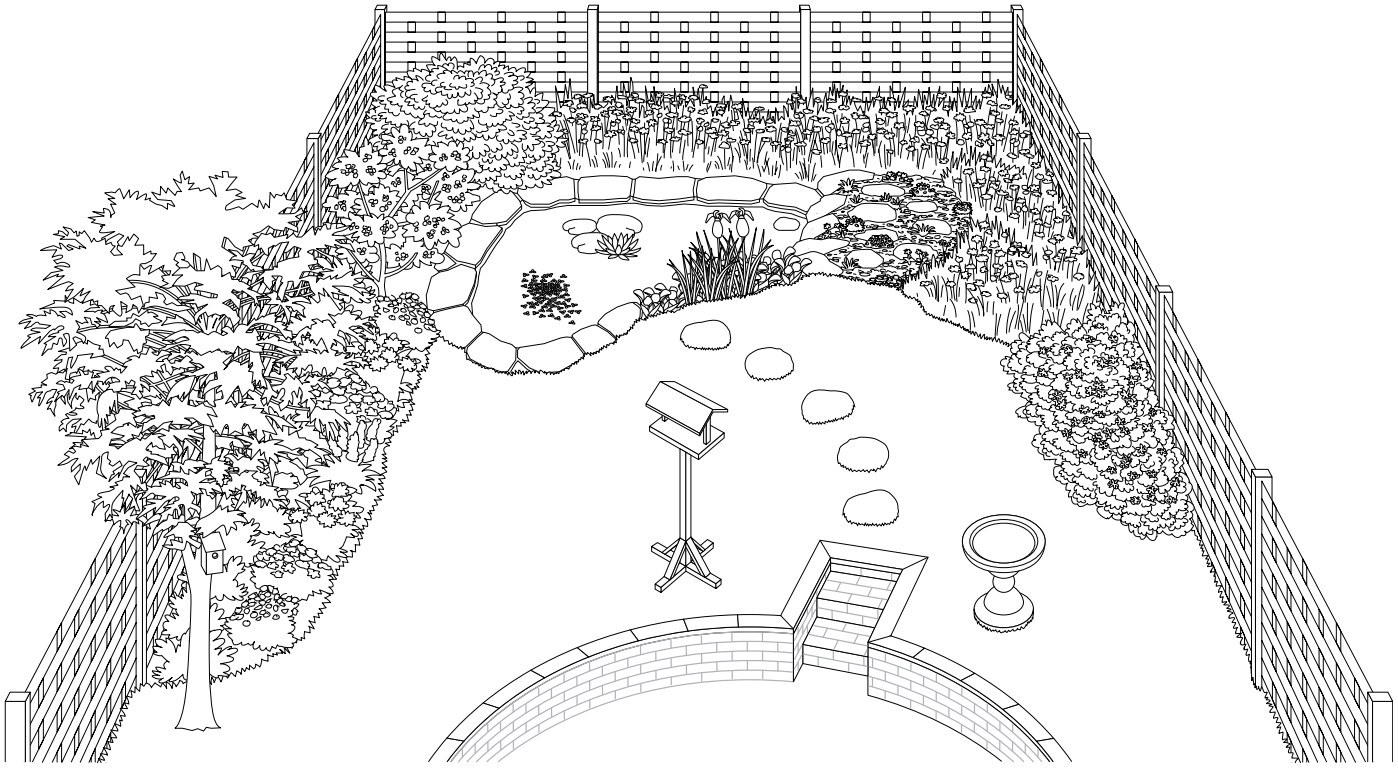
PS



Name:..... Form:.....







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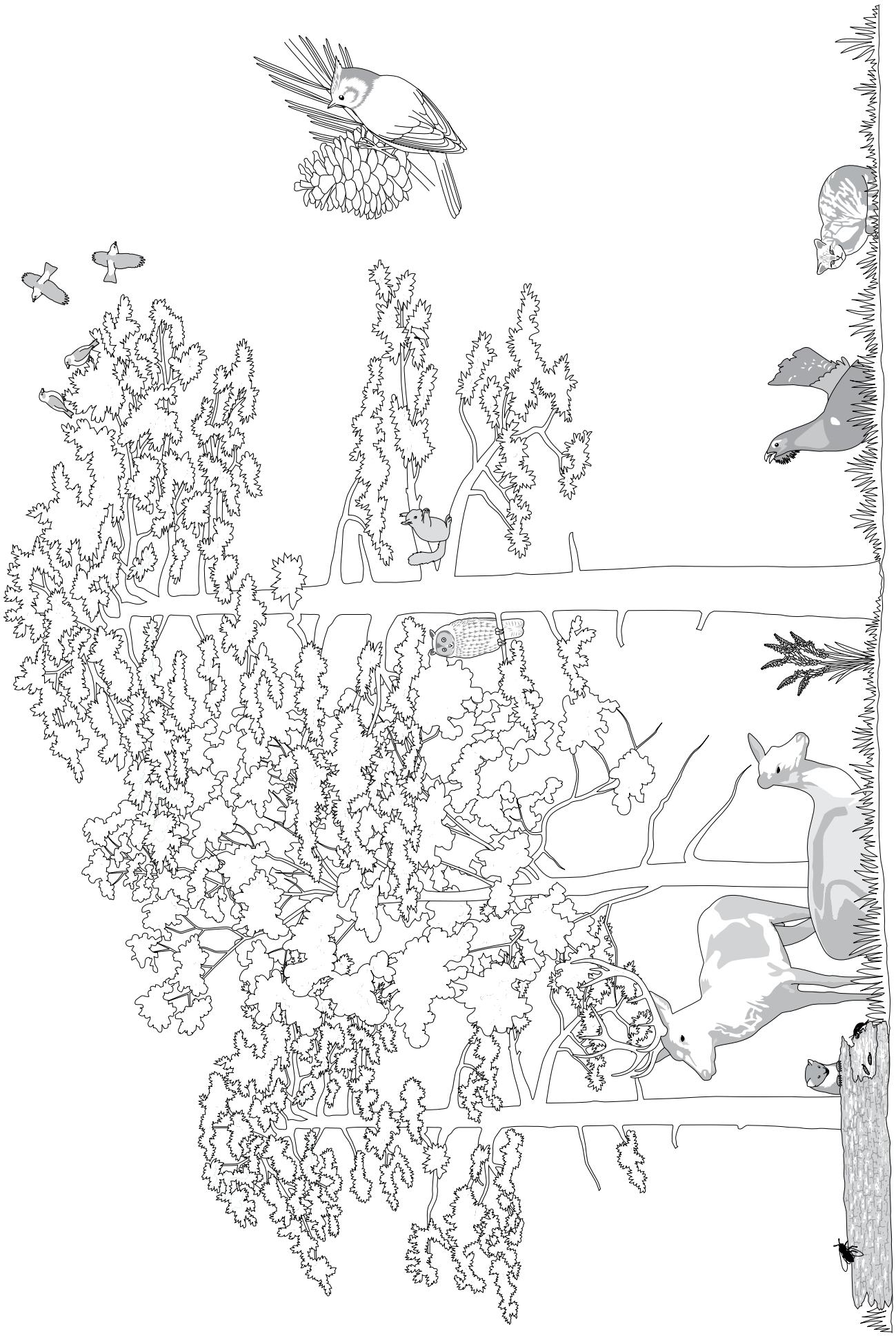


C I 1

Name:..... Form:.....

Based on **pages 4 and 5** of *Caring for our Environment*

One world: spaceship Earth

We affect all the environment around us, often in quite surprising ways.

In this space, make a drawing of a flower in a pot on a windowsill.

How do we affect the way this plant grows? One answer is already given for you, as an example.

✎ By keeping it indoors we change the amount of sunlight the plant gets.

✎ .....

✎ .....

✎ .....

✎ .....

1 Answers, Notes, Background

Based on **pages 4 and 5** of *Caring for our Environment*

Answers

Here are a few suggestions that students may come up with. There will be a lot more.

We change the amount of water it gets.

We determine the soil it grows in.

We determine whether the plant will be in dry air or moist air.

We determine whether the plant will be warm or cool.

By pruning it, we determine its size and shape.

We protect it from frost and so allow it to grow in a place where it might not survive in the wild.

By growing hybrids that look nice we might be growing infertile plants that cannot reproduce.

Notes

This worksheet takes an everyday living thing such as a plant in a pot, and helps students to realise that we control almost everything about the way it grows.

To visualise this better and to help students with their drawings, you might want to put a plant in a pot for students to draw.

If you want to extend this beyond the plant, you can notice that we have made the pot, the watering can we use and so on.

Name:..... Form:.....

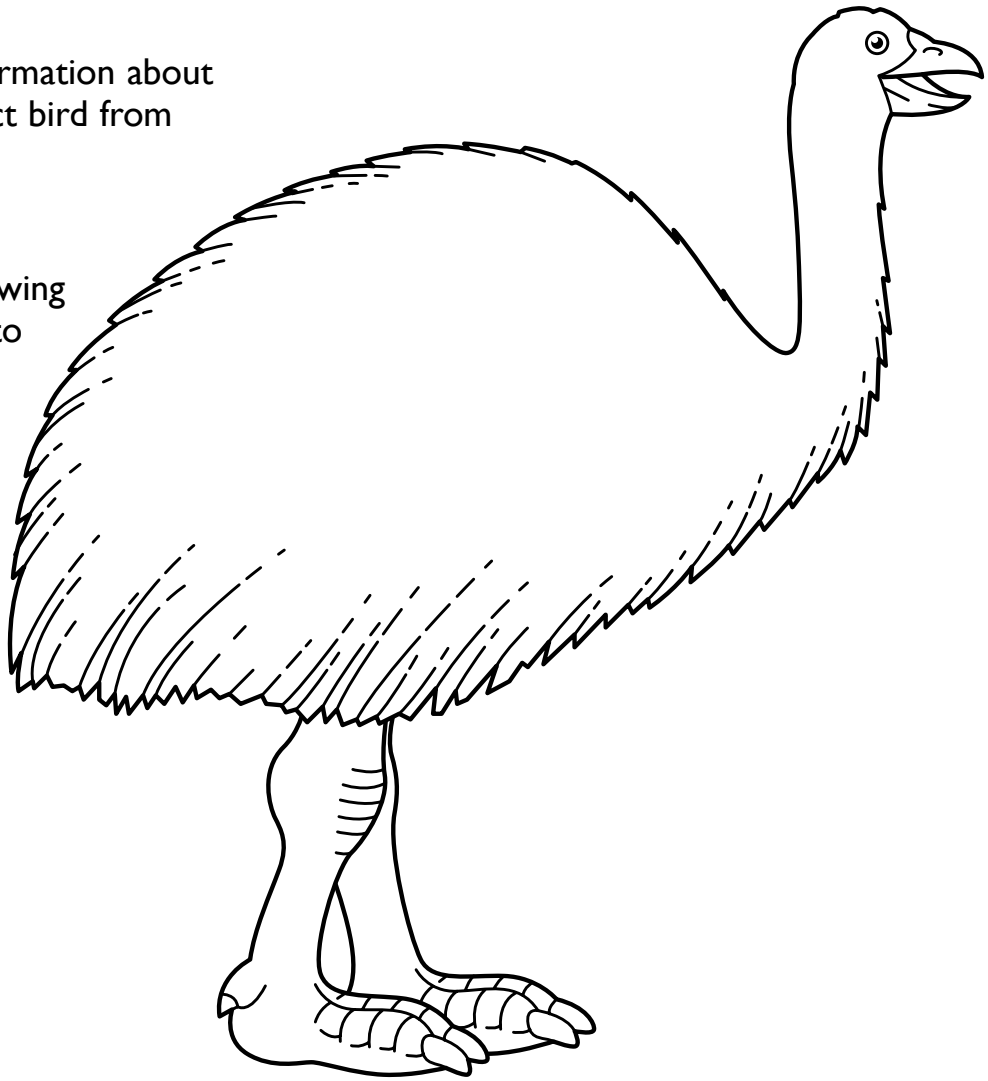
Based on **pages 6 and 7** of *Caring for our Environment*

Why living things become extinct

Living things become extinct quickly when they cannot compete with others around them.

Here is some information about the Moa, an extinct bird from New Zealand.

Make up a poster (and include a drawing showing yourself to scale) to explain to others what the Moa was like and what happened to it.



Giant Moa

The Giant Moa (pronounced moor) was 3m tall and weighed 250kg. This made it one the world's biggest birds ever. The Giant Moa lived in the forests of New Zealand. When the Maori people arrived in New Zealand in about 1150AD they found the Giant Moa good to eat, so they ate them to extinction. They did not try to farm them and make sure as many were reared as were eaten. When Captain Cook arrived in New Zealand in 1769 the Giant Moa had already been extinct for 150 years.

2 Answers, Notes, Background

Based on **pages 6 and 7** of *Caring for our Environment*

Answers

Varies with ingenuity of student.

Notes

There are, of course, two quite different causes of extinction. There are slow extinctions, due to natural changes in the climate or environment, or the way that one species can out-compete another. There are also rapid, natural mass extinctions such as the meteorite impact or whatever else caused the extinction of the dinosaurs. In the context of this book we are, however, talking about the way that extinction has been induced by human activities.

To get students to understand this, you might care to introduce the current argument over the conservation of fish stocks. Governments are saying that they must reduce catches or extinction may follow. On the other hand, fishermen are saying that reducing their catches will endanger their livelihoods. The two sides have a long and short term view respectively. Short term views are more liable to lead to extinction today just as they did in the past.

Not all extinctions are due to intentional slaughter, as the dodo shows, so students have to be aware that extinction can be caused by unthought through side effects as well as intentional effects.

Name:..... Form:.....

Based on **pages 8 and 9** of *Caring for our Environment*

Endangered species

Over 99% of all species that ever lived are now extinct. But there is a difference between becoming extinct naturally and becoming extinct as a result of the activities of people.

One good way to help prevent species from becoming extinct is to make their plight better known.

Here is some information about the blue whale from the research of other children.

Read this extract and then:

(a) Check that they got their facts right by finding out about the blue whale in books, CD roms and on the Internet.

(b) Make a poster to illustrate one of the points they have made about why the species in endangered.

Blue whale

The blue whale is a mammal. The blue whale's body can grow to 30 metres long. It weighs more than 100 tonnes and is the largest mammal alive. It eats the smallest ocean life called krill and plankton. In the winter the blue whale migrates to the warm waters of the tropics. The food in the tropics is running out. So the blue whale depends on its blubber to stay alive.

The blue whale is endangered for two reasons. Those reasons are water pollution and hunting. Water pollution means the people are throwing rubbish and toxic waste in the water. So the fish eat it, and the blue whales eat them and they get sick and die.

Hunting means that people are getting together on a boat, and taking their guns and shooting them. Sometimes people kill them to make oil, pet foods and glue. But that is bad, so there should be laws against hunting blue whales.

3 Answers, Notes, Background

Based on **pages 8 and 9** of *Caring for our Environment*

Answers

This depends on the nature of the topic chosen.

Notes

This activity allows practice in assimilating knowledge and then communicating it to others.

The students are asked to read a passage of text. But instead of taking it for granted, they are asked to check the facts. This is, of course, what they should always do with new pieces of information. So here they learn interpretive and research skills. Checking facts is always vital in dealing with emotive issues such as endangered species.

They may find that they do not agree with all aspects of the extract. They should be encouraged to check the facts from as many sources as possible to get a consensus. If the consensus does not agree with the extract, then the information in the extract should be rejected.

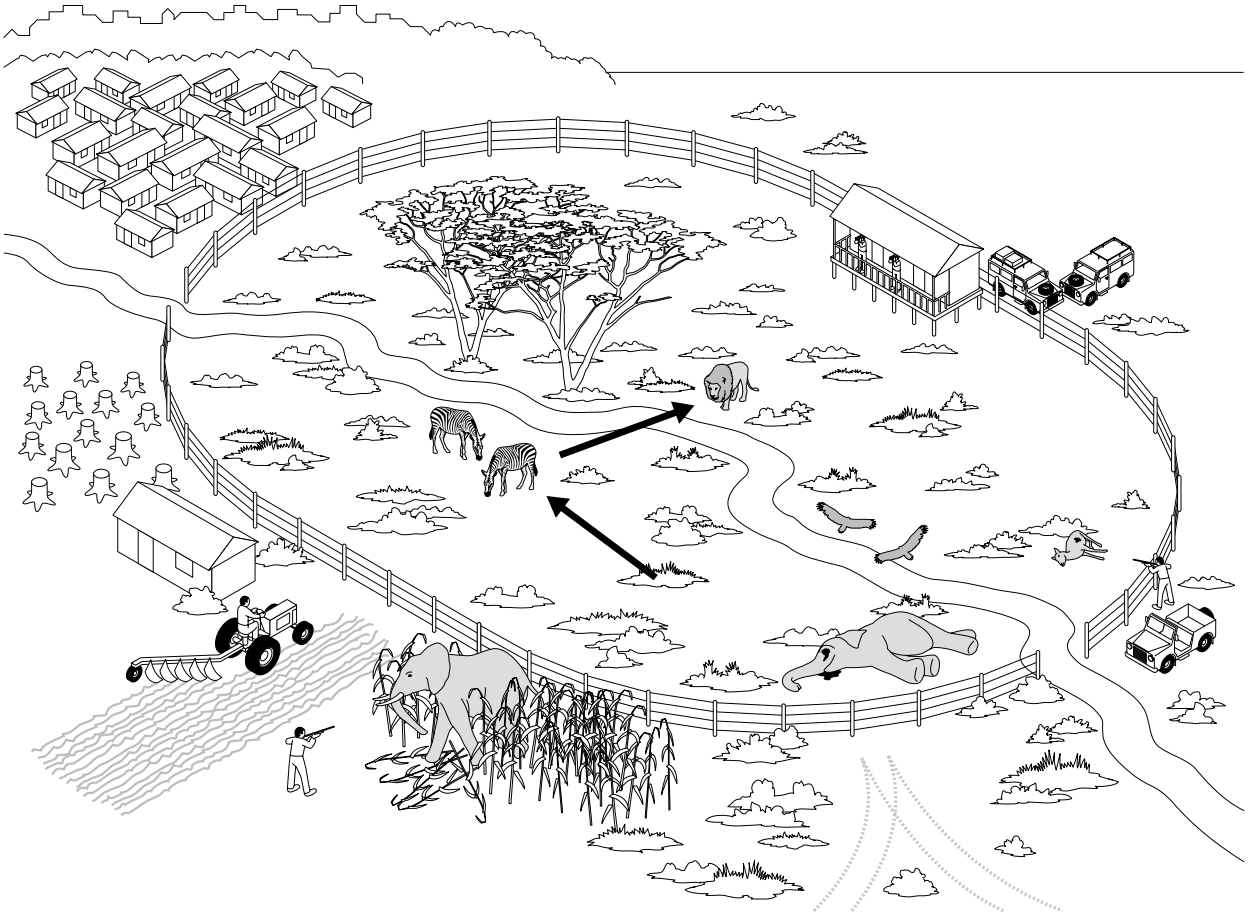
In making a poster, students must be careful to follow the instructions. Some students will simply produce a diagram of a blue whale, but what is required is a poster describing one reason why the whale is endangered.

Name:..... Form:.....

See **pages 10 and 11** of *Caring for our Environment*

The many threats to all animals

Wild animals are threatened as people use up more and more land.



Q1. The arrows show what is eaten by what (this is called a food chain). The arrows point to grass, a lion and a zebra. Write these in order of what eats what.

✎ .....

Q2. Why is there a fence around the game park?

✎ .....

✎ .....

Q3. Why is it easier to have a game park in Africa than in the UK?

✎ .....

✎ .....

4 Answers, Notes, Background

See **pages 10 and 11** of *Caring for our Environment*

Answers

1. **Grass is eaten by zebras which are eaten by lions.**
2. **To keep people and game apart. Without it, people might start to farm the game reserve and large animals like lions might eat farm animals.**
3. **In order to have a viable game park, there has to be sufficient space for the top carnivores to breed successfully. Top carnivores need a very large territory and this is generally not available in the UK. It should be pointed out to students that safari parks are not game parks, because they do not provide an environment in which animals can find their own food or breed in an unrestricted way.**

Notes

You may wish to make more of this diagram, perhaps by beginning with a diagram of a sample food chain (examples can be found in the book *Living Things in their Environment* in the *Curriculum Visions* series).

Students can then notice how real food chains also contain decomposers. For example, in Africa, vultures often begin the process of dealing with dead animals.

You may also care to consider each aspect of the threat to animals separately. You can consider:

- Encroachment on wilderness due to farming.
- The fact that some animals trample fields and so get shot.
- The hunting of animals for ivory, fur and so on.
- The loss of suitable habitat as a result of cutting down forests.
- The encroachment of urban areas.

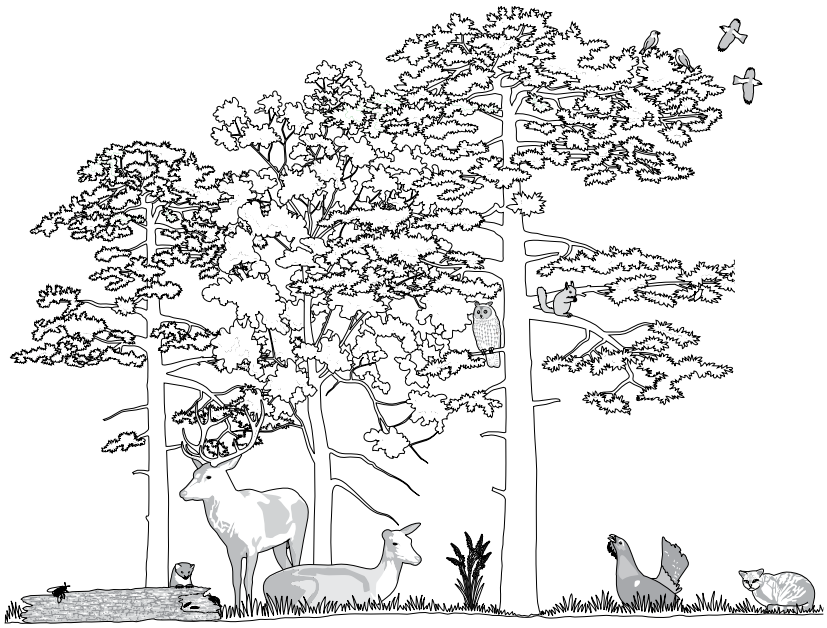
Students may be able to think up more.

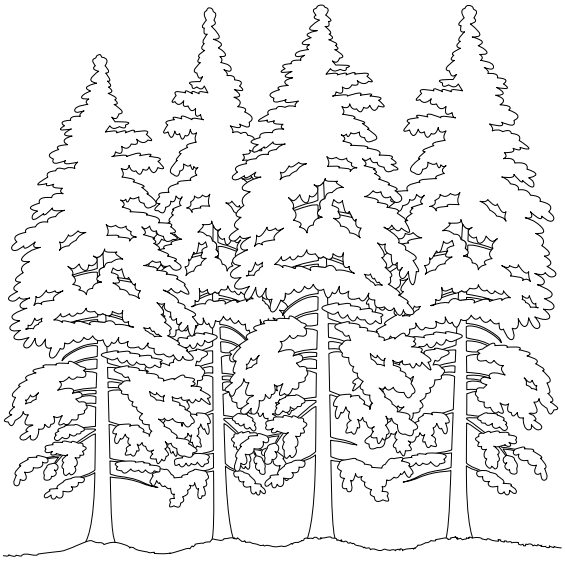
Name:..... Form:.....

See **pages 12 and 13** of *Caring for our Environment*

Endangering our forests

Changing the forests can take away homes of many animals.





What has changed between the picture on the left and the one on the right?

List as many differences as you can.

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

5 Answers, Notes, Background

See **pages 12 and 13** of *Caring for our Environment*

Answers

The trees on the left are of different species; those on the right are all the same.

The trees on the left are more widely spaced than those on the right, giving the chance for more light to reach the forest floor.

The spacing of the trees on the left is varied, while those on the right are all the same. Varied spacing creates more habitats.

The forest on the left supports a wide variety of animals, because there are many different things to eat, while the forest on the right supports few animals because there is little diversity of food.

Notes

The emphasis here is on showing that the natural environment contains a rich diversity of living things because it is varied in character. The plantation represents a much more restricted environment because all of the trees are the same species and because they are packed together.

You can extend this argument to many other places, for example a park, a farm field, or a garden.

There is more on gardens later in the book.

Name:..... Form:.....

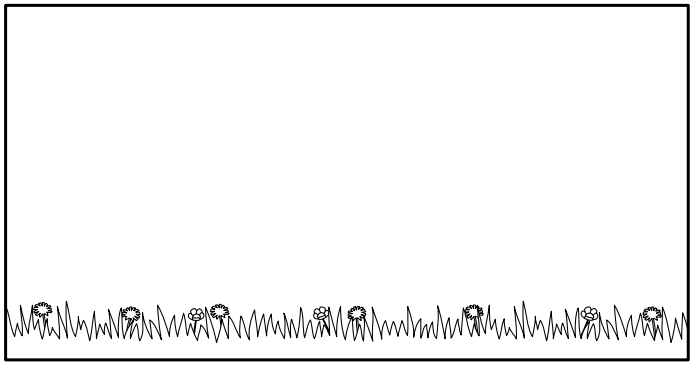
Based on **pages 14 and 15** of *Caring for our Environment*

Return of the wilderness

A wilderness returns in stages over many years. For a time the land may look 'untidy' scrub, but it will eventually become forest.

Use the information beside each box to draw the stages of how a wilderness regrows.

If land is left clear the first things to return are plants we normally call weeds, such as grass, dandelions and buttercups.



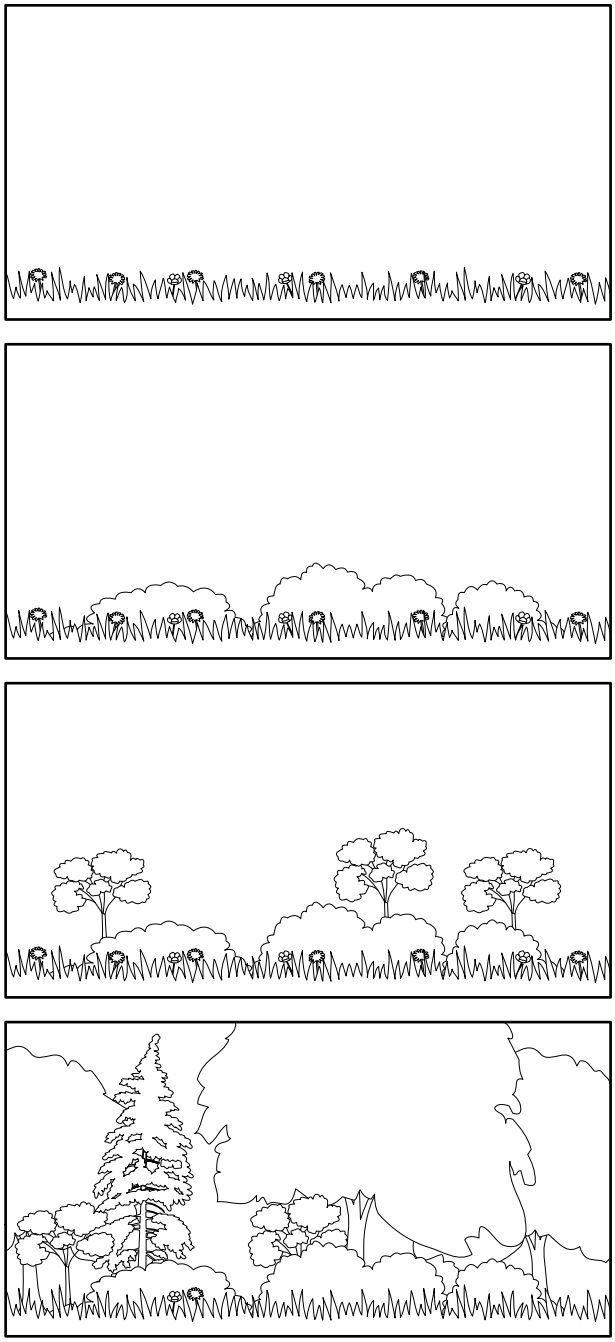
Bigger plants called shrubs appear next. These are things like blackberry bushes.

After some years small trees begin to grow above the bushes. Silver Birch trees are one example.

After half a century big trees have grown up. They block out much of the light and the weeds die back except in sunny glades.

Answers, Notes, Background

Based on **pages 14 and 15** of *Caring for our Environment*



Notes

The exercise here is called plant succession. It does not matter how well the drawings are done, just that students change low-growing weeds for forest as they go between the top and bottom diagrams.

What they will see is that cleared land returns to a wild state by going through stages from untidy scrub through to forest.

If you have scrubland nearby you might show students (by a visit or through pictures you have taken) this stage in progress.

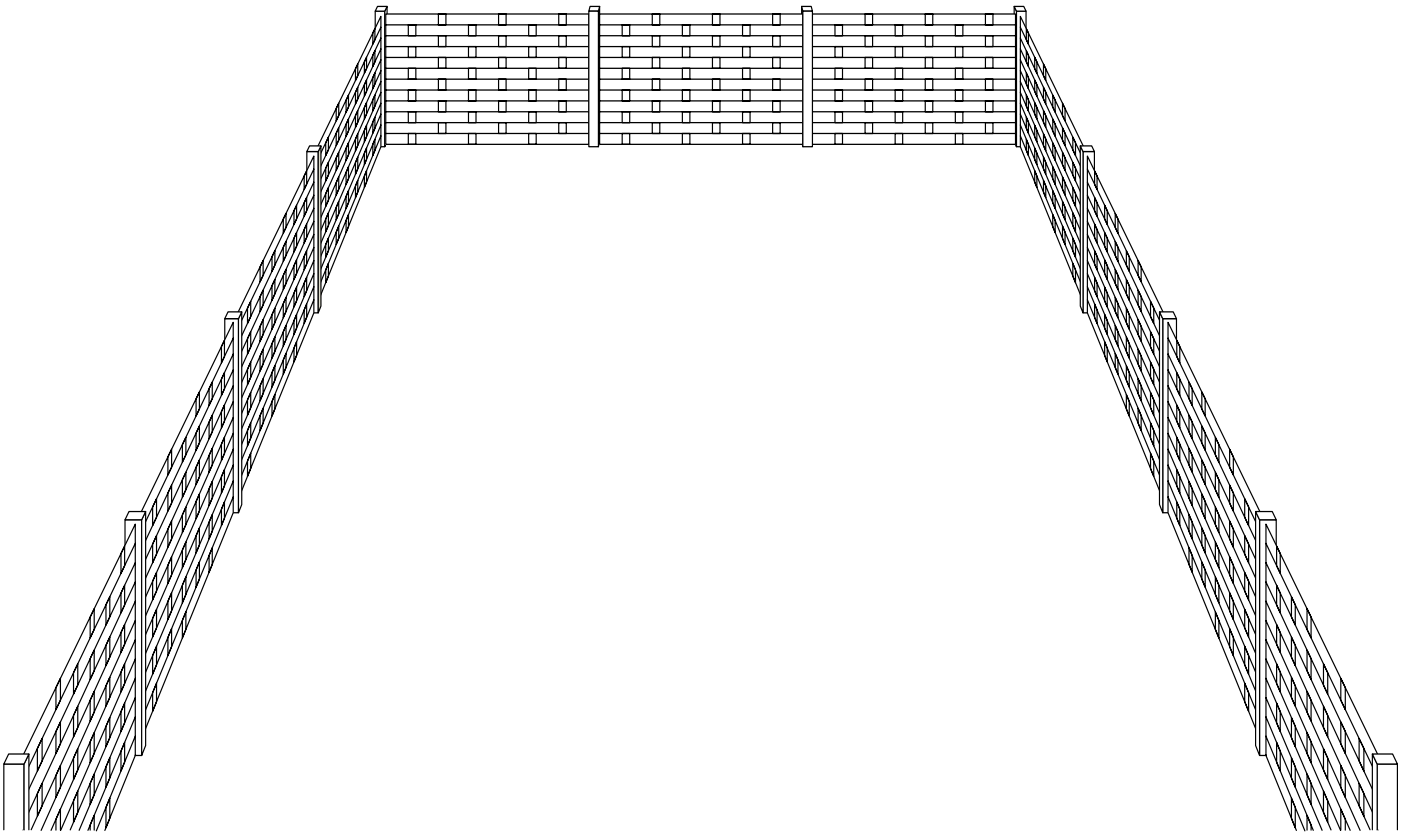
Name:..... Form:.....

See **pages 16 and 17** of *Caring for our Environment*

A garden for all

A garden can also be a home for wildlife – if you let it.

Here is a plain lawn and a fence. Draw on to it your design of a wildlife garden that you can still use, but you can share with other living things.



Explain here what you have designed.

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

7 Answers, Notes, Background

See **pages 16 and 17** of *Caring for our Environment*

Answers

The design will depend on the student. But the student must show how they meant the garden to be attractive and also suitable for a variety of wildlife.

Notes

This is a marvellous opportunity for students to design their own garden. It might form the core of a substantial whole class project where you investigate the flowers and other plants in a garden centre, or through a catalogue, and then 'plant' them on your paper garden so as to provide a diversity of environments.

The example in the book is just one of many.

Students could also make cut-out plants and fences and so change the shape of their garden by moving the cut-outs about on a paper garden plan.

Name:..... Form:.....

Based on **pages 18 and 19** of *Caring for our Environment*

Better ways to look after plants

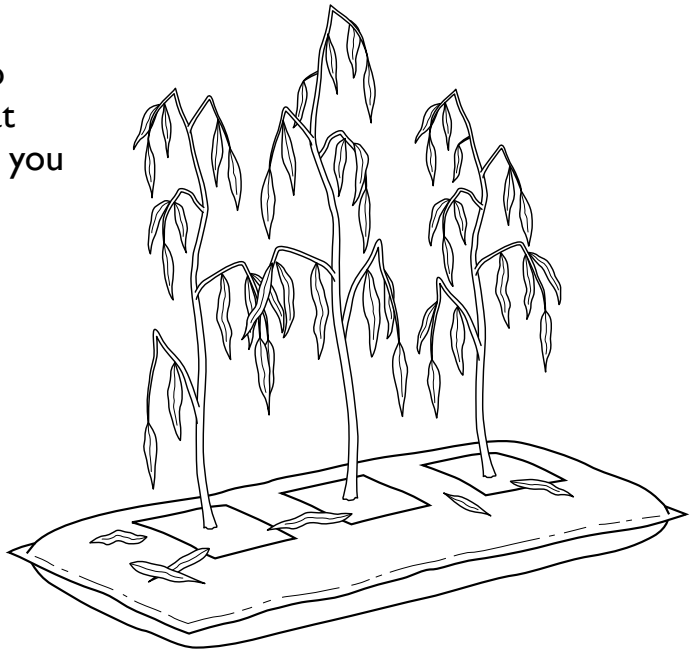
Growing plants in pots and gardens, like farms, can be more or less friendly to the environment.

Q1. A plant in a pot needs water and sunlight. What else does it need to grow healthily?

✎ .....

✎ .....

Q2. Here is a growbag. The tomato plants growing in it are now dying at the end of the season. What should you do with the bag?



✎ .....

✎ .....

Q3. Find out how to make a compost heap.

How could you compost dead plants using just a dustbin?

✎ .....

✎ .....

✎ .....

8 Answers, Notes, Background

Based on **pages 18 and 19** of *Caring for our Environment*

Answers

1. **A source of nourishment (usually found in fertile soil, but may come from compost bought in a garden centre).**
2. **Putting it out with the rubbish is a very unfriendly thing to do. Students might suggest tipping the contents onto the garden beds, or composting the plant remains (including roots).**
3. **This is a real challenge. It involves the ideas of keeping minibeasts (decomposers) healthy as well as creating the compost. Compost heaps can be made in dustbins if the dustbins have aeration holes and are kept to one side of the garden. The compost needs to have soil with microbes in it added, or special compost activators can be bought.**

   The purpose of the question is to promote the idea that organic gardening is possible in the city just as it is in the country.

Notes

This worksheet is transferred from farmland, which is not in the day-to-day experience of most students, to gardens and even window boxes, which are much more familiar.

In fact, in many ways, a pot or a tub provides a much better example of how to work with nature because there is a tendency to throw dead plants and their pots into the waste bin rather than recycle the contents, and to use artificial fertilisers and pesticides rather than organic versions.

Name:..... Form:.....

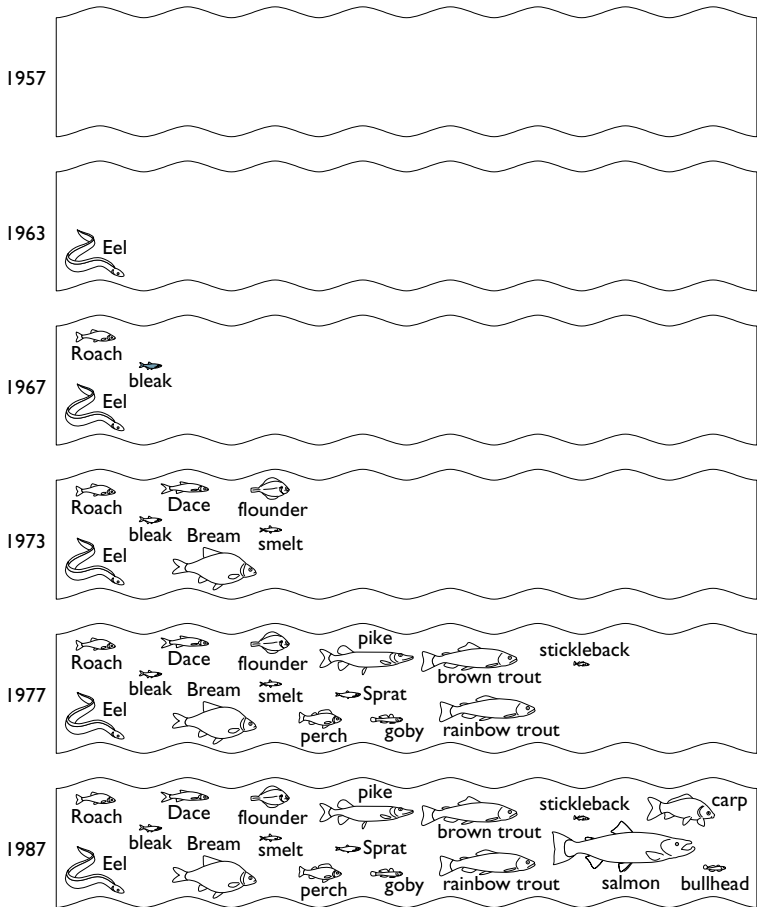
Based on **pages 20 and 21** of *Caring for our Environment*

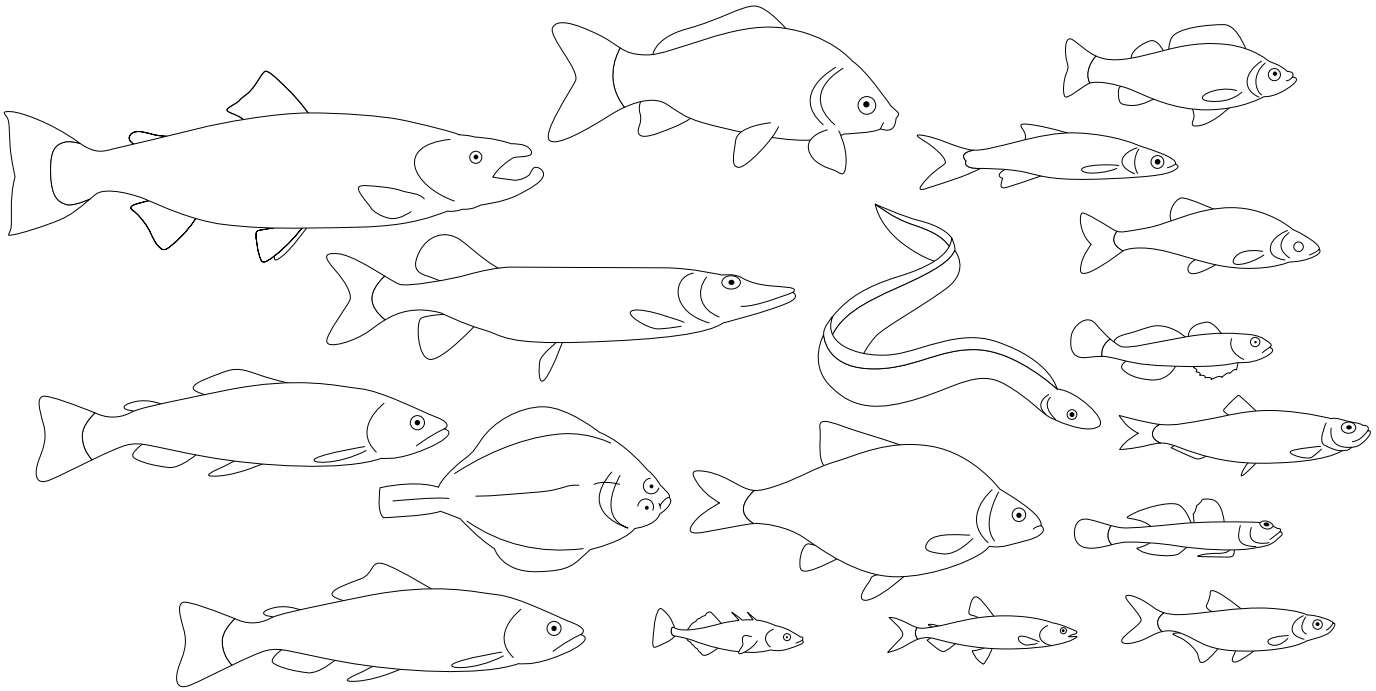
It's easy to destroy a river

It's good news when a river adds to its variety of living things.

This diagram shows how the variety of living things in the River Thames has increased. But not everyone might be able to understand the diagram.

Make up a poster that shows the same idea, but more cheerfully and clearly. Use the outlines of fish below to help you (copy them and colour them in then stick them to your poster).





9A Answers, Notes, Background

Based on **pages 20 and 21** of *Caring for our Environment*

Answers

Depends on the inventiveness of the children.

Notes

This is an attempt to get children to reinterpret data in a different form for a different audience.

If you want to get students to do an electronic project to make up, for example, a pretend web page, then you will need digital images of the fish. You will find these in the 'Caring for our Environment' section of our web site. Go to **www.curriculumvisions.com** and click down to page 20.

As extension work, you could get students to work out some food chains from the pictures on pages 20 and 21 and see that there are more food chains on page 21 than on page 20.

Name:..... Form:.....

Based on **pages 20 and 21** of *Caring for our Environment*

It's easy to destroy a river

It is usually far easier and quicker to destroy than to build.

You need to be at a computer with access to the Internet. Open a browser, such as Internet Explorer and type in www.google.com or the name of another search engine of your choice.

Enter the word "Conservation" in the search engine and press OK.

Look down the list that appears until you find a conservation group. Name your selected conservation group and the country it is in.

✎ .....

✎ .....

From the conservation group web site, explain what their aims are and how they are going about it.

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

9B Answers, Notes, Background

Based on **pages 20 and 21** of *Caring for our Environment*

Answers

There are no specific answers because it depends on the group chosen.

Notes

Students may need some guidance as they work so that they do not get side tracked by detail. They only need to write down a brief description of the group.

On the other hand, the material could form the basis for a project, or for creating an electronic answer sheet. By copying and pasting text from the selected web site into a new document, the student could create an introduction to the target web site.

Skills include copying text and images, and creating a new document with suitable arrangement of fonts and so on.

Name:..... Form:.....

Based on **pages 22 and 23** of *Caring for our Environment*

We can't help consuming

We can't help consuming, but we can at least reduce the bulk of what we send to the dustbin, reuse items or recycle them.

Managing waste is all about the 3Rs: **Reuse** (what you can), **Recycle** (as much as possible) and **Reduce** (the bulk of your waste), by choosing things that can be recycled.

Make up a poster to show this using these letters.

R

R

R

Answers, Notes, Background

Based on **pages 22 and 23** of *Caring for our Environment*

Answers

This depends on the ingenuity of the students. They could just use text, but you could also encourage them to use small pictures. For example, under reduce they could show six plastic shopping bags, each with one item, and then all six items in just one shopping bag – reducing the amount of plastic bags that will get thrown away.

Discuss with students whether the order of the 3Rs is important. Can they see any difference if the order is changed?

Notes

This is such an important idea that it is even worth making up into a drama, or making poems that start with the 3Rs.

Try to use the 3Rs as you continue the teaching, so that it is reinforced.

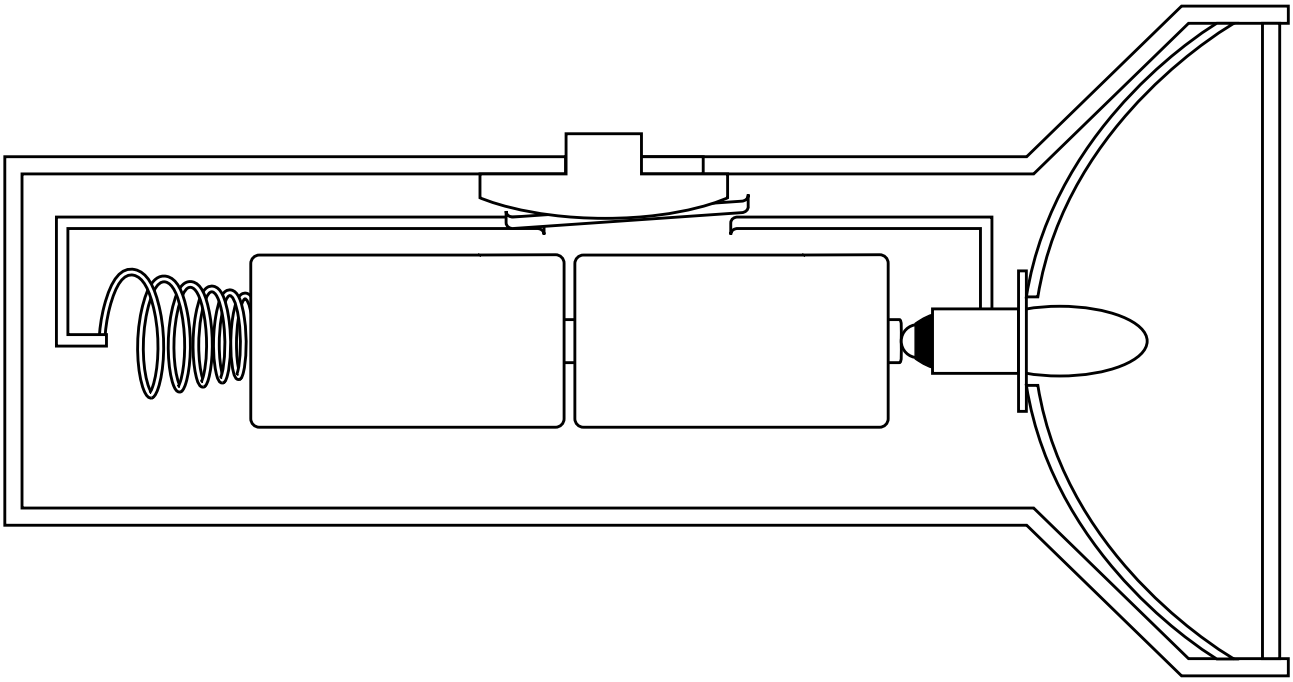
Name:..... Form:.....

Based on **pages 24 and 25** of *Caring for our Environment*

When we turn on a light

Before we can turn on a light, all kinds of resources have to be used.

Q1. Look at this diagram of a torch. Find out what each part is made of. Make sure you include the batteries.



Q2. Now organise the material you have discovered into these types:

Plastic	Metal	Glass	Chemicals
✎.....	✎.....	✎.....	✎.....
✎.....	✎.....	✎.....	✎.....
✎.....	✎.....	✎.....	✎.....

Q3. Write which materials are recyclable.

✎ .....

Answers, Notes, Background

Based on **pages 24 and 25** of *Caring for our Environment*

Answers

This will depend on the torch, but in general the case will be made from plastic, the connecting strips, the reflector, the bulb base and the switch will be made from metal, the bulb will be made from glass and the batteries will be made from a metal casing and have a mixture of chemicals inside.

(For safety reasons, do not let students open batteries. They can find out what they contain from the companion *Curriculum Visions* book, *The Electricity Book*, or an encyclopedia.)

At the end, they will see that the act of making a torch bulb light has required a range of resources to be made into products, and for the chemical energy in the batteries to have been changed into electricity, which then flows in a filament and makes light.

Notes

This is a cross-curricula topic that can involve physical science. Students can explore the world of light making, and in particular the torch.

It is important that they think about the torch in a number of ways. They should be encouraged to think of the torch as a piece of clever engineering, as well as a means of converting one kind of energy to another.

They should also think about whether there are any obvious ways in which the resources could be used more economically. For example, the metal contactors could be made thinner, less material could have been put in the plastic case. But then they should see that if the metal is too thin it might break easily and cause faults. If the case was lighter weight it might crush or crack more easily. So they can see that a number of factors need to be taken into account when designing an object.

They can also ask about how easy it is to recycle the materials. Can the metal inside readily be pulled out from the plastic case, for example.

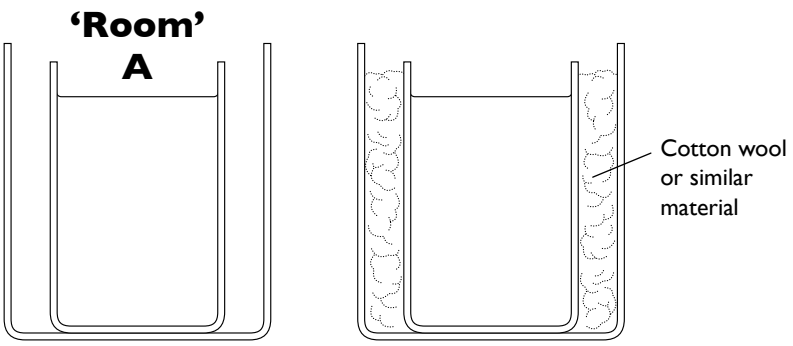
Name:..... Form:.....

Based on **pages 26 and 27** of *Caring for our Environment*

Saving energy at home

What is an insulating material and how good is it?

Set up four containers to make your two 'rooms', 'Room' A and 'Room' B – as shown in the diagram.



Pour the same amount of very warm water into the middle container inside each 'room'.

Take the temperature of the water in each 'room' and fill in the first line of the table.

Time (mins)	Temperature in 'Room' A °C	Temperature in 'Room' B °C
0		
5		
10		
15		
20		
25		
30		

Every five minutes, take the temperature of the water in each container and record it in the table.

Make a graph or chart of your results.

What do your results show?

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 26 and 27** of *Caring for our Environment*

Answers

This will vary with the apparatus used.

The results show that the insulating materials stop heat from leaving a warm room. As a result, they show that the use of insulation materials saves energy.

You could extend this by asking students to find out about any insulation material they might have at home.

Notes

For this activity it would be helpful to have a number of different materials available, such as some metal sheets (aluminium foil) which make poor insulators, and also good insulation materials that you can get from a home improvement centre such as a sheet of polystyrene foam, fibreglass insulation and shredded paper insulation. You can also use cotton wool, pieces of knitting and other materials that students might think are good at insulating.

To make model rooms to test these materials you will need four beakers per group of students, two small and two large. The tests of a control (no insulation) against an insulation material will be a fair test.

You will also need two thermometers per group of students.

The small beakers are filled with warm water (not boiling, to prevent risk of scalding). Hot water from a tap might be a suitable source.

Make sure that students can recognise that they are testing these materials on a model, and that the small beaker represents the warm room and the large beaker the outside of the house. The space between them is the wall and its cavity.

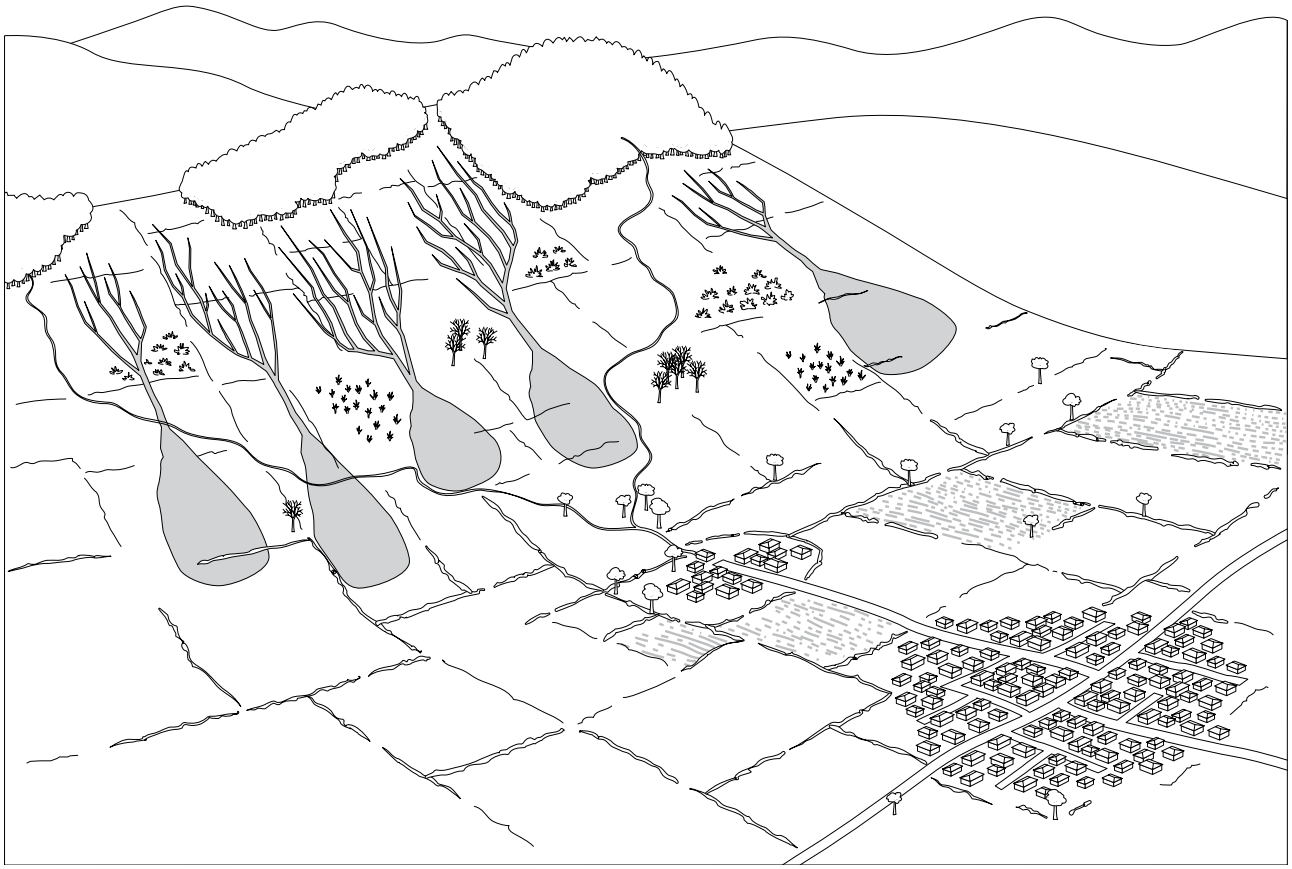
To continue with a fair test, the temperature of the water in each experiment must be the same. Students may need reminding that the temperature must only be read when the liquid in the thermometer has steadied.

Name:..... Form:.....

Based on **pages 28 and 29** of *Caring for our Environment*

Saving energy, land and trees

When you are poor, you use whatever energy you can find.



Imagine you are a student at a school in the village shown in the diagram. It is four kilometres to the forest at the top of the steep hill. There you will have to collect enough fallen branches to make a fire to cook your family's food.

Write a story on going to collect the wood and bringing it back every day after school.

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 28 and 29** of *Caring for our Environment*

Answers

This will depend on the story each student writes. But answers might include:

- **How much time it takes to get there and back.**
- **How heavy the wood is to carry (i.e. several kilos).**
- **How there is less and less wood to collect.**
- **How there is little time for play or even homework when wood collecting has to come first.**
- **How the land looks more and more bare and more and more eroded.**

Notes

This is a very important topic, but as it introduces people and lands that will be unfamiliar to the students, you may need to give it some preparation in terms of locating a suitable place. If you want to use the location on which this diagram is based, then it is in hill lands of Kenya about midway between Mombasa and Nairobi. It is called the Sagalla Hills.

The key thing is to show students how having little money alters one's entire perspective about energy and where to find it. They can also see that trying to get energy results in many other parts of the environment being affected, causing further hardship. For example, deforestation causes soil erosion and ultimately loss of fertility, lower food yields and a less healthy society.

Name:..... Form:.....

Based on **pages 30 and 31** of *Caring for our Environment*

Saving water

Most people do not know that there are many easy ways to save water.

Here are 25 ways to save water. Choose 5 of these and make up a poster to help the people in your home know how easy it is to save water.

1. Run the dishwasher and the washing machine only when they are full.
2. Don't pre-rinse dishes before loading the dishwasher.
3. When you only have a few things to wash, wash dishes by hand.
4. Wash vegetables and fruits in a bowl, not in a sink with running water.
5. Put used water on plants, such as water used to clean vegetables. (But do not use water with detergent in it.)
6. Steam vegetables instead of boiling.
7. Chill drinking water in the refrigerator instead of running the tap until the water is cold.
8. When you buy a new dishwasher, choose it for its water saving and energy saving values.
9. When you buy a new washing machine, choose it for its water saving and energy saving values.
10. Stop any leaking taps or leaking toilet flushes.
11. Turn off the tap when brushing your teeth.
12. Use a shower, not a bath, and keep showers short.
13. Put a brick in the toilet tank to cut down the amount of water in the flush.
14. Fix leaky hoses and hose connections in the garden.
15. Use a sprinkler head that gives large drops instead of a fine mist. A fine mist evaporates more quickly.
16. Use a drip irrigator rather than a sprinkler.
17. Water during the coolest time of the day to reduce evaporation.
18. Let the grass grow. Taller grass shades the soil and less water is lost from it.
19. In a drought, first water trees and shrubs, then perennials and annuals last. Leave the lawn to go brown.
20. Add a mulch on the soil to keep it from losing water.
21. Choose plants that will stand up to a dry spell without wilting (e.g. golden rod, thyme, rosemary, lavender, salvia).
22. Buy a rain barrel to catch water from your gutter for watering your plants.
23. Cover a swimming pool when not in use.
24. Fill the pool less than normal.
25. Only use car washes that use recycled water.

Answers, Notes, Background

Based on **pages 30 and 31** of *Caring for our Environment*

Answers

This will depend on student choices: see notes.

Notes

The idea of communicating basic science ideas is carried forward in this worksheet in the form of a poster that will help other members of the family remember how easy it is to save water at home.

Students can choose the ideas they think would work best and use them. In making their choices, students will have to look at all of the choices and then filter them based on their home circumstances. They may need some help with this.

Students should also notice that the poster is meant for home use, and so needs to be friendly. For example, it is better to use a decoration of flowers than a formal warning of the kind you might find displayed publicly.

Students could also think up a slogan such as "use washing up water to give the plants a drink during a dry spell", "a shower a day keeps drought away", "when you brush, the tap should be hush", or something else fun but memorable. See what your students can come up with.

Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: How much?

Every day we throw away enough rubbish to fill Trafalgar Square in London to the height of Nelson's Column.

The diagram below shows Trafalgar Square. Draw in rubbish until it is filled to the height of Nelson's Column.

Answers, Notes, Background

Based on **pages 32 and 33** of *Caring for our Environment*

Answers

This depends on the drawing skills of the students.

Notes

The purpose of this activity is to take a very familiar and large open space and then show the magnitude of our rubbish problem (but note this does not include commercial rubbish).

From this, students can understand a number of things:

- They can get a sense of the magnitude of the problem on a meaningful scale.
- They can focus on the whole business of rubbish and how to cart it away.
- They can imagine the amount of landfill that needs to be found in order to get rid of it.

It is important to note that the volume of rubbish depends on how much it has been compressed, so the idea of filling Trafalgar Square is only intended to give an idea of the scale of the problem. But students can immediately understand the sense in compressing rubbish before it is transported – and so they can see the purpose of the squashing ram in the back of dustcarts (link to technology) and they could see the sense in trying to reuse some of it.

This activity sets the scene for more detailed consideration in subsequent worksheets.

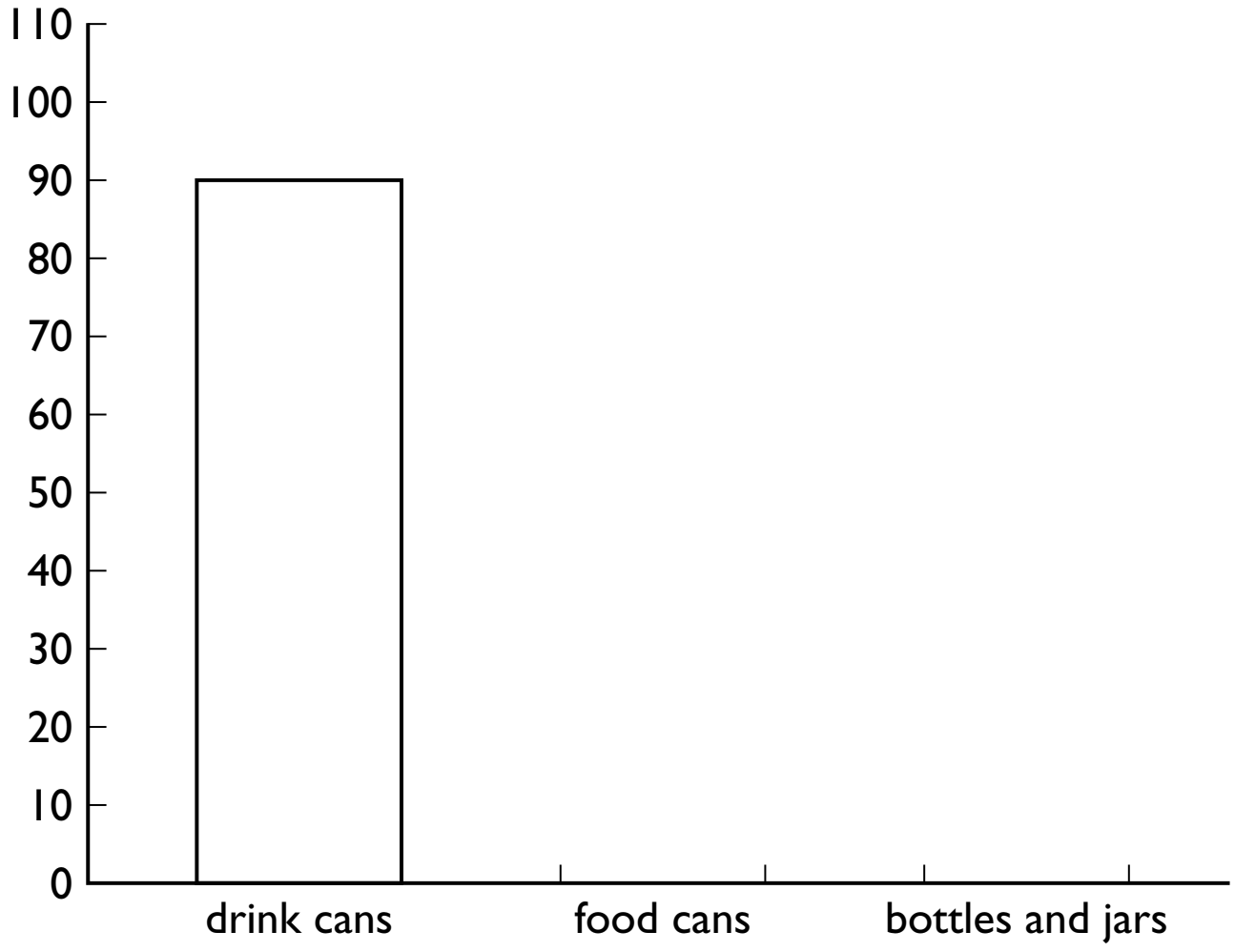
Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Ourselves

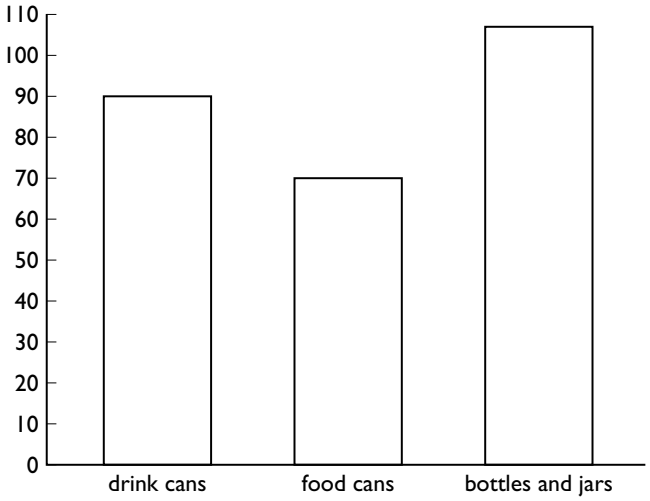
We each use many things that are sold in cans, bottles and jars. All of these can be recycled.

In the space below, complete a bar chart of these facts. One bar has already been done for you. Each year, each of us uses, on average, 90 drink cans, 70 food cans, and 107 bottles and jars.



Answers

The completed bar chart should look like this:



Notes

This cross-curricular activity uses simple mathematics charting to show the amount of various categories of waste that we each create.

To give students some idea of the volume of each type of waste, see how many of each type of waste are needed to fill a waste bin in class. Then discuss the recycling bins that are found in public places and why they are placed publicly, rather than have the recyclables collected from each household. This can create a little more mathematics. If we get through 107 bottles and jars a year, how many do we get through in a week? The answer is about 2. But a household may have several people in it, so the total per person needs to be multiplied by the number in the household.

All the same, the volume per household is small and so it is better to wait until the volume has built up. Then it is most convenient to take bottles and jars to the bottle bank where we can enjoy listening to them smash up as they are dropped.

Why do we want to smash them up? To reduce their bulk so we can fit more in each bin.

Cans do not break in this way, but we can reduce their bulk by squashing them. Many councils also collect recycling from homes if it is put in the recycling boxes provided to householders.

Extensions

You can go on to look at how we might store the waste cans and bottles until we have enough to recycle. Some people keep a number of small dustbins next to the main bin for this purpose. This keeps them tidy and out of harm's way.

Students could do an audit to find out how many of their families recycle and how they do it in an average week. It would also show how many people do not recycle.

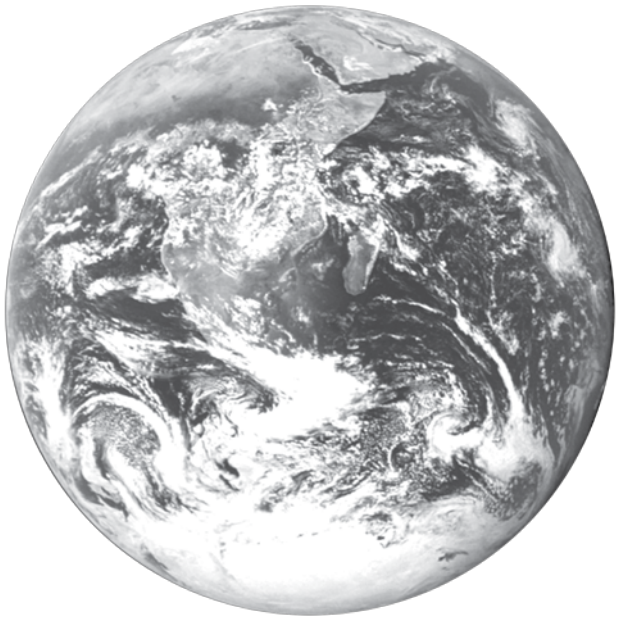
Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Seeing how far it stretches

In the UK, around seventeen billion cans of all shapes and sizes are thrown away each year.

Every year we throw away enough cans (mainly of steel and aluminium) so that, if placed end to end they would stretch to the Moon and back nearly three times! Add the cans to this diagram and then write a slogan below to point out to people what a waste this can be.



Answers, Notes, Background

Based on **pages 32 and 33** of *Caring for our Environment*

Answers

This depends on the drawing skills of the students.

Notes

As we continue to think about waste, we can also show how advertising the scale of the problem can be both interesting and useful.

Students can be asked to show the same thing another way.

For example, the Moon is nearly 390,000 km (390 million metres, 39,000,000,000 cm) from the Earth. If a can is on average 13 cm long, it would need 3 billion cans to reach to the Moon. (So, 17 billion cans is nearly 6 times this amount, and therefore nearly three times to the Moon and back.)

The Earth has a circumference of about 40,000 km, about a tenth of the distance to the Moon. So we can say approximately that the cans would wrap nearly 30 times around the Earth.

This is an excellent example of transforming dull numbers into something more meaningful.

Students might like to make a drawing of the cans wrapped thirty times around the Earth and write another caption for an advertisement to encourage recycling.

Extensions

You can also think about how long it would take a person to collect up all of these cans, assuming that they could collect the cans at about 3 km an hour.

Students could divide 40,000 by 3 and find an answer of 13,000 hours. Then they could say that, supposing a person walked for eight hours a day, they would need 13,000 hours divided by 8, which is approximately 1,700 days, or five years!

It is also a good time to point out that we do not need exact answers here because we are only making a point of principle. Students could therefore be made aware of how it is sometimes useful to round up figures, rather than ending up with unreal exact numbers from using their calculators.

You should be able to think of lots of other amusing transformations.

(Note that these calculations depend heavily on the average length of can and the figures shown here are chosen to make the mathematics easy, so it is best to treat the real result as simply ‘very large’. Very able students could find the average length of their drink cans and recalculate the data above.)

Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Packaging

A quarter of what we throw away is packaging.

What are the main types of materials used for packaging?

✎ .....

✎ .....

About a quarter of everything an average household throws away is packaging.

Why don't the contents of the packages go into the bin?

✎ .....

✎ .....

✎ .....

Why does it matter that we throw packaging away?

✎ .....

✎ .....

✎ .....

✎ .....

Why can't the rubbish collectors deal with this for us?

✎ .....

✎ .....

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 32 and 33** of *Caring for our Environment*

Answers

1. **Glass, metal, paper and cardboard and plastic.**
2. **Because they are either reusable goods like radios and cutlery (which we keep), or we consume them, such as cornflakes and baked beans.**
3. **Because it means we have to find new packaging materials from the ground or from trees and we have to spend energy doing this. We also have to find landfill sites to put the waste in.**
4. **Because once mixed the materials are hard to separate and may be contaminated by decaying food and other substances. This is why it is essential that we separate out the materials and put them out separately for collection.**

Notes

This comprehension exercise tests whether or not students have understood the main concepts of waste disposal.

They need to have understood that it makes sense to separate out waste while it is still clean and so easy to do so. If homes had several small bins instead of one large one, they could throw paper, plastic and metal into separate bins. Then only mixed materials would have to go to landfill or incinerators.

Environmental services cannot easily separate out our rubbish because by then it is contaminated with food. They also do not know how much of a health hazard it might be. That is why the materials we want put out separately have to be clean. Ask students how they would like it if they had to pick up dirty bottles and cans? It takes only a few seconds to rinse a container before throwing it into its proper bin.

This also gives a chance for students to think how simple the idea of creating clean, separated waste really is.

Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Glass recycling

Used glass is easily recycled when mixed with new glass.

On the back of this sheet of paper, make up a diagram which shows how glass is recycled. You should include all of these facts:

1. Glass is collected from the bottle banks.
2. In the glass collecting factory, metal caps and other unwanted materials are removed.
3. The glass is crushed and then taken to the glass works.
4. It is hard to make new glass from only old glass, so some of the crushed glass is mixed with the sand, limestone and soda ash used to make new glass. All of this is heated in a furnace.
5. The molten glass is poured into moulds to make new bottles and jars.
6. The bottles and jars are filled with produce.
7. The filled bottles go to shops.
8. We buy the bottles, then take the empties to the bottle bank for recycling.

Answers

This depends on the skills of the students. They could choose to represent each stage by a symbol, for example a red square for a factory, a green circle for a bottle bank. Arrows on the diagram should show the flow of actions.

Notes

Glass is not the major item we throw away, making up only 9% of domestic waste. However, it is an easy material to recycle, with about 500 bottles and jars being used per household per year. Our recycling record for this is not too bad at 25%, but could clearly be much better as it is easy to find one of the 22,000 bottle banks that are dotted around the UK.

Children might like to guess how many bottles and jars a bank can hold before it is full. The answer is about 3,000. You could also discuss why a tall, deep container is better than a wide shallow one (the distance needed to drop to break the glass). You could also discuss why the bank fills up slowly to begin with and much faster as it fills (the top ones do not break and so use more volume).

Because of recycling, about a quarter of the glass in every new bottle is recycled material. Clear glass bottles contain the least recycled glass because using coloured glass will affect the colour of new clear glass. A green glass bottle can contain more recycled glass because the colour from the recycling does not matter as much, so some 60% can be of recycled glass.

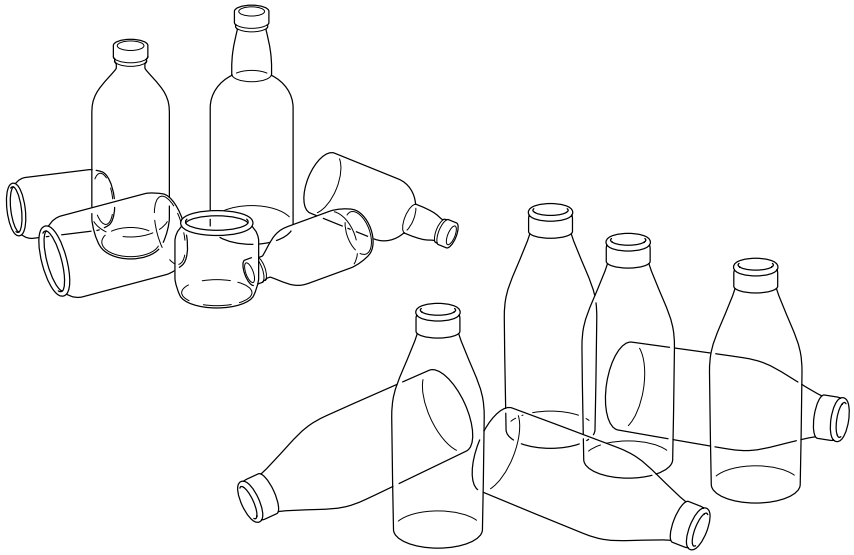
Also, students should know that design helps in reducing the usage of resources. In the past, bottles and jars were overdesigned and so were made thicker than they needed to be. Now, with computer-aided design, they use 30% less material and are therefore 30% lighter to carry. So both us and the environment win. This is an excellent example of science and technology put to good use.

Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Reusing glass jars and bottles

Some things can be reused without having to be made again.



Collect as big a range of glass bottles and jars as you can. Make sure each one has been cleaned out thoroughly.

Now make two collections. On one side place the bottles and jars that could be reused and on the other side those that need to be recycled (broken up and remade). You should carefully think through why you have made your choice.

Write down here what made you choose the collection for reuse.

✎ .....

✎ .....

✎ .....

Write down what made you choose the collection for recycling.

✎ .....

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 32 and 33** of *Caring for our Environment*

Answers

These will vary between students. The main thing to look out for is that there has been logic and consistency in choice of criteria.

Notes

There are two kinds of recycling: reusing the object and recycling the object as a new material.

Students should collect a number of different kinds of glass containers and see which can be reused as objects and which can only be recycled as glass.

The main point for discussion will be the criteria used for dividing the bottles and jars into two groups. Many students may believe that everything needs to be smashed up to be reused. But this is, of course, far from the case. You may wish to get them to think about what food containers in the home are washed up and reused regularly instead of being thrown away. The answer will include all table glassware, crockery and cutlery and pots and pans. So we are used to reusing objects, and many people who make jam, for example, will treasure and reuse glass jars for this purpose.

The most obvious example of a reusable item is a glass milk bottle. Because it takes a lot of energy to make new bottles from recycled glass, but very little energy to reuse bottles (other than sterilising) reusing is the best way of all.

So students should see that returning milk bottles to the milkman or shop makes sense.

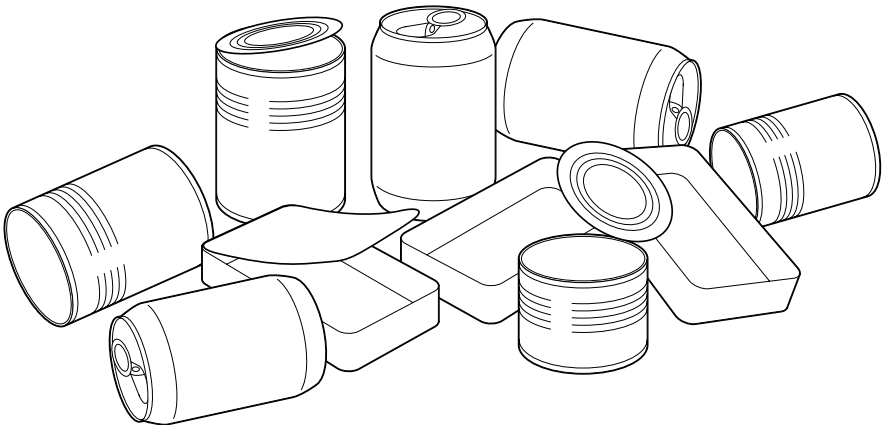
But why can't wine bottles be used in the same way, you might ask. The answer is that the bottles are all sorts of shapes and sizes and they usually come from overseas, whereas milk bottles can be returned locally and they will all be of one of two shapes.

Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Steel recycling

Steel is a very strong material that can easily be bent into new shapes. It can also be recycled.



Collect as many empty cans as possible. Try to find soup cans, fizzy drink cans and other food cans including pet food cans. They should be thoroughly clean and not have any sharp edges.

Sort the cans into steel ones and those made of other materials (mostly aluminium). You need to think of an easy and reliable way of doing this (hint: think of magnets).

✎ .....

✎ .....

Write down the number of cans made from steel here.

✎ .....

Write down the number of cans made from other materials (aluminium) here.

✎ .....

Is steel the most common material used for cans?

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 32 and 33** of *Caring for our Environment*

Answers

This is an opportunity to show students how to sort materials by using science. They should not rely on sight or weight because, although steel is more dense than aluminium, steel cans are thinner walled than aluminium ones. They should conclude that the most reliable way is by using a magnet. If the magnet sticks to the can, it is steel.

In general, their answers should show that steel (coated with tin or teflon or both) is more common than aluminium.

This will depend on the cans the students have brought in.

You can extend the activity by getting the more able students to work out the proportion of steel to other cans (nationally it is 3 steel cans to 1 can of other materials).

Notes

Students may need to be guided away from the idea that steel is heavy and comes in thick slabs. Modern steel used in cans is very thin and strong. And modern cans contain about 40% less material than they did in the late 1980s. As a result, they are cheaper to produce because they use a smaller quantity of materials and also less energy is needed to make a smaller amount of steel.

Steel has to be protected from liquids in case it rusts. Get students to look at the inside and outside and see what coatings are used.

Steelmaking is a less energy intensive process than aluminium smelting and so it requires less energy to make a steel can than an aluminium one. As a result, the more cans there are made of aluminium, the more extra energy consumed (and the more greenhouse gases produced and the more the impact on global warming).

Recycling steel uses only a quarter of the energy needed to make steel from iron ore.

Around 13 billion steel cans are used in the UK each year. If each can was 13cm long, 3 billion cans would stretch to the Moon and 13 billion cans would stretch there and back more than twice. (See also page 79.)

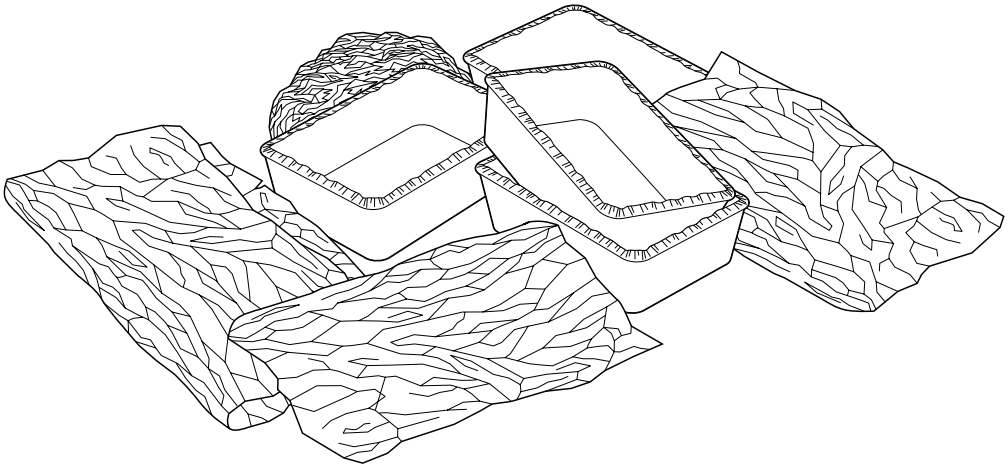
Steel will be collected by rubbish trucks if put in a recycling bin by the kerbside.

Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Aluminium recycling

Aluminium is the most recycled packaging material in the world.



Aluminium is used for drink cans, but it is also used for other kinds of food and drink packaging, Can you name some?

Although six out of ten drinks cans are made from aluminium, four out of ten are made from steel.

As a class, collect a number of cans and then test each one with a magnet. A magnet will be attracted to a steel can, but not to an aluminium can.

Now make two piles of cans of the same size. One pile should be aluminium cans. The other pile should be steel cans. Weigh the two piles. Now can you think of another test to separate aluminium from steel?

✎ .....

✎ .....

Now you have finished with the cans, what should you do with them?

✎ .....

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 32 and 33** of *Caring for our Environment*

Answers

1. **Fast food containers, aluminium foil for wrapping food, and so on.**
2. **Steel weighs more than aluminium, so another test would be weight. However, this is less practical than using a magnet because both kinds of can seem to weigh about the same when held singly.**
3. **Take them to a recycling centre and put them in the correct bin, don't just put them in the rubbish!**

Notes

Aluminium is a very common element but requires a large amount of energy to extract it from the rocks it is found in. Until this technology was available, aluminium was amazingly expensive. It was used instead of gold as the setting for expensive jewellery in the late 19th and early 20th century.

When a relatively cheap means was found for extracting the metal from its ore the price fell, but it is still more expensive than steel.

It has many specific uses, such as electricity cables and drink cans. Most electricity cables in the home are copper, but those under the street and hanging between pylons are aluminium. Aluminium is more plentiful and cheaper than copper.

About six out of ten drink cans are made from aluminium. Because aluminium requires a large energy input to make, it is a particularly sensible material to recycle.

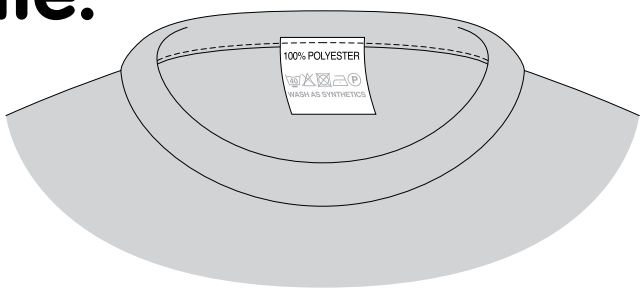
Recycling aluminium uses only 5% of the power needed to make aluminium from raw materials. Aluminium packaging accounts for just 2% by weight, but 50% by value, of the materials collected for recycling. The aluminium can is the most recycled drinks package in the world.

Aluminium drink cans are very thin – just 0.3 mm thick.

Name:..... Form:.....

Based on **pages 32 and 33** of *Caring for our Environment*

The waste we create: Clothes recycling



Clothes can often be reused as well as the material recycled.

Q1. What do you do with old or worn out clothes?

✎ .....

Q2. What are clothes made from? Look at the labels of some clothes, such as a jumper you might be wearing, and write down the materials?

✎ .....

Q3. Some clothes are made from wool, others from cotton and a few from silk. Almost everything else is made from oil. Do you think you can recycle all of these materials in the same way?

✎ .....

✎ .....

Q4. What is the difference between recycling and reusing clothes?

✎ .....

✎ .....

✎ .....

Q5. Would you want someone to reuse a jumper you have thrown out because you have grown too big for it or should the material be recycled?

✎ .....

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 32 and 33** of *Caring for our Environment*

Answers

1. **Depends on the student. It might be helpful to make a chart of what everyone in the class does.**
2. **This is an opportunity to look at different materials and their uses. Many clothes are made from polyester or acrylic. Both of these are synthetic fibres made from oil. Other common clothing materials are cotton and wool, both natural materials.**
3. **As with other categories of waste, mixed rubbish is almost impossible to deal with.**
4. **Reuse of clothing means to find a new owner for the same product. This requires no extra energy in remaking the product. Recycling clothing means to use the material as a material, taking no account of what it was made into.**
5. **You would want someone to reuse it. Many such items can be extremely useful to poorer people and those in the developing world. This is because we often throw out clothes before the article is entirely worn out. Reuse of clothes is quite different to, say, a used drinks can which has no reuse value.**

Notes

This is a very different topic area from the others in this book. In almost all other cases the waste we create is recycled because the items have no reuse value.

In this case, because the clothes we throw out have not usually been totally worn out, and because buying new items is very expensive, it is usually practicable to have them reused.

Reused clothing can carry quite high values for waste materials, as second hand clothing stores show.

You could extend this to a consideration of some developing countries and how people make good use of the small amounts of money they get.

For reference, it takes about 8 litres of crude oil to make about 1kg of clothing made from synthetic material. However, as the total clothing manufacture using oil is small compared to other uses of oil, it is best not to concentrate on the resource being used up, but rather on the best use unwanted clothes can be put to.

Name:..... Form:.....

Based on **pages 34 and 35** of *Caring for our Environment*

What can we do with plastics?

Plastic is used in many types of packaging.

Find out the main types of plastic that are thrown away. To do this at home, arrange to collect all of the plastic that would have been thrown into the waste bin for two days, and make sure that it is thoroughly clean.

Sort the plastic into (a) bottles; (b) wrapping materials; (c) other plastics (put plastic bags here).

Weigh each kind and write the answers here (a) ..... gm: (b) ..... gm; (c) ..... gm

✎ .....

In the space below, make a chart of these results.

Answers, Notes, Background

Based on **pages 34 and 35** of *Caring for our Environment*

Answers

This depends on what is collected. Students may need some assistance in weighing and also in creating a bar chart.

You may feel that you should do all of the weighing in class to ensure accuracy. Also, students can see that they have each collected some different things. You could then discuss the idea of using everyone's collections of waste together to produce a better sample for making the charts.

Notes

Very large numbers of plastic bottles are used every day: about 3 bottles a week for everyone in the country (57 million in the UK).

Each recycled plastic bottle saves about the same energy as used by a 100W bulb over three and a half hours. (Making plastic is an energy-intensive business.)

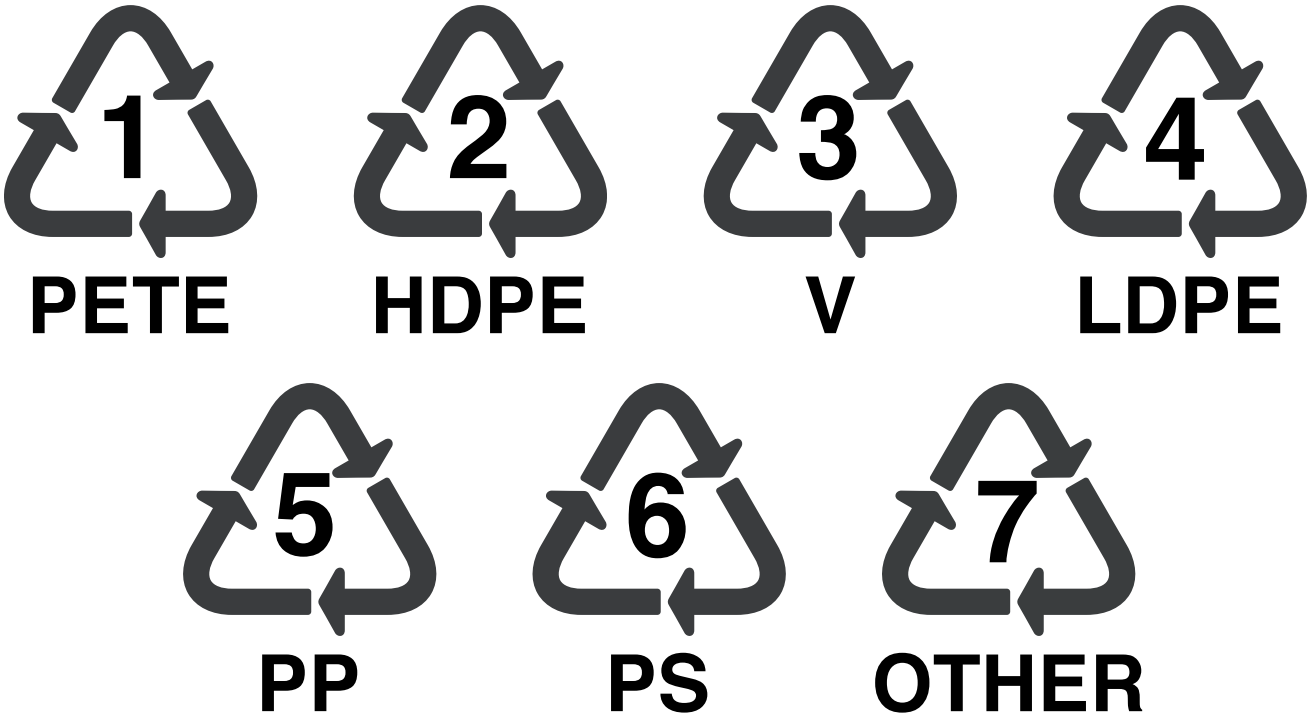
Many plastics can be used for a surprising range of uses, for example, 25 recycled soft drink bottles can be turned into the lining for a fleece jacket.

Name:..... Form:.....

Based on **pages 34 and 35** of *Caring for our Environment*

Plastic recycling labels

Most plastic packaging is now labelled to help recycling.



Using the pile of plastic you collected in the previous activity, look for the recycling label. It will look like one of the symbols shown above. If it doesn't have a label, put it to one side.

Now look at your pile of unlabelled items. Most plastic bags are LDPE, so add these to pile (4). Cling film is usually LDPE as well so add this to pile (4).

Look at the others. Does a lack of labelling make it hard to recycle it?

✎ .....

Weigh each pile and write the answers here:

(1) ..... gm: (2) ..... gm; (3) ..... gm; (4) ..... gm; (5) ..... gm; (6) ..... gm; (7) ..... gm.

Make a chart of the results on the reverse of this sheet.

Answers, Notes, Background

Based on **pages 34 and 35** of *Caring for our Environment*

Answers

This will depend on the plastic collected by each student.

This activity should be done in conjunction with the previous activity so that you do not end up with two lots of waste to dispose of!

Notes

This is an extremely important activity.

For the first time, students will notice the labelling on many packages and they will begin to understand that there are many kinds of plastic. Because many plastics look so alike (but have very different properties) they will then begin to understand the need to sort the material.

They will also begin to see the most common types of plastic in items thrown in the bin. Of course, plastic is used more widely than this, but material in the bin is an indication of what is most often thrown away and wasted.

Try to find a reason for including such items as plastic dinner plates, plastic knives and forks and so on, as used in aircraft meals, many canteens and the like. Get students to discuss if there is any alternative to this. (Plastic in aircraft meals has been reintroduced after terrorist attacks, so a whole range of wider issues can be discussed if you wish).

Name:..... Form:.....

See **pages 36 and 37** of *Caring for our Environment*

Making use of paper

If we did not recycle our paper we would put six trees in our waste bins each year.

Q1. Write down some of the ways we use paper.

✎ .....

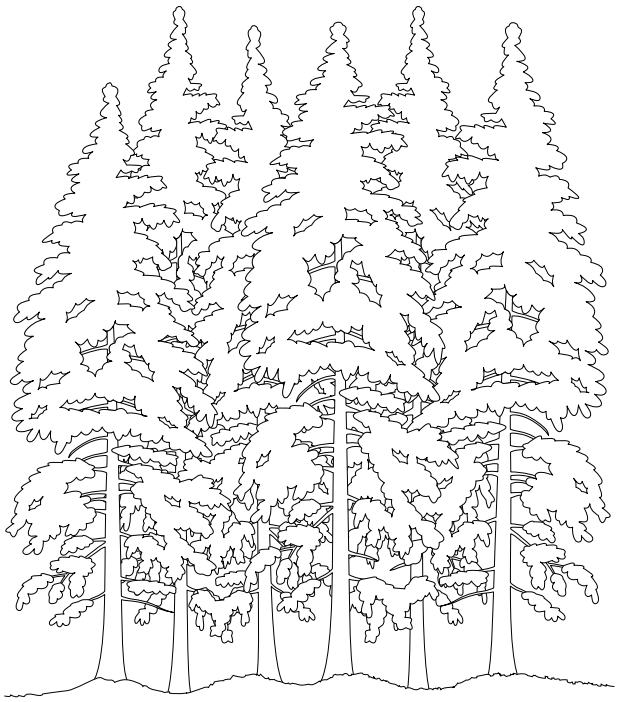
✎ .....

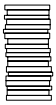
✎ .....

✎ .....

✎ .....

Q2. Make a drawing to show that the paper each home uses up, on average, is equal to six trees. You could draw piles of paper in stacks. One such stack has been started for you.





Answers, Notes, Background

See **pages 36 and 37** of *Caring for our Environment*

Answers

1. **In books, as writing paper, in packaging, paper towels, and so on.**
2. **This depends on the drawing skills of the students.**

Notes

Here students may need some assistance to see that they could draw piles of paper stacked in columns and this means they need only to represent them with horizontal lines. One such stack has been started.

The size of this stack may seem surprising to many students. It is not a reason to stop using paper, however, but to consider the benefits of recycling and also the way that forests are sustainably managed.

This could lead on to a discussion of stewardship and the environment. If we recycle as much as possible we do not need so many forests for paper but, if we replant what we have cut down, then the situation is not so bad.

On the other hand, burning used paper instead of recycling it would be like setting forests on fire. This would also add carbon dioxide to the air and add to the greenhouse effect and global warming.

So here we have an excellent example of how recycling cannot only keep piles of rubbish from building up, but can help protect the air as well. That is, students can see how doing one thing can affect a surprising range of other things in the environment.

Name:..... Form:.....

Based on **pages 36 and 37** of *Caring for our Environment*

Making use of paper: Saving forests

If we simply throw paper away, we need to grow trees to replace it. The size of the forests needed for this is amazing.

The UK uses a forest the size of Wales every year in paper. Use an atlas to find out where Wales is and draw on to this diagram the border between Wales and England. Finally, draw and then colour a forest covering Wales.

Answers, Notes, Background

Based on **pages 36 and 37** of *Caring for our Environment*

Answers

This depends on the drawing skills of the students.

Notes

This is another excellent example of making numbers more meaningful to people at large.

In this case we are using the figures to make a spacial comparison.

Students can combine basic geography and facts about their country, mapping, conservation skills.

Extensions

You may want to redraw these facts into another form. For example, how much of Ireland would be covered? For this you would need to get students to draw in the rest of Ireland, again using an atlas.

- How much of Scotland would need to be covered?
- How much of England?
- Wales is 21,000 sq km.
- Northern Ireland is 14,000 sq km.
- Scotland is 79,000 sq km.
- England is 130,000 sq km.

The fact that England has much less forest than other places in Great Britain (England has about 3% of the land under forest) can be used to illustrate the fact that we have to import most of our timber. This can then be used to show the impact that we have on other countries by importing timber.

You may wish to give the advantages to other countries of this. We buy wood and so have to pay money, which is good for them (and economically not so good for us).

Name:..... Form:.....

Based on **pages 38 and 39** of *Caring for our Environment*

Environmentally friendly materials

An environmentally friendly product is one that does not harm the environment while it is being used or when it is thrown away.

Find these things: A wooden kitchen spoon

An electronic calculator

A cup

A lunch box

Now add some others:

✎ .....

✎ .....

To be environmentally friendly, an object has to be able to rot away in the ground or to be easily recycled.

Fill in this table for each of the objects you have collected.

Object	Does it rot away in rubbish?	Can it be easily recycled?
Wooden spoon		
Calculator		
Cup		
Lunch box		

Answers, Notes, Background

Based on **pages 38 and 39** of *Caring for our Environment*

Answers

This depends in part on exactly what the objects are made from.

The point is to show that some things are naturally environmentally friendly. A wooden spoon will rot away and can also be recycled as wood.

A ceramic cup cannot be recycled and will not rot, but it is mostly made from clay and so will cause no harm in a landfill.

A lunch box may be made entirely from one plastic (check the symbols on each part) and thus it can be recycled even though it will not rot in a rubbish tip.

A calculator is a complex manufactured item. They contain many plastics, ceramics and metals and so are not environmentally friendly products (this applies to all electronic products).

Notes

There are several kinds of environmentally friendly products. Some are made of materials that dissolve, as shown in the class book, while others can be disassembled and their different components recycled individually.

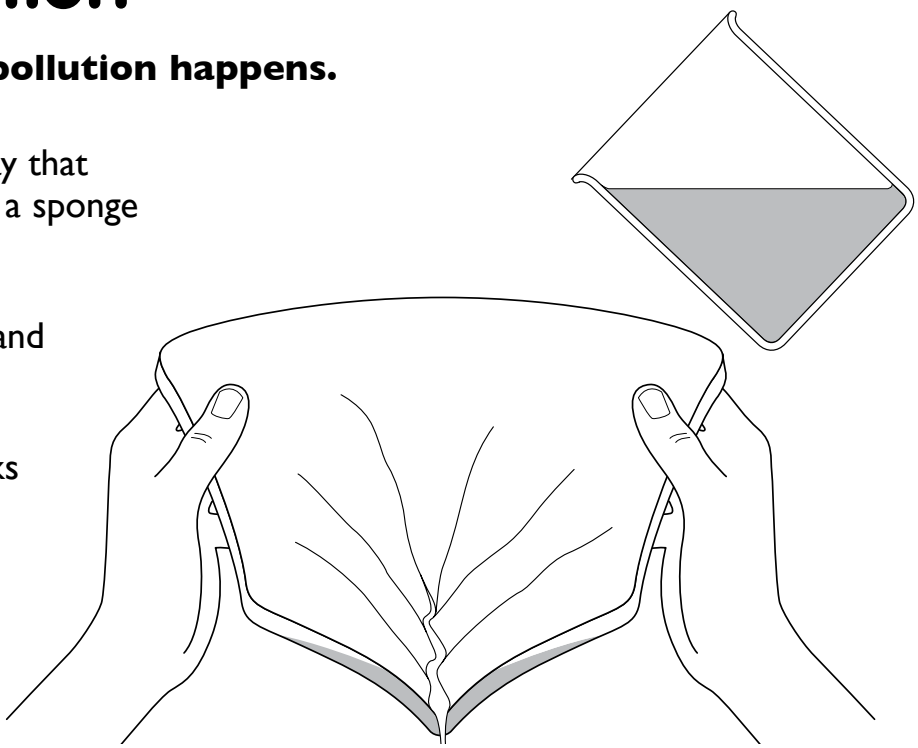
But at this moment, the scope of these materials is limited and so it may be easier for students to consider whether it is environmentally friendly in principle and how it might be made more so.

Name:..... Form:.....

Based on **pages 40 and 41** of *Caring for our Environment*

Water pollution

Find out how water pollution happens.



You can investigate the way that pollution spreads by using a sponge and some food colouring.

Get a large sponge sheet and wet it.

Now fold it so that it looks like a river basin.

Now add some food colouring to a jug of water. The colour needs to be really strong, so use lots of dye and just a little water.

Drip the coloured water onto the sponge somewhere near the top edge. This would be the same as if, for example, a home sent its sewage straight into the ground.

Now watch the coloured water and write down what you see.

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

Answers, Notes, Background

Based on **pages 40 and 41** of *Caring for our Environment*

Answers

These depend on the set up. However, students should notice that the dye spreads out from the place where it was dripped. That is, contamination spreads away from a point source. Taking any water from the soil near to this point would be dangerous if the source of pollution were sewage as chemicals, for example, and this has been the traditional cause of many illnesses.

Students should also see that the pollution eventually gets through the sponge and begins to flow out of the bottom of the sponge (i.e. it has contaminated the river).

So here are two reasons for not allowing the soil to be contaminated. It is not just direct tipping into water courses that causes pollution.

Notes

In this activity, students discover that water pollution often moves through the ground and that disease and toxic chemicals can be transferred by water through soil and rock.

The connection between sources of water and water disposal are emphasised.

You can connect this with topics such as the spread of disease. These are more fully covered in *The Water Book*, which is part of the *Curriculum Visions* series.

You will need a large sponge sheet and a sheet of plastic, some food colouring or other soluble dye, a jug or other source of water and a tray to collect the water that drips.

Name:..... Form:.....

Based on **pages 42 and 43** of *Caring for our Environment*

Oil pollution

What might it be like to find oil pollution on your nearest beach?

Imagine you are one of the people shown on page 43 of the book.

Write a diary below, saying what your problems were and what success you had on the first day after an oil slick reached the beach.

Tuesday

The oil slick that we heard about in the news reached our beach today. We all rushed down to look and to see what we could do. The smell was horrible and made us feel sick.

Then we saw black shapes moving on the beach. They were birds all covered in thick black oil…

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

✎ .....

Notes

Making up a diary will help students to think about the extent of the damage caused by oil slicks. It involves an understanding of how to deal with oil, from beach clean up, to animal rescue, to getting government to help, to getting the press involved to publicise the problem, to thinking about the effects on tourism.

You may find that it is easy enough to get data about oil spills from the Internet. Go to a search engine and type in "Oil pollution". There are many famous oil spill pictures, including the Exxon Valdez used in the book.

Name:..... Form:.....

Based on **pages 42 and 43** of *Caring for our Environment*

Oil pollution

Oil can be difficult to clean up.

For this activity you need some thick, dark oil, for example, used engine oil (or cooking oil with food colouring mixed in), a few pebbles, a glass bowl and water.

Fill a bowl a quarter full with water and then add the pebbles and pour in some oil.

Write down what happens.

✎ .....

✎ .....

Now rock the bowl to and fro. This will stir the oil and water just like the sea might. Try to get the engine oil out of the water. Write down your results here.

First I tried ✎ .....

✎ .....

Result ✎ .....

✎ .....

Then I tried ✎ .....

..

✎ .....

Result ✎ .....

✎ .....

Notes

This activity is designed to show dramatically how difficult it is to get oil out of water.

You may want to provide students with rubber gloves for this practical.

They should try scooping any floating oil from the water. Then they should try pouring in some detergent. They may also think of some other ways to get the bowl and the pebbles clean.

At the end they will have realised that, although oil and water do not mix, oil sticks to the bowl and pebbles and cannot be removed by using water alone (it is immiscible). This links to the dissolving science curricula.

Name:..... Form:.....

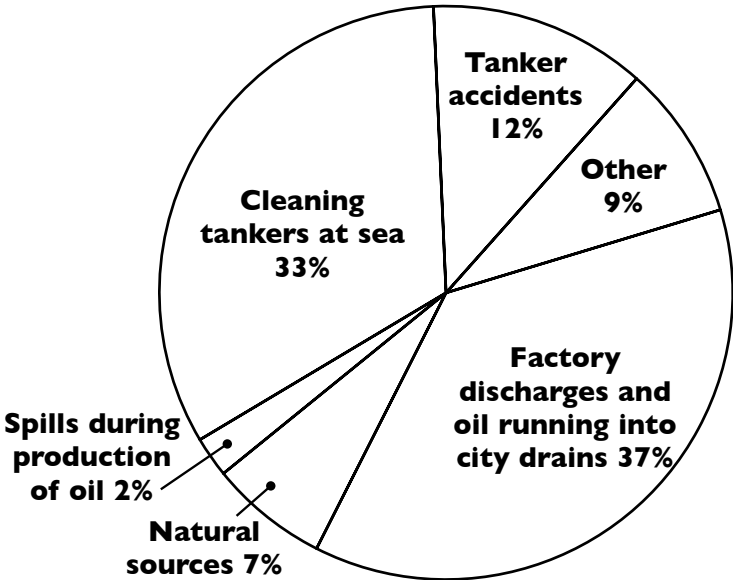
Based on **pages 42 and 43** of *Caring for our Environment*

Oil pollution

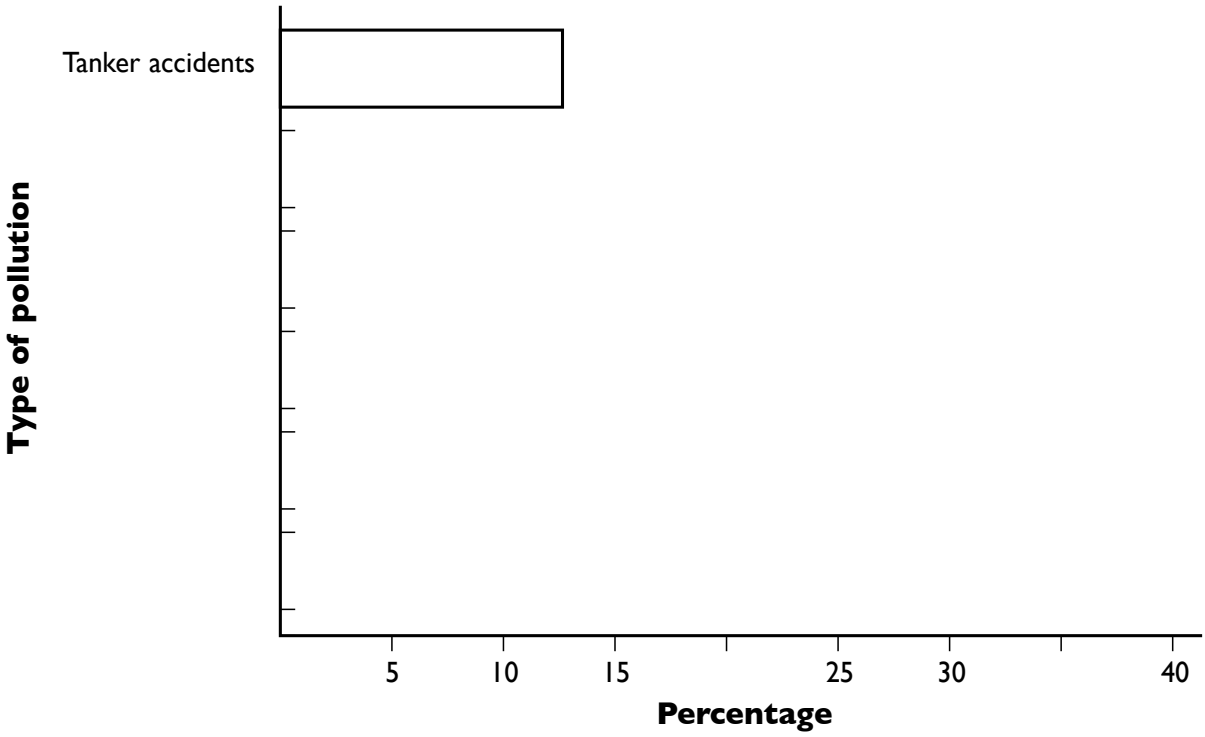
There are many causes of oil pollution.

The diagram above is called a pie chart because it looks like a pie you might bake. It is divided into slices showing what causes oil pollution.

Write the information out as a table below.



Now make this information into a bar chart below.
The first bar has been done for you.



Notes

This worksheet is a test of manipulating information from one type of presentation to a table and then on to another kind of presentation. It is a cross-curricula link with mathematics.

Name:..... Form:.....

Based on **pages 44 and 45** of *Caring for our Environment*

Air pollution

Air pollution is unseen, but it causes great damage.

The table below shows how much nitrogen pollution was recorded in 2003 at various places.

Find the five places with the highest pollution and mark them on a map in a colour.

Find the five places with the lowest pollution and add them to your map in a different colour.

Are big cities more polluted than small towns?

✎ .....

Annual average (parts per billion) nitrogen pollution 2003			
Place name	**Annual average**	**Place name**	**Annual average**
Aberdeen	16	Exeter kerbside	21
Bath roadside	31	Glasgow centre	26 (1990: 26)
Belfast centre	17	Glasgow kerbside	41
Billingham	17 (1990: 21)	Harwell (Oxon)	8
Birmingham	18	Hull	18
Blackpool	13	Inverness	12
Bolton	19	Leeds centre	40
Bournemouth	12	London centre	40
Bradford centre	20	London roadside	56 (1990: 42)
Brighton roadside	23	Manchester centre	24 (1990: 28)
Bristol centre	20	Newcastle centre	17
Bury roadside	39	Northampton	13
Cambridge roadside	24	Norwich centre	13
Camden kerbside	34	Norwich roadside	17
Canterbury	11	Plymouth centre	15
Cardiff centre	19	Sheffield centre	21
Derry	8	Stoke-on-Trent centre	16
Dumfries	20	Swansea	18

21 Answers, Notes, Background

Based on **pages 44 and 45** of *Caring for our Environment*

Answers

To be mapped.

Notes

You will need a map of the UK. Students can either have their own maps or you can add places to a map shown on your whiteboard. You may also use the map given on page 98 of this teacher's guide.

The figures show mean annual nitrogen pollution (in parts per billion).

You may care to use this information (which comes from the UK Air Quality National Information Archive) to help in geography studies in finding out where places are in the UK.

You may also care to enlarge a map of the region around where you work and add more towns from the table.

The figures are from 2003, except for those in brackets, which are for 1990. More able students should be able to tell whether pollution has gone up in the last 13 years (note there were many fewer monitoring stations in 1990 than there are today).

You may also care to get more able students to rank the places in the table and even make a column chart of the ranked results with the height of the column being the amount of pollution.

Ask children to notice the difference between kerbside values and values taken elsewhere (usually at a monitoring site away from the road). What can they deduce about pollution close to a road and therefore what causes it?